

**A PROCESS EVALUATION OF NEWLY IMPLEMENTING SOUTH AFRICAN
ROADSIDE WELLNESS CLINICS FOR TRUCK DRIVERS**

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Johannesburg, June 2018

DECLARATION

I, Samanta Tresha Lalla-Edward, declare that this thesis is my own work. It is being submitted for the degree of Doctor of Philosophy at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other university.



S T Lalla-Edward

11th day of June 2018 in Johannesburg.

DEDICATION

In memory of my loving mother

Chan Lalla

1944-2017

God looked around his garden

And found an empty place.

He then looked down upon the earth,

And saw your tired face.

He put His arms around you

And lifted you to rest.

God's garden must be beautiful,

He always takes the best.

He knew that you were suffering,

He knew that you were in pain.

He knew that you would never

Get well on earth again.

He saw the road was getting rough

And the hills were hard to climb.

So He closed your weary eyelids

And whispered "Peace be thine."

It broke our hearts to lose you

But you did not go alone...

For part of us went with you

The day God called you home.

D. W. MCCONWAY

CONFERENCE PRESENTATIONS

9th Interest Workshop 2015, Harare, Zimbabwe, 5-7 May 2015

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Lalla-Edward ST; Fobosi SC; Hankins CA; Case KK; Venter WDF; Gomez GB. Healthcare provision for truck drivers in sub-Saharan Africa: A systematic review and meta-analysis. (Oral)

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http://regist2.virology-education.com/abstractbook/2015_3.pdf

PEER REVIEWED PUBLICATIONS

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Lalla-Edward ST, Ncube S, Matthew P, Hankins CA, Venter WDF, Gomez GB. Uptake of health services among truck drivers in South Africa: analysis of routine data from nine roadside wellness centres. BMC Health Services Research. 2017;17(1):649.

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NON-PEER REVIEWED PUBLICATIONS

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ABSTRACT

Truck drivers have specific healthcare needs. South African policy prioritises truck drivers for service delivery, as part of the country's HIV response. A non-governmental organisation, North Star Alliance has established roadside wellness centres (RWCs) providing healthcare to truckers, sex workers and communities along transport corridors.

North Star commissioned an evaluation of their services through a project called the North South Corridor Demonstration Project (NSCDP). A subset of the NSCDP is presented in this thesis and contributes one of the first reports that comprehensively contextualizes truck driver health programming in the region. The evaluation includes a systematic review of evaluations of truck driver health care interventions in the region; accessibility and appropriateness of the RWCs; and exploring truck drivers' healthcare seeking behaviour.

The evaluation adopted a programme logic model for a mixed-methods approach using programme data for the South African (SA) Department of Health reporting routinely collected data (n=13 252 records), individual interviews (n=46), and longitudinal data for nine SA RWCs. An adapted continuum of HIV care (access, utilisation, linkage, retention) conceptual framework was used to organise the thesis.

Access: Truck drivers were predominantly young SA men in stable relationships and reported relatively low sexual risk-taking. Truck drivers reported complex and stressful lifestyles. They found the services highly acceptable but provided recommendations.

Utilisation: Truck drivers mainly accessed non-HIV primary healthcare services (65%; 11 001/17 885).

Linkage and retention in care: Of 5 548 tested for HIV. 4% were positive, with 57% (59/104 clients with CD4 testing) were eligible for antiretroviral treatment at the then

initiation threshold of 500 cells/uL. RWCs had an average monthly ART initiation rate of 7.7 and a retention rate of 54% (among those who consented for follow-up). The unit cost per client initiated and in care was approximately ZAR878.

Comprehensive care packages (incorporating mental health service; other non-communicable diseases and addressing occupational requirements) delivered through accessible satellite facilities should form the foundation of service delivery models for truck drivers.

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Chapter 1: Introduction

HIV epidemic and social determinants of HIV

In 2016 there were 36.7 million [30.8 million–42.9 million] people living with HIV globally of which 1.8 million [1.6 million–2.1 million] were newly infected in that year [1]. Sub-Saharan Africa bears the highest burden of HIV worldwide [2]. There was an estimated 25.5 million people living with HIV in this region in 2016 – this being 69% of the global HIV burden. By 2016 13.8 million (2.1 million in western and central Africa and 11.7 million in eastern and southern Africa) accessing antiretroviral therapy (ART) [1].

HIV epidemic in South Africa

South Africa, for 2016, reported 270 000 (240 000 - 290 000) new HIV infections and 110 000 (88 000 - 140 000) AIDS-related deaths. The country has the largest HIV epidemic in the world, with 19% of the global number of people living with HIV, 15% of new infections and 11% of AIDS related deaths [3].

Consequently, South Africa implements the largest treatment programme in the world, contributing 20% of people accessing ART globally. The country has one of the largest locally funded programmes, in which 80% of the AIDS response is driven by the government/national health ministry [3].

With approximately 7.1 million (56% on ART) people living with HIV continuous access to care and efficient service provision is needed nationally [3]. However the burden of HIV is not homogenously distributed. KwaZulu-Natal, Mpumalanga, Free State and Gauteng have the highest prevalence in the country [4].

Mobility and HIV

Mobility is a complex concept predominantly used in demography and migration studies. The concept of population mobility has evolved from Ravenstein's initial laws of migration. Whilst Ravenstein's seven laws of migration [5] laid the foundation for understanding population movement, subsequent authors like Lee [6] and Grigg [7] extended Ravenstein's work to develop the theory of migration and contributed to the current composite, hard-to-define, hard-to-measure modern concept [8].

Indeed, currently several types of mobility can be defined. Mobility can be temporal (i.e. linked to time and modernization), circular (i.e. recurrent migration to and from a specific destination), permanent (as in the case of a migrant who moves permanently settles in another location and may even have residency) [8] and occupational mobility.

The various types of mobility exhibit a different relationship with the epidemiology of HIV. People who emigrate and permanently settle somewhere else are mobile. This migrant population's relationship to HIV risk is linked to the community where they move to and the stigma (or lack of) they may endure when they get there. However, their mobility and how it affects their HIV risk is different from those of truck drivers (this study's population of interest), with an occupational type of mobility.

Nonetheless, there is widespread recognition of the relationship between mobility and the risk for HIV and other infectious disease acquisition and transmission [8-14]. In particular, Deane and Parkhurst [11] and Taylor and Garduno's [8] papers make use of a literature review method to gather information, analyse what data are available and provide their respective collated observations on mobility and HIV while supplementing the relational data presented by other researchers. Since their papers review existing literature on the topic, both groups of researchers mention early on that it is challenging to appropriately cluster articles and studies investigating

mobility, migration and HIV primarily because of the heterogeneity found in the definitions of mobility and migration. Further, both agree that this heterogeneity enables data to be interpreted in multiple manners which then leads to a decreased constancy in, and to an extent reliability of the hypotheses regarding the associations between mobility and HIV. Nonetheless, both authors present definitions of mobility which are appropriately related to the contexts of their research objectives.

While in agreement with these aforementioned factors being related to communicable disease transmission Gomez, Venter et al [14] affirm the proximate determinants framework [15] which identifies mobility as being a distal determinant of health. They reiterate the idea that it is not the mobility directly which influences disease transmission and that increased susceptibility to acquire HIV and sexually transmitted infections (STI) and the increased possibility of transmitting HIV and STIs are due to the behavioural consequences of mobility i.e. separation from families and communities for extended periods of time, loneliness due to the separation, and lack of access to prevention, treatment, and care services.

Despite the fact that both their papers focus on the influence of mobility and HIV, Deane and Parkhurst [11] and Taylor and Garduno [8] approach the topic from differing angles thereby presenting a more comprehensive view of HIV and mobility. Deane and Parkhurst [11] concentrate on the link between mobility, risk behaviour patterning and HIV transmission and Taylor and Garduno [8] investigation explores one step further in the HIV treatment cascade and elaborates on the impact of mobility on retention in care and adherence to medication by HIV positive clients.

In the works by Deane and Parkhurst [11] and Boe and Crush [16] population mobility is directly identified as the driver of the HIV epidemic. These authors portray mobility as adversely influencing infectious disease transmission patterns in that mobile populations have multiple concurrent partners; there is increased probability of their sexual networks overlapping and there is reported inconsistent condom

usage. The inconsistent condom usage is affirmed by findings of the HIV and STI prevalence work conducted by Ramjee and Gouws [9].

In summary, for truck drivers two main causal pathways have been proposed to explain how mobility influences their HIV risk. Taylor and Garduno [8] detail explanations on the negative effects of mobility on access to care which include lack of medical insurance, communication issues, perceived risk, deportation, possession/lack of legal identity documents in order to access care, and stigma. In keeping with the thoughts of Gomez, Venter et al [14] regarding access to care, Taylor and Garduno [8] introduce a theoretical framework which proposes that mobility may have two endpoints: a) a negative influence on care through delays in accessing care, treatment interruption and lack of social support, or b) the potential to positively influence treatment outcomes by improving access to care and decreasing stigma (presenting healthcare seekers with the freedom to access care in another geographic health setting without discrimination).

The shortcoming in the literature included above is that it provides descriptions of the authors' perspectives on the relationships of mobility on accessing care only as they relate to fixed clinics. Service provision through roadside wellness clinics, as satellite points of service delivery that are adapted shipping containers and potentially moveable to other sites on the trucking route, as opposed to conventional fixed facilities within truck drivers' communities provides the opportunity to gather evidence that would allow for an informed decision of support or negation of Taylor and Garduno [8] proposal regarding the positive influence of mobility on care. There is limited literature on HIV truck driver testing preferences regarding site. However a recent study in Kenya (albeit slightly biased due to the recruitment strategy) assessing HIV testing preferences in long distance truck drivers reported truck drivers as preferring to be tested in roadside wellness clinics and being less likely to test at home or at the office [17].

Acceptability, uptake and linkage to care for truck drivers

Indeed, the success of HIV and other healthcare programmes lies in the ability to create appropriate, accessible programmes but also to link people to and retain them in care. Globally there is a dearth of information on access to, linkage to, and retention in ART care by truck drivers. To potentially understand what healthcare acceptability, uptake and linkage looks like in truck drivers one may need to consider reported information on general population and other high risk mobile populations as proxies.

Studies from Asian countries have shown the importance of a user-friendly approach in facilitating both client uptake and retention in care in other linked high risk and mobile populations. Wong [18] assessed the acceptability of service delivery in a Chinese clinic for sex workers due to the clinic's low utilization rates. This study's results highlighted the importance of not just introducing an intervention but rather of introducing an appropriate, user-friendly and acceptable intervention for optimal uptake of service delivery. Post the acceptability study, programmatic adjustments were made and the clinic headcounts improved three fold.

The work of Aho, Nguyen [19] highlighted the retention in care aspect of acceptability. Their work showed that not only is acceptability crucial for initial uptake, it is imperative for retaining people in care, especially when they require treatment for extended periods of time. This work further supports the conceptual framework proposed in the methods with regards to not implementing and evaluating a system in isolation from the user.

A systematic review of pre-ART retention in care shows that only 68 % of ART eligible patients actually start treatment in sub-Saharan Africa [20]. A CD4 point of care study in Hillbrow, South Africa (a site known for its fluid population) in which half the study population were non South Africans showed that approximately 63% of

patients did not return for pre-ART care [21]. Although pre-treatment loss is high, not much is known about the reasons people fail to remain in care.

UNAIDS data shows that while there is improved HIV testing and treatment coverage in sub-Saharan Africa, retention rates are lower than desired, prompting UNAIDS to stress how imperative it is for HIV programmes to focus on improving retention in care [22]. HIV studies, particularly in non-migrant populations, have shown that patients are lost at all points in the HIV care pathway [20] with some studies reporting a loss to follow up rate of ART patients being around 35% [23]. This, combined with the negative effects of mobility on HIV [8, 11, 14, 16] (as elaborated on prior) show that both linkage to and long term retention in care are likely to be more of a challenge for migrant populations.

Truck driver key population, South African National Strategic Plan and Prioritization of interventions

HIV in the truck driver population

Truck drivers are a subpopulation currently considered vulnerable (to both HIV acquisition and transmission) in South Africa, despite a lack of evidence of this being the case. The previous National Strategic Plan explicitly mentions them as a high risk group [24], with no source cited for the information. However there is heterogeneity in the HIV prevalences in various studies. An early Indian study reported a prevalence of 1% [25] with another reporting an average HIV prevalence of 4.6% [26] and a third one reporting 12.0% HIV prevalence [27]. In comparison, the general male adult HIV prevalence in India during this period (2008) was reported as 0.38% and men accounted for 61% of people living with HIV in India [28]. Studies from Nigeria show a 10% HIV positivity rate for long distance truck drivers [29] while in 2014 approximately 1.3 million of the 3 million people living with HIV in Nigeria was adult males [30]. The Azberjain research had a much lower HIV prevalence of 1.5% [31].

The first South African truck driver study published in 2001 reported a 56% HIV prevalence rate among truck drivers who were clients of female sex workers [9] while a second South African survey conducted a few years later found an HIV prevalence of 26%[32]. These prevalences are higher than the general male adult population HIV prevalence. A large representative behavioural survey reported adult male HIV prevalence in South Africa to be 9.9%[33] during this period.

Over time there has been increased reporting on the role of truck drivers as the bridge population linking HIV transmission from one geographical area to another and subsequently into the general population [34]. Data hereabout varies but globally there is a common discourse which assumes truck drivers are agents of HIV transmission because of their links with sex workers. Very early studies conducted in India cite truck drivers as being responsible for transmitting HIV to the sex workers in Indian villages who could then infect others in their sexual network [35]. Subsequent Indian studies also infer truck drivers to be drivers of the epidemic by engaging in unprotected sex with sex workers and others in their (truck driver) network [27]. This reporting is perpetuated in results from Brazil [36], Kenya [37], South Africa [9, 38] and the US [39]. However, all of these results remain unproven, both in terms of truck drivers' importance in transmission and their presumed higher prevalence and the role of sex workers. This thesis will present some data which challenges the theories of the high prevalence and high truck driver- sex worker interactions.

South African National Strategic Plan and Prioritised interventions

South Africa's National Strategic Plan on HIV, TB and STIs 2012-2016 (NSP) highlighted several populations to be prioritised in HIV care and prevention responses to facilitate the achievement of the countries strategic objectives set in the said document [40] as well as to contribute to the attainment of the global 90-90-90 goals [41]. Here truck drivers are identified as one of the high risk population and as such the South African Department of Transport established a framework for HIV and AIDS for the transport sector. This framework has been aligned with the NSP

(2012-2016). The current NSP (2017–2022) aims to accelerate progress towards meeting the targets by: reducing new HIV infections; improving access and ART service delivery, strengthening care and support; broadening the coverage of key and vulnerable populations; and addressing the social and structural drivers of HIV, tuberculosis and STIs. The plan will be implemented through nine provincial implementation plans [3].

Due to the varied distribution of HIV in the South African truck driver population the response to the epidemic is complicated and requires a multidisciplinary approach comprising efforts from scientists, communities, epidemiologists, economists and public health specialists. The value of collaborations lies in the provision of evidence on various areas such as identifying drivers of the epidemic [2], informing intervention design and exploration of interventions [42], and implementing prioritized interventions for a wide range of populations [10].

Prioritised initiatives have been based on the two main factors of the ability to access (and link to) to care and on the risk, i.e. the theory of core groups [43, 44] facilitating the transmission of any STI (including HIV). This knowledge of the role of risk in determining priority is supplemented by the acknowledgement of access to care. In their study, Mishra, Steen et al [45] show that priority interventions are instrumental in altering HIV and STI transmission dynamics.

The value of their work lies in two important findings: first, that in order to get true results from evaluations of focussed interventions, the evaluation needs to be conducted after the intervention has run for a period of time long enough to be able to achieve a measurable impact (defined at a population level and in terms of HIV prevalence/ incidence); and second, interventions must be designed to respond to the local epidemiological context and as such, be tailored to the local realities.

It is generally accepted that key/high risk populations are significant to the HIV epidemic [46]. Therefore whether or not priority interventions are important to health outcomes of truck drivers (as a key population) is not the subject of much debate in the literature. Although it is expected that in general, interventions should be implemented in a way that they can actually be accessed (there is reduced ability to measure/ offer impact with no use), it is particularly more imperative that priority interventions for key populations – in this case truck drivers, are designed and offered in a way which facilitates access. There is limited information around the effect of truck driver (and where related sex worker) HIV prevention interventions in southern and more specifically South Africa.

Descriptions of the truck driver population and prioritised interventions are elaborated on in chapter 2.

North Star Alliance and North South Corridor Demonstration Project

In response to the NSP's strategic objectives and prioritising truck drivers for service delivery, several non-governmental or not-for-profit organisations, such as North Star Alliance and Trucking Wellness, have established roadside wellness centres (RWCs). These organisations provide services provision with the overall goal of improving truck drivers' health outcomes in these primary healthcare settings, RWCs.

North Star Alliance

North Star Alliance is a not-for-profit organisation working across sub-Saharan Africa since 2006. It uses converted shipping containers, staffed with trained clinical and outreach teams, located on the trucking corridors in Africa, to provide comprehensive primary healthcare services to truck drivers, sex workers and the

immediate communities surrounding these RWCs. With some country mandated exceptions (for example ART services in South Africa), the North Star Alliance RWCs do not make use of paper-based client files; instead they are supported by a networked electronic data administration system called COMETS. This system was designed to facilitate the capture of clinical information, allowing clients to access their health records at every clinic within the network along transport corridors (as elaborated on in chapter 4 of this thesis).

North Star clinics offer not only HIV/STI specific services such as condom distribution, STI syndromic treatment, HIV testing and counselling (HCT), and tuberculosis (TB) screening but also other PHC services such as malaria screening and treatment, and in some instances cervical cancer screening, family planning and diagnosis and treatment of common illnesses. During the last four years, North Star expanded their services to include initiation and provision of ART. Recently, it was announced that six North Star sites had been included as part of the National pilot programme to expand services further to provide UTT and PrEP.

South African Roadside Wellness Clinics

This evaluation took place in nine South African sites in seven provinces (Cato Ridge and Pongola (KwaZulu Natal), Bloemfontein (Free State), Bloemhof (North West), Ngodwana (Mpumalanga), Musina (Limpopo), Upington (Northern Cape), Pomona and City Deep (Gauteng). Clinic operating hours were based on formative needs assessments conducted prior to each RWC being set up. All clinics operate on weekdays and are typically open for a minimum of six hours. Operating hours for some clinics have changed in the period post this research. However at the time of the data collection, Cato Ridge and Bloemhof were operating 14:00-22:00; Upington 18:00-22:00; Ngodwana 11:00-19:00 and Musina 07:00-15:00.

Clinics became operational at different times during the October 2013 – September 2015 review period. Cato Ridge, City Deep and Ngodwana were all opened in

September 2013, while Musina, Upington and Bloemhof were opened in January 2014, February 2014 and March 2014 respectively. Pongola opened in June 2014 while City Deep closed in September 2014 and Bloemfontein opened. Pomona (replacement clinic for City Deep) opened in January 2015.[47]

North South Corridor Demonstration Project (NSCDP)

The Dutch Ministry of Foreign Affairs has been a long-term funder of North Star Alliance. When the Ministry undertook an end-of-term review of North Star Alliance services and performance, two of the primary recommendations were

- North Star Alliance must ensure that it remains relevant to the health, safety and wellness needs and concerns of mobile populations and, in particular, to those of its core target group of truck drivers;
- North Star Alliance should continue to strengthen its focus on the value-add that it brings to the transport sector, and work to expand its existing competencies, skills set and the service excellence, products, and innovations that it is known for

In response to these recommendations, North Star Alliance in collaboration with Wits Reproductive Health and HIV Institute (Wits RHI) and Amsterdam Institute for Global Health and Development presented a proposal for service expansion and research to the Dutch Ministry of Foreign Affairs which was refined post discussions to become the North South Corridor Demonstration Project (NSCDP). The overall purpose of the project and collaboration was to support the expansion of health services provided by North Star Alliance to include nurse-initiated management of antiretroviral treatment (NIMART), while documenting the extent of implementation and the quality of North Star Alliance's non-ART services.

If the findings were positive, this body of evidence could then be used to argue the role of North Star Alliance services in improving the health of mobile populations, including truck drivers. Contracts were signed in December 2013 for a project of

three years (from 1 January 2014 to 31 December 2016). The research proposal followed an implementation science framework, and was designed as an iterative process whereby the research findings were fed back to North Star Alliance with the aim of facilitating ongoing improvements in data collection and data quality. The research proposal also aimed to provide insights into the appropriateness (by assessing factors of access) and uptake of healthcare services by key populations and to document the implementation of the new ART service (using linkage to care and retention in ART care as performance measures). By July 2014, a comprehensive protocol of health services research was developed.

The programme evaluation assessed the services in three countries and for three population groups. However, an in-depth evaluation protocol was developed to explore how RWCs specifically respond to the health care needs (by gathering information on access to care, RWC healthcare utilisation and linkage to and retention in ART care) of truck drivers travelling along the South African trucking corridor. The results of this in-depth evaluation, presented using a continuum of care framework, was the focus of this doctoral study. Other non-trucker specific outputs are included in the appendices to for contextual purposes.

Study Objectives

In order to build a body of evidence showing the impact of North Star Alliance's RWC model on the health of truck drivers, the following were defined:

Research question

How do RWCs respond to the health care needs of truck drivers?

Objectives

1. To present a systematic review of the impact and methods of evaluation of truck driver health care interventions in SSA (Chapter 2)

2. To determine truck drivers' acceptability of the Roadside Wellness Clinics (Chapter 3)
 - a. To explore truck drivers views on access in terms of location, operating times, services offered and delivery of services
 - b. To understand why truck drivers who know about the Roadside Wellness Clinics do not use them
 - c. To explore truck drivers' experiences of accessing care and support
3. To explore truck drivers healthcare seeking behaviour
 - a. To describe the contextual factors of being a truck driver which influence the decision to seek health care (Chapter 3)
 - b. To describe service utilization (Chapter 4)
 - c. To describe linkage to ART care (Chapter 5)
 - d. To describe retention in ART care (Chapter 5)

Methods

In this section, I am describing the overall, abbreviated methodology used for the evaluation. In depth methods are explained in each of the chapters 2-5.

The combination of a comprehensive logic framework and a conceptual framework was used to design the overall evaluation of the NSCDP. Below is a description of each of the frameworks and how they come together at the point of mapping the data.

Logic framework

This evaluation adopted a programme logic model as a comprehensive framework for a mixed methods approach [48] and the indicators were defined accordingly (Figure 1.1).



Figure 1.1 Logic framework

In this model, inputs represented resources used by the programme (for example, staff or costs); activities are actions in which resources are used (for example, training sessions, recruitment, and site accreditation). Inputs and activities were expected to be influenced by clinic related (healthcare worker capacity and competency (including their attitudes) to deliver services to this vulnerable population, availability of stock for screening and treatment) and environmental factors (setting up the infrastructure for the clinic and physical location of the clinics (e.g. on a national highway, at a truck stop, or close to where a big truck can be parked)) in facilitating access to truck drivers. The first level of results associated with a project were the outputs. These were the direct immediate-term results (for example, ART initiations, primary healthcare visits). The second level of results associated with a project and representing medium-term consequences were the outcomes (for example, changes in the proportion of HIV-positive people diagnosed or the proportion of eligible patients on ART). Finally, the third level of project results and long-term consequences were impact indicators, such as changes in HIV prevalence. This third level of results is generally particularly challenging to measure (Figure 1.2)[47] and was out of the scope of this doctoral research.

Issues measuring impact
Attribution: How do the observed changes in the target unit (e.g., individual, community, or region) compare with the changes that would have been observed without the intervention, holding all other factors constant? To be able to attribute an effect we need a comparison group – this can be a control arm in a trial; a statistical control from the population; or a modelled counterfactual. The main issue is to ensure that the only variable is the programme, all other factors being the same. This is particularly challenging when the programme is not the only healthcare programme being accessed. Measurement: What to measure? Impact indicators such as HIV prevalence at population level have long timeframes in order to observe changes and underlying trends in the epidemic. The ability to measure changes in impact indicators is dependent on programme coverage. This is challenging in this case as there is no indication of North Star Alliance coverage among this population or whether this coverage is enough to enact a change at population level.

Figure 1.2 Expanded explanation of challenges with determining impact as part of the evaluation

Conceptual Framework

The success of a health care intervention can be measured by the health outcomes of the population to whom the intervention is directed at [49]. Improving health outcomes relies on the ability to maintain patients in care. Dependent on the health condition – within the South African health system this means maintaining patients across a continuum of care (including for e.g. screening at one facility and receiving follow up services at another).

Although the primary focus of the evaluation was to determine how the RWCs respond to the health needs of truck drivers primarily as it related to HIV, there was also in depth analysis on the other health care services offered by the RWCs.

While the public health sector can make efforts to provide, link and retain clients in care, the ultimate decision to access health care lies with the client (in this case the truck driver). Further the decision to repeatedly access care and/or remain in care will be influenced by how acceptable the client perceives the intervention to be. This means that one cannot disassociate the individual from the system/intervention when evaluating it. Therefore this evaluation employed an adapted continuum of HIV care framework [50] (Figure 1.3) to a) organize the elements of the health care system and the individual which was assessed during the process evaluation and b) thread all the components together to facilitate the coherent presentation of findings.

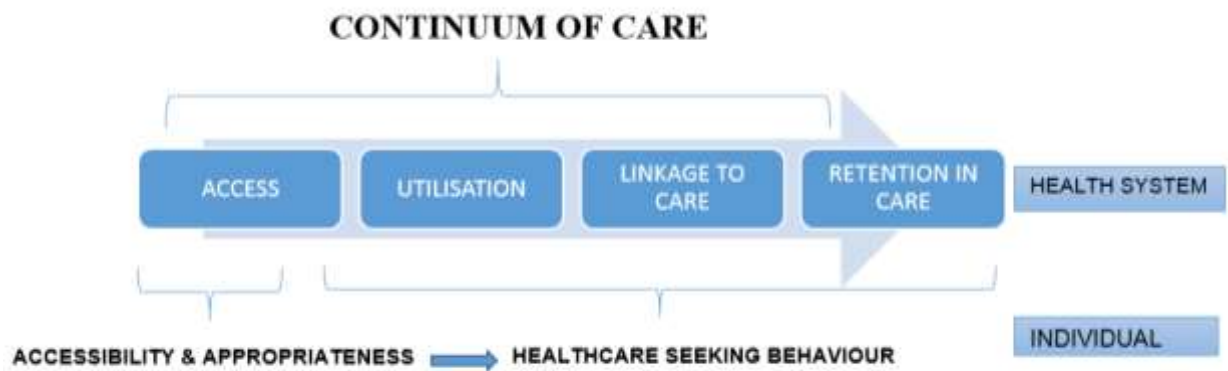


Figure 1.3 Conceptual framework for process evaluation components of RWCs

Definitions

Accessibility and Appropriateness: in the context of the evaluation, these were explored by looking at the dimensions of access. “Facilitating access is concerned with helping people to command appropriate health care resources in order to preserve or improve their health”[51]. From the clinic perspective the evaluation will measure the users’ and non-users’ perspective of the RWCs location, operational hours and service delivery package.

Utilisation: Utilisation was defined by the extent to which a population accesses a service/clinic [51]. This is the number and frequency of clients receiving a service (e.g. TB screening) that they actually went to the clinic for.

Linkage to care: Linkage measures were based on the outcome of interest [52]. In the evaluation context, the focus was on whether patients who were referred for care post screening at the RWC presented at the referral site and were integrated into care.

Retention in care: The primary focus for retention was on the clients accessing services for ART. As a process evaluation, retention was measured by the clinic's ability to keep ART clients in care for 6 months post visit/consultation 1 by the patient.

Evaluation framework

Having defined indicators using the logic model, they were then mapped along the cascade of care for both ART and non-ART interventions (other prevention HIV services but also tuberculosis, malaria, sexually transmitted infections and primary healthcare) in order to measure the project objectives. The resulting evaluation framework is presented in Table 1.1

Table 1.1 Evaluation framework

	Objective 2 ¹	Objective 3 ²
Inputs/Activities	(qualitative research on accessibility (and appropriateness) to care and truckers' health survey to establish healthcare needs) ³ Services provided Opening hours	Adapted NIMART service development Number of nurses recruited and trained Accreditation of sites Costs
Outputs	Type of services accessed Repeat visits	Number on ART Number linked to Tier.net ⁴ Number linked to care among referred
Outcomes		Number eligible patients started ART Number ART patients retained in care

Notes ¹ To determine truck drivers' acceptability of the Roadside Wellness Clinics

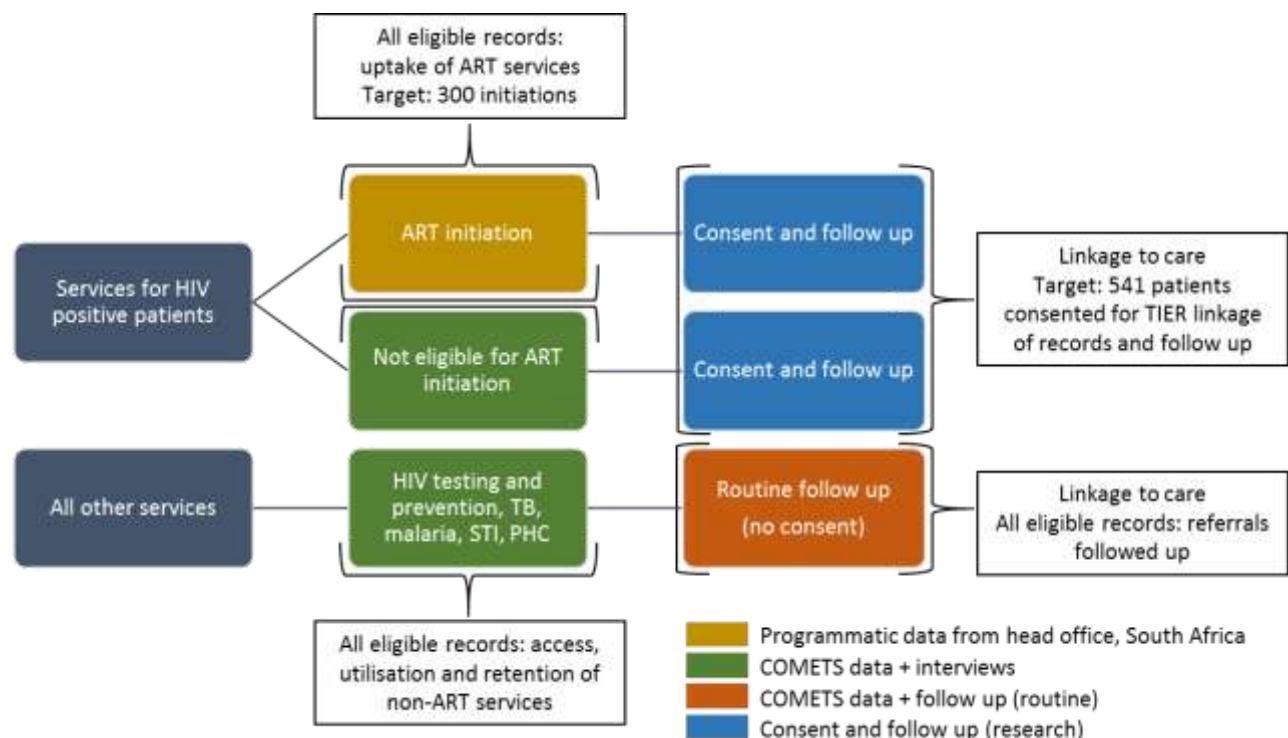
² To explore truck drivers healthcare seeking behaviour

³ Inputs and activities in objective 2 are not measured in terms of a qualitative indicator but evaluated as a body of qualitative evidence⁴ Tier.net is the South African National ART Monitoring & Evaluation system

Abbreviations: NIMART, nurse-initiated and managed antiretroviral treatment; ART, antiretroviral treatment

Data sources

Since this project comprised multiple components, each contributing answers to a portion of the research problem, data were collected from different sources (Figure 1.4). This included: descriptive analysis of programme data for Ministry reporting, descriptive and statistical modelling of routinely-collected data in COMETS, qualitative analysis of individual interviews, and the establishment of two cohorts for descriptive statistics (one cohort using routinely collected follow-up data and one cohort of HIV-positive patients actively followed up through phone calls and record linkage to Tier.Net system - South African National ART Monitoring & Evaluation system (described in chapter 5)).



Abbreviations: ART, antiretroviral therapy; HIV, human immunodeficiency virus; TB, tuberculosis; STI, sexually transmitted infections; PHC, primary healthcare

Figure 1.4 Data sources by type of service and analysis

The section below describes each data source and the data process.

Programmatic data from the North Star Alliance Regional Office in South Africa

ART data

Data from patients being treated with ART in South Africa need to be collected and reported to the Department of Health. These data were reported from the RWCs to the Regional Office in South Africa weekly and were also recorded in paper records at each site. These data were used to evaluate the uptake of North Star Alliance NIMART.

COMETS routinely collected data

Data were analysed for nine South African RWCs across seven provinces. These clinics were located in Cato Ridge and Pongola (KwaZulu Natal), Bloemfontein (Free State), Bloemhof (North West), Ngodwana (Mpumalanga), Musina (Limpopo), Upington (Northern Cape), and Pomona and City Deep (Gauteng). Currently, eight of these clinics are operational. The City Deep site in Gauteng province was closed due to challenges experienced by truck drivers in accessing the location and for that reason was relocated to another district.

Anonymised data were last extracted on 11 April 2016 from North Star Alliance's COMETS database for the two-year period from 1st October 2013 to 30th September 2015. Information extracted included site name, COMETS unique identifier, socio-demographic variables (such as age, sex, occupation, nationality, and marital status), and visit information (including visit dates and the type of service accessed).

Information such as educational level or income is not routinely collected in this system; therefore, this information could not be included in the analysis. After data extraction, duplicate and incomplete records were excluded. Records were then organized to provide both unique attendee and unique visit information. All data were analysed using STATA 12.

Continuous data (age) were described by means, and then grouped into categories. Categorical data such as nationality and marital status were categorised in two groups each. For nationality it was defined as South African and other nationalities. 24 more nationalities were included : Angola, Botswana, Congo and DRC, Ethiopia, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Niger, Nigeria, Rwanda, Saint Helena, Senegal, Somalia, South Sudan, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, and Zimbabwe. For marital status, a group of truck drivers with no stable partner, including those reported to be either divorced, single or widowed, and a group with stable partners, including those reported to be married or cohabiting, were defined.

All services accessed were reported by type of service. Types of service included: HIV, STI, TB, malaria and PHC. The distribution was described for both the sample of attendees and for visits across different socio-demographic characteristics and services accessed. Associations between having multiple visits and socio-demographic characteristics using unit-variable and multi-variable logistic regression models was assessed.

Referral information was extracted and analysed. Referral outcome was defined as the patient attending the referral site (successful linkage to care). For those whose referral outcome was not recorded (and who consented to be followed up), they were followed up with a phone call to determine referral result.

The data had some limitations. The main classification of clinic attendees into occupational groups depended largely on accurate and complete reporting by patients. As with any analysis of routine data, the researcher is dependent on the quality of the routine reporting. Significant efforts were made to achieve an adequate level of recording, with several rounds of audits and validation checks described in the next section “Data quality”.

Data quality

Wits RHI provided monitoring and evaluation support, co-funded by USAID, to select South African North Star Alliance RWCs. The monitoring and data quality activities, together with findings from the PEPFAR site improvement through monitoring (SIMS) assessments, are detailed below.

RWC data were reported to Wits RHI on a monthly basis. These data were quality checked and all discrepancies were queried with the clinics until the data were signed off. Wits RHI's access to databases of the North Star Alliance database COMETS was used as an additional mechanism to verify the reported data. Lastly, the Wits RHI team, together with core monitoring staff from North Star Alliance visited the clinics on a quarterly basis to conduct SIMS assessments. After the assessments, planning meetings were conducted and it was decided that, due to the number and type of data discrepancies found (despite continuous technical support), a data technical working group (comprising members from Wits RHI and North Star Alliance) would be formed. This working group has met on a monthly basis, operating according to agreed-upon terms of reference.

Objective/research specific data management is elaborated on in the individual chapters 2-5.

Ethical Clearance

Ethical clearance was provided by the University of the Witwatersrand Human Research Ethics Committee (M140506) on 30 May 2014 for all the work presented in chapters 2-5 of this thesis. In addition, North Star Alliance and Wits RHI signed a data user's agreement on 6 May 2014 to ensure that data were appropriately handled throughout the data management cycle.

Signed consent form was obtained from all participants in the qualitative interviews (chapter 3) and those who agreed to be followed up (chapter 5). Information sheets and consent forms were explained in local languages if the participant requested. Patient confidentiality was maintained throughout the evaluation. All local databases were secured with password-protected access systems. All extracted data were dissociated from personal identifiers and remained anonymous and unlinked throughout the analysis. Clinical information that was extracted was anonymised into forms that were stored with the qualitative transcripts. On completion of the evaluation all the research forms were stored in the Wits RHI data archive room.

Regulatory documentation has been included in appendix A.

Structure of Thesis

The combination/overlap of the frameworks detailed above provide the layout/presentation of this thesis.

The inclusion of the systematic review as chapter two, serves to provide a contextual overview of healthcare programmes available to truck drivers in sub-Saharan Africa. In chapters three to five the research which is linked to individual components of the conceptual framework/ continuum of care is presented. Lastly in chapter 6 I present a critical discussion on the implications of this evaluation findings together with recommendations on health programming for, and research on truck drivers.

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Chapter 2: Systematic review and meta-analysis

Title	Healthcare Programmes for Truck Drivers in Sub-Saharan Africa: A systematic Review and Meta- Analysis			
Authors	Lalla-Edward ST, Fobosi SC, Hankins C, Case K, Venter WDF, Gomez GB			
Author's contribution	STLE	60%	KC	2%
	SCF	9%	WDF	2%
	CH	2%	GB	25%
	Conceived and designed the review: STLE, WDFV and GBG. Conducted the searches: STLE, SCF, KKC and GBG. Data extraction: STLE. Data analysis: STLE and GBG. STLE wrote the first draft. All authors critically revised the manuscript for intellectual content and approved the final draft.			
Journal	PLoS One			
Impact	2.806 (2016)			
Link/citation	Lalla-Edward ST, Fobosi SC, Hankins C, Case K, Venter WDF, Gomez G (2016) Healthcare Programmes for Truck Drivers in Sub-Saharan Africa: A systematic Review and Meta- Analysis. PLoS ONE 11(6):e0156975. Doi 10.1371/journal.pone.0156975			
Appendix reference	B1			

Using systematic review methodology and reporting conditions, this chapter will contextualise healthcare programmes in sub-Saharan Africa that have included some focus on truck drivers.

Introduction

Transport workers, such as truck drivers, have specific healthcare needs. Globally, they bear a disproportionate health burden, including high rates of sexually transmitted infections (STI), cancer, cardiovascular diseases, chronic conditions

(predominantly diabetes, obesity, backache, leg pains), respiratory diseases, and an array of mental health conditions (with the most common being depression, anxiety, chronic insomnia, personality disorders and post-traumatic stress disorder).

Occupational factors that increase risk include irregular schedules, sedentary lifestyle due to long hours of driving/sitting, musculoskeletal and other injuries due to loading and unloading cargo, exposure to road accidents and deaths, extended periods of social isolation, unhealthy food choices on the road and poor access to healthcare [1-7].

In sub-Saharan Africa, transport corridors are essential for local economies due to lack of waterways and inadequate rail services. These corridors have been characterised as being affected by transience, unemployment, and poverty [8-10]. Because of the transcontinental nature of the transport industry, health programmes prioritising truck drivers require complementary national healthcare policies. Most countries in the region are aware of the susceptibility of transport workers to poor health outcomes and Ministries of Transport and Health have begun to develop strategic plans to address this issue [11]. However, public sector financial and human resources constraints have delayed progress [12].

The trucking industry in sub-Saharan Africa is predominantly privately-run and has attracted international donor and domestic funding for work-related programmes tackling different aspects of truck drivers' health needs. Increasingly, implementation has been proceeding across the region of healthcare programmes prioritising truck drivers and concentrating on services to increase awareness and identification of communicable (STI, HIV (including prevention of mother to child transmission (PMTCT), tuberculosis, and malaria) and chronic diseases (hypertension and diabetes), as well as general primary healthcare [13-36]. Nevertheless, further planning for efficient implementation, scale-up, and sustainability of healthcare programmes for truck drivers is hindered by knowledge gaps about this population's needs and the impact of existing healthcare services on health outcomes. The objectives of this review were to describe healthcare programmes implemented in

sub-Saharan Africa, prioritising truck drivers, assess the methods used to evaluate them, and evaluate their impact on truck drivers' health outcomes.

Methods

The systematic review of the published and unpublished literature was performed following the registered protocol (CRD42014013327) on the international prospective register of systematic reviews, Prospero [37]. The PRISMA guidelines for reporting of systematic reviews and meta-analyses was adhered to [38].

Search strategy and study selection

Searches were performed on scientific databases such as PubMed/Medline and ISI Web of Knowledge, institutional databases (University of Witwatersrand, Imperial College London, London School of Hygiene and Tropical Medicine, University of North Carolina), non-profit organisations and country-level reports (South African National AIDS Council, USAID-PEPFAR, NGO websites), and online search engines (google, google scholar) using a broad search strategy including both MeSH headings and free text (29 permutations of search terms related to: 1) the population (truck driver, lorry driver, long haul driver, long distance driver, driver); 2) intervention (health intervention); and 3 outcome (odds ratio, risk ratio, evaluation, cost-effectiveness, effect, impact, effectiveness), with no date or language limitations. Experts and non-profit organisations working with truck drivers (or with migrant populations in general) were consulted separately to identify unpublished reports. Country-level reports of funders and NGO (i.e. South African National AIDS Council, USAID-PEPFAR, NGO websites) were also reviewed. Citations and bibliographies of records were reviewed to identify additional relevant material. All searches were run independently by myself and another researcher. Results were downloaded, duplicates removed, and a database of all possible records organised for review by the end of January 2015.

Titles and abstracts were then screened by two independent reviewers (myself and another) to include all publications and reports describing a healthcare programme in

sub-Saharan Africa providing services designed specifically for truck drivers. The full text records of all the material selected for further examination were assessed independently for inclusion. Another reviewer and I compared the final list of selected material.

Data extraction and analysis

A pre-defined tool to extract data describing each programme, its evaluation method and reported results was designed. Data included: implementation and evaluation years, implementation and evaluation locations, services provided, service providers, funders, evaluators, details of evaluation method, and reported results. I undertook the data extraction and a second reviewer conducted a quality control check.

Tabulated data describing current and past healthcare programmes, providing an overview of these programmes in the region by type and coverage over time, is presented, followed by a critical assessment and a narrative review of the evaluation methods used. Methodological quality of each evaluation was assessed on the basis of study's internal validity (sites and population included, sample size, and sampling method), data reported, and whether a comparison group was included in the analysis. Due to variation across studies in the ways of reporting evaluation results, all indicators reported were mapped against a logic model for programme evaluation connecting the following elements: inputs (e.g., staff), activities (e.g., trainings, services), outputs (e.g., clients served, tests conducted), and results ranging from intermediate outcomes (e.g., risk behaviour change) to long-term impact (e.g., reduction in STI incidence) [39].

Whenever possible, calculations were done for unadjusted risk ratios (RRs) and 95% confidence intervals (CIs) from data provided. These RRs and 95% CI for all impact and outcome indicator results are presented in forest plots to provide an overview of the potential impact these programmes have had on truck driver health. A sensitivity analysis was performed to assess the robustness of our findings to the choice of summary statistic and calculated unadjusted risk differences and 95% CI from data

provided as an alternative. Because the results presented in the forest plots presented significant heterogeneity, the sources of between-study heterogeneity through a subgroup analysis by type of indicator, was assessed. Outcome indicators were assessed in two broad categories: 1) indicators of risk behaviour (condom use, number of sexual partners, alcohol and drug use), 2) indicators measuring knowledge, attitudes, and perceptions. Impact indicators included reported measures of HIV prevalence and STI incidence. A random-effects model to calculate summary RRs and 95% CI by subgroup was applied. The robustness of the findings to this methodological decision was tested by re-running the analysis using a fixed-effects model to calculate summary statistics by subgroup. All analyses were conducted in STATA 12.

Results

37 publications from 5,599 identified unique records were included. The results of the searches and selection process are summarised in Figure 2.1.

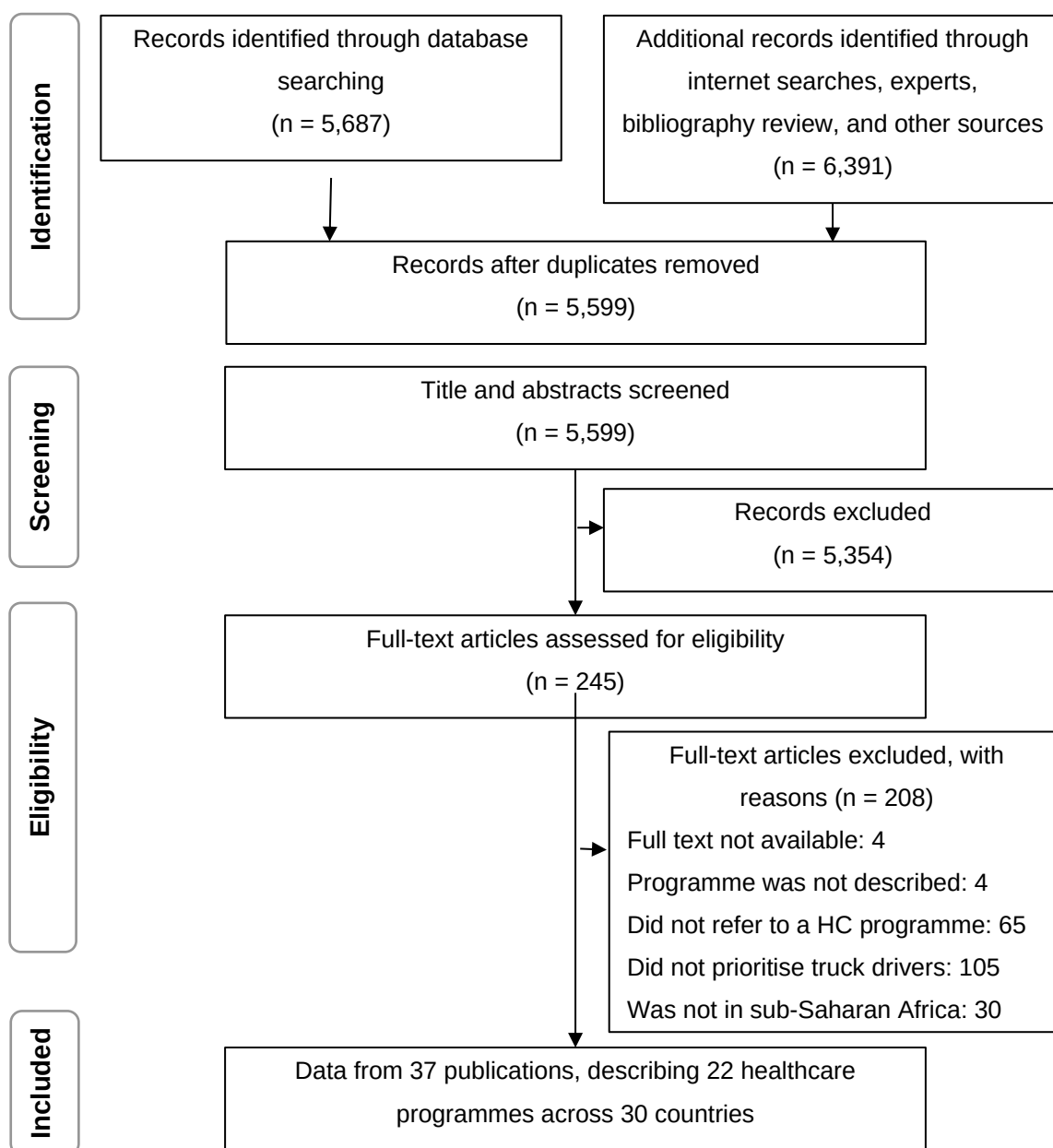
Overview of healthcare programmes for truck drivers

The selected publications described 22 healthcare programmes across 30 countries. Table 2.1 presents a summary description of each programme.

Although healthcare programmes in general were searched with the aim of including any programme providing services for any health-related issues, all programmes identified cover HIV-related interventions, with only three programmes expanding their services to cover malaria, tuberculosis, or general primary care services (i.e. ROADS II, Corridors of Hope, and North Star Alliance) [17, 18, 27, 36, 40-43]. The majority of the programmes rely strongly on peer educators and healthcare workers to offer HIV prevention services. These include behaviour change communication (BCC) (n=15); condom marketing and distribution (n=16); STI screening and/or syndromic treatment (n=11); stigma reduction activities (n=10); information, education, and communication (IEC) (n= 9); HIV testing and counselling (HTC) (n=9) through outreach or site-based programmes, in addition to capacity building for

community or local staff, PMTCT, family planning, income generation activities, and linkage to clinical and social support services in 11 programmes.

The African Medical and Research Foundation (AMREF) implemented the first healthcare programme for truck drivers in the region in 1989 in Tanzania [26]. This programme lasted four years and focused on IEC for HIV prevention. Shortly thereafter, in 1990, World Vision introduced a programme in Southern Africa (Mozambique, Swaziland, Zambia, and Zimbabwe) [30]. The World Vision programme is ongoing, making it the longest running truck driver healthcare programme in sub-Saharan Africa. Fourteen [21-26, 28, 30, 31, 33-35, 44-48] of the 22 identified programmes were delivered within a single country setting, whilst four [13-20, 27, 30, 36, 40-43] programmes have broader geographical coverage, covering eight or more countries.



Abbreviation: n, number

Figure 2.1 Flow diagram of study selection using the PRISMA flow for reporting systematic reviews

Table 2.1 Description of healthcare programmes for truck drivers in sub-Saharan Africa

Programme	Duration	Countries	Description	Funded by	Eval
AMREF Truck Driver project [26, 45]	1989-1993	TZA	Implementers: PE. Clients: TD, FSW. Interventions: IEC	USAID/AMREF	Yes
World Vision [30]	1990-current	MOZ, SWZ, ZMB, ZWE	Implementers: PE, HCW. Clients: TD, FSW, OVC. Interventions: IEC, PMTCT, income generating activities	WFP, SADC	No
Prevention of sexual transmission of HIV through IEC [25]	1991-1994	MWI	Implementers: PE. Clients: TD, FSW. Intervention: IEC	European Commission	Yes
NECTOI's AIDS education program [22, 23]	1992-1997	ZWE	Implementers: PE. Clients: TD, FSW. Intervention: IEC, including drama, radio programmes	NECTOI, SIDA, USAID, FHI - AIDSCAP, NDA	Yes
Behavioural risk-reduction programme [21]	1993	KEN	Implementers: Mobile team*. Clients: TD. Intervention: IEC, HTC, condom distribution, STI testing and treatment	US NIH	Yes
The Nigeria STD control intervention [24]	1996-1997	NGA	Implementers: State University Ado-Ekiti. Clients: TD, SW, SW managers, students. Intervention: IEC, stigma reduction, condom distribution and demonstration	SIDA	No
Prévention du SIDA sur les Axes Migratoire de l'Afrique de l'Ouest (PSAMAO) [29]	1997-2000	BEN, BFA, CMR, CIV, MLI, NER, TGO	Implementers: PE. Clients: TD, FSW, seasonal migrant workers. Intervention: IEC, mass media, condom demonstration, inter-educational cassettes	USAID	Yes

Chevron Workplace AIDS Prevention Programme [28]	1998-current	NGA	Implementers: HCW. Clients: TD. Intervention: IEC, poetry, drama, music video shows, moonlight storytelling, condom promotion, positive living, STI treatment, HTC, PMTCT	Chevron	No
Corridor Empower Project/Trucking Wellness [33]	1999-current	ZAF	Implementers: HCW, PE. Clients: TD. Intervention: STI treatment, HTC, IEC, condom distribution, PC, ART, nutrition supplements	PPP	No
Corridors of Hope [27, 40-43]	1999-current	DRC, ZMB	Implementers: HCW, PE. Clients: TD, FSW. Intervention: HTC, condom distribution, STI and malaria screening and treatment, FP, TB screening and referral, participatory learning, economic strengthening activities	USAID, JICA	Yes
	1999-current	ZMB	Expanded clients to out-of-school youth (10-24yrs)	USAID	Yes
	1999-current	ANG, BWA, LSO, MWI, MOZ, NAM, ZAF, SWZ, ZMB, ZWE	Expanded clients to traders	USAID	No
Reproductive Health services for populations at high risk of HIV in Mozambique [34]	2001	MOZ	Implementers: night-clinic HCW, PE. Clients: TD, SW. Intervention: STI testing and treatment, IEC, condom distribution, outreach, FP, HTC	FICA	Yes
Ugandan Transport Sector Workplace HIV Interventions [30, 44]	2001-2003	UGA	Implementers: HCW, PE**. Clients: TD, transport employees. IEC, condom distribution, forming CBOs at truck stops	UCTOA, ITF, AGTWU-URWU, Ugandan MoH	No

High Risk Corridors Initiative (HRCI) [30, 49]	2001-2008	DJI, ETH	Implementers: PE, HBC volunteers, HCW, spiritual counsellors. Clients: TD, transport workers, FSW, youth in and out of school, influential leaders, civil servants, OVC, PLWHA. Intervention: IEC, HTC, ART, STI screening, OI treatment/referral, livelihood enhancement	USAID	Yes
ADRA's HIV/AIDS Programme [31]	2002-2005	GHA	Implementers: PE. Clients: TD, mechanics, tailors, hairdressers. Intervention: drama activities, posters, radio talk shows, durbars	USAID	Yes
The T-MARC Project [35, 50]	2004-2010	TZA	Implementers (Formative phase): FHI360. Clients: counsellors and NGO workers Implementers (Intervention phase): counsellors and NGO workers. Clients: TD, SW, tan boys and miners. Interventions: IEC (including "being faithful"), male and female condoms, FP, ORS.	USAID	No
WFP's HIV/AIDS training [30]	2004-current	BDI, DRC, DJI, ETH, ERI, KEN, RWA, SLE, TZA, UGA	Implementers: trainers. Clients: transport and contract workers. Intervention: IEC, stigma and discrimination reduction messages	WFP	No
HIV/AIDS project for the Abidjan-Lagos Corridor*** [32, 51]	2004-current	BEN, GHA, CIV, NGA, TGO	Implementers: HCW, PE. Clients: transport workers, migrants, SW, local populations. Intervention: IEC, social marketing of condoms, ART, HTC, STI and OI treatment, HIV grants to CSOs	World Bank (post 2007: Global Fund, USAID)	Yes

GDC Haulage workplace HIV/AIDS Programme [30]	2006	ZWE	Implementers: PE. Clients: TD. Intervention: outreach, video drama activities	GDC Haulage	No
ROADS II Project**** [13-20]	2006	DJI	Implementers: PE. Clients: TD, their assistants, SW, low income women, youth out of school, community men, bar/restaurant employees. Intervention: HTC, BCC, drama, film screening, stigma/GBV reduction, local CBO capacity building	USAID/FHI360	Yes
	2008	RWA	Expanded DJI model to OVC, PLWHA, fishermen, and homeless. Add'l interventions: ART referrals, OVC support, economic opportunities, FP, MCH, nutrition	USAID/FHI360	Yes
	2008	TZA	Expanded RWA model to MSM, IDU. Add'l interventions: condom promotion, IDU, palliative care, HS strengthening	USAID/FHI360	Yes
	2008	UGA	Expanded RWA model to uniformed services, people engaging in MCP. Add'l interventions: condom promotion	USAID/FHI360	Yes
	2009	ZMB	Expanded UGA model to discordant couples. Add'l interventions: male circumcision, screening for TB/malaria, STI syndromic tx, FP	USAID/FHI360	Yes
	2009	BDI	Expanded TZA/ZMB models. Add'l interventions: IEC, PMTCT	USAID/FHI360	Yes
	2012	KEN	Expanded DJI model to married youth, older orphans. Add'l interventions: PC, referral	USAID/FHI360	Yes
North Star Alliance [36]	2007-current	BWA, DRC, KEN, MWI, MOZ, ZAF, SWZ, TZA, GMB, UGA, ZMB, ZWE	Implementers: HCW, PE. Clients: TD, their assistants, SW, local community. Interventions: HTC, BCC, condom promotion and distribution, STI testing and syndromic treatment, TB and malaria pre-screening, ART, general check-ups and referral	PPP	No

RTI International's HIV Prevention Interventions for Most-at-Risk	2008-2013	BWA	Implementers: PE. Clients: TD, SW, SW clients, young women (15-29 yrs). Intervention: condom promotion and distribution; support of referral; HCW and PE capacity building	USAID	No
Populations project [47] Improving HIV/AIDS knowledge and risk behaviours of drivers [48]	2011	NGA	Implementers: PE. Clients: TD. Intervention: three-day intervention (2-3 hours per day) on IEC	n/a	Yes

Notes: *Mobile team consisting of a physician, nurses, health educator, clerical assistant, driver. ** Not listed but implicit from intervention service delivery package *** Currently named "Organisation du Corridor Abidjan-Lagos (OCAL) project"; **** Limited accessible programme information on ROADS I. ROADS I was implemented in south Sudan, Ethiopia, Democratic Republic of Congo and ROADS II countries. Countries: ANG, Angola; BEN, Benin; BWA, Botswana; BFA, Burkina Faso; BDI, Burundi; CMR, Cameroon; DRC, Democratic Republic of Congo; CIV, Côte d'Ivoire; DJI, Djibouti; ERI, Eritrea; ETH, Ethiopia; GHA, Ghana; KEN, Kenya; LSO, Lesotho; MWI, Malawi; MLI, Mali; MOZ, Mozambique; NAM, Namibia; NER, Niger; NGA, Nigeria; RWA, Rwanda; SLE, Sierra Leone; ZAF, South Africa; SWZ, Swaziland; TZA, Tanzania; GMB, The Gambia; TGO, Togo; UGA, Uganda; ZMB, Zambia; ZWE, Zimbabwe

Abbreviations: Eval, evaluated; PE, peer educator; HCW, healthcare worker; TD, truck driver; FSW, female sex worker; IEC, information, education and communication; USAID, United States Agency for International Development; AMREF, African Medical & Research Foundation; OVC, Orphans and Vulnerable Children; HIV, human immunodeficiency virus; PMTCT, prevention of mother to child transmission; WFP, World Food Program; SADC, Southern African Development Community; NECTOI, National Employment Council for the Transport Operating Industry; AIDS, acquired immunodeficiency syndrome; SIDA, Swedish International Development Agency; FHI

(FHI360), Family Health International; NGO, non-governmental organisation; AIDSCAP, AIDS Control and Prevention Project; NDA, Norwegian Development Agency; HTC, HIV testing and counselling; STI, sexually transmitted infection; US NIH, United States National Institutes of Health; ART, antiretroviral treatment; PPP, public-private partnership; FP, family planning; TB, tuberculosis; yrs, years; JICA, Japan International Cooperation Agency; FICA, Flemish International Cooperation Agency; UCTOA, Uganda Commercial Truck Owners Association; ITF, International Transport Forum; AGTWU-URWU, Amalgamated Transport and General Workers' Union- Uganda Railway Workers Union; ADRA, Adventist Development and Relief Agency; CBOs, community-based organisations; MoH, ministry of health; PLWHA, people living with HIV/AIDS; NGO, non-governmental organisation; ORS, oral rehydration solution; OI, opportunistic infections; CSO, community service officers ; GBV, gender-based violence; MCH, maternal and child health; BCC, behaviour change communication; MSM, men who have sex with other men; IDU, injection drug users; MCP, multiple and concurrent partnerships; PC, primary care; Add'l, additional; HS, health system

Programmes with a broad geographical coverage vary in their objectives and approach. The Corridors of Hope project, implemented in 11 countries, provides services to key populations (including truck drivers, female sex workers, and members of surrounding communities) along transport corridors and at border sites. The main focus of the project is comprehensive HIV prevention services and improved linkages and referral networks [43]. The ROADS II project, operational in eight countries, aims primarily to address HIV and other health issues in the communities around transport corridors by engaging with the communities and community leadership to ensure uptake of services provided at the programme's SafeTstops [13]. The World Food Program's HIV training programme, implemented in ten countries, is a train-the-trainer initiative for truck drivers and contract workers with a focus on BCC and activities to reduce stigma and discrimination [30]. The North Star Alliance Programme, active in 12 countries, is a primary healthcare programme delivered through stationary and mobile clinics operated by healthcare workers and peer educators [36]. Countries in Southern Africa with high HIV prevalence, such as Zambia, Zimbabwe, Tanzania, and Mozambique, had five or more programmes active nationally. Figure 2.2 illustrates the distribution of programmes per country against adult HIV prevalence in the general population and along main transport corridors in 2014 [52]. A variety of funders, with domestic investments constituting a minority were observed. Among the international funders, USAID represented the largest investor, with just under half of the programmes (n=9) funded or co-funded by this agency.

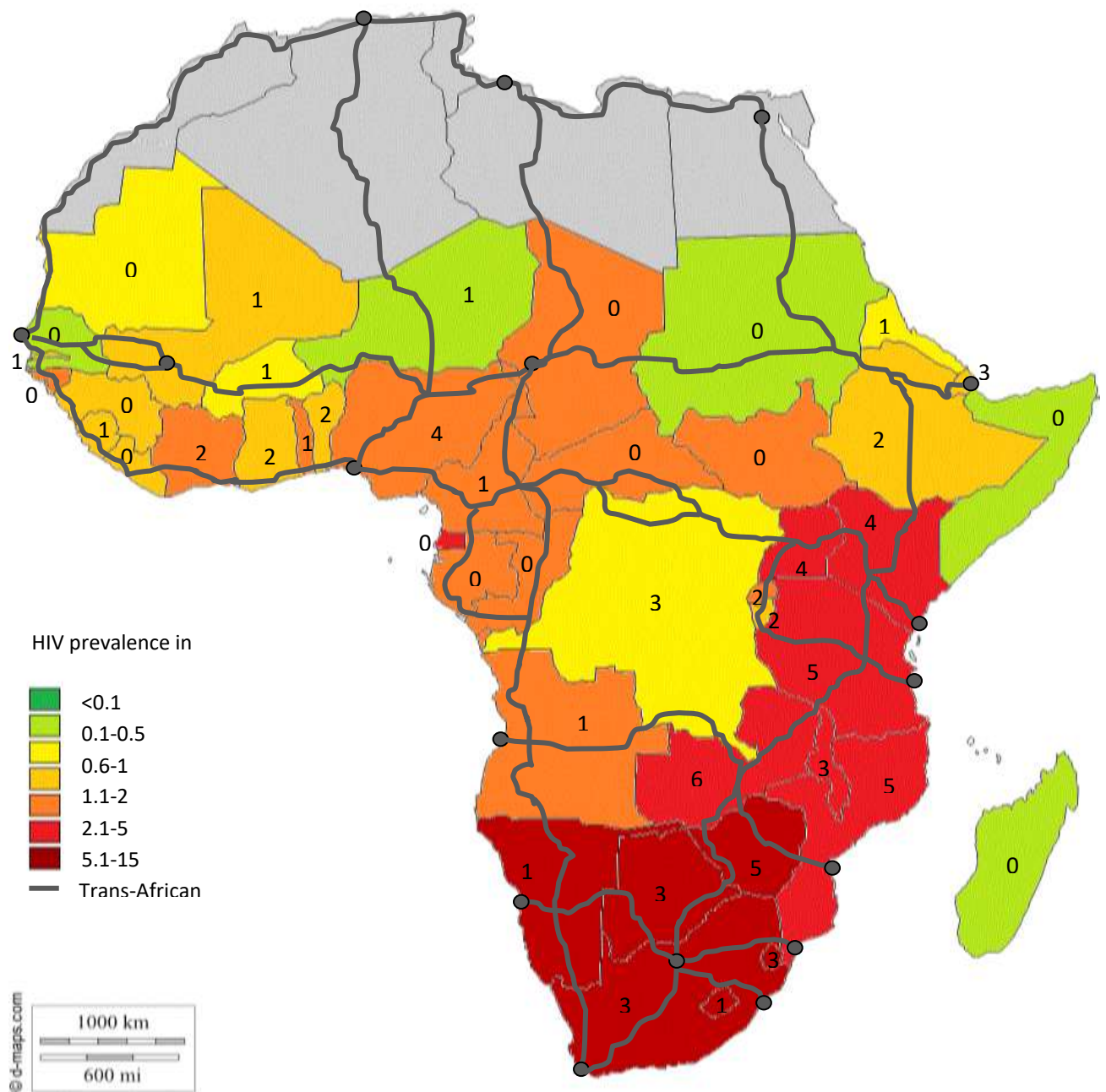


Figure 2.2 Country-level HIV prevalence and number of healthcare programmes for truck drivers

Evaluations of healthcare programmes for truck drivers

Of the 22 programmes identified, just over half ($n=12$) were evaluated in 17 countries [21-23, 25-27, 29-32, 34, 40-43, 45, 48, 49, 52-54]. A detailed description of the evaluation methods is provided in Table 2.2.

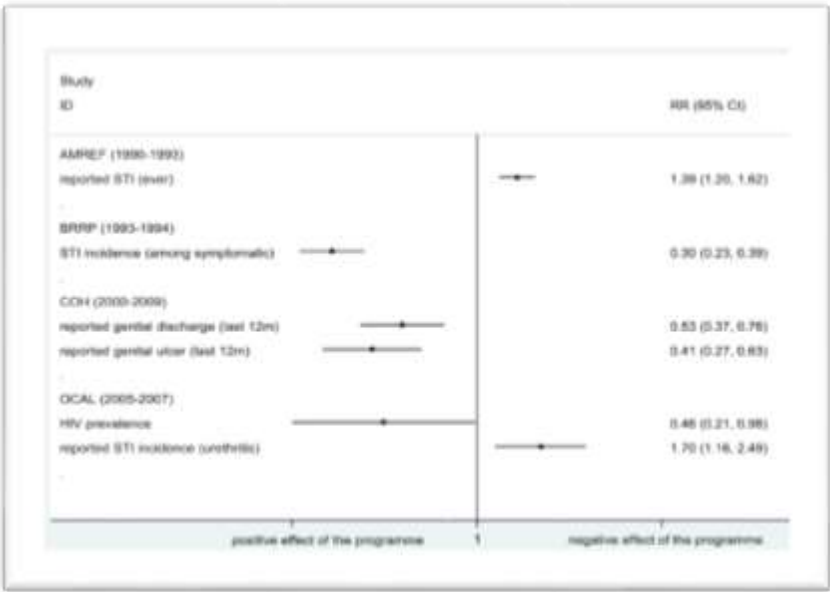
Evaluations were conducted between 1990 and 2012 in single countries, with the exception of two programmes that were evaluated across several countries [32, 53]. Programmes tended to be evaluated only once, excluding the Corridors of Hope project that underwent five evaluations, three external and two internal, during the period 2000 to 2009 [27, 40-43]. External evaluators performed five of the 12 evaluations [31, 32, 34, 49, 53]. Methodological approaches and their quality varied across studies, ranging from qualitative appraisals, including focus group discussions and interviews, to quantitative designs such as pre- and post-intervention surveys, statistical analysis of routinely-collected data, and trend analysis of repeated cross-sectional surveys. Sampling strategies, when used, and sample sizes also varied across evaluations. Due to the mobility of this population, most of the evaluations had to adjust their sample size and sample method to make use of simple random or purposive sampling. We assessed major limitations in the majority of evaluation studies. These included: 1) absence of control or comparison groups (n=10), [21, 22, 26, 27, 29, 31, 32, 34, 40-43, 45, 48, 49, 53] hindering the attribution of any effect observed to the programme, 2) the lack of biological data measurements (e.g. HIV/STI testing), introducing bias in reporting of some of the evaluated outcomes (n=4) [22, 23, 26, 27, 32, 40-43, 51].

A detailed description of the 75 indicators reported in 12 programme evaluations can be found in Table 2.3, with the reported results in Table 2.4. Four programmes reported on inputs and activities available within programmes (i.e. number of sites established, staff trained and resources used) [32, 34, 49, 53]. Only two programmes [49, 53] provided information on costs, however they did not evaluate the programmes' cost-effectiveness. All programmes reported output (n=42) or outcome indicators (n=16). Output indicators generally described the volume of services provided and clients reached. Six programmes provided sufficient data on outcome or impact indicators to be included in the meta-analysis. A total of five programmes, evaluated in Benin, Ethiopia, Ghana, Ivory Coast, Kenya, Nigeria, Tanzania, Togo and Zambia, reported one or more impact indicator results [21, 26, 32, 42, 49]. These impact indicators included changes in HIV prevalence for one programme and STI incidence for four [21, 26, 32, 42] programmes. However, only one study conducted biological STI testing. It provided syphilis serology for all patients and

further investigation for symptomatic patients, including culture for *Neisseria gonorrhoeae* and *Haemophilus ducreyi*, and antigen detection of *Chlamydia trachomatis* [21]. The other programmes relied on self-reported symptoms. One programme reported changes in AIDS-related mortality, stigma, and social norms using qualitative data [49].

Impact of healthcare programmes

An overview of the potential impact on truck driver health by programme by plotting the RRs and 95% CI for all reported outcomes and impact indicators is provide in Figures 2.3 and 2.4. In the OCAL programme it could be argued that the decrease in HIV prevalence may in fact not actually be a "positive effect of the programme." This is due to the expectation that a successful treatment programme should increase the life expectancy of the truck drivers over time. Therefore the HIV prevalence may increase over time . In fact, an increase in STIs combined with a decrease in HIV prevalence could also imply that this programme is having little or no effect.



Abbreviations: ID, identifier; RR, relative risk; CI, confidence interval; AMREF, African Medical & Research Foundation; STI, sexually transmitted infection; BRRP, Behavioral Risk Reduction Program; COH, Corridors of Hope; OCAL, Organisation du Corridor Abidjan-Lagos

Figure 2.3 Relative risk in reported impact indicators by evaluated programmes (random effects model)

The programmes reported mixed results on impact indicators with two [26, 32, 51] out of four programmes [21, 26, 32, 42, 51] showing an increase in reported prevalence of STIs. Results for outcome indicators were consistent across the programmes, with decreases in reported risk behaviours or misconceptions and negative attitudes towards people living with HIV. All programmes reported substantial increases in output indicators, such as the number of HTC sessions or the numbers of condoms distributed (Table 2.4).

Finally, in Figure 2.5 a subgroup analysis exploring the heterogeneity in the results by type of indicator reported is presented. While the indicators reported did not explain all the heterogeneity present in the results (with all p values <0.001 for all subgroups analysed), the main impact of these programmes can be shown as a significant reduction in risk behaviours and negative attitudes and misconceptions reported against people living with HIV, with all RRs below one. Alternative figures 2.3, 2.4 and 2.5 are presented at the end plotting risk differences and 95% CI for all outcomes and impact indicators and using a fixed-effects model as an alternative to the random effects model, respectively. The results were robust to these sensitivity analyses.

Table 2.2 Description of methods used during programme evaluations

Programme	Year	Country	Sites	Population	Sample size	Sampling	Method and limitations
AMREF Truck Driver project [26, 45]	1990, 1991, 1993	TZA	Seven major truck stops and three trucking companies sites	TD	1990, n=425 1991, n=198 1993, n=305	Random	Internal evaluation. Cross-sectional surveys (KAP) at three time points: baseline, 18 m, 24 m Limitations: No HIV testing, reported prevalence of STI, lack of comparison group
				FSW	1990, n=304 1991, n= 121 1993, n=318	Two-stage cluster	
Behavioural risk-reduction programme [21]	1993-1994	KEN	Depots of six trucking companies	Men, HIV-negative, employed at trucking companies	n=556	All eligible	Internal evaluation. Prospective cohort study, follow up visits every 3m for 12 m. Limitations: Selective population. N=133 screened but not enrolled; N=215 lost to follow-up. Symptomatic STI evaluation only, lack of comparison groups
NECTOI's AIDS education programme [22, 23]	1995, 1997	ZWE	21 sites on major highways, border crossings, and at	Transport workers**	N/A	N/A	Internal evaluation. Cross-sectional surveys (KAP) at two times points: baseline, 24 m.
				FSW	N/A	N/A	Limitations: lack of comparison group, lack of

			the edges of large cities				biological data on testing and limited questions on behaviour
Prevention of sexual transmission of HIV through IEC[25]	1996	MWI	All Blantyre's trucking companies Six districts from two regions	TD FSW	n=347, one focus group n=424, six focus groups	Random All eligible, bar-based	Internal evaluation. Mixed methods (focus groups, questionnaires). Three groups: 1) active PE, 2) no PE, 3) average (no PE, HCW visits). Limitations: Poor PE retention for follow up assessment, social desirability bias***
Prévention du SIDA sur les Axes Migratoire de l'Afrique de l'Ouest (PSAMAO) [29]	1997, 2000	BFA	One site	TD	1997, n= 831 2000, n=1032	Two-stage random	Internal evaluation. Cross-sectional surveys (KAP) at two time points: baseline, 36 m. Limitations: lack of comparison group, unique site
Corridors of Hope (CoH) [27, 40-43]	2000	ZMB	Three sites	TD	n=867	All eligible	External evaluation. Cross-sectional BSS. Limitations: lack of comparison group, lack of biological data on testing.
	2003	ZMB	Two sites	TD UP M+Light TD	n= 686 n= 349 n= 228	All eligible	External evaluation. Cross-sectional BSS. Limitations: lack of comparison group, lack of biological data on testing.
	2005	ZMB	One site	TD UP M+Light TD	n=146 n=206 n=150	All eligible	External evaluation. Cross-sectional BSS. Limitations: unique site, lack of comparison group, lack of biological data on testing.

	2006	ZMB	Three sites	TD	n=1,006	All eligible (2 sites), cluster (1 site)	Internal evaluation. Cross-sectional BSS. Trend analysis on behaviour indicators (2000, 2003 and 2006). Limitations: lack of comparison group, lack of biological data on testing.
	2008-2009	ZMB	Four sites	TD	n=1,863	Time-location cluster	Internal evaluation. Cross-sectional BSS. Trend analysis on behaviour indicators (2000, 2003, 2006 and 2009). Limitations: lack of comparison group, lack of biological data on testing.
The HIV/AIDS project for the Abidjan-Lagos Corridor* [32, 51]	2005	BEN,	Eight border crossing points	TD	2005, n=594	N/A	External evaluation. Three population-based surveys (KAP + behaviour + reported STI and HIV prevalence). Limitations: lack of comparison group. Lack of biological data on STI testing.
	2007	GHA, CIV, NGA, TGO		FSW	2007, n=533 2005, n=235 2007, n=188	N/A	
ADRA's HIV/AIDS Programme [31]	2006	GHA	One municipality	TD Mechanics Hairdressers Tailors/DM	n=5 n=68 n=61 n=66	Stratified random	External evaluation. Cross-sectional survey (questionnaire, discussion checklist). Limitations: lack of comparison group, small sample including PE

High Risk Corridor Initiative (HRCI) [30, 49]	2007	ETH	Six sites	TD, HCW, PE, PLWHA, community †	n=291	N/A	External evaluation. Mixed method (focus groups, interviews, analysis of routinely-collected data). Limitations: lack of comparison group. Small sample. Routinely collected data not disaggregated by population reached, results presented only in narrative.
Reproductive Health services for populations at high risk of HIV in Mozambique [34]	2007-2009	MOZ	One site	TD FSW KI	n=32 n=16 n=28	Purposive	External evaluation. Mixed method (focus groups, structured interviews, analysis of routinely-collected data, costs). Limitations: lack of comparison group, unique site, small sample
Improving HIV/AIDS knowledge and risk behaviours of drivers [48]	2011	NGA	One site	TD	n=140 (each group)	Multi-staged	Internal evaluation. Cross-sectional surveys (before and after). Included a control group. Limitations: unique site
ROADS II [53]	2012	BDI, DJI, DRC, KEN, MOZ, RWA, sSUD, TZA,	Five sites (Burundi, Kenya, Mozambique, Rwanda, and Tanzania) across three types of programming	TD Other	n=20 n=433	Purposive	External evaluation. Mixed methods (document review, key information interviews, analysis of routinely-collected data, costs). Limitations: lack of baseline, lack of comparison group, cannot determine impact – 1) qualitative evaluation of visited sites; 2) conducted a year prior to project end

UGA,
ZMB

Notes: * Currently named “Organisation du Corridor Abidjan-Lagos (OCAL) project”; ** transport workers include truck drivers, bus drivers and their assistants; ***difference in reported condom usage data between interviews and focus groups; †Community includes teachers, spiritual leaders, general community members, and volunteers. Countries: BDI, Burundi; BEN, Benin; BFA, Burkina Faso; CIV, Côte d'Ivoire; DJI, Djibouti; DRC, Democratic Republic of Congo, ETH, Ethiopia; GHA, Ghana; KEN, Kenya; MWI, Malawi; MOZ, Mozambique; NGA, Nigeria; RWA, Rwanda; sSUD, south Sudan; TZA, Tanzania; TGO, Togo; UGA, Uganda; ZMB, Zambia; ZWE, Zimbabwe

Abbreviations: n, number; KAP, Knowledge, attitudes and practices; m, months; HIV, human immunodeficiency virus; TD, truck drivers; FSW, female sex workers; STI, sexually transmitted infections; n/a, not available; ADRA, Adventist Development and Relief Agency; IEC, information, education and communication; PE, peer educator; HCW, healthcare worker; M+Light TD, minibuss and light truck drivers; BSS, behavioural surveillance survey; DM, dressmakers; PLWHA, people living with HIV/AIDS; KI, key informant

Table 2.3 Mapping of programme results using a programme evaluation framework [39]

Input/Activities		Output		Outcome		Impact	
Indicators	N	Indicators	N	Indicators	N	Indicators	N
<i>Facilities/services available</i>	2	<i>HTC services (number of sessions, number of patients reached or referred, uptake of PICT)</i>	5	<i>Risk behaviour (condom use, number of sexual partners, alcohol and drug use)</i>	9	<i>Health-related</i>	5
n checkpoints per 100 km [32]	1	n HTC sessions and patients receiving HIV test results [34, 40-43, 53]	3	Frequency with sex workers [21, 42]	2	STI incidence [25, 26, 40-43, 45]	4
% sites reporting adequate supply of ABX for STIs [32, 51]	1	n having access to HTC [27, 32, 34, 49, 51]	4	Condoms usage [21, 23, 25-27, 29, 32, 40-43, 45, 48, 49, 51]	9	n AIDS deaths [49]	1
n sites providing HIV-related palliative care [49]	1	% men reporting access to HTC [40-43]	1	Extramarital sex [21]	1	HIV prevalence [51]	1
n sites outlets providing HTC [49, 51]	1	n households referred for HTC [49]	1	Alcohol and drug use [40-43]	1		
n sites accessing QA [49]	1	n individuals receiving PICT [49]	1	n participants using condoms [27]	1		
n targeted condom service outlets [49]	1	n individuals reached through outreach HTC [49]	1	n reported sexual partners [27]	1		
n youth clubs established [49]	1	n pregnant women with known HIV status [53]	1	<i>Knowledge, attitudes, and perceptions</i>	9		
% HTC sites supervised [49]	1	<i>Condoms distribution services</i>	4	Stigma/discrimination towards people with HIV [40-43]	1		

<i>Staff employed/training provided</i>	1	n condom distributed [23, 32, 34, 51]	3	Risk perception [23, 26, 45]	2
n trainings conducted [49]	1	n individuals receiving condoms [49]	1	HIV/AIDS awareness and knowledge [26, 29, 31, 32, 42, 45, 48, 49, 51]	6
n peer educators in the programme [49]	1	<i>Referral services</i>	1	Perceptions of, and attitudes towards HIV/AIDS [26, 45]	1
<i>Materials developed and resources used</i>	3	n HBC programmes linked with health centres and hospitals [49]	1	Condom knowledge [22, 48]	2
n IEC materials developed [49]	1	% HIV-positives referred [49]	1	Knowledge of STIs ^[40-43]	1
Average running cost of the clinic [34]	1	<i>Clients served</i>	5	<i>Clinical outcomes</i>	2
Waiting times [34]	1	n satisfied clients [34]	1	% positive among PICT [49]	1
Budgets/expenditure [53]	1	% target audience reached [49]	1	% positive among HTC [49]	1
		% reporting exposure to COH [40-43]	1	n having STIs [27]	1
		Change in clinic attendance ^[34]	1	% reporting STIs ^[40-43]	1
		<i>Sexual health services</i>	2		
		n visiting for STI management [34]	1		
		n visiting for contraception [34]	1		
		n counselling visits for RH/FP as a result of USG assistance[53]	1		
		<i>Behaviour change services</i>	2		
		n IEC materials distributed [49]	1		

n reached with outreach promoting abstinence and/or being faithful [49]	1
n reached with outreach promoting behaviour change beyond abstinence and/or being faithful [49]	1
n counselled on adherence [49]	1
n targeted population reached with individual and/or small group level HIV prevention interventions that are based on evidence and/or meet the minimum standards required [53]	1
n MARPS reached with individual and/or small group level HIV prevention interventions that are based on evidence and/or meet the minimum standards required [53]	1
n counselling visits for RH/FP as a result of USG assistance [53]	1
<i>Staff trained</i>	1
n trained in programmes promoting abstinence and/or being faithful [49]	1

n trained in programmes promoting behaviour change beyond abstinence and/or being faithful [49]	1
n individuals trained to provide HIV related palliative care [49]	1
n individuals trained in HTC [49, 51]	1
n trained in FP/RH with USG funds [53]	1
<i>Other services</i>	2
n provided with HIV-related palliative care [49]	1
n screened for TB symptoms [49]	1
n on cotrimoxazole prophylaxis [49]	1
n on food and nutrition support [49]	1
n receiving insecticide-treated bed nets [49]	1
n receiving safe water treatment [49]	1
n circumcised [42]	1
Change in ART access [49]	1
n people who have seen or heard a specific USG supported FP/RH message [53]	1
n PLHIV reached with a minimum package of PwP interventions [53]	1

n eligible adults and children provided with a minimum of one care service [53]	1
n eligible clients who received at least 1 PLHIV care and support service [53]	1

Abbreviations: n, number; prog, programme; HTC, HIV testing and counselling; PICT, provider-initiated counselling and testing; STI, sexually transmitted infections; AIDS, acquired immunodeficiency syndrome; HIV, human immunodeficiency virus; ABX, antibiotics; QA, quality assurance; %, percentage; HBC, home-based care; IEC, information, education and communication; COH, corridors of hope; TB, tuberculosis; ART, antiretroviral treatment; PwP, prevention with positives; PLHIV, people living with HIV

Table 2.4 Evaluation results of programmes reporting changes in indicator results for TD populations only

Indicators	Programme	Country	Reported change
<i>Output indicators</i>			
Change in HTC uptake and receiving test results	Corridors of Hope [42]	ZMB	Increase (2000 – 2009) in TD who had reported ever doing HTC: from 33·5 – 49·4 Increase (2000 – 2009) in TD who received HTC results: from 90·4 to 98·9%
Change in HTC access	Reproductive Health services for populations at high risk of HIV in Mozambique [34]	MOZ	Increase (2004-2009) in average number of tests performed observed in all populations: from 54·0 to 115·0 per month
	High Risk Corridor Initiative [51]	ETH	Increase (2005-2007) in number of people who used HTC centres along the corridor: from 1,000 to 27,639 Increase (2005-2007) in number of border crossing points with HTC centres: from 3 to 16
Change in condom distribution volume	Prevention of sexual transmission of HIV through IEC [25]	MWI	Relative increase compared to baseline (1996): 33·0% in active PE arm, 2·5% in no PE arm, 8·5% in average arm (HCW visits but no PE)
	Reproductive Health services for populations at high risk of HIV in Mozambique [34]	MOZ	Increase (2004 – 2009) in total volume for the period from 3,151 to 9,200
	High Risk Corridor Initiative [51]	ETH	Increase (2005-2007) in condoms distributed throughout the corridor: from 0·97 million to 8·8 million
Change in ART access	High Risk Corridor Initiative [49]	ETH	Increase (2005-2007) in number of people accessing ART post HTC or HBC referrals (no reported statistics – narrative)
Change in clinic attendance	Reproductive Health services for populations at high risk of HIV in Mozambique [34]	MOZ	Increase in all clinic visit (2004 – 2009) from 206 to 475 per month; in STI visits from 20 to 28

<i>Outcome indicators</i>			
Change in sexual partners	Corridors of Hope [42]	ZMB	<i>Increase in protective sexual behaviours</i> (2000 – 2009) Did not have sex with a regular SP in last 12m: from 0.4% to 43.0%; reported not having sex with FSW in last 12m: from 68.0% to 78.0%; reported not having sex with a non-regular, non-commercial SP in last 12m: from 73.0% to 99.0% <i>Decrease in risk sexual behaviours</i> (2000 – 2009) Reported two or more regular SP in last 12m: from 21.0% to 4.0%; reported two or more commercial SP in last 12m, from 22.0% to 15%; reported sex with two or more non-regular, commercial SP in last 12m: from 8.0% to 1.0%
	Behavioural risk-reduction programme [21]	KEN	Decrease in % reporting extramarital sex (1993-1994): from 49% to 36%
Change in condom use	Corridors of Hope [42]	ZMB	(2000 – 2009) Reported using a condom during last sex with a SW: from 93% to 97%; reported consistent condom use with SW: from 84% to 91%; reported condom use on last occasion with a regular SP in last 12 months: from 43.0% to 73.0%; reported consistent condom use with regular SP: from 8.0% to 60.0%
	NECTOI's AIDS education programme [29]	ZWE	Increase (1995 – 1997) in % reporting consistent condom use: from 72.0% to 82.0%. (SW: Increase (1995 – 1997) in consistent condom use: from 82.2% to 88.6%)
	AMREF [26, 45]	TZA	Increase (1990 – 1991) in ever using condoms: from 56.1 % to 73.7%. Decrease (1991 – 1993) in ever using condoms: from 73.7% to 71.5%.

	The HIV/AIDS project for the Abidjan-Lagos Corridor* [32, 51]	BEN, GHA, CIV, NGA, TGO	Increase (2005-2007) in reported condom use during last sex act with non-regular SP in last 12 months: from 59·0% to 78·8% (among SW: from 58·8% to 70·5 %)
	Prevention of sexual transmission of HIV through IEC [25]	MWI	(Increase (1996) in having ever used condoms among SW: from 66·5% to 100·0%)
	Behavioural risk-reduction programme [21]	KEN	Decrease (1993-1994) in consistent condom use during extramarital sex: from 34·0% to 29·0%
	NECTOI's AIDS education programme [22, 23]	ZWE	Increase (1994 -1997) in condom use: no reported statistics – narrative
	Prévention du SIDA sur les Axes Migratoire de l'Afrique de l'Ouest (PSAMAO) [29]	BFA	Increase (1997-2000) in condom use with occasional sexual partners: no reported statistics – narrative
	Improving HIV/AIDS knowledge and risk behaviours of drivers in Nigeria [48]	NGA	Increase (2011) in current condom use: from 34·3% to 51·9%
Change in alcohol and drug use	High Risk Corridor Initiative [49]	ETH	Increase (2005-2007) in condom use: no reported statistics - narrative
	Corridors of Hope [42]	ZMB	Decrease (2000-2009) in alcohol and drug use: from 11·0% to 3·0%
	ADRA's HIV/AIDS Programme [31]	GHA	Increase (2006) in knowledge about difference between HIV and AIDS; transmission modes and signs and symptoms of HIV infected persons: no reported statistics - narrative
	AMREF [26, 45]	TZA	Increase (1991-1993) in % reporting accurate knowledge about intercourse as mode of transmission: from 97·4% to 99%. (SW: from 93·4% to 97·2%) Decrease (1991-1993) in % reporting misconceptions about modes of transmission: shaking hands, from 40·7% to 17·4%
Change in HIV/AIDS awareness and knowledge			

			(SW: from 42·4% to 19·2%); mosquitos, from 55·5% to 43·3% (SW: 61·8% to 45·3%)
	Corridors of Hope [42]	ZMB	Increase (2000 -2009) in % TD who know that abstinence can prevent HIV: Livingstone, from 93·0 % to 99·3%; Chirundu, from 88·2 % to 97·9%; Kapiri Moshi, from 92·1 % to 98·6%. Decrease (2000-2009) in % TD who think that HIV can be transmitted by mosquitos: Livingstone, from 15·8 % to 7·3%; Chirundu, from 17·6 % to 7·8%; Kapiri Moshi, from 26·1 % to 9·1%. Change (2000-2009) in % TD who think that HIV can be transmitted through sharing a meal: Livingstone, from 5·5% to 4·0%; Chirundu, from 9·0% to 10·3%; Kapiri Moshi, from 23·1% to 12·9%
	High Risk Corridor Initiative [49]	ETH	Increase (2005-2007) in TD being able to identify at least two ways to prevent HIV/AIDS: from 68·0 % to 82·7%. (Increase (2005-2007) in SW being able to identify at least two ways to prevent HIV/AIDS: from 59·5 % to 87·9%)
	Improving HIV/AIDS knowledge and risk behaviours of drivers in Nigeria [48]	NGA	Increase (2011) in knowledge about HIV/AIDS: from 89·3% to 100·0%
	Prévention du SIDA sur les Axes Migratoire de l'Afrique de l'Ouest (PSAMAO) [29]	BFA	Increase (1997-2000) in HIV/AIDS knowledge: no reported statistics – narrative
	The HIV/AIDS project for the Abidjan-Lagos Corridor* [32, 49, 51]	BEN, GHA, CIV, NGA, TGO	Increase (2005-2007) in TD identifying at least two ways to prevent HIV: from 68·0% to 90·0% (SW: from 59·5% to 90%)
Change in risk perception	AMREF [26, 45]	TZA	Increase (1991-1993) in perceiving self at risk: from 54·5% to 62·1%

	NECTOI's AIDS education programme [22]	ZWE	Decrease (1995-1997) in % perceiving self at risk: from 52.7% to 30.2% (SW: from 44.6% to 13.2%)
	AMREF [26, 45]	TZA	Increase (1991-1993) % reporting positive attitudes: willing to live in the same house, from 66.7% to 90.8% (SW: from 43.3% to 79.9%); willing to eat together, from 57.6% to 69.5% (SW: 33.5% to 52.5 %); willing to share toilet, from 53.1% to 56.1% (SW: from 81.9% to 97.2%)
Change condom knowledge	Improving HIV/AIDS knowledge and risk behaviours of drivers in Nigeria [48]	NGA	Increase (2011) in awareness of condom use as a preventive practice: from 81.4% to 100.0%
	NECTOI's AIDS education programme [22]	ZWE	Increase (1995-1997) in HIV awareness and condom use: no reported statistics – narrative
Change in knowledge of STIs	Corridors of Hope [40, 42]	ZMB	Increase (2006 -2009) in % knowing two or more STI symptoms: in men, from 73.0% to 81.2% and in women, 44.0% to 59.6%

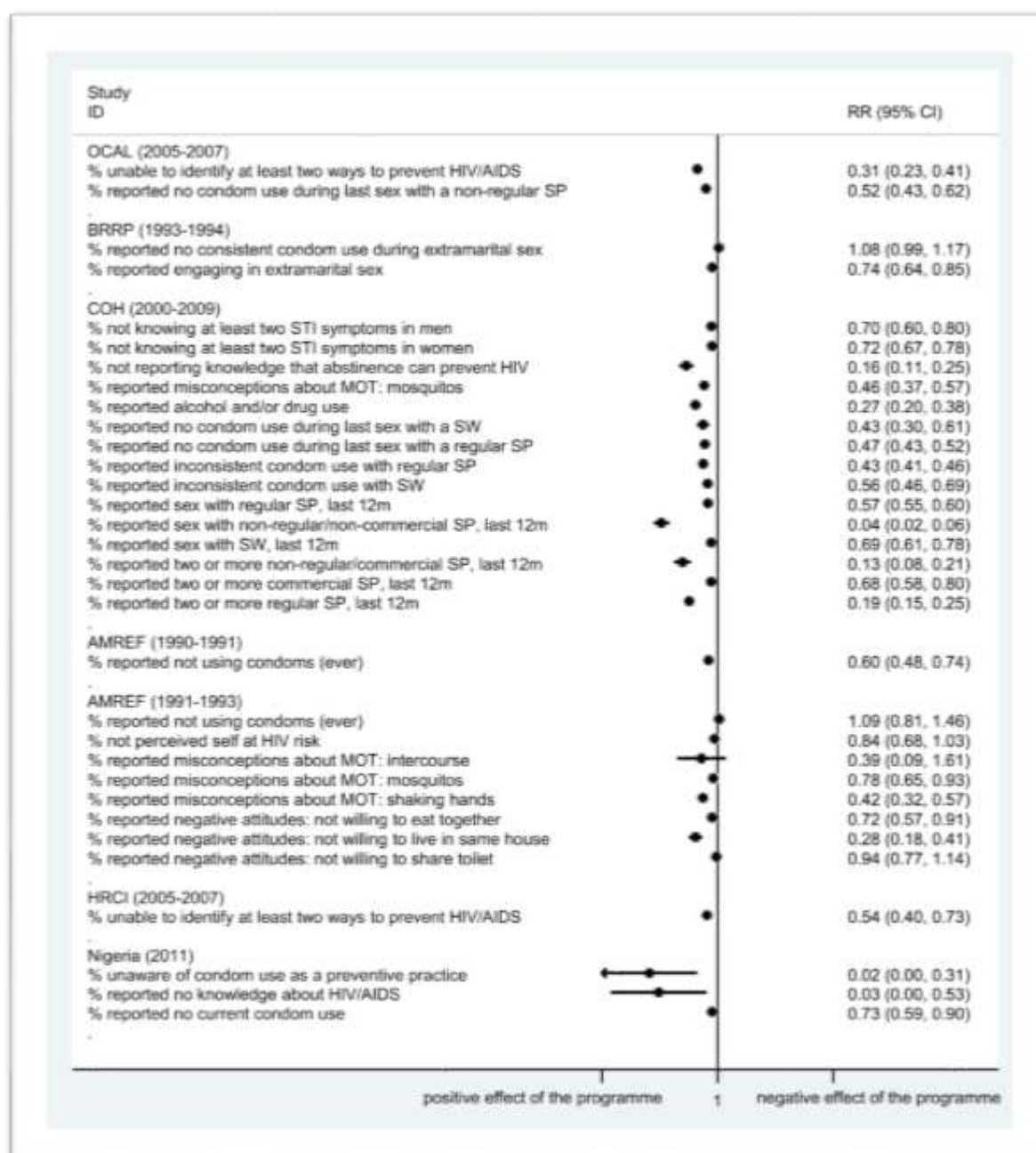
Impact indicators

Change in STI incidence	Corridors of Hope [42]	ZMB	Decrease in proportion reporting genital discharge in the last 12m: from 6.4 (2000) to 5.7 (2003) to 4.9 (2006) to 3.4% (2009); genital ulcers/sores in the last 12m: from 5.3 (2000) to 8 (2003) to 2.8 (2006) to 2.2% (2009)
	AMREF [26]	TZA	Increase in proportion of TD reporting ever having had an STI: from 40.2% to 56.7%. (SW: from 15.5% to 36.8%)
	The HIV/AIDS project for the Abidjan-Lagos Corridor* [32, 51]	BEN, GHA, CIV, NGA, TGO	Increase in reported STI incidence: from 6.7 to 11.5/100 person-yrs. (Decrease in STI prevalence among SW: from 8.9% to 3.8%)
	Behavioural risk-reduction programme [21]	KEN	Decrease in STI incidence: from 34.0 to 10/100 person-yrs

Change in HIV prevalence	The HIV/AIDS project for the Abidjan-Lagos Corridor* [32, 51]	BEN, GHA, CIV, NGA, TGO	Decrease in HIV prevalence: from 5.0% (Feb 2005)/2.7% (Dec 2005) to 1.7% (2007). (Uncertain trend in HIV prevalence among FSW: from 30.1% (Feb 2005)/12.7% (Dec 2005) to 20.7% (2007)).
Change in AIDS deaths	High Risk Corridor Initiative [49]	ETH	Decrease in AIDS deaths among all MARP from routinely-collected data. Only narrative description

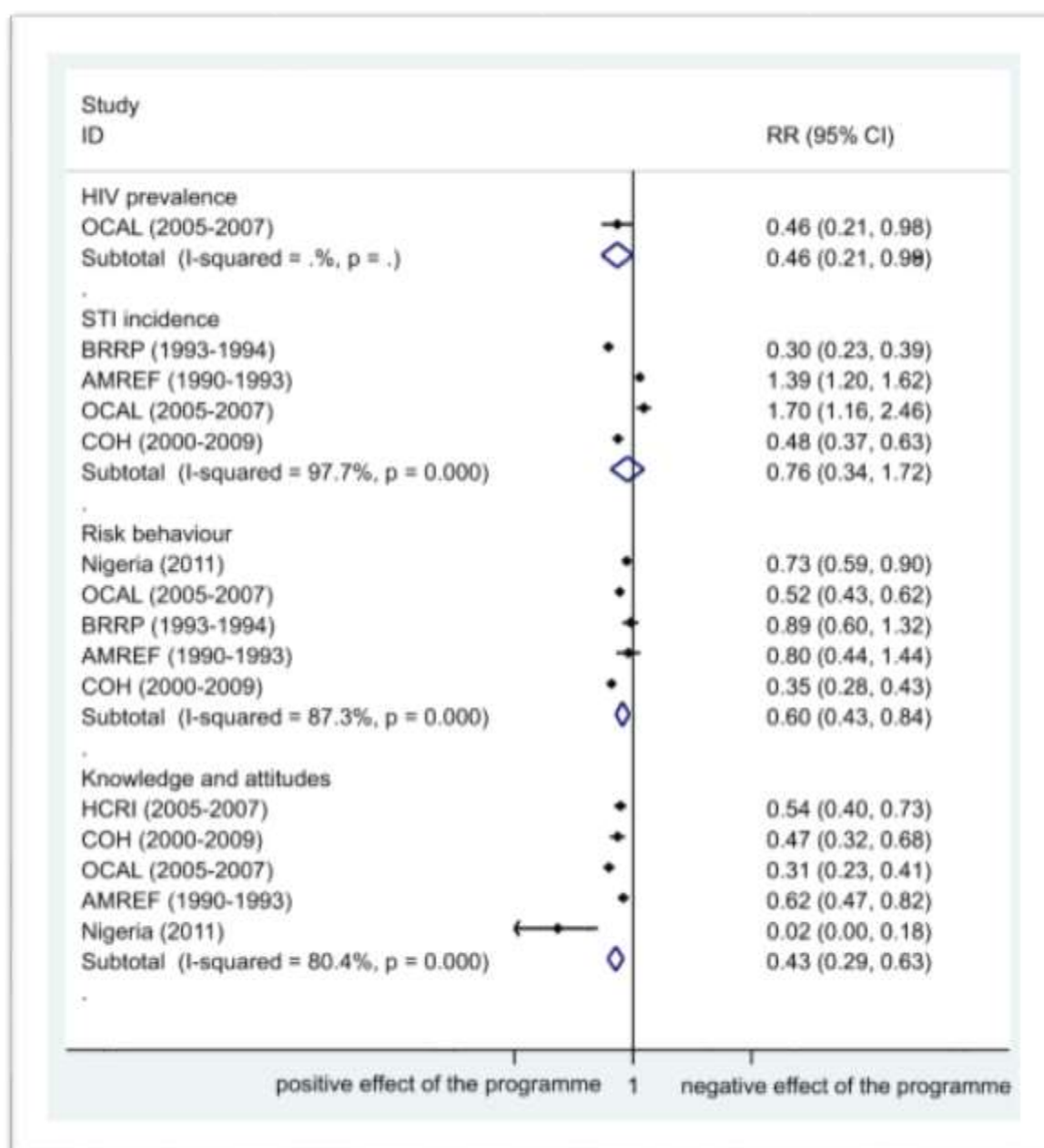
* Currently: Organisation du Corridor Abidjan-Lagos (OCAL) project. Countries: BEN, Benin; BFA, Burkina Faso; CIV, Côte d'Ivoire; ETH, Ethiopia; GHA, Ghana; KEN, Kenya; MWI, Malawi; MOZ, Mozambique; NGA, Nigeria; TZA, Tanzania; TGO, Togo; ZMB, Zambia; ZWE, Zimbabwe.

Abbreviations: HTC, HIV testing and counselling; HIV, human immunodeficiency virus; IEC, information education communication; PE, peer educator; HCW, healthcare worker; ART, antiretroviral treatment; STI, sexually transmitted infection; SP, sexual partner; m, months; (F)SW, (female) sex worker; NECTOI, National Employment Council for the Transport Operating Industry; AMREF, African Medical & Research Foundation; AIDS, acquired immunodeficiency syndrome; STD, sexually transmitted disease; ADRA, Adventist Development and Relief Agency; yrs, years; MARP, most-at-risk-populations, FGC, female genital cutting



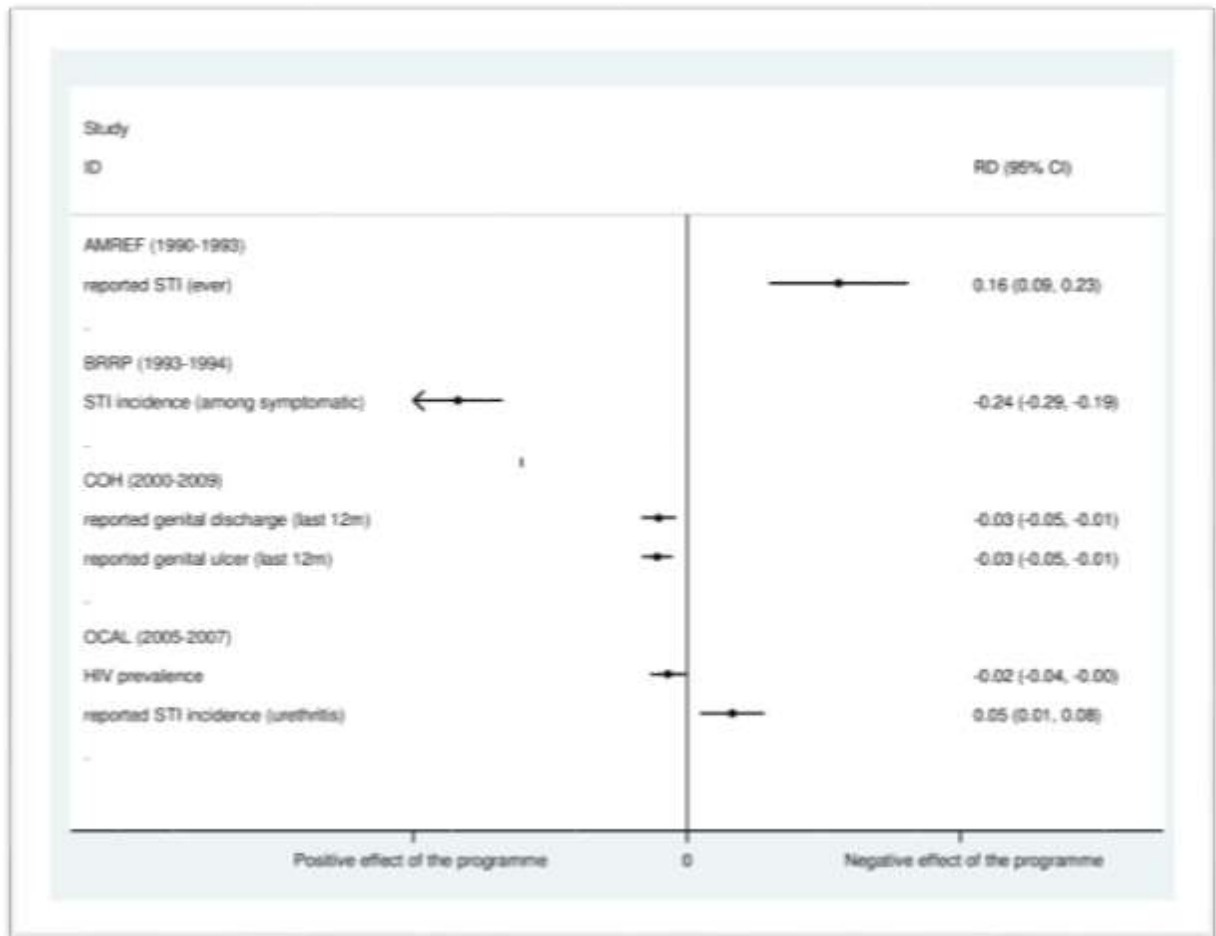
Abbreviations: ID, identifier; RR, relative risk; CI, confidence interval; OCAL, Organisation du Corridor Abidjan-Lagos; %, percentage; HIV, human immunodeficiency virus; AIDS, acquired immunodeficiency syndrome; SP, sexual partner; BRRP, Behavioral Risk Reduction Program; STI, sexually transmitted infection; MOT, modes of transmission; SW, sex worker; 12m, 12 months; COH, Corridors of Hope; AMREF, African Medical & Research Foundation; HRCI, High Risk Corridors Initiative

Figure 2.4 Relative risk in reported outcome indicators by evaluated programmes (random effects model)



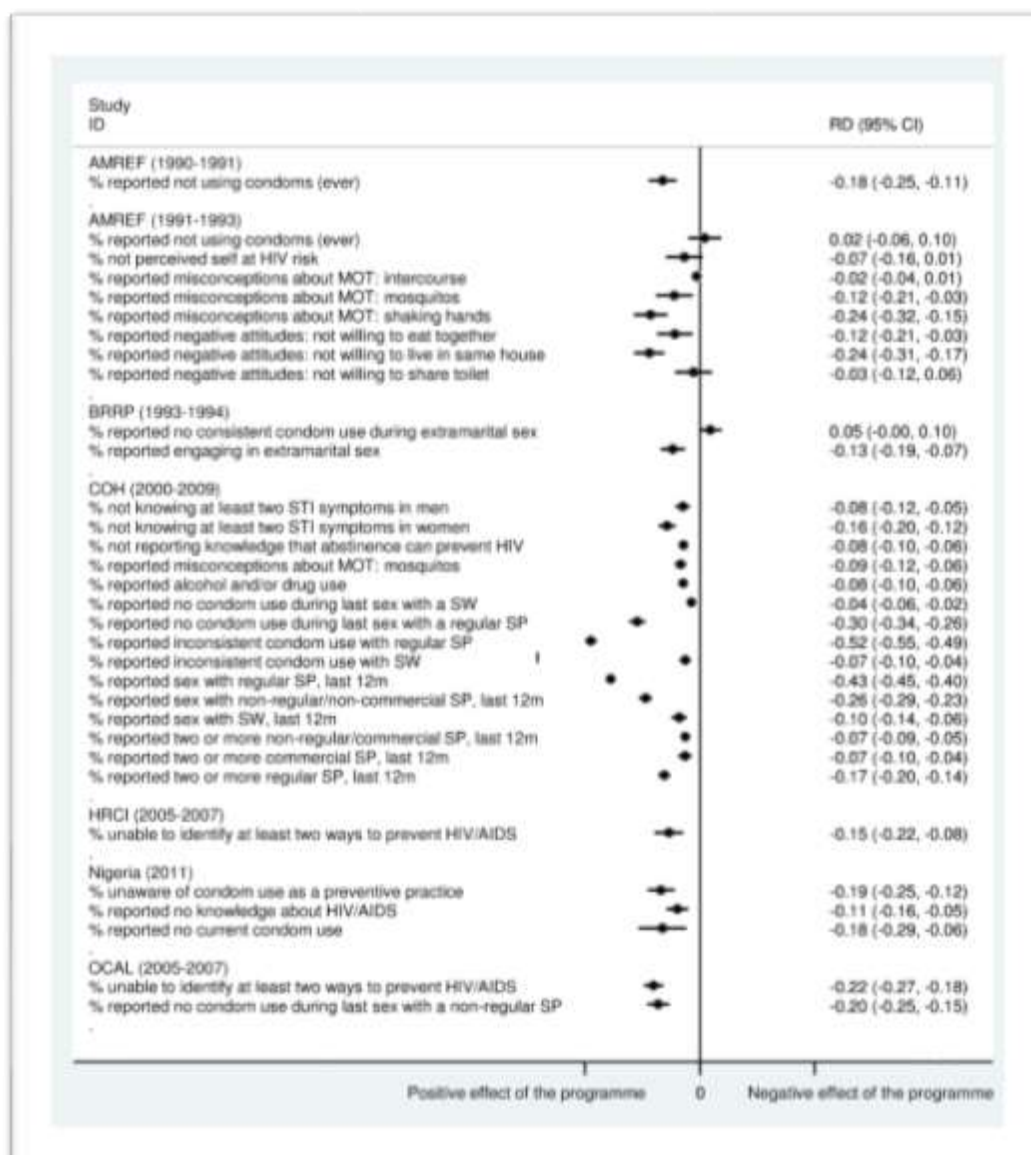
Abbreviations: ID, identifier; RR, relative risk; CI, confidence interval; HIV, human immunodeficiency virus; OCAL, Organisation du Corridor Abidjan-Lagos; %, percentage; p, p-value; STI, sexually transmitted infection; BRRP, Behavioral Risk Reduction Program; AMREF, African Medical & Research Foundation; COH, Corridors of Hope; HCRI, High Risk Corridors Initiative

Figure 2.5 Subgroup analysis, summary of relative risk estimates by type of indicator to display heterogeneity of reported programme results (random effects model)



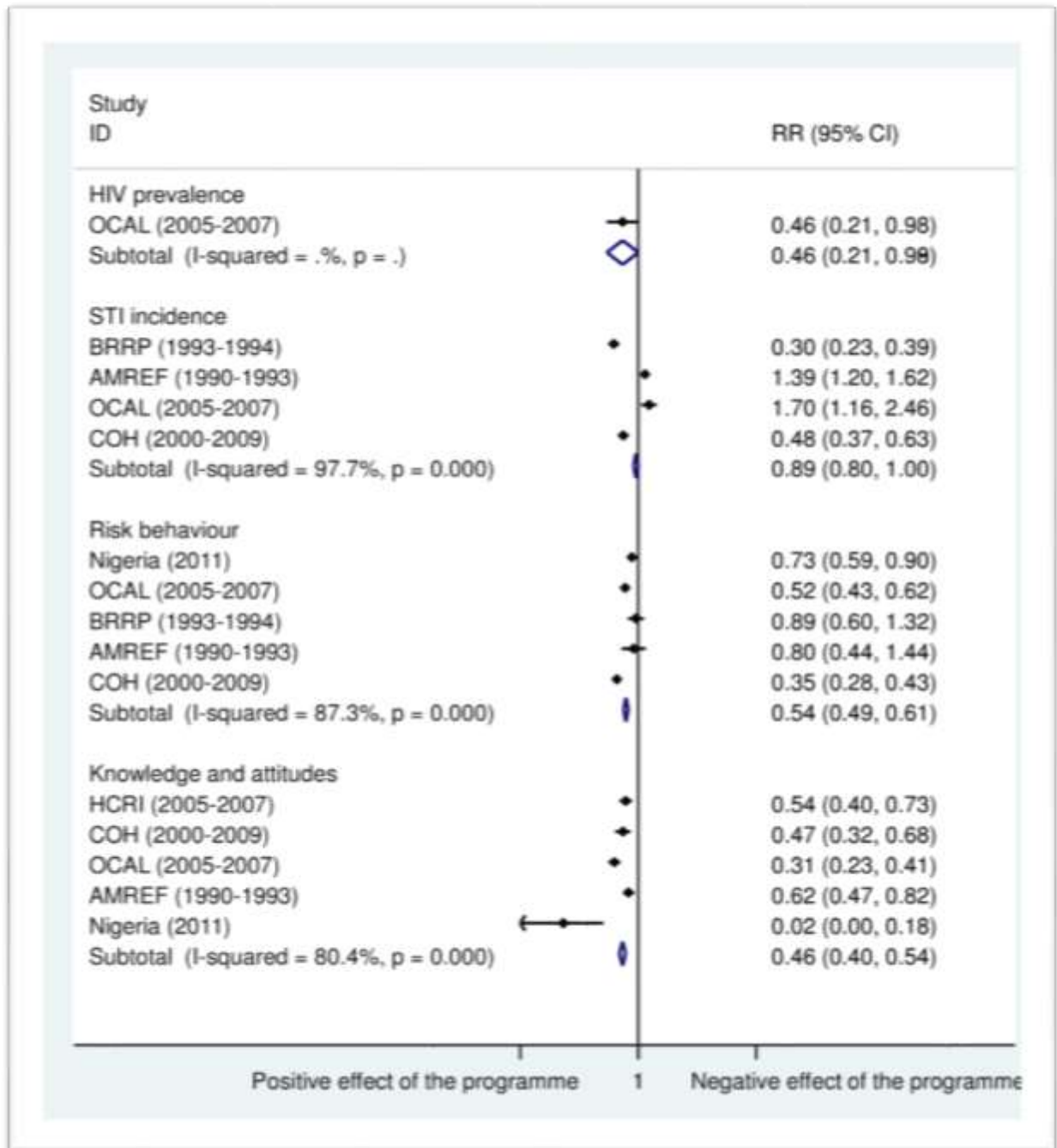
Abbreviations: ID, identifier; RD, relative difference; CI, confidence interval; AMREF, African Medical & Research Foundation; STI, sexually transmitted infection; BRRP, Behavioral Risk Reduction Program; COH, Corridors of Hope; 12m, 12 months; OCAL, Organisation du Corridor Abidjan-Lagos

Figure 2.6 Relative difference in impact indicators by programme (fixed-effects model)



Abbreviations: ID, identifier; RD, relative difference; CI, confidence interval; AMREF, African Medical & Research Foundation; %, percentage; HIV, human immunodeficiency virus; MOT, modes of transmission; BRRP, Behavioral Risk Reduction Program; COH, Corridors of Hope; STI, sexually transmitted infection; SW, sex worker; SP, sexual partner; 12m, 12 months; HRCI, High Risk Corridor Initiative; AIDS: acquired immunodeficiency syndrome; OCAL, Organisation du Corridor Abidjan-Lagos

Figure 2.7 Relative difference in outcome indicators by programme (fixed-effects model)



Abbreviations: ID, identifier; RR, relative risk; CI, confidence interval; HIV, human immunodeficiency virus; OCAL, Organisation du Corridor Abidjan-Lagos; %, percentage; p, p-value; STI, sexually transmitted infection; BRRP, Behavioral Risk Reduction Program; AMREF, African Medical & Research Foundation; COH, Corridors of Hope; HCRI, High Risk Corridor Initiative

Figure 2.8 Subgroup analysis, summary of relative risk estimates by type of reported programme indicator (fixed-effects model)

Discussion

A description of 22 healthcare programmes prioritising truck drivers that have been implemented in 30 countries across sub-Saharan Africa, have been described in this review. These healthcare programmes included short-term interventions of narrow scope, such as limited primary health care and diagnosis of communicable diseases. A minority of healthcare programmes expanded the scope to include gender based violence reduction and palliative care. While most countries had or have healthcare programmes for truck drivers that provide services of HIV prevention and diagnosis, no antiretroviral treatment (ART) services have been offered on site. This provision of vertical services reflects the overall regional HIV disease burden and the particular focus of donors, while the lack of ART provision reflects the logistical challenges of treatment provision across borders. Regionally, HIV prevalence estimates among truck drivers have been reported as high. Studies from Nigeria show a 10% HIV prevalence among truck drivers [55] while South African surveys have reported HIV prevalence estimates in truck drivers who were clients of female sex workers as high as 56% [56] and in truck drivers in general as 26% [57], in 2001 and 2003/4 respectively [58]. This increased vulnerability to acquiring and transmitting HIV among truck drivers has prompted UNAIDS and national governments to identify them as a key population, prioritising this group in their HIV programmes, as does South Africa's National Strategic Plan on HIV, TB and STIs 2012-2016 [11], for example. However, the majority of the programmes in this review did not actively seek to identify people living with HIV (through HTC) and link them to care, but rather focussed on healthcare messaging and BCC. Although this is in keeping with findings of the 2012 review of sex worker programmes in Africa [59], healthcare programmes for truck drivers have seen a progression in scope from 2001 onwards reflected in the increasing (though still insufficient) number of services delivered from satellite and mobile clinics. The World Health Organisation and UNAIDS focus on increasing testing and linkage to ART care can be translated, among truck drivers, into 90% of truck drivers living with HIV being aware of their HIV-positive status, 90% of HIV-positive truck drivers being on ART, and 90% of truck drivers on ART achieving viral suppression [60]. In the absence of data, and with the very limited coverage of these programmes, it seems that there is a considerable way to go from what appears to

be a low baseline for all three of these indicators in truck-driver populations in sub-Saharan Africa.

It was also observed that, in terms of evaluations, just above half of these programmes have been evaluated to date and, of these, most looked only at input or outcome indicators. The evaluation methodologies relied on routinely-collected data and were constrained by low evaluation budgets. In planning for scale-up of programmes, Ministries of Health need to know which interventions, delivered in which way, and at what cost were more effective and efficient. Rigorous measurement of programme outcomes and impact is therefore needed to be able to support wider implementation of programmes. Yet, only six programmes reported sufficient data to analyse outcome or impact indicators. Moreover, programmes prioritising truck drivers have failed to demonstrate an attributable impact on STI incidence or HIV prevalence, due to study designs that lack control arms and heterogeneous trends in HIV risk reduction. However, the programmes overall could be considered to have had a positive effect on risk behaviours, knowledge, and attitudes, albeit the issue of attribution also remains open for these outcomes. For continuous improvement of programme delivery, monitoring and evaluation (M&E) needs to be built into all programmes at the design stage [61]. In the absence of good M&E frameworks, these programmes lose out on valuable process information and are less able to identify and address gaps and make informed decisions regarding operations management and service delivery, including effective and efficient use of resources.

The majority of the programmes were funded by agencies external to the country of implementation and for limited periods of time. Only three programmes were funded by trucking companies/bodies. This funding situation influences the evaluation aim and objectives. Firstly, the need to report specific indicators for programme monitoring and reporting is donor-dictated, influencing the evaluation design and generally streamlining data collection to be compliant with donor priorities. Since main indicators are input, output, and outcome monitoring data, programmes remain

deficient in measures to evaluate impact unless a separate study is envisaged. Secondly, programmes that are proven efficient and have an impact should be scaled-up. Yet scalability and sustainability are real concerns where implementing countries and relevant stakeholders are not closely involved and have no ownership of programmes.

The review presented several limitations. First, the aim was to describe healthcare programmes prioritising truck drivers based on information available. Due to the nature of the documents reviewed, the assessment of the quality of services provided in these programmes could not be performed therefore limiting the quality assessment to the methodologies employed where an evaluation was conducted. Additionally, the focus was on reports and programme descriptions available publicly. This might have limited the completeness of the mapping. However, stakeholders were contacted and efforts were made to include all grey literature. The meta-analysis was performed to summarise the results of programme evaluations. The aim therefore was to quantify the impact these programmes have had on truck driver health indicators. However, due to the diversity of indicators reported, the meta-analysis results could only be used to make qualitative statements as to where the programmes had a positive impact. Finally, there was important heterogeneity in the results presented. This heterogeneity was explored in a subgroup analysis by type of indicator reported. Other covariates that could have helped to explain the heterogeneity observed included the study setting, study type or even the choice of measurement. Due to the limited number of studies in each of these sub categories, it was not possible to produce subgroup analyses for all covariates or to run a meta-regression to quantify their impact on the variance.

Lessons learnt

We analysed results of evaluations along a logic frame including inputs, outputs, outcomes, impact. Analyses linking inputs to outcomes or impact, for example cost effectiveness or technical efficiency studies, were not reviewed. These types of analyses can inform programmes in most efficient ways to delivery services and are

central for planning. Overall, we undertook a systematic review and meta-analysis of published literature. A main limitation of our method is that we were unable to identify or include internal reports. It means we probably omitted important evaluations that are not in the public domain. However, this review highlighted several important programmatic points of learning. While the need for truck driver healthcare interventions was recognised, the majority of the programme designers or implementers did not include primary stakeholders/recipients (truck drivers) of their intervention at the conception phase. Programmes tend to replicate the same model in different locations, without adaptation to local preferences and needs. While the benefits of knowing your health status (for any particular condition) may be important, linkages to care beyond the knowledge acquisition are important for long term impact. The weak (or no) linkage to care options in these programmes means that there was no follow up in these evaluations. This made it difficult to identify impacts in medium to long terms.

We observed a need for strengthening the M&E processes in these programmes to provide feedback to funders and implementers in such way that any programme can be adapted to its client changing needs. Finally, funding is restricted. Limited availability of programmatic data at all levels (input, output, outcome, impact) rendered programmes unable to report on their successes to motivate for additional funding for continuity of their interventions. Healthcare priorities require contemporary methods be employed to deliver services to vulnerable populations to get these health conditions under control. Achieving these priorities can only be done with evidence based/informed implementation.

Conclusion

Diverse healthcare programmes prioritising truck drivers have been implemented in 30 sub-Saharan African countries since 1989. Just over half of these healthcare programmes have been evaluated. Among those evaluated, potential benefits to truck drivers have been shown. However, information gaps about availability of services and their effects impede further planning and implementation of effective healthcare programmes for truck drivers.

Collaborative efforts among workplaces, governments, and trucking governing bodies are essential to the design of effective programmes. Given the mobility associated with this population's occupation, inter-governmental collaboration is imperative to facilitate service delivery along the trucking corridors and ensure continuity of care. The interconnected nature of the transportation network provides a unique opportunity that should be taken advantage of to establish stronger linkages to healthcare programmes and provision of services for this important population. Without this, truck drivers will be left behind in the move to achieve the global targets for access and linkage to care in sub-Saharan Africa.

The information reported in this systematic review underscored the strengths, weaknesses and recommendations for truck driver health programming and evaluation thereof. These findings reinforce the design of this process evaluation (described in chapter 1) and provide the backdrop for the layout of the results reported on in these subsequent chapters.

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Chapter 3: Assessing accessibility and appropriateness of South African Roadside Wellness Centres

Title	Healthcare for Truck Drivers: assessing accessibility and appropriateness of South African Roadside Wellness Centres			
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Author's contribution	STLE	70%	WDF	8%
	PM	2%	GBG	15%
	CAH	5%		
	Designed the study: STLE, WDFV and GBG. Data analysis and interpretation: STLE. Wrote the initial draft: STLE. All authors critically reviewed and approved of the final draft.			
Journal	Journal of Transport and Health			
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Appendix Ref	B2			

The frameworks explained in chapter one and some of the discussion points in chapter two draw attention to the importance of stakeholder involvement and engagement in the assessment and ownership of systems and programmes. Therefore in this chapter the process component of access and service delivery is assessed, by gaining the perspective of the clients receiving the services.

Introduction

Long working hours present limited opportunities for truck drivers to access healthcare facilities with limited opening hours, and make them vulnerable to unfavourable clinical outcomes[1-7]. Similar to its role in the United States economy [8], the South African trucking industry has a major impact on the health and well-being of the overall economy, as it facilitates the movement of products nationally and internationally and contributes to social development [9]. With an approximate total of over 500,000 truck drivers in South Africa [10], efforts need to be directed towards prioritised healthcare interventions to maintain a healthy truck driver work force.

In response to this priority, several funders and implementers have developed interventions to address truck driver health needs. North Star Alliance (North Star) is a non-governmental organisation that engages in several public-private partnerships to alleviate healthcare challenges faced by truck drivers, sex workers and local communities around sub-Saharan transport corridors by providing services in roadside wellness centres (RWCs) [11]. They make use of converted shipping containers painted in blue (thus known in the communities they serve as the *blue box*) to provide an array of outreach and primary healthcare services, including sexual reproductive health services. Although largely focussing on screening clients for diseases and referring them to the nearest appropriate fixed healthcare facilities (where prior referral relationships have been established), North Star has partnered with organisations like Wits Reproductive Health and HIV Institute (Wits RHI) to expand and strengthen HIV and ART clinical services. North Star uses a networked patient record system (COMETS) which facilitates paperless retrieval of client records at any RWC along the corridor. At the end of September 2015 - there were 34, 237 unique visits of which 16, 784 were unique visits by 13, 328 unique truck drivers; across nine South African RWCs [12].

Little is known about the health, health seeking and risk behavioural profiles of truck drivers in South Africa. Surveys conducted in the 1990s reported HIV prevalence of 69% in the 55- 59 year age group in 1999, [13] and 26% in 2003/4 [14] and an STI prevalence of 66% [13]. The lack of truck driver health evidence is compounded by the paucity of available, reported information on the acceptability and appropriateness of RWCs for the truck driver population. Using the North Star model of service delivery as a case study we gathered in-depth qualitative information on truck drivers' views on access to, and appropriateness of, the RWC concept for selected PEPFAR supported South African RWCs. Therefore the aim of this evaluation component is to present these truck drivers' perspectives, opinions, and recommendations for the, RWCs in South Africa. To contextualise recommendations, the data on risk perceptions that emerged during the interviews is also reported on in this chapter.

Methods

Setting

Six South African sites in six provinces (Cato Ridge (KwaZulu Natal), Bloemhof (North West), Ngodwana (Mpumalanga), Musina (Limpopo), City Deep (Gauteng) and Upington (Northern Cape)) were included in this evaluation. These sites were chosen because they were operational at the start of the evaluation.

Clinics became operational at different times. Cato Ridge, City Deep and Ngodwana were all opened in September 2013. For logistic reasons City Deep was closed in September 2014 (and relocated to a more accessible location in Pomona). Musina, Upington and Bloemhof were opened in January 2014, February 2014 and March 2014 respectively [12].

All clinics operate on weekdays and are typically open for a minimum of six hours. Operating hours for some clinics have changed in the period since this research. However at the time of the data collection, Cato Ridge and Bloemhof were operating at 14:00-22:00; Upington 18:00-22:00; Ngodwana 11:00-19:00 and Musina 07:00-15:00. The City Deep site primarily functioned as a mobile clinic. Healthcare workers are proficient in the vernacular mostly spoken in the location of the RWC that they co-ordinated and offered services from, as well as other South African official languages including English. This facilitates communication and service provision to both local and international clients.

All RWCs are classified as urban and located on busy routes in the South African trucking corridor. Cato Ridge and Upington are located slightly parallel to the major N3 and N10 highways respectively. Bloemhof and Ngodwana are situated on the very busy N12 and N4 highways respectively. Musina RWC is located close to the South Africa/ Zimbabwe border and is recognised as the busiest border crossing in Southern Africa. City Deep RWC was located in a retail centre which was a hub for the transport and freight industry – using the N17 highway.

Pilot

Pilot interviews were conducted with five truck drivers at the City Deep RWC to ensure that the contents of the semi-structured interview guide were being interpreted (and administered) correctly by both the interviewer and truck drivers. During this pilot process it was found that questions and discussions could not always be as long and as in-depth as preferred because some truck drivers needed to load and leave. Truck drivers did not have any objections to the topics covered neither did they have suggestions for inclusions to or exclusions from the guide. Instead of removing items from the guide, interviewers became more articulate with practice which allowed for the process to move faster and more effectively.

Data collection

Data collection took place over a four month period, from December 2014 to March 2015. Purposive sampling was employed to recruit participants. Truck drivers were recruited from the truck stops and the immediate area surrounding the RWCs. A total of 96 truck drivers were approached. 1 in every 1.5 truck driver users (n=35) and 1 in every 2 non-users (n=44) who were approached, agreed to participate. The remaining 17 were not familiar with the RWCs. One major recruitment barrier was that the truck drivers lacked time during the day to participate in the interviews.

For security purposes, data were collected by a male interviewer using a final semi-structured interview guide that covered three main areas as outlined in Table 3.1. Since the primary function of the interviews was to gather information on access to care and appropriateness of the RWC in meeting the healthcare needs of truck drivers we probed on healthcare experiences, assessing access on the three components of geographic location, operating hours and package of services offered, and appropriateness. To enhance understanding of service delivery gaps for all truck drivers and the user truck drivers' perspectives on access and appropriateness, information was collected on their health seeking behaviour.

In addition to the safety factors linked to using a male interviewer, the male interviewer was used to minimise respondent bias as some of the questions that were asked were of a personal nature – particularly as they related to sexual behaviour and engagement with sex workers. Assuming that majority of the interview participants would be male, it was deemed as less appropriate for a female to be involved in data collection.

Given the nature of truck driving, non-conventional methods of data collection had to be employed to overcome recruitment challenges. These included conducting interviews in the trucks while the truck drivers were waiting in the depot line to load, or while having layovers late in the evening at truck stops. Additionally truck drivers

were asked to complete a demographic questionnaire after the interviews. There was no reimbursement for participating in the interviews.

Table 3.1 Outline of topics included in the semi-structured interview

Who	Topic	Probes
Users	Access	Location Operating hours Services offered
Users and Non-users	Health seeking behaviour	General Health Healthcare access points Intrinsic health seeking decision making Occupational health Services accessed
User and Non-users	Overall experience	RWC awareness Overall experience Opinion on non-usage Recommendations

Abbreviation: RWC, roadside wellness clinic

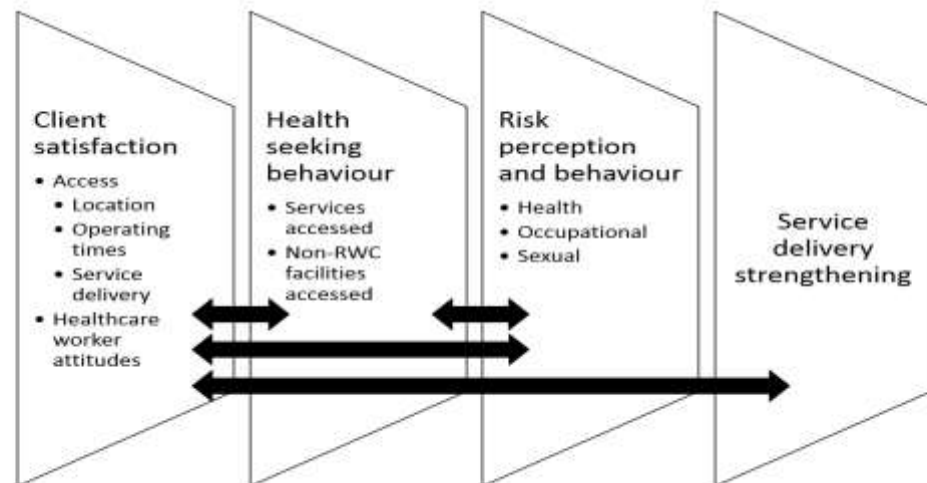
Data analysis

Interviews were audio-recorded and transcribed verbatim. Interviews that were conducted in isiZulu were translated into English and then back translated by a second transcriber. Timeous quality checking of all transcripts permitted real time changes to be made to the interview and transcribing/translating processes. All transcripts were imported and analysed using NVIVO 10. The analytical process was guided by the framework method of analysis [15], in which inductive reasoning was applied, using the grounded theory approach. After independently following the three steps of coding (1. open coding – data reduced to units of analysis/codes; 2. axial coding – focussing on themes as opposed to the actual codes and 3. selective

coding – data is paired with the relevant theme for comparison and contrast) [16] two members (myself and one other researcher) of the study team compared and finalised the coding framework. For reliability, data were coded independently by two researchers (myself and one other researcher) and reviewed by a third. Transcripts were reviewed, coded and organised into the themes outlined in Table 3.2. Figure 3.1 shows the interrelatedness of the themes. A selection of supporting statements are included in the results.

Table 3.2 Description of themes, sub-themes and categories

Themes	Sub-themes/Concepts	Categories
Client satisfaction	Access	Location, operating times, service delivery
	Healthcare worker attitudes	Friendly, judgemental, helpful, nice, good, bad
Health seeking behaviour	Services accessed	HIV, blood, sugar/diabetes, urine, flu, headache
	Non-RWC facilities accessed	Hospitals, clinics, pharmacy
	Alternate care	Traditional healers, church, God, Christian, modern medicine
Risk perception and behaviour	Health	Physiological, kidney failure, swollen feet, fat, unhealthy food, diet, physical, psychological
	Occupational	Accidents, hijacking
	Sexual	Sex worker engagement, condom
Service delivery strengthening		Recommend, improve, change



Abbreviation: RWC, roadside wellness centre

Figure 3.1 Relationship between themes that emerged during analysis

Results

Socio-demographic information

46 Interviews were conducted across the six RWCs with 24 users and 22 non-users. All the truck drivers were male. Non-users were older, had more English speakers, had more children and were more likely to be in the R5000-R10000 income bracket. Both groups were comprised mainly of married South Africans who had completed some secondary education and were employed on a full-time basis. There were no widowers. With the exception of one South African truck driver, all listed their partners as female. A summary of the demographic characteristics of the participating truck drivers has been included in Table 3.3.

Table 3.3 Demographic information of participants

	Users	Non- users
Sex	24 males	22 males
Age , mean (SD)[range]	37.5 (11.2)[21-65]	42 (11.7)
Age group , n		
20-29	8	4
30-39	9	5
40-49	1	8
50+	6	5
Nationality , n (%)		
Namibian	0	1
Malawi	1	0
South African	15	16
Zambian	1	1
Zimbabwean	5	4
Not provided	2	0
Main language , n (%)		
English	2	5
Sesotho	2	4
Shona	4	1
Tswana	3	1
Zulu	7	5
Other	6	6
Education , n (%)		
Some primary	3	1
Completed primary	3	3
Some secondary	10	12
Completed secondary	7	4
Tertiary/post-secondary	1	2
Employment , n (%)		
Full time	22	20
Part time	0	2

Self employed	2	0
Monthly income, n (%)		
< R5,000/\$500	6	5
R5,000 –R10,000 / \$500 - \$1,000	7	10
> R10,000/\$1,000	11	7
Marital status, n (%)		
Single	4	5
Married	17	14
Cohabiting	2	3
Divorced	1	0
Number of children, n (%)		
0	3	1
1	3	5
2	9	3
>2	9	13

Abbreviations: SD, standard deviation; n, number; %, percentage; <, less than; R, South African Rand; \$, United States Dollar; >, greater than

Main themes

The main themes that emerged from the analysis were client satisfaction, health seeking behaviour, risk perception and behaviour, and service delivery strengthening.

All individuals provided information on health seeking behaviour while 59%, 48%, and 30% of individuals provided information on client satisfaction, service delivery strengthening and risk perception and behaviour, respectively. A table showing the thematic distribution of responses disaggregated by RWC and category of participant, derived during the thematic analysis, has been included in Table 3.4.

Table 3.4 Distribution of responses

Themes	Number of participants						
	Total n	Bloemhof	Cato Ridge	City Deep	Musina	Ngodwana	Upington
Client satisfaction	27	5 U 2 NU	5 U 5 NU	3 U 1 NU	3 U 1 NU	1 U 1 NU	
Health seeking behaviour	46	5 U 4 NU	5 U 5 NU	5 U 3 NU	5 U 3 NU	3 U 3 NU	1 U 4 NU
Risk perception and behaviour	14	2 NU		1 U 2 NU	3 U 3 NU	2 U 1 NU	
Service delivery strengthening	22	3 U	5 U 3 NU	2 U	4 U 1 NU		4 NU

Abbreviations: n, number; U, user; NU, non-user

Client Satisfaction

Access – location

The majority of the truck drivers knew and were happy with RWC locations. Users and non-users (although not directly asked) of the RWCs stated:

Yes, it is in a right location because many truck drivers sleep here (Cato Ridge, Non-user)

Where it is actually is very accessible to anyone, because it is on a National road.

Everyone can go there, not specifically the truck drivers. Now that I know what times it opens, I can come anytime (Bloemhof, Non-user)

The clinic is in a good place (Upington, User)

However, there were some (e.g. from Ngodwana RWC) who had not seen the RWC itself but had accessed mobile/outreach services (e.g. HIV counselling and testing, education sessions) offered by the centre staff:

No, I don't go there. Those sisters come to us (Ngodwana, User)

No I don't hear from anyone. Those sisters came and asked me if I don't want to know my status. I said I want, then they tested me (Ngodwana, User)).

A total of 7 truck drivers (3 non-users (Bloemhof, Cato Ridge, Musina) and 4 users (3 City Deep, 1 Cato Ridge) mentioned the lack of visibility/ poor signage whereby centres could not be seen from the road/entrance of the truck stops. Comments included:

Maybe a sign directing people to where the clinic is situated. When the clinic is visible it would really help. Even if I walk past, I would just decide to go in and be checked (City Deep, User)

It's actually fine if you put up a sign there (reference to a spot). People will be more educated, that's more information, that's enough, when I am sick I know where to go (Musina, Non-user)

The drivers noted that locations that facilitated them parking their trucks close by were highly valued (this was all facilities we surveyed, except City Deep RWC). They mentioned that this is not possible with local fixed facilities and is a barrier to accessing conventional healthcare for truck drivers.

Access - Operating times

There was varied knowledge about the operating times. Some truck drivers did not know the operating hours and found the centres open by chance while others were fully aware of the operating hours due to the positive marketing of the RWCs by the healthcare workers. There was also a group of non-users who did not know the operating hours but used the interview as an opportunity to gain more information about the wellness centres.

There were mixed opinions on the times that RWCs should operate, depending on the RWC location and whether a long-or short-haul driver was providing the suggestion. Some truck drivers felt that the evening worked best (*If they can try to work from 4pm up to 10pm at night, because there are plenty of trucks (Upington, User)*) while many were in favour of 24 hours (*I think for 24 hours (Bloemhof, User); 24 hours like a whole sweet (Cato Ridge, User); ...however it is limited in operating hours. Preferably if the clinic was 24 hours (Cato Ridge, Non-user)*). Several felt that the clinic should be accessible all the time (*24 hours 7 days a week (Musina, User)*). One non-user in Cato Ridge emphasized the convenience of a 24 hour centre citing that driving times vary and having the option of being able to go into a RWC even at midnight might be appealing for truck drivers.

Access – Service delivery

Overall, truck drivers did not complain about the package of services delivery bouquet. Some dissatisfaction was expressed about medication, with two users complaining about unavailability of the hypertension medication dosage they specifically required and one non-user not finding malaria medication available. The majority said that they did not have to wait to be seen and for the truck drivers who did wait, they reported waiting times to be between five to fifteen minutes. The only recommendations provided concerning RWC infrastructure were having more covered seating space in the case of rain, controlled temperature (warmer in winter), and multiple consultation rooms to avoid waiting. All truck drivers felt that the wellness centre set up did not pose any issues to their privacy.

Healthcare worker attitudes

Globally healthcare workers attitudes have been linked to barriers of healthcare access for mobile and at risk populations. Based on the commentary, RWCs are an enabling environment for healthcare for truck drivers. Truck drivers who accessed

the RWCs praised healthcare workers for their knowledge, professionalism (*It was right. I never had stress, they never forced me (Ngodwana User)* and patience (*Their sense of caring is right to me (Ngodwana, User)*). They felt comfortable with the healthcare workers and that they could discuss their healthcare needs without being judged. When asked how they would rate the healthcare workers out of a score of five, most gave ratings of either four or five. They supported their ratings with statements of recommendation of the clinic and nurses to other truck drivers and motivation for their own continued use of the RWCs.

Health seeking behaviour

Services accessed

Over three quarters of the truck drivers accessed the RWCs for 3 services: HIV testing, blood pressure measurement, and diabetes screening. A small percentage went to get chronic medication refills en route travelling across the border and an even smaller number presented at the centres because they had pain and flu symptoms. This pattern of service utilisation was similar in non-users who did report accessing care at other facilities. Approximately half of the non-users said that they do not access routine care (though available) but only seek medical attention if they are sick (*I only go to the clinic when I am sick, I do not go to the clinic for check-ups (Cato Ridge)*).

Non-RWC facilities accessed

When they did not access the RWCs truck drivers accessed care at their local clinics and hospitals. The local clinics were primarily to receive chronic medication. They accessed hospitals if they had to undergo procedures ranging from dentistry to minor operations. Both user and non-user groups reported using pharmacies if they had headaches. Noticeably none of the drivers mentioned accessing care at a private general practitioner or specialist.

Alternate care: Traditional healing and religious support

Many truck drivers reported the past and current use of traditional healers. Some acknowledged both the differences and complementarity between traditional healing and conventional medical services.

.... Modern medicine has side effects. (Upington, User)

Most of the time I use a traditional healer, but the problem is that they can't check for high blood pressure and sugar diabetes. This is why sometimes I go to the clinic for my blood to be checked. (Ngodwana, User)

Other truck drivers explained that accessing traditional healing was in conflict with their religious beliefs and practices.

To be honest, since growing up I have never visited one because at my home we are Jehovah's Witnesses. (Upington, User)

There was more use of traditional healers among the RWC non-users. One non-user highlighted that truck drivers do believe in traditional healers.

We go there so that we can get the traditional medicine, so that it can help us with our kidneys, and truck drivers believe in traditional medicine (Bloemhof, Non-user).

Another non-user spoke about the frequency and reasons for visiting traditional healers.

Many times... No, I do not remember. I do go to a traditional healer, especially when we have problems or something traditional that we have to do at home... Sometimes, when there is a disease in the family. Sometimes a kids gets sick – things like that. I go to the traditional healer and get something to heal the sick person. I am a man of culture, man; I service myself. (Ngodwana, Non-user)

Two of the truck drivers from City Deep non-user group sought assistance from their churches when they had problems (*When I don't feel well I go to church; Like, when I don't feel well – that something is not right – I go and see the church*).

Perceptions of not seeking healthcare

Truck drivers who accessed care at the RWCs and RWC non-users expressed similar views on why their colleagues did not seek healthcare. Both groups were of the opinion that fear was the barrier to accessing care for those truck drivers who did not go to any clinics or doctors. A non-user from Bloemhof said ...*And then there is a group that has a phobia – their phobia is the fear of what people will say when they see me going to the clinic, you understand.* Many felt that truck drivers are conscious of both non-communicable and communicable diseases. Although a few mentioned testing for HIV was scary, many, unexpectedly, listed truck drivers being afraid of finding out that they were diabetic or hypertensive. Knowing the state of one's health seemed to present complications in the life of the truck driver. Aside from the explicit knowledge that being off the road (either to get diagnosed or when one is ill) means there was no pay, there were a few implicit complications to knowing that one was ill.

Firstly, majority of the men were married and because of this, men knew that if they were diagnosed with illnesses they would need to make a concerted effort to remain healthy for the sake of their families. Also dependent on what they were diagnosed with they would need to inform their partners. Secondly, there was a sense of vulnerability. Although truck drivers knew the effects of their sedentary lifestyle they knew that the nature of the job was not conducive to always eating healthily, getting adequate exercise and resting when required. Therefore it was pointless to know what was wrong with them as they were partially helpless in executing a solution. Lastly, there was the issue of the challenge to their masculinity. Once diagnosed, it was confirmed that the man was sick and this illness did not lend well to those truck drivers who subscribed to hegemony.

Nevertheless amid all this mention of fear there was the feeling that truck drivers needed to take charge of their health (... *Such people I say they are not strong enough, because it is your own life. I for one am saving also my wife, because when I am at home I go and check (Bloemhof, Non-user); People need to change their minds. (Upington, Non-user)*). Not all the truck drivers in this study explicitly

expressed themselves as being afraid of getting help when they were sick. However, through a little self-reflection, there were hints that support (*What made me to come to this clinic is that you came to me... and my wife has been telling me to go to the clinic and get tested. I felt that fear that I had disappear Bloemhof, User*) and persuasion (*...they know that there is a Wellness Centre there to get tested, for someone to get up and go and get tested it brings some fear. Maybe they need influence, if you know what I am saying. (Musina, Non-user); You should talk to them and be friendly and convince them that they should come for 1, 2, 3 reasons. (Ngodwana, Non-user)*) could assist with improving the numbers of truck drivers who access any form of healthcare.

Risk perception and behaviour

Risk presented itself in the interviews from the perspectives of health, non-health related occupational risks, and sexual behaviour risks. In speaking about the perceived risks of their jobs, the truck drivers showed their vulnerabilities and the challenges of balancing being a breadwinner, man and family person against being physically and mentally happy.

Health (physiological, physical, psychological)

There was recognition that truck drivers in general have poor health linked to sedentary lifestyles and poor diet. The majority viewed themselves at risk for hypertension and obesity. One Bloemhof (non-user) driver elaborated further that *kidney failure is first. It is caused by driving for a long time, swollen feet, you see swollen feet can be gout, high blood and sugar diabetes. We drink cool drink and we don't drink water. Also, too much sugar and food that has too much oil in it because we don't eat food that is cooked from home.* Another user spoke about the disadvantages of the nature of their work on their health – *Most of our guys are overweight and the risk of HIV is too much...We are not taught on what to eat and on*

what not to eat. Maybe we lack information, those are the disadvantages of our work. We are not aware of anything about risks and STIs. I eat every food that I get because I have no choice. (Musina, User).

Some drivers also touched on exercise. Exercises, because some of the drivers when they are sleeping here and sitting inside the truck for 24 hours are not good and that's why we are sick because we don't exercise (Cato Ridge, User).

Many truck drivers work under agents who allocated jobs to them. In order to make the maximum amount of money they have to avail themselves of all opportunities. This therefore affects how much time drivers have available to go home/see family as well as sleep (*You see, I do not have a time to spend with my family, because most of the time I am on the road (Ngodwana, Non-user); Sometimes, it's not all the time. You see, all the time we are wasting on the road, loading point, offloading point; at home you can rest two days only. It's not right but we have to if we want a job (City Deep, User)*). Implicit in these narrations is the psychological strain from the lack of comfort associated with family, home and rest (*That's the main thing that I told you, that this transport to get home is difficult. Even now I have a load that is going to Nelspruit, even to see my wife is difficult...now I am getting stress because of this (User, Cato Ridge)*).

Occupational

The major occupational risk cited was accidents. Reasons offered included; non-South African drivers lacking familiarity with South African road signs and road rules, drivers getting sleepy and losing concentration, drivers having vision and visibility issues – especially linked to seeing bright lights and oncoming traffic, and truck malfunctions (*...the body of the truck capsizing as a result of a burst tyre (Cato Ridge, Non-user)*). An additional reason offered was drunk driving (*The first thing related to risks when driving is drunk driving, and the problem of money (Ngodwana, User)*). Responses around drunk driving indicated that truck drivers were referring to their colleagues being drunk causing them to 1) not being able to react timeously to

events on the road (e.g. braking); 2) speed and 3) have altered judgement (speed bumps, potholes, roadworks etc.) as well as being victims of drunk non-truck drivers. Hijacking was the other occupational risk mentioned. Cargo is expensive and placed them at risk.

Sexual

All men spoke freely about sex worker engagement. When probed they responded without hesitation or reservation giving the impression that they were answering truthfully since they were not deliberating about what the desirable answer (for either them or the interviewer) would be. The varied justifications gave insight into the truck drivers' insecurities, knowledge and values. All men confirmed sex worker availability on the truck routes, even if they did not use their services. Together with City Deep, Cato Ridge participants reported very easy access to sex workers (*...when they are with these magoshas (sex workers) because they are plenty of them, even here outside (Cato Ridge, User); They are everywhere – they are some of the people that the government should really deal with (Cato Ridge, Non-user)*). Although some men reported having engaged with sex workers at some stage in their early truck driving career none of the men reported engaging with sex workers in the six months prior to and at the time of the interviews. Majority of the men were in stable relationships and knew about the risks of multiple sexual partners. Some went as far as saying that they do not interact with females while on the road because they could engage in consensual sex or even give ladies a lift and then be accused of rape (*You would be lucky when there are police around, for she would cry and say you raped her (City Deep, Non-user)*) and the men feared going to jail. Risky sexual behaviour was also linked to death. Truck drivers were aware that sex without a condom is risky (*Another risk is that of sleeping with girls without a condom (Ngodwana, User)*) and can lead to sexually transmitted infections (*STIs still torments truck drivers...if we can't control ourselves we should use a condom and they (the clinic) do supply them (Upington; User)*). One truck driver in Bloemhof cited non-engagement with sex workers being related to his empathy for them, sharing his thoughts on the type of circumstances

that would force young women into prostitution. He could not be comfortable with himself knowing that he had potentially taken advantage of a vulnerable woman and the fact that once the woman was done with him she seamlessly moved onto the next customer.

Service delivery strengthening

Truck drivers were aware of their healthcare needs. The majority of the recommendations came from users (n=14) and from the Cato Ridge RWC (n= 8 truck drivers). Supplementary to the prior mentioned suggestions there was the recurring idea of the availability of vaccinations at RWCs– especially for yellow fever, particularly as it is a requirement for cross-border travel (*If they have vaccination, most of the drivers would come and join, I am sure. (Cato Ridge, Non-user); ...I don't know how you are going to solve it...about this vaccination of this fever, the yellow fever, we are having this problem...Why don't you guys put this vaccination in your what you call North?(Musina, Non-user)*). Predominantly non-users indicated that this would speak to their healthcare needs. While users were happy with the healthcare workers there was a strong recommendation from both users and non-users to have a doctor available to deal with illnesses outside the scope of nurses and counsellors. There was an implicit suggestion that doctors would add more credibility to the whole concept of the RWCs (*...because it is only the doctor who can know the problem I have (Musina, User); There should be a full time doctor that will make this clinic to be a proper clinic (City Deep, User)*).

Discussion

Comparison to existing evidence

While there is limited published information about the socio-demographic profile of truck drivers in South Africa, the mean age of our respondents was similar to those who participated in two earlier South African studies in 1992 1992 (average age of

39 years) [17] and 1999 (mean age of 37 years) [13], and to this analyses in chapter 4. It is assumed that the respondents in this study may be representative of the general South African trucking population however this result also highlights that there has not been a shift in the average age of truck drivers in South Africa over a long period of time. A survey conducted in South Africa using 1528 data sources including employees, employers and recruitment points reported that the average monthly salary for a truck driver in South Africa is ZAR 13,387 [18] with the average monthly gross salary in South Africa as at July 2017 being ZAR 19,170[19]. The majority of the clinic users from this access component reported earning more than ZAR 10, 000 while the majority of the non-users reported earning between ZAR 5000 and ZAR 10, 000.

Truck drivers were cognisant of the consequences of risky sexual behaviour. Converse to findings in some other African[20-22] and Indian [23, 24] studies, this study findings indicate that there was little interaction with sex workers prior to, and at the time of the interviews. This could be attributed to more of the truck drivers being in stable relationships. Where ages were reported [20, 24] it could not definitely be concluded that age was a common contributing factor to risky behaviour. In relation to this study, the Indian study had a younger group of men reporting risky sexual behaviour while the African study had older men mostly likely to engage with commercial sex workers. It was observed that aside from the one Indian study [23] all the others were conducted and reported prior to 2010. This could be indicative of a shift in truck driver sexual behaviour in the recent years attributed to increased exposure to behaviour change communication interventions and healthcare information. Irrespective of the comparisons, it is acknowledged that there could be a negligible possibility of reporting bias in this Access component with the truck drivers not being completely honest about their interactions with sex workers.

It was evident that truck drivers recognized that both their fellow truck drivers and they were in poor health. Further they understood some of the key underlying determinants with many speaking about the fact that they had to sit for long periods,

their work was controlled by others, and the stress caused by several aspects of their job. Although there is a dearth of supporting data from national studies in South Africa on these health risk behaviours and the rates of obesity, diabetes, cardiovascular disease or mental health in truck drivers, these truck drivers are clearly highlighting factors which affect their health. These factors require consideration to develop broader (health and governance) solutions to improve their health.

Road accidents remain one of the leading causes of death in the workplace[25] with truck drivers having the most exposure to work related road risk [26]. Drunk driving is a noteworthy occupational risk mentioned primarily related to it being a contravention of the law as well as the accompanying danger to other road users. From our results truck drivers were at risk of being driven into by drunk truck drivers and other motorists. Further there was reference to the truck drivers themselves being drunk and having poor judgement to timeously react to events on the road. Drunk driving coupled with them speeding placed them at risk of causing accidents (and possible fatalities) with any other road user in close proximity. Lastly, there were instances of fatigue and lapses in concentration cited as risks of the job. It clearly came across that these last-mentioned factors were strongly related to the monetary aspect of truck driving. Time on the road is directly proportional to the amount of money a truck driver would earn. Therefore they forgo sleep in order to fulfil the requirements of their job. Law makers and trucking industry stakeholders need to implement more interventions related to curbing reckless driving and enforcing stricter policies on the number of hours a motorist is allowed to drive, to improve road safety for all road users.

Considerations for health programming for truck drivers

The findings of this evaluation component suggested that truck drivers are generally aware of the occupational health risks of long distance truck driving and have clear ideas about how health services should be tailored to their needs. Some truck drivers (similar to the general population) are less proactive in seeking healthcare (although

available) and will need to be attracted into attending clinics. One potential opportunity to increase utilisation of services would be the offering of occupation-relevant services including vaccinations and routine screenings required for professional driving permits.

Exercise and sport are recognised as being beneficial to health and wellbeing [27]. Since truck drivers said that they sleep at truck stops while they wait for their loading instructions, wellness centres could consider housing an exercise room with basic exercise equipment that drivers could use when they are not working. The advantages of this are two-fold; 1) increased visibility and utilisation of the RWCs and 2) improved overall health of truck drivers.

Generally, the burden of chronic illnesses in low-and middle-income countries is increasing [28]. Self-reports in this study were no different with the major healthcare needs focussing on hypertension and diabetes. Truck drivers mainly accessed services for hypertension, followed by diabetes, and spoke about how these services together with services for musculoskeletal illnesses would be appropriate for them.

The nature of trucking lends to long periods away from home and increased loneliness [29]. Although not an explicit finding, truck drivers exhibited some emotional tension when speaking about the trade-offs between spending time with their families and generating income to provide for those families. The findings, presented under the Health subsection of the Risk perception and behaviour theme, of the presence of mental health stresses is in keeping with the work of Shattell, Apostolopoulos et al [30] conducted in the United States. This anxiety is exacerbated by the physical strain that accompanies overworking the body and mind. Therefore additional to exploring non-communicable disease treatments related to cardiovascular and musculoskeletal diseases it is important for truck driver healthcare to incorporate aspects of mental health screening and treatment.

Focussing on the mental health aspect will also assist with allaying fears and address the many vulnerabilities that truck drivers have but may not be able to deal with.

Truck drivers did report seeking help in a variety of settings. Conventional health care offerings need to be conscious of the overlap with less formal health care provision through traditional health workers and pharmacies.

Limitations

The study's limitations include conducting interviews with only a small sample of male-only truck drivers. This limits the generalizability of our findings in terms of gender (albeit there being a small female truck driver population) and the wider population. Truck drivers had limited amounts of time as they needed to load and get on the route. The shorter than anticipated interview durations did not lend themselves to the gathering of in-depth information. Recruitment was only done near and about the North Star RWCs. Finally, it was not the same number of truck drivers interviewed per site therefore the opinions about satellite services and other RWCs may be different. Finally, the possibility of bias with self-reported data, particularly related to sexual behaviour data in favour of answering in a perceived socially desirable manner has been considered.

Conclusion

Overall, it was found that truck drivers are willing to access healthcare at RWCs and they found the concept a RWC suitable. However, currently, access is sometimes hindered by minor operational factors (e.g. signage and operating times) that can easily be addressed to increase utilization. Inclusion of truck drivers who did not access the clinic highlighted the need for conscious recognition that mobile populations' health care needs extend beyond infectious diseases. Comprehensive

care packages (incorporating services for mental health and other non-communicable diseases), which acknowledge the role of traditional healing and alternative medicine, delivered through accessible satellite facilities should form the foundation of service delivery models for truck drivers and other mobile populations. Finally, subsequent to the establishment of these accessible and appropriate healthcare delivery models there needs to be increased health promotion efforts to increase uptake among truck drivers for enhanced health outcomes.

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Chapter 4: Uptake of health services among truck drivers in South Africa

Title	Uptake of health services among truck drivers in South Africa: analysis of routine data from nine roadside wellness centres			
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Author's contribution	STLE	65%	CAH	2%
	SN	5%	WDFV	2%
	PM	1%	GBG	25%
	Conceived and designed the study: STLE; WDFV and GBG. Data extraction and cleaning: SN. Analysed the data: STLE, SN and GBG. STLE wrote the first draft. All authors critically revised the manuscript for intellectual content and approved the final draft.			
Journal	BMC Health Services Research			
Impact	1.827 (2016)			
Link/citation	Lalla-Edward et al. BMC Health Services Research (2017) 17:649 DOI 10.1186/s12913-017-2595-3			
Appendix reference	B3			

Triangulation [1] is a commonly used data analysis technique to validate findings of studies. Consequently quantitative data analyses were conducted on the Roadside Wellness Clinics' (RWCs) client database to assess whether the narratives documented in chapter three were reflected in practice. However to provide a more comprehensive representation, an expanded analyses (inclusion of more RWCs than were involved in the qualitative component) was conducted and detailed in this chapter.

Introduction

Long distance truck drivers, due to their occupational circumstances are usually more susceptible to worse health outcomes compared to the general population [2-7]. Research shows that truck drivers bear a disproportionate burden of both communicable, (HIV, sexually transmitted infections (STI), tuberculosis (TB)) and non-communicable, (chronic, mental, respiratory, cardiovascular, muscular) diseases [6, 8-14]. In particular, it is their potential contribution to the HIV epidemic [15-19] that has prompted countries and donors to support healthcare services specifically catering for this population [14]. As a result, existing healthcare programmes for truck drivers have introduced or re-oriented their services to HIV prevention and antiretroviral treatment, with a few programmes providing a broader variety of services. However, little is known about patterns of healthcare utilisation among truck drivers and whether this focus on HIV/AIDS is appropriate to client demand or whether other services should be provided, with these specialised programmes encouraged to expand their service provision.

An example of healthcare programmes for truck drivers is North Star Alliance, a non-governmental organisation providing healthcare to mobile populations and communities along transport corridors and at border crossings through a network of Roadside Wellness Centres (RWCs) across sub-Saharan Africa [20]. These RWCs are adapted shipping containers staffed with trained clinical and outreach teams. North Star Alliance provides a comprehensive menu of services, covering primary healthcare (PHC), HIV prevention and screening for a variety of infectious diseases (STI, TB, malaria...). These services are described in Table 4.1. With the exception of antiretroviral therapy (ART) services, the North Star Alliance RWCs in South Africa do not make use of paper-based client files; instead they are supported by a networked electronic data administration system called COMETS. This system was designed to facilitate the capture of clinical information, allowing clients to access their health records at every clinic within the network along transport corridors. The aim of this study component was to describe healthcare utilisation among truck drivers across South Africa, using routinely collected data

obtained by the COMETS system as well as to characterise clinic attendees to inform future service planning and development.

Methods

Setting

Nine RWCs across seven provinces in South Africa were included in this analysis. These clinics are located in Cato Ridge and Pongola (KwaZulu Natal), Bloemfontein (Free State), Bloemhof (North West), Ngodwana (Mpumalanga), Musina (Limpopo), Upington (Northern Cape), as well as Pomona and City Deep (Gauteng). Currently, eight of these clinics are operational. The City Deep site in the Gauteng province was closed due to challenges experienced by truck drivers in accessing the location and was relocated to another district. It now operates at the Pomona site (Gauteng province). North Star Alliance does not have RWCs in the remaining two provinces (Western Cape and Eastern Cape). In all of the RWCs, services are offered to truck drivers and sex workers within the immediate communities surrounding the RWCs.

Data extraction

Anonymised data were last extracted on 11 April 2016 from North Star Alliance's COMETS database for a two-year period from 1st October 2013 to 30th September 2015. Information extracted included site name, COMETS unique identification number, socio-demographic variables (such as age, sex, occupation, nationality and marital status) and visit information (including visit date and type of service accessed). COMETS has been programmed to classify services as PHC, HIV, STI, Malaria, and TB based on the selection of ICD 10 variables selected by the healthcare worker. We extracted this information as classified by the system and did not recode/rename services for the purposes of this analysis. Information such as educational level or income is not routinely collected in this system; therefore, this information could not be included in the analysis. After data extraction, we excluded

duplicate and incomplete records. Records were then organised to provide both unique attendee and unique visit information.

Analysis

All data were analysed using STATA 12. The analysis was restricted to a sub-set of records pertaining to truck drivers aged 18 to 65 years. Since age could not be physically verified, using this age range (the legal working age in South Africa) assisted with data cleaning/quality processes particularly as there were some instances of unreliable information.

Continuous data (age) were described by mean and standard deviation (SD), then grouped into categories. Categorical data such as nationality and marital status were categorised in two groups each. Nationality was defined as South African and other nationalities. Other nationalities reported included a wide range of countries: Angola, Botswana, Congo and Democratic Republic of Congo, Ethiopia, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Niger, Nigeria, Rwanda, Saint Helena, Senegal, Somalia, South Sudan, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, and Zimbabwe. The marital status definition comprised a group of truck drivers with no stable partner, including those who were currently divorced, single, or widowed; and a group with a stable partner, including those who reported being currently married or cohabitating.

Table 4.1 North Star Alliance Tier I core service package implementation guidelines

	PREVENTION	SCREENING	DIAGNOSIS AND TESTS	CARE AND TREATMENT	REFERRAL
HIV/AIDS	Health promotion and education; Condom demonstration and distribution; Male circumcision; Outreach/moonlight; PREP; PEP	Medical history; Sexual behaviour; STIs; Blood transfusion; Previous HCT; and any other risk factors; Physical examination (Symptoms of OIs, STIs, TB)	HIV rapid Testing (<i>follow user instruction</i>); advise on return visit/ window period, on partner's testing; CD4 (rapid lab test – Pima machine); VL	Nutritional supplements; Basic care of OI; Side effects of ART ; Emergency provision of ART; Cotrimoxazole; Counselling: adherence and disclosure to support person	To referral hospital /team for complementary and periodic investigations; Nutrition and psychological support; Second line treatment; Management of severe side effects
STIs	Health promotion and education; Condom demonstration and distribution; Male circumcision; Outreach/moonlight; Partner contact	Personal medical history; Behavioural risk factors; Physical examination	Syphilis rapid test(<i>follow user instruction</i>); Provider initiated HCT	Syndromic management Counselling for partner treatment; Advise on follow up and return date	To referral hospital for recurrence, non-responsive and complicated cases
TB	Health promotion and education; Infection control measures in facility (ventilation / N95 masks); INH prophylaxis	Personal medical history; Socio and professional background; Physical examination; Screening questionnaire	Weight/BMI; Provider initiated HCT; Sputum collection for symptomatic clients	Counselling on adherence to treatment and periodic follow-up for treated cases	To referral hospital for further investigations (Chest X-ray)

MALARIA	Health promotion and education (excl. vector control at domestic level); Provision of preventive/prophylactic treatment to traveller	Medical history; Personal social and professional background; Current treatment (over-the-counter, traditional etc.); Travel history	Physical examination; Malaria rapid testing	Provide malaria and symptomatic treatments; Advise on second course of treatment one week later in high incidence countries and on preventive actions	To nearest hospital for complicated cases (neurological, vomiting, uncontrolled temperature >40°C)
GASTRO - INTESTINAL INFECTIONS / DISORDERS	Health promotion and education (personal and food hygiene); Public health education and sensitization Dietary advice	Medical history (recurrence, food and drink hygiene, habits, HIV status); Current treatment (over-the-counter, traditional etc.); Physical examination (dehydration)	If recurrence, propose rapid HIV testing	Antibiotics; Probiotics or anti-fungals where indicated; ORS provided in mild dehydration; Anti-spasmodics; Antacids for symptomatic relief	To nearest hospital for continuous vomiting, severe dehydration; suspected notifiable diseases
RESPIRATORY TRACT INFECTIONS	Health promotion and education; Public health education and sensitization	Medical history (HIV status); Personal social background (close contact with TB cases); Current treatment (over-the-counter, traditional etc.); Physical examination; TB screening questionnaire	If suspect of TB: Sputum collection, Propose HIV test	Antibiotics when evidence of microbial infection or community acquired pneumonia; Mucolytics and bronchodilators where indicated	To referral hospital reachable in next 48 hours for complementary investigations (chest X-ray); To nearest hospital for severe or life threatening cases

EAR, NOSE AND THROAT AND EYE INFECTIONS	Health promotion and education; Public health education and sensitization	Medical history (recurrence); Physical examination	Snellen test for visual accuracy; ENT exam; Ortoscope for ears; Visual assessment of larynx and under light	Antibiotics, anti-inflammations, antihistamines	To specialist if recurrence, chronic, severe
SKIN INFECTIONS & DISORDERS	Health promotion and education (allergens, personal hygiene); Public health education and sensitization	Medical history; Socio-economic; Professional background; Physical examination	Aspect of lesions (diagnosis supported by visual documentation); Physical exam	Symptomatic and etiologic management Topical antifungals / antibiotics / steroids where indicated	To specialist for recurrence, chronic and severe cases
HYPERTENSION	Health promotion and education (lifestyle and nutrition)	Medical history - personal, familial; Professional background; Current treatment (over-the-counter, traditional etc.); Physical exam (cardiac)	BP, Weight, BMI, urine test (<i>follow user instruction</i>); Repeat BP measure after rest; Classify / stage for treatment	Life style modification counselling; Anti-hypertensives according to stage; Fast acting anti-HPT for acute/ severe cases	To nearest hospital if not controllable at RWC; for further investigation and in case HPT urgency and emergency
DIABETES	Health promotion and education (lifestyle and nutrition)	Medical history - personal, familial; Professional background (over-the-counter, traditional etc.);	Urine test; Blood test; Weight , BMI; <i>Refer to related SOPs (Physical exam – exclude complications / target organ damage)</i>	Nutrition counselling if mild; Treatment initiation for complications / mild cases; Maintaining and follow-up compulsory for treatment modification	To nearest hospital if secondary complications target organ damage

		Physical examination (signs of associated illnesses)			
CERVICAL CANCER	Health promotion and education; Public health education and sensitization; Promote health seeking behaviour - immunization or periodic medical screening according to age group	Medical history (STIs, pain, bleeding); Physical examination Preventive screening: All female STI cases; All women from age 25 to 50	N/A	N/A	To referral hospital for pap smear and other investigations
BONE AND JOINT DISORDERS	Health promotion and education (ergonomic, workplace station organization, manual handling)	Personal medical history; Professional background and tasks; Former and current treatment	Physical examination	Analysis / anti-inflammatory (calcium supplements) (where indicated)	To specialist for investigations and care; Blood tests (autoimmune diagnosis; rheumatoid diagnosis); Orthopedic consultation and radiology
NEURO - PSYCHOLOGICAL DISORDERS	Health education (Stress factors – stress mitigation)	Personal medical history (meningitis, depression, epilepsy); Professional background & tasks; Physical examination; Former and current	Vital signs; CNS physical exam; Mini mental state exam	Symptomatic management: Analgesics / anti-inflammatories	To nearest hospital if severe or uncontrollable; To specialist for further investigations and/or care If relevant, advise for psychological support

		treatment; Substance abuse; Check for stress-related condition			
SUBSTANCE USE DISORDER	Health promotion and education; Public health education and sensitization; Lifestyle modification	Identification of substance and of substance use disorder: complaints, observation, questions, relationship with other organic and systemic health conditions; (Consider illegal drugs, medicines, traditional “drugs”, alcohol); Physical examination	HIV rapid test in case of PWID	Education and counselling; Symptomatic care; Forced rest in case where behaviour is incompatible with driving, risky behaviour for self and others	To nearest referral hospital for severe intoxication; To specialist for psychological and medical support and for detoxification
EMERGENCY / FIRST AID	Health education and sensitization (domestic and “on the road” safety); Emergency contact list, local and along corridor	Physical examination: Rapid primary and secondary assessment of case severity Rapid screening for referral	First aid / basic life support techniques / vitals monitoring / fully equipped emergency trolley	First aid measures for full recovery or stabilization prior to referral, in a timely manner	To nearest referral hospital for further care, investigations and/or follow up (EMRS services used)
FAMILY PLANNING	Health promotion and education;	Pregnancy test prior HIV test offered	N/A	Injectable contraceptive (2 and 3 month doses); Oral contraceptives ; Male and female condoms	To local family planning services for other forms of contraception

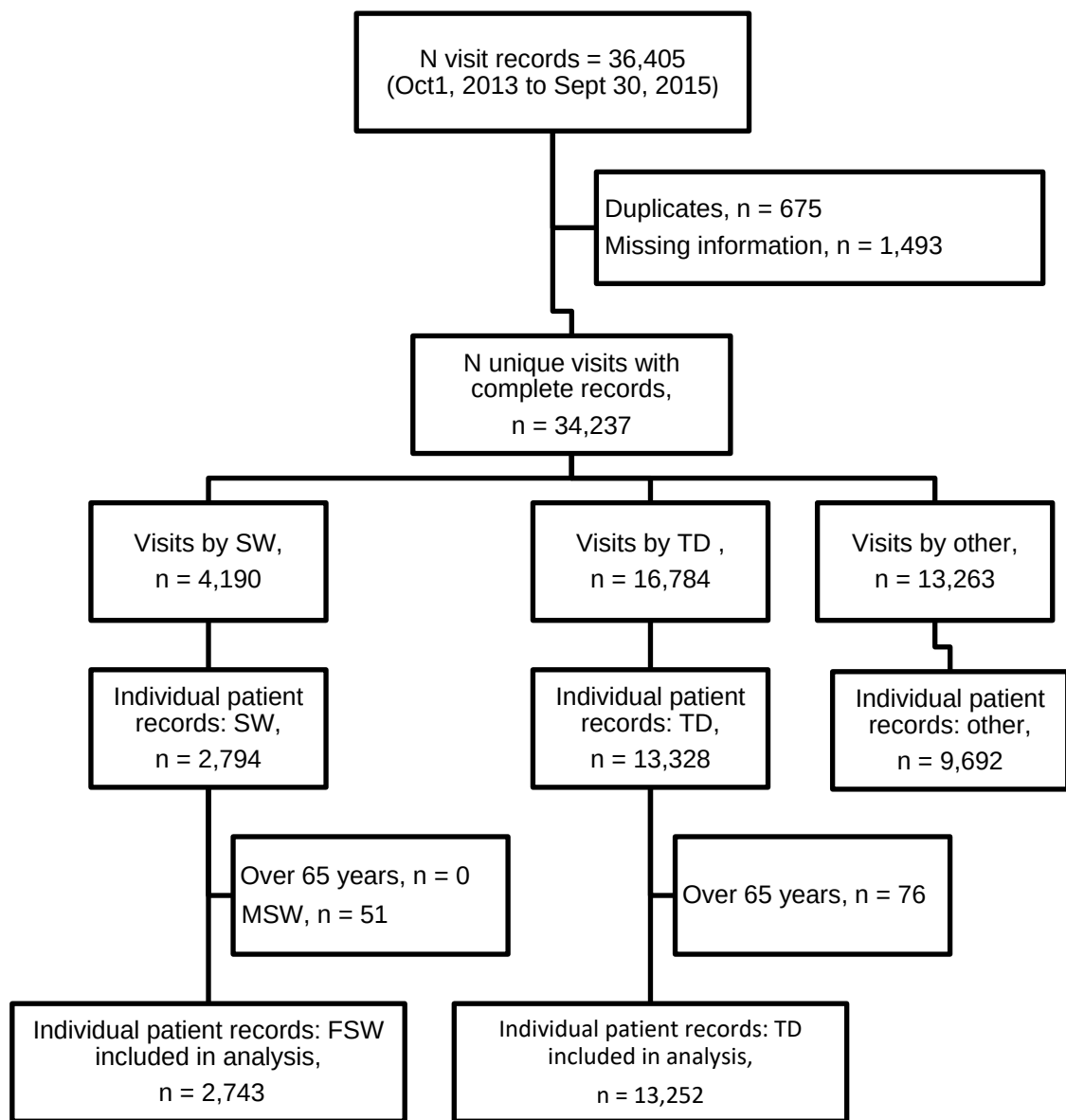
Abbreviations: HIV, human immunodeficiency virus; AIDS, acquired immune deficiency syndrome; PREP, pre-exposure prophylaxis; PEP, post exposure prophylaxis; STI, sexually transmitted infection; HCT, HIV Counselling and Testing; OI, opportunistic infection; TB, tuberculosis; VL, viral load; ART, antiretroviral therapy; INH, isoniazid; BMI, body mass index; etc., etcetera; ENT, ear, nose and throat; BP, blood pressure; RWC, roadside wellness centre; HPT, hypertension; SOP, standard operating procedure; NA, not applicable; CNS, central nervous system; PWID, person who injects drugs; EMS, emergency medical services

Services accessed was examined by type of service: HIV, STI, TB, malaria, and PHC. PHC comprises an array of services, including but not limited to respiratory, chronic, cardiovascular and muscular illnesses (more detail of services provided is given in table S4.1 at the end of the chapter). The distribution was described by attendees and by visits across different socio-demographic characteristics and services accessed.

Finally, associations were assessed between services accessed and socio-demographic characteristics using univariable and multivariable logistic regression models. Robust standard errors were calculated for all models to allow for intragroup correlations and the sample structure, i.e. visits by individuals nested in sites. All variables were included in the multivariable models. We reported both unadjusted and adjusted odds ratios, 95% confidence intervals and p values. P values less than 0.05 were considered significant.

Results

Information for 36,405 records was extracted. After excluding duplicate records (n=675) and incomplete records (n=1493), there were 34,237 records. Of these, almost half (49%, 16,784/34,237) were records from truck drivers' visits. After excluding truck drivers aged above 65 years, there were 13,252 individual truck drivers who made 16,688 visits (an average of 1.26 visits/person) and accessed 17,885 services (an average of 1.07 services/visit and 1.35 services/person) across nine clinics during the two year reporting period (Figure 4.1).



Abbreviations: N, number; n, number, SW, sex worker; TD, truck driver; MSW, male sex worker; FSW, female sex worker

Figure 4.1 Flowchart of routinely collected data extraction and records selection for inclusion in analysis

Service utilisation

In Table 4.2, the distribution of individuals and services accessed by socio-demographic characteristics and type of services is presented. The mean age of truck drivers accessing the sites was 39 years (SD 9.9). More than half (56%, CI 0.55-0.57) of them were less than 40 years old ($n=7,403/13,252$), followed by 27% ($n=3,551/13,252$, CI 0.26-0.28) in the 40-49 year age category, while less than 1% ($n=96/13,252$, CI 0.01-0.01) were younger than 20 years. Considering stability of partnerships, 67% ($n=8,887/13,252$, CI 0.67-0.68) of truck drivers reported being either married (monogamy or polygamy) or cohabitating, with a large majority of these men being in a monogamous marriage (96%, $n=8,575/8,887$, CI 0.96-0.97). The majority of the truck drivers accessing services across the clinics were South African (82%, $n=10,825/13,252$, CI 0.81-0.82).

The most accessed category of services provided by the clinics was PHC, accounting for 62% (CI 0.61-0.62 of the workload ($n=11,001/17,885$)). This was followed by HIV services at 32% ($n=5,660/17,885$, CI 0.31-0.32). Lower proportions of services were accessed for STIs and less than 1% of services were accessed for TB and malaria, respectively. Across all service categories younger truck drivers, with a stable partner currently, and those of South African origin were the main clinic attendees.

Table 4.2 Services accessed disaggregated by socio-demographic characteristics of truck drivers

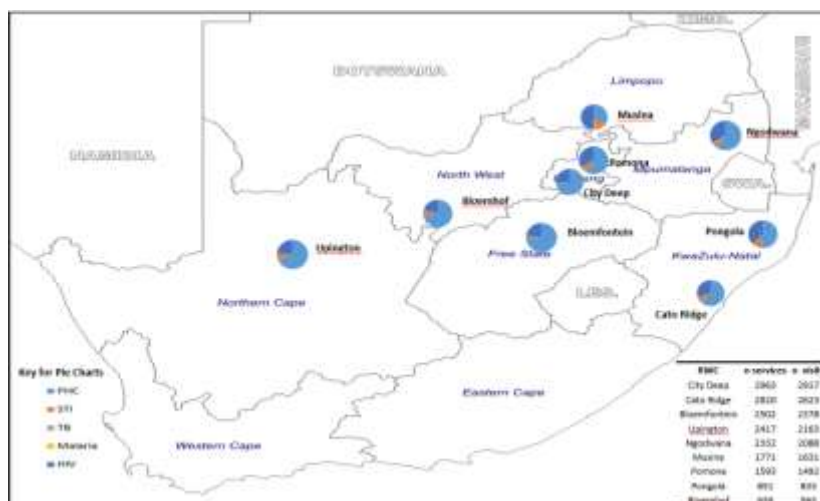
Services accessed (n = 17,885)						
	Clients	HIV, n (%)	STI, n (%)	TB, n (%)	Malaria, n (%)	PHC, n (%)
Total	13,252	5,660 (31.6)	1,092 (6.1)	62 (0.3)	70 (0.4)	11,001 (61.5)
Age, mean (SD)	39.2 (9.9)	37.2 (9.4)	36.2 (8.7)	40.4 (9.5)	39.2 (8.4)	41.1 (10.0)
Age						
< 20 years	96 (0.7)	59 (1.0)	11 (1.0)	0	0	45 (0.4)
20-29 years	2114 (16.0)	1131 (20.1)	232 (21.2)	8 (12.9)	7 (10.0)	1330 (12.1)
30-39 years	5193 (39.2)	2470 (43.6)	511 (46.8)	22 (35.5)	36 (51.4)	3879 (35.3)
40-49 years	3551 (26.8)	1310 (23.1)	254 (23.3)	18 (29.0)	19 (27.1)	3273 (29.7)
50-65 years	2298 (17.3)	690 (12.2)	84 (7.7)	14 (22.6)	8 (11.4)	2474 (22.5)
Sex						
Female	182 (1.4)	68 (1.2)	14 (1.3)	1 (1.6)	0 (0.0)	119 (1.1)
Male	13,070 (98.6)	5,592 (98.8)	1,078 (98.7)	61 (98.4)	70 (100.0)	10,882 (98.9)
Marital status						
SP	8,887 (67.1)	3,807 (67.3)	639 (58.5)	39 (62.9)	61 (87.1)	7,626 (69.3)
No SP	4,365 (32.9)	1,853 (32.7)	453 (41.5)	23 (37.1)	9 (12.9)	3,375 (30.7)
Nationality						
South African	10,825 (81.7)	4,209 (74.4)	789 (72.3)	47 (75.8)	18 (25.7)	9,373 (85.2)
Other	2,427 (18.3)	1,451 (25.6)	303 (27.7)	15 (24.2)	52 (74.3)	1,628 (17.8)

Abbreviations: HIV, human immunodeficiency virus; STI, sexually transmitted infection; TB, tuberculosis; PHC, primary healthcare; n, number; No SP, no stable partner; SP, with stable partner.

Figure 4.2 represents the variation across time of services accessed together with the opening of clinics. PHC services are consistently the type of services most

accessed, with HIV services showing the same trends as PHC services over time. With the exception of PHC services at the beginning of the reporting period, all categories of services displayed the same trend of utilisation: service utilisation peaked in the immediate few months following the opening of new clinics, with a substantial decrease in demand seen in the period leading up to the end of year holidays. In the first fiscal year (from October 2013 to September 2014), 6,569 services were accessed with an approximate 75% increase observed during the second fiscal year (from October 2014 to September 2015) in which 11,316 services were rendered to truck drivers.

Figure 4.3 shows service utilisation for services by location. The majority of the sites served a similar volume of clients; of the operational facilities, the newest of the RWCs, Bloemfontein RWC, reported the highest headcount. Although there were challenges in providing services to truck drivers at the City Deep clinic, it reported the highest service volume (2,963 services in 2,917 visits). This was facilitated by healthcare workers providing mobile outreach services to truck drivers as opposed to truck drivers coming into the clinic. Clients of RWCs in high HIV prevalence border communities (e.g. Pongola; KwaZulu-Natal HIV prevalence = 28%^[21]) or neighbouring high HIV prevalence areas (e.g. Musina (Limpopo) with a farm worker HIV prevalence = 28% ^[22]) accessed proportionally more HIV-related services, while other RWCs such as Bloemhof and Bloemfontein mainly dispensed PHC services.



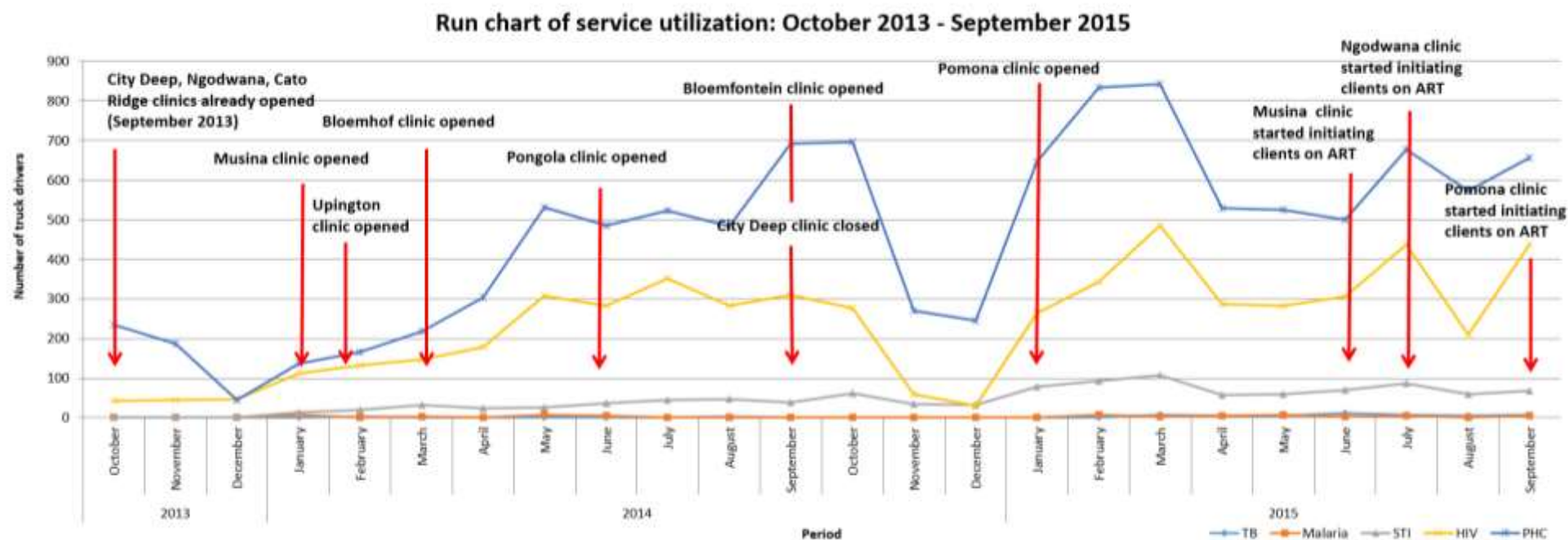
Abbreviations: PHC, primary healthcare; STI, sexually transmitted infection; TB, tuberculosis; HIV, human immunodeficiency virus; RWC, roadside wellness clinic; n, number

Figure 4.2 Map showing nine South African roadside wellness clinics' location, service utilisation and total number of visits per clinic

The vast majority of visits saw only one service being accessed (93%, $n=15,523/16,688$). Of the remaining 7% of visits, up to five services were accessed per visit. The most sought after multiple service combination was PHC and HIV (5%, $n= 835/16,688$) followed by PHC and STI (less than 1%, $n=145/16,688$). The combination of TB and HIV services in one visit remained extremely low at less than 1% ($n=14/16,688$).

Factors associated with service utilisation

In Table 4.3, the results of both univariable and multivariable analyses is presented. Older truck drivers were more likely to access PHC services and less likely to access TB, HIV or STI services. Those with stable partners currently were less likely to access STI and TB services than those without a stable partner currently. South African attendees were more likely than non-South Africans to access PHC, while attendees from other nationalities were more likely to access HIV and malaria services.



Abbreviations: TB, tuberculosis; STI, sexually transmitted infection; HIV, human immunodeficiency virus; PHC, primary healthcare

Figure 4.3 Service delivery and roadside wellness clinic implementation information for October 2013 to September 2015

Table 4.3 Determinants of service uptake across all sites

	HIV (n=16,688 records; n=5,660 services)		STI (n=16,688 records; n=1,092 services)		TB (n=16,580 records ¹ ; n=62 services)		MALARIA (n=16,580 records ¹ ; n=70 services)		PHC (n=16,688 records; n=11001 services)	
Age	UOR [95% CI]	AOR [95% CI]	UOR [95% CI]	AOR [95% CI]	UOR [95% CI]	AOR [95% CI]	UOR [95% CI]	AOR [95% CI]	UOR [95% CI]	AOR [95% CI]
<20 years	reference	reference	reference	reference	-	-	-	-	reference	reference
20-29 years	0.67 [0.25- 1.84]	0.67 [0.23- 1.92]	0.89 [0.50- 1.58]	0.82 [0.45- 1.48]	reference	reference	reference	reference	1.56 [0.55- 4.44]	1.62 [0.53- 4.92]
30-39 years	0.52 [0.18- 0.48]	0.49 [0.17- 1.38]	0.76 [0.43- 1.36]	0.75 [0.42- 1.34]	1.08 [0.41- 2.82]	0.91 [0.72- 1.16]	2.03 [0.66- 6.24]	1.59 [0.46- 5.46]	2.14 [0.78- 5.86]	2.30 [0.83- 6.36]
40-49 years	0.34 [0.13- 0.84]*	0.31 [0.13- 0.77]*	0.52 [0.28- 0.98]*	0.56 [0.30- 1.03]	1.25 [0.54- 2.88]	0.68 [0.52- 0.89]**	1.50 [0.61- 3.71]	1.30 [0.46- 3.62]	3.56 [1.46- 8.70]**	3.75 [1.54- 9.12]**
50-65 years	0.24 [0.09- 0.65]**	0.24 [0.09- 0.63]***	0.25 [0.13- 0.49]***	0.29 [0.15- 0.57]***	1.44 [0.63- 3.28]	0.35 [0.22- 0.58]***	0.94 [0.29- 3.02]	1.24 [0.40- 3.89]	5.76 [2.32- 14.30]***	5.62 [2.30- 13.72]***
Marital status										
No SP	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference
SP	0.95 [0.65- 1.37]	1.10 [0.76- 1.60]	0.64 [0.42- 0.98]*	0.68 [0.57- 0.81]***	0.80 [0.55- 1.15]	0.68 [0.57- 0.82]***	3.19 [1.89- 5.40]***	1.54 [0.84- 2.81]	1.18 [0.78- 1.81]	1.01 [0.73- 1.41]

Nationality										
South African	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference
Other	1.87[1.18-2.96]**	1.72 [1.13-2.60]*	1.70 [0.92-3.14]	1.77 [0.95-3.28]	1.36 [0.70-2.65]	1.72 [0.92-3.23]	12.50 [4.44-35.19]***	11.04 [3.89-31.29]***	0.47 [0.25-0.88]*	0.50 [0.27-0.90]*

Notes: ¹ records with <20y (n=108) were dropped in this analysis, because there were no TB/malaria visits recorded

Abbreviations: HIV, human immunodeficiency virus; STI, sexually transmitted infection; TB, tuberculosis; PHC, primary healthcare; n, number; UOR, unadjusted odds ratio; AOR, adjusted odds ratio (refers to adjusted for all variables in table); 95% CI, 95% confidence interval; No SP: no stable partner includes the following categories: divorced, single or widowed. SP: with stable partner includes married and cohabiting. *indicates a p value<0.05; ** p value<0.01; *** p value<0.001

Discussion

This is the first report of comprehensive health service utilisation among truck drivers in South Africa. The main results show that truck drivers attending RWCs are mainly middle-aged and in stable relationships. While HIV services are important to truck drivers from other countries, PHC services are most in demand among South African truck drivers. It could be argued that North Star Alliance's comprehensive service package suits the majority of South African clinic attendees and that further development of PHC services might be an important consideration for future healthcare planning in South Africa.

As anticipated, as the number of RWCs increased over time, the absolute number of clients accessing services increased. However, changes in service delivery such as increased efforts to promote the clinics through outreach, the introduction of ART services for HIV-positive clients, and the increase in scope of the PHC services offered are likely to have contributed to increasing service uptake. The same yearly patterns of utilisation overall were mirrored across service type, i.e. peaks during the second quarter of the year and troughs in the last quarter. This pattern of utilisation is in keeping with trends seen among other service providers in the South African public healthcare system. The last quarter decreases are usually attributed to companies slowing down work as the year end approaches and closing for holidays.

STI prevalence in the truck driver population has been estimated to be higher than in the general population [23]. The results showed that STI service utilisation in this mobile population was low. However, this might be related to the profile of clinic attendees (i.e. older and in stable partnerships) who might be at lower risk.

The low malaria service utilisation could be explained by South Africa's low malaria prevalence[24] and resulting low risk perception. While HIV services were second highest in demand, the TB and HIV combination remained extremely low (less than 1%). Although the entry point for services cannot be determined from the database, it is apparent that there is an opportunity to improve provider-initiated testing and

counselling [25] services and to promote screening for multiple diseases in a single visit, such as TB screening for HIV clients and vice versa but also in combination with non-communicable disease screening.

Lastly, observations were made on the different patterns of utilisation, both in volume and type of services, depending on location. Although the Bloemfontein clinic was one of the last clinics to become operational, it had the highest number of people accessing it, because it is located on a busy national route and offers the most potential for service utilisation and uptake. The absence of RWCs in Western and Eastern Cape does not allow us to comment on truck driver healthcare utilisation in those provinces. However, based on the arrangement of the South African trucking corridor, the Bloemfontein RWC could be used as a proxy for utilisation trends. From the geographical size and infrastructure perspectives, it is expected that truck driver utilisation would be much higher in the Western Cape compared to the Eastern Cape.

The characterisation of clinic attendees, through this analyses, indicates that the cross-border mobile population was most likely to access services for communicable diseases, such as malaria and HIV, whereas South African drivers were most likely to access PHC services. This could imply that transiting truck drivers may feel more comfortable accessing communicable disease services outside their home country while on the road, with North Star Alliance possibly filling a gap in service provision for this population. Programmatically this begs the question of whether non-South Africans access services in this way to avoid stigma, discrimination, and unnecessary disclosure in their home countries – especially in the case of positive results for HIV and STIs. However, linkage to care and treatment for them remains a challenge.

North Star Alliance also provides services to local communities both in Zambia and Zimbabwe. However, routinely collected data from other countries show that patients in South Africa tend to come to North Star Alliance services more regularly than in

the other countries. There is a similar pattern of utilization by truck drivers both by country and over time. In South Africa, truck drivers tend to attend PHC services and these visits have increased over a two-year period. In Zambia, truck drivers mostly access HIV-related services while in Zimbabwe, they access both PHC and HIV-related services. The number of services accessed have remained stable in Zambia and Zimbabwe. Albeit the variable data quality across countries utilisation is more likely to be attributed to the overall healthcare services, facilities and general infrastructure available to the general populations in Zambia and Zimbabwe.

Formally contextualising and generalising findings from this study to the African trucker population is limited by the dearth of available comprehensive truck driver healthcare utilisation data; possibly linked to services offered to them (the emphasis on sexually transmitted diseases in truck drivers has influenced health programming for truck drivers to focus on HIV (behaviour change communication, outreach, condom distribution and testing) and STIs) and programmes' general lack of recording and reporting[14]. However a Nigerian survey reported that commercial truck drivers in the age range 30-39 years were most likely to use HIV services [26], where no significance was found in this Uptake study. Moreover, a survey conducted in the US among long distance truck drivers similarly found that the middle aged, married truck drivers had the most interest in PHC related services and less interest in STIs; dissimilarly finding that HIV was the second least of interest [6]. Accessing healthcare is in part related to availability and this availability is related to country's evidenced or perceived burdens of diseases. From the observations mentioned above it stands to reason that high burdened HIV countries will have a strong HIV response and healthcare utilisation will be favoured towards HIV services. However, it is crucial to note that lack of reporting hinders the development of appropriate country responses which ultimately influences patterns of utilisation, uptake and health outcomes not only in truck drivers but in all populations (priority and general).

This study presents some limitations. Firstly, with routinely collected information only, there is the possibility that utilisation is actually higher than that reported and

misreporting is possible. However, when paper records were also available, data quality checks were performed periodically as part of quality assurance programmes for external funders. Linked to this is the possibility of misclassification of services during the programming processes and incorrect recording of services on COMETS, being accessed. Since I used the pre-programmed classifications in COMETS for the analysis with limited access to the back-end of the system and no access to the system developers, the programmed classification/categorisation of services could not be verified. Further the COMETS front-end comprises many tick boxes per condition facilitating the likelihood of errors being made during the consultation. Lastly, the study assessed utilisation among attendees of North Star Alliance's RWCs but did not assess the users' health service needs. Nevertheless, the results highlight the need for programme planners to consider the following vital aspects when designing healthcare packages for this priority population. Firstly, given that truck drivers mostly access services for non-communicable diseases, the lack of provider-initiated testing and counselling illustrates an important missed opportunity. Comprehensive care service delivery packages and training for staff to deliver them in these settings will increase the quality and impact of services available to truck drivers, which in turn might increase service demand. Attracting more truck drivers into the clinics provides further opportunities for healthcare providers to offer screening, testing, and/or management of other communicable diseases. This comprehensive care and its increased use will simultaneously generate a healthier truck driver population, with subsequent economic benefits, and will address diseases that are public health priorities.

Conclusion

This utilisation analysis shows that tailored services do assist in alleviating healthcare access challenges faced by truck drivers. It is however important to ensure that service packages and clinics speak to the needs of truck drivers in terms of services offered and clinic location. A comprehensive package of care will tackle both communicable and non-communicable disease burdens and provide South Africa with a healthier truck driver workforce.

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Chapter 5: Addition of antiretroviral therapy to a primary care health delivery model in South Africa for truck drivers: Assessing linkage to and retention in care

Title	Antiretroviral therapy for truck drivers and mobile sex workers in Southern Africa: North Star Alliance's model of care			
Authors	Samanta Tresha Lalla-Edward; Paul Matthew; Catherine A Hankins; Gabriela B Gomez; WD Francois Venter			
Author's contribution	STLE	60%	GBG	15%
	PM	2%	WDFV	15%
	CAH	8%		
	Designed the study: STLE, WDFV and GBG. Analysed the data and interpreted results: STLE, GBG and WDFV. Wrote the initial draft: STLE. All authors critically reviewed and approved of the final draft.			
Journal	Awaiting editorial decision WHO Bulletin			
Impact	4.49 (2015/2016)			

The success of an intervention lies in its ability to get people to access the intervention for the first time and then continue to make use of it. This linkage to and subsequent retention in care is crucial to improving the health outcomes of clients. In the preceding chapters I described the clinic users (and non-user's) perspectives about the service offerings as a supplement to the clinic usage data. Since North Star Alliance offers many services (which are primary healthcare (PHC) focussed), in this chapter, I will complete the care cascade by detailing the implementation and performance of the newly introduced antiretroviral therapy (ART) programme only.

Introduction

The trucking industry is vital to sub-Saharan African economies, as land-locked communities largely lack access to adequate rail infrastructure, waterways, or affordable air transport for goods. In South Africa alone, there are an estimated 500,000 truck drivers [1]. Most of these truck drivers, who are overwhelmingly men,

are employed by small businesses. While truck drivers are relatively well paid when measured against similar semi-skilled labour, benefits such as health insurance are not the norm.

Truck drivers have specific healthcare needs, health vulnerabilities, and healthcare access challenges. Globally, truck drivers bear a disproportionate health burden, including high transmission and acquisition rates of sexually transmitted infections (STIs) and HIV [2-4]. Since 1989, there have been 22 healthcare programmes for truck drivers and other mobile populations operating across 30 countries in sub-Saharan Africa. All of them have been either totally or partially funded by international or domestic donors, through non-governmental organisations and/or consortia of private associations. These health programmes aim to tackle different aspects of the health needs of truck drivers and populations along corridors, with a focus on HIV prevention and were delivered primarily through mobile or satellite facilities instead of at conventional local community (public health) healthcare facilities. Just over half of the programmes have been evaluated, with results showing overall positive changes in HIV risk behaviours, knowledge, and attitudes following their implementation[5]. However, a limitation of these programmes is the lack of provision of ART as part of their HIV prevention and care packages.

An increase in ART provision to vulnerable populations is needed for countries to achieve global and national goals towards the 90-90-90 targets set by UNAIDS to end the AIDS epidemic (i.e. by 2020, 90% of all people living with HIV will know their HIV status 90% of all people with diagnosed HIV infection will receive sustained ART 90% of all people receiving ART will have viral suppression) [6]. As ART coverage increases in the HIV hyper-endemic countries in sub-Saharan Africa, integrating this life-saving measure within primary care delivery systems has become a priority. Task-shifting and decentralisation of ART services improve both accessibility for hard-to-reach groups and strengthen retention of patients, while improving healthcare system efficiency and reducing the burden of managing uncomplicated cases [7-9]. This coupled with the reported successes of satellite services (chapter 2) and some truck driver's preferences for accessing HIV services at RWCs [10] , renders RWCs

as appropriate settings for initiating and maintaining truck drivers on treatment.

However, it presents several operational challenges when considering its application to the benefit of mobile and vulnerable populations in cross-border settings, such as transport corridors. Acknowledging this, the Dutch Ministry of Foreign Affairs, a long-term funder of North Star Alliance, recommended adding ART services to the RWC platform and funded the North South Corridor Demonstration Project (NSCDP). The NSCDP, a collaboration between North Star Alliance, Wits Reproductive Health and HIV Institute (Wits RHI), and the Amsterdam Institute for Global Health and Development, aimed to develop, implement, and evaluate an ART service tailored to the needs of vulnerable populations along one transport corridor.

North Star Alliance's model of care

North Star Alliance is a non-governmental organisation (NGO) providing PHC to truck drivers and sex workers, as well as to communities surrounding transport corridors in sub-Saharan Africa. North Star Alliance's model of care uses modified shipping containers as roadside wellness centres (RWCs) (Figure 5.1) and an electronic data system (called COMETS) interconnected along trucking corridors. Additionally it uses the data systems mandated by the national ministry in which the RWC is located. To date, there are 11 RWCs in South Africa among 38 in sub Saharan Africa [11].



Figure 5.1 Roadside Wellness Clinic, Upington, South Africa

From its origin, North Star Alliance's care provision has focused on general services including HIV prevention and testing; screening and treatment of STIs, tuberculosis (TB), and malaria; family planning and the diagnosis and chronic care of common illnesses, such as hypertension or upper respiratory infections. Recently, my co-authors and I presented the results of a programme evaluation of North Star Alliance's core services. In a two-year period, 2013-2015, 13, 252 clients accessed 17,885 services in the South African RWCs alone, the majority of these (62%, n=11, 001/17, 885) were for general PHC services [12].

Demonstrating health impact after implementation of any intervention is required to motivate for additional financial, human and programmatic resources for ongoing programmes, especially for sustainability. The plan for RWCs in countries like South Africa is to integrate them into a public-private partnership, where the health ministry can eventually offer this programme as part of their routine public health services.

Although this evaluation was planned for South Africa, Zambia and Zimbabwe, there were challenges in obtaining ethical approvals in the latter two countries. Therefore, in this chapter, I only document the process of designing and setting up ART services at the South African RWCs, and present evaluation results of the first year of this service for truck drivers. Lastly I reflect on the lessons learnt and future developments.

Design and Implementation

The NSCDP was designed to be a proof of deliverability for South African guidelines-approved Nurse-Initiated and - Managed Antiretroviral Therapy (NIMART)[13] services, tailored to the needs of truck drivers, sex workers, and communities along transport corridors. The South African ART programme currently mandates that treatment be freely available in all public health facilities to all individuals testing HIV-positive. However, previously (during the period of implementation presented here)

there was a CD4 count threshold which determined eligibility to ART (i.e. 500 CD4 cells/mL)[14]. Laboratory services were free and provided by the National Health Laboratory Services (NHLS) [15].

The NSCDP was intended to adapt NIMART to the decentralised setting of RWCs following the South African Department of Health (DoH) policies. An initial step in the service design was to assess the clinical and operational steps needed to prepare RWCs for site accreditation. For this, the clinical aspects of the current NIMART protocol, adapting assessment, referral, and initiation algorithms to the setting were reviewed. The appropriateness of recommended drug regimens for truck drivers needed to be assessed therefore the monitoring protocol, including tests and testing frequency was reviewed. Following this review, policy documents and standard operating procedures as well as an integrated curriculum (described below) supporting decentralised delivery of ART services was developed.

Wits RHI developed the integrated curriculum (comprising material for trainers and trainees) supporting primary healthcare focused delivery of services for either ART, PHC or both. Additionally, staff received monthly e-learning sessions. These comprised of case studies that were presented via conferencing facilities to staff at all RWCs. The content covered cases that were more unusual/complicated, to assist staff with thinking through unconventional medical situations and provide them with information on how to handle complicated cases.

From an operational perspective, all RWCs underwent a readiness assessment. Following this assessment, several actions were taken. These included recruitment, training, mentoring, and competency certification (based on their submitted portfolios of evidence) of clinical staff; training of counsellors and non-clinical staff on counselling skills and basic HIV care (done to ensure that all staff present at RWCs were aware of the services offered and could appropriately deal with clients' questions, while promoting use of the RWC); establishment of between-site and cross-border monitoring with follow-up through electronic data sharing; technical

assistance on drug and equipment procurement; upgrade of monitoring and evaluation (M&E) tools; and expansion of clinical stationary and identification of referral sites. The completion of these actions led to site accreditation, a pre-requisite to start ART services.

HIV and CD4 Testing at NIMART accredited RWCs

HIV counselling and testing was conducted in accordance with the South African guidelines for testing [16]. HIV testing was conducted at the RWCs by either a nurse or counsellor providing the pre- and post-test counselling and using a rapid test kit. When a client tested positive for HIV, a second confirmatory test was performed. In the case where results were discordant, blood was drawn and sent to the NHLS for Elisa testing. Clients with confirmed HIV (i.e. two reactive tests) had a blood draw that was sent for viral load and CD4 count testing at the NHLS. Eligible clients were called and allocated dates for follow up appointments to continue with adherence counselling prior to treatment initiation. In cases where the client did not want to be initiated at the RWC or the facility was not accredited at the time of the client testing positive, they were given the option of being referred to a facility of their choice and were given a referral letter. Later on test and treat became policy. This was out of the scope of the evaluation period.

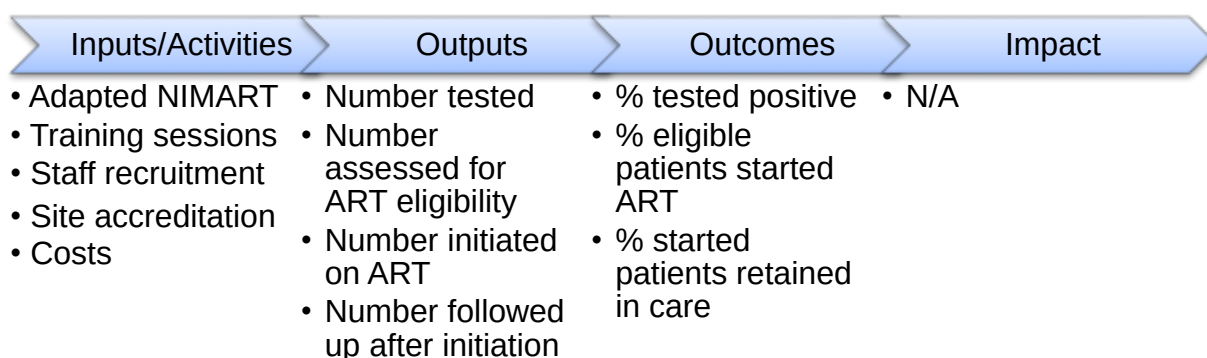
Evaluation of ART Services in RWCs

Methods

The NIMART service addition to the RWC service offering was evaluated for the period from inception up to 31st May 2016. After this date, the ART policy in South Africa changed with the exclusion of any CD4 threshold for initiation of ART and the addition of pre-exposure prophylaxis (PrEP) through a national pilot programme [17]

for HIV negative people at ongoing high risk of HIV exposure.

In order to evaluate this programme, a logic model [18] was adopted, as a comprehensive framework for mixed methods evaluation (Figure 5.2). In this model, inputs represented resources used by the programme (e.g. costs) and activities were actions that used resources (e.g. training sessions, recruitment of personnel, site accreditation). The first level of results associated with the programme was the outputs. These were direct immediate-term results (e.g. number of ART initiations). The second level of results associated with the programme and representing medium-term consequences were outcomes (e.g. proportion of HIV-positive people diagnosed, proportion of eligible patients on ART). Finally, the third level of programme results and long-term consequences were measured through impact indicators. An example of this indicator is HIV incidence, which was outside the scope of this evaluation.



Abbreviations: NIMART; Nurse-Initiated and - Managed Antiretroviral Therapy; ART, antiretroviral therapy; %, percentage; N/A, not applicable

Figure 5.2 Logic model for programme evaluation used in the evaluation of the roadside wellness clinic antiretroviral therapy design and implementation

A group of truck drivers was followed up to assess the contribution of North Star Alliance's services to the successful linkage to care of HIV-positive clients in South Africa. Clients over 18 years of age, who tested HIV-positive at the RWC and who had been referred for ART services or had initiated ART at one of the accredited

RWCs were asked to participate until the sample size was reached. Informed consent and contact details were obtained from clients. Three methods for obtaining follow-up information were described to the client: 1) they could be contacted directly by study researchers; and/or 2) their data could be accessed from the NHLS database; and/or 3) the referral clinic could be contacted to determine whether they had presented for further assessment at the clinic to which they were referred.

The total sample size was calculated from the scientific literature estimating, in South Africa, the proportion of patients enrolling in care after a positive HIV test: 44% (range 31%–68%)(16). Therefore, a total sample size of 541 clients found to be HIV-positive and referred to care would be needed to estimate the expected proportion of 44% with a precision of 5% in the 95% confidence interval (i.e. if the proportion is 44%, the expected 95% CI will be 10% points wide, $\pm 5\%$, from 39% to 49%). This assumed a 30% loss to follow-up/records with missing information within the group.

Data were collected from the NHLS database to determine whether patients were ART eligible and the name of the clinic at which they presented. Follow-up was done until November 2016 (to give the clients who initiated in May 2016 a six month treatment period) with the referral clinic to determine whether clients initiated ART. For HIV-positive clients initiated onsite, aggregated uptake data from the North Star Alliance regional office were used for analysis and comparison. Those clients without data in COMETS or NHLS directly were followed up telephonically. ART data were extracted from the South African National M&E ART system, Tier.net, database after matching participants who gave consent for access to their Tier.net records. Matching was done on several criteria, including date of birth, name, and date of diagnosis.

The financial costs were calculated from a provider's perspective. The costs excluded drugs and diagnostics, as these costs are incurred by the DoH. All expenditures by site from North Star Alliance records for the duration of the NSCDP and Wits RHI's expenditures related to training and NIMART service development were reviewed.

Staff time was allocated following the completion of timesheets by nurses at the sites. Nurse time during initiation and follow up visits was included. Other recurrent, capital and programme management costs were allocated based on service utilisation records and included all ART-related visits. All costs were estimated in local currency then converted into 2016 USD (1ZAR=0,074USD).

Results

Table 5.1 presents all NIMART programme indicators, disaggregated by site. The site certification period indicates how long it took for the RWC to get accredited to provide ART whilst the active period represents how long the clinic have been initiating clients on ART (i.e. period between accreditation and the evaluation date).

Across South African sites, heterogeneity in positivity was observed, with, truck drivers having the lowest HIV positivity rates than other categories of clients being tested at the RWCs.

North Star Alliance ART services were implemented during a period where national guidelines in South Africa recommended initiation of ART at a CD4 threshold of 500 cells/mL [19]. 104/231 (45%, CI 0.38-0.52) of the HIV positive clients had CD4 count testing. At this initiation threshold, 57% (59/104, CI 0.47-0.66) of HIV positive truck drivers presenting for CD4 count testing were eligible for treatment. Overall, from January 2014 up to the end of May 2016, North Star Alliance achieved a total of 285 ART initiations in the South African sites of which 21% (n=61/285, CI 0.17-0.27) were in truck drivers. The majority (43%, CI 0.30-0.56) of truck drivers were initiated on ART at the Pomona RWC. This could be attributed to the aggressive campaigns conducted on weekends by the RWC clinical staff. Despite efforts by all the RWC teams, overall the monthly average initiations in truck drivers remained low (Table 5.2).

76/231 (33%, CI 0.27-0.39) Truck drivers consented to be followed up; of these only 36% (0.25-0.47) were matched in Tier.net. After following up through numerous phone calls, questionnaires on follow-up were completed for a total of 54% (CI 0.42-0.65). Among those eligible and followed up, by the end of the NSCDP, 54% (n=22/41, CI 0.37- 0.69) had started and were retained in ART care at six months.

Table 5.1 NIMART programme indicators per site

RWC	Site certification	Active period	Population	HIV positivity n, %, CI			Eligible for ART n, %, CI			ART initiations n, %, CI			Reasons for delay in start
Hoedspruit	Before NSCDP	11 months	All	165/645	26%	0.22-0.29	166/200	83%	0.77-0.88	170			Site preparations occurred separately from the NSCDP
			Truck drivers	12/35	34%	0.19-0.52	0/0	-		17*	10%	0.06-0.16	
Musina	18 months	11 months	All	112/3451	3%	0.03-0.04	29/37	78%	0.61-0.90	21			Disruptions in electricity; negotiations for additional space to accommodate the high volumes of clients
			Truck drivers	47/2279	2%	0.00107-0.00019358	11/14	79%	0.50-0.95	8	38%	0.18-0.62	
Pomona	9 months	8 months	All	148/2437	6%	0.5-0.7	83/129	64%	0.55-0.73	57			Initially no supply of ART to the RWC; had to negotiate with a nearby fixed facility to be a referral site for lab tests
			Truck drivers	50/1464	3%	0.03-0.04	36/56	64%	0.50-0.77	26	46%	0.32-0.59	
Ngodwana	19 months	10 months	All	204/1449	14%	0.12-0.16	17/61	28%	0.17-0.41	24			Limited support from district DoH; challenges with laboratory services; drug stock outs
			Truck drivers	92/806	11%	0.09-0.14	9/31	29%	0.14-0.48	5	21%	0.07-0.42	
Bloemhof	20 months	1 month	All	3/33	9%	0.02-0.24	0/2	0%		1			Challenges with security; signage; relationship with the district DoH; shared DoH staff; initial clinic design; drug shortages
			Truck drivers	0/6	0%	0-0.46**	0/0	-		1*	100%	0.025-1.00**	
Uppington	24 months	6 months	All	40/749	5%	0.04-0.07	19/21	90%	0.70-0.99	11			Challenges with shipping of samples to NHLS
			Truck drivers	23/75	31%	0.21-0.42	0/0	-		3	27%	0.06-0.61	
Pongola	8 months	4 months	All	70/1020	7%	0.05-0.09	3/3	100%	0.29-1**	1			Challenges with NHLS logistics
			Truck drivers	7/883	1%	0.003193-0.016265	3/3	100%	0.29-1**	1	100%	0.025-1.00**	
TOTAL			All	742/9784	8%	0.07-0.08	317/453	70%	0.66-0.74	285			
			Truck drivers	231/5548	4%	0.04-0.05	59/104	57%	0.47-0.66	61	21%	0.1-0.27	

Abbreviations: n, number; %, percentage; CI, confidence interval; NIMART, nurse-initiated and managed antiretroviral therapy; NSCDP, North South Corridor Demonstration Project; RWC, roadside wellness centre; ART, antiretroviral therapy; North South Corridor Demonstration Project; NHLS, National Health Laboratory System.

* More initiations than eligible for ART as these included clients transferred into the RWC for ART initiation** one-sided, 97.5% confidence interval

Table 5.2 Distribution of truck driver initiations

RWC	Months	Truck drivers	Average number of initiations per month n (SD, CI)
Hoedspruit	11	17	1.5 (1.13, 0.79-2.30)
Musina	11	8	0.7 (1.01; 0.05-1.41)
Pomona	8	26	3.25 (1.67, 1.85-4.65)
Ngodwana	10	5	0.5 (0.85, 0-1.11)
Bloemhof	1	1	1 *
Upington	6	3	0.5 (0.55, 0-1.11)
Pongola	4	1	0.25 (0.5, 0-1.05)
Total	51	61	7.7

Abbreviations: RWC, roadside wellness centre; n, number; SD, standard deviation; CI, confidence interval

Note: * No SD or CI as there is only one observation

Table 5.3 Follow up of consented HIV positive clients

RWC	Consented	In Tier.net	In Tier.net %, CI		Followed- up	Followed- up %, CI	
Bloemfontein	5	-	0		4	80	0.28-0.99
Musina	42	13	31	0.18-0.47	20	48	0.32-0.64
Ngodwana	4	1	25	0.0063095- 0.8058796	2	50	0.10-0.93
Pomona	25	13	52	0.31-0.72	15	60	0.39-0.79
Total	76	27	36	0.25-0.47	41	54	0.42-0.65

Abbreviations: RWC, roadside wellness centre; %, percentage; CI, confidence interval

The unit cost per patient initiated and in care was estimated to be approximately \$65 per year. This included \$17 in staff (i.e. nurses), \$9 in other recurrent costs (i.e. other

staff, utilities), \$14 capital costs (i.e. space, vehicles, furniture), and \$25 in programme management costs (i.e. legal, meetings and project management). The total start-up cost was estimated to be \$17,979, the majority of which was NIMART adaptation, curriculum development and training (97%). Site preparation accounted only for 3% of start-up costs.

Lessons learned and Future Developments

Overall, the ART service integration within the network of RWCs, which has good geographical coverage and client recording systems, made programmatic sense, particularly for mobile populations. During the design and piloting of the NSCDP ART service, operational and logistical lessons were learnt that will improve service expansion to other sites. In particular, standard operating procedures developed for training all staff combined with monitoring, reporting, and data quality processes to facilitate service scale-up.

The integration of services with the South African DoH also presented some logistical and operational challenges. Provinces responded differently to ART service provision at the RWCs and negotiations needed to occur at various levels in the DoH. Indeed, much of the delay in implementation was due to this lack of synchronisation throughout negotiations with several sites having to wait over a year for medicine and laboratory support. Due to the extended periods between staff training and sites starting ART services, staff had to be given refresher training, increasing delays and costs. Once the service started, there are long turnaround times for NHLS results and site dependence on the National DoH for drug supply resulted in an ART stock out in one site.

Although notable HIV rates were observed among those testing, the HIV prevalence among truck drivers remained low. Therefore the numbers initiated on ART were relatively modest, and also varied by site. Further, 45% of those HIV positive were

tested for CD4 count and 57% of those had low CD4 counts (less than 500 CD4 cells/mL) indicating that most clients presented late to care but, importantly, that there were potential gains to be achieved in linkage to care now that the requirement for CD4 count testing and eligibility assessment has been lifted considering that majority of those eligible chose to start ART in this setting. However only 45% testing for CD4 counts most likely implies that the remaining 55% were referred elsewhere for CD4 count testing. Despite there no longer being a CD4 count threshold, this low rate indicates that more needs to be done at the RWC level to understand the higher referral rate and to identify mechanisms to promote clients continuing with their HIV screening and management processes at the RWC.

The most important lesson learned relates more to the feasibility, both of the intervention and of the evaluation of the NIMART programme in the RWCs. During the evaluation we only succeeded in recruiting 61 patients needing ART, while the intended sample size was 541 which is less than 15%. In addition, the large proportion of HIV positive patients of whom did not get the CD4 count might have introduced a bias, and we were not successful in obtaining the 6-months retention outcome of 20 of the 61 patients. I therefore did not have not enough data to estimate the retention rate, which was the objective of this component.

The programmatic financial cost per person initiated and in care was estimated to be at \$65 (ZAR878) per year, excluding drugs and diagnostics (but including all programme costs). This estimate in a hard-to-access population was similar to other recently published estimates of decentralised NIMART in PHC settings (at \$69, excluding \$170 in drugs and diagnostics)[20]. However, previous studies looking at ART delivery in South Africa have estimated higher costs, such \$299 in 2014 for the MATCH study excluding drugs and diagnosis [21]. These estimates are for service delivery that is doctor-led and included facilities and hospitals, which explains the difference in costs.

The main limitation in the assessment of the ART service was the lack of impact

measurement (i.e. longer term effects of the intervention at an individual and population level). However, with the evidence portfolio that has been developed throughout the evaluation, it would be possible to conduct secondary data analysis, whereby extrapolation can be done from proof of deliverability at outcome and output level to impact at a population level. This will facilitate a cost-effectiveness assessment of this option for service delivery, in particular if investments in infrastructure (excluded here) are needed. A second limitation were the low numbers of truck drivers accessing CD4 count testing and initiating on ART. As the sample size was not reached, the generalisability of the findings are limited.

In June 2016, the South African DoH announced a roll-out of PrEP and immediate ART, irrespective of CD4 count, nationally(19). A systematic assessment of potential sites showed six North Star Alliance sites as being immediately ready for roll-out. This positive assessment was a direct consequence of the site's participation in the NSCDP.

Conclusion

As starting point for offering ART in the RWC setting, North Star Alliance RWCs represent a useful platform to expand access to testing, improve linkage to ART care for remote and vulnerable populations, and help monitor (uncomplicated) clients along transport corridors, therefore also contributing potentially to retention in care. As such, the value of this platform in helping countries achieve the 90-90-90 targets to help end the AIDS epidemic has been partially demonstrated [6] Therefore with the change in treatment guidelines and the lessons learnt from the experienced operational challenges the usefulness of this approach still requires further investigation.

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Chapter 6: Conclusion

Truck drivers are central to the economy within Southern Africa, due to reliance on road transport for transport of goods. The introductory chapter describes the health crisis created by HIV in the Southern African region, the complex interplay of mobility and truck drivers in the epidemic, and the intervention that was evaluated as part of this thesis. In this chapter, I summarise the findings of the thesis, and critically review both previous research as well as my own found in the previous chapters, with an extensive discussion on the limitations of the studies. Lastly, I will discuss the significance of the findings for both the South African trucking industry and public health programming together with recommendations for further research.

North Star Alliance operates roadside wellness centres (RWCs) using converted shipping containers to offer basic primary healthcare to high risk mobile populations and surrounding communities. Plans to expand North Star Alliance's service delivery package to include the provision of antiretroviral therapy (ART) led to the implementation of the North South Corridor Demonstration Project (NSCDP). This evaluation documented the continuum of ART care (access, utilisation, linkage and retention) for truck drivers; and it was approved as a doctoral study presented in this thesis.

The information presented in the preceding chapters forms the first inclusive document reporting on truck driver health programming in sub-Saharan Africa, while describing selected healthcare behaviours of the South African truck driver population accessing satellite healthcare.

Systematic review and meta-analysis: Landscape of Health Interventions for Truck Drivers

Only a small number programmes were available for examination in the systematic review. Generally, evaluation designs available for the review lacked rigour and the parameters were largely donor controlled. We were able to establish that while many interventions were introduced or existed for truck drivers in Southern Africa, they were primarily focussed on HIV prevention and testing, rather than treatment or other disease interventions, with little outcome information available, due to limited attention to monitoring and more importantly evaluation requirements.

The full results of the systematic review of the literature available on healthcare programmes prioritizing truck drivers in sub-Saharan Africa (description, evaluation methods, and impact results) are presented in chapter 2. In summary, 22 healthcare programmes implemented in 30 countries across sub-Saharan Africa since 1989 provided mainly HIV prevention and diagnosis services. No ART services were offered on site and only three programmes expanded their services to cover malaria, tuberculosis, and general primary care services. Just over half were evaluated, with widely varied methodological approaches and quality.

Limitations found in most of the studies included: 1) absence of control or comparison groups, hindering attribution to the programme of any observed effect; and 2) the lack of objective biological data measurements (e.g. HIV/sexually transmitted infections (STI) testing), introducing biases in reporting of some of the outcomes evaluated.

Output indicators generally described services provided and number of clients reached, while some programmes reported varying outcome or impact indicators. Results were consistent across the programmes, with decreases in reported risk behaviours. All programmes reported substantial increases in output indicators, such

as the number of HIV counselling and testing sessions or the numbers of condoms distributed.

The majority of the programmes were funded or co-funded by agencies external to the country of implementation, with a small minority funded by trucking companies/bodies.

In summary, the systematic review centred on a relatively small number of evaluations of externally funded and inadequately monitored projects. Truck driver health assessments require both assessments of their needs, as well as rigorous assessment of the performance of current programmes. With this systematic review and meta-analysis, I demonstrated the gaps in the current knowledge base concerning programme offerings on trucker health.

Assessing accessibility, appropriateness, utilisation, linkage to and retention in care

In chapter 2, I contextualised healthcare offerings for truck drivers in sub-Saharan Africa (including initiatives which were implemented in South Africa). In subsequent chapters, I documented the socio- demographic and behavioural profile of North Star Alliance's client base, as well as patterns of healthcare usage, and challenges in delivery.

I analysed data that was collected using a combination of qualitative interviews with truck drivers and routinely collected data from the clinics to gain insight into the truck driver health profile i.e. healthcare seeking behaviour, health conditions at the time, sexual behaviour and risk taking and characterised the client population such that the clinics serving them can be improved for future service development. Truck drivers were largely young South African men (with surprisingly low HIV risk taking behavior

across sexual behavior and partnerships, and a low HIV prevalence in those testing). More than half HIV-positive truckers were on ART. Truckers found the offered services highly acceptable, mainly accessing primary healthcare services, but provided recommendations for expanding the scope of the services that should be offered by RWCs.

The introduction of ART within the clinic network was relatively effective (half of clients took up treatment) and was not as costly when compared to other programmes, although truck drivers tended to test only once significant immunosuppression had occurred. Therefore, a longer-term assessment to evaluate whether uptake improves as clinicians gain experience, as well as quality measures such as viral suppression rates, will be important.

The chapters go in-depth into recommendations, but in summary I believe making waiting areas more comfortable, expanding the scope of services to dispense more medication, including vaccinations, and make HIV and other testing more accessible were the main recommendations of users of North Star Alliance services, with better marketing of services, clinics, and locations. The presence of a doctor (even if sessional) seemed to increase the appeal of the RWCs. Finally, the use of point of care CD4 count results machines and expanding the service offering to have a greater focus on non-communicable diseases will be more applicable for truck drivers.

Challenges and limitations within the thesis

Overall the evaluation presented significant limitations.

The aim of the systematic review was to describe healthcare programmes prioritising truck drivers based on information available. Due to the nature of the documents reviewed, the assessment of the quality of services provided in these programmes

could not be performed therefore limiting the quality assessment to the methodologies employed where an evaluation was conducted. Additionally, the focus was on reports and programme descriptions available publicly. This might have limited the completeness of the mapping. The meta-analysis was performed to summarise the results of programme evaluations. The aim therefore was to quantify the impact these programmes have had on truck driver health indicators. However, due to the diversity of indicators reported, the meta-analysis results could only be used to make qualitative statements as to where the programmes had a positive impact. Finally, there was important heterogeneity in the results presented. This heterogeneity was explored in a subgroup analysis by type of indicator reported. Other covariates that could have helped to explain the heterogeneity observed included the study setting, study type or even the choice of measurement. Due to the limited number of studies in each of these sub categories, it was not possible to produce subgroup analyses for all covariates or to run a meta-regression to quantify their impact on the variance.

For the qualitative component, the major limitation was conducting interviews with only a small sample of male-only truck drivers. This limited the generalizability of the findings in terms of gender (albeit there being a small female truck driver population) and the wider population. Truck drivers had limited amounts of time as they needed to load and get on the route. The shorter than anticipated interview durations did not lend themselves to the gathering of in-depth information. Recruitment was only done near and about the North Star Alliance RWCs. Finally, it was not the same number of truck drivers interviewed per site therefore the opinions about satellite services and other RWCs may be different.

Based on our understanding of the North Star Alliance operation (including the electronic client record system), we planned to produce a report containing comprehensive data on pre-selected indicators, processes and results (including the case of the systematic review) and we allocated timelines accordingly. When the evaluation commenced, we encountered several challenges, primarily revolving

around data collection – i.e. availability of participants, availability of data, accessibility of data and overall data quality (incomplete and duplicate recording). While the programmatic staff followed the proper consenting processes they were inconsistent in how they implemented the enrolment – many times missing out on opportunities to recruit and enrol truck drivers who were eligible for follow up. All of these challenges led to missing data, extended periods of data cleaning for the quantitative components, and longer periods of time to enrol the required number of clients for follow up. Despite this the evaluation team was able to generate a useful body of evidence, and provided useful to feed back to North Star Alliance.

When considering the utilisation aspect with routinely collected information only, there was the possibility that utilisation was actually higher than that reported and misreporting was possible. The data described healthcare utilisation among attendees of North Star Alliance's RWCs and thus excluded both truck drivers who required health services but did not access them at all and those accessing services from providers other than RWCs.

Finally, the main limitation in the assessment of the ART service was the lack of impact measurement (i.e. long-term effects of the intervention at an individual and population level and/or the inclusion of a control group). Based on the scale and timeframe of this evaluation I could not report on changes in HIV incidence, long term retention in care and mortality and definite attribution of positive health outcomes in the truck driver population to North Star RWCs.

If this evaluation was to be re-designed I would consider more of a participatory evaluation approach particularly at the design stage. This would entail spending time observing the pragmatic implementation and engaging with the data sources prior to finalising the evaluation protocol. As this is a mobile population who travel cross border and work according to limiting schedules, additional design considerations to maximise the quantity and quality of data that can be obtained would entail; the use

of mobile technology data solutions – for example – use of interactive mobile applications which facilitates the truck driver completing questions during his/her down time, incentivising participants who consent to be in qualitative and/or follow/longitudinal study components and changing the individual interviews to focus group discussions conducted in truck stops scheduled according to when the truck stops are the busiest (assumption would be late afternoon going into the evening) with truck drivers who are socialising and resting.

Recommendations

There is a dearth of comprehensive information on truck driver health and health programmes in sub-Saharan Africa – particularly South Africa. Although there are healthcare programmes for truck drivers (primarily offered through RWCs) in South Africa, the measurement of the impact of RWCs on truck driver health outcomes in the South African context is limited by the knowledge available about them, i.e. on the total population size, their current health status, patterns of healthcare utilization and most importantly healthcare needs. This evaluation therefore is the first report that 1) comprehensively contextualised truck driver health programming in sub-Saharan Africa and 2) described some of the healthcare behaviour of the truck driver population accessing satellite healthcare in South Africa.

The review of truck driver-prioritised healthcare interventions across sub-Saharan Africa importantly highlighted deficiencies in programme design and evaluation. Firstly while most countries had or have healthcare programmes for truck drivers that provide services of HIV prevention and diagnosis, no ART had been offered on site. The provision of vertical services reflected both the overall regional HIV disease burden and the particular focus of donors, while the lack of ART provision reflected both the lack of ART access in early programmes, and later delay in integrating ART into programmes.

Regionally, HIV prevalence estimates among truck drivers have been reported as high. This increased vulnerability to acquiring and transmitting HIV among truck drivers has prompted UNAIDS and national governments to identify them as a key population, prioritising this group in their HIV programmes, as did South Africa's National Strategic Plan on HIV, TB and STIs 2012-2016 [1], for example. However, the majority of the programmes did not actively seek to identify people living with HIV (through HIV testing) and link them to care, but rather focussed on healthcare messaging and behaviour change communication. The World Health Organisation and UNAIDS focus on increasing testing and linkage to ART care can be translated, among truck drivers, into 90% of truck drivers living with HIV being aware of their HIV-positive status, 90% of HIV-positive truck drivers being on ART, and 90% of truck drivers on ART achieving viral suppression [2]. In the absence of data (prior to this evaluation), and with the very limited programme coverage it would seem that there is a considerable way to go from what appears to be a low baseline for all three of these indicators in truck-driver populations in sub-Saharan Africa.

Secondly, it was also observed that, in terms of evaluations, just above half of the programmes implemented in sub-Saharan Africa have been evaluated to date and, of these, mostly focussed only on input or outcome indicators. The evaluation methodologies relied on routinely-collected data and were constrained by low evaluation budgets. In planning for scale-up of programmes, Ministries of Health need to know which interventions, delivered in which way, and at what cost were more effective and efficient. Rigorous measurement of programme outcomes and impact is therefore needed to be able to support wider implementation of programmes. Yet, only six programmes reported sufficient data to analyse outcome or impact indicators. Moreover, programmes prioritising truck drivers have failed to demonstrate an attributable impact on STI incidence or HIV prevalence, due to study designs that lack control arms and heterogeneous trends in HIV risk reduction. However, the programmes overall could be considered to have had a positive effect on risk behaviours, knowledge, and attitudes, albeit the issue of attribution also remains open for these outcomes. For continuous improvement of programme delivery, monitoring and evaluation (M&E) needs to be built into all programmes at

the design stage [3]. In the absence of good M&E frameworks, these programmes lose out on valuable process information and are less able to identify and address gaps and make informed decisions regarding operations management and service delivery, including effective and efficient use of resources. Additionally, the poor M&E, coupled with the restrictive funder (usually external to the implementing country) compliance renders programmes deficient in measures to evaluate impact and the ability to scale up where programmes are proven efficient is compromised primarily because scalability and sustainability cannot be achieved where implementing countries and relevant stakeholders are not closely involved and have no ownership of programmes.

Although there is limited published information about the socio-demographic profile of truck drivers in South Africa, the mean age of the truck drivers included in the evaluation was similar to those who participated in two earlier South African studies in 1992 [4] and 1999 [5]. It is therefore assumed that the truck drivers in this study may be representative of the general South African trucking population however this result also highlights that there has not been a shift in the average age of truck drivers in South Africa over a long period of time. Although the average age of truck drivers has not shifted, the results of this evaluation highlight that there have been shifts in healthcare and sexual awareness and behaviour. Truck drivers were cognisant of the consequences of risky sexual behaviour. Converse to findings in some other African [6-8] and Indian [9, 10] studies, this study findings indicate that there was little interaction with sex workers prior to, and at the time of participation. Further HIV (and STI) prevalence was much lower in the analysed group than that reported in previous South African HIV truck driver studies [5, 11]. The findings of this evaluation further suggested that truck drivers were generally aware of the occupational health risks of long distance truck driving and had clear ideas about how health services should be tailored to their needs. All of these factors are central to how prospective healthcare programmes for truck drivers are designed.

Considerations for health programming for truck drivers

While HIV services are important to truck drivers from other countries, PHC services are most in demand among South African truck drivers. Generally, the burden of chronic illnesses in low-and middle-income countries is increasing [12]. Self-reports in this study were no different with the major healthcare needs focussing on hypertension and diabetes. Truck drivers mainly accessed services for hypertension, followed by diabetes, and spoke about how these services together with services for musculoskeletal illnesses would be appropriate for them.

Although PHC services were most accessed in South Africa and HIV prevalence are low, HIV services are and will be needed for the foreseeable future. Truck drivers mostly accessed one service per visit and these were services for non-communicable diseases therefore the lack of provider-initiated testing and counselling illustrated an important missed opportunity. The loss to follow up along the ART cascade of care further illustrated that there are potential gains to be achieved in linkage to and retention in care based on the current South African ART guidelines and because ART eligible truck drivers are choosing to start and receive ART in the RWC setting. Comprehensive care service delivery packages and training for staff to deliver them in these settings will increase the quality and impact of services available to truck drivers, which in turn will increase service demand.

Some truck drivers seemed less proactive in seeking healthcare (although available) and will need to be attracted into attending clinics. One potential opportunity to increase healthcare uptake would be the provision of occupation-relevant services including vaccinations and routine screenings required for professional driving permits at selected venues that are truck driver friendly (e.g. satellite clinics on the trucking corridors, mobile clinics at work places, express lines at fixed clinics).

The nature of trucking lends to long periods away from home and increased loneliness [13]. Although not an explicit finding, truck drivers exhibited some emotional tension when speaking about the trade-offs between spending time with their families and generating income to provide for those families. This anxiety was exacerbated by the accompanying daily physical strain their bodies underwent. Therefore additional to exploring non-communicable disease treatments related to cardiovascular and musculoskeletal diseases it is important for truck driver healthcare to incorporate aspects of mental health screening and treatment. Focussing on the mental health aspect will also assist with allaying fears and address the many vulnerabilities that truck drivers have but may not be able to deal with.

Exercise and sport are recognised as being beneficial to health and wellbeing [14]. Since truck drivers said that they sleep at truck stops while they wait for their loading instructions, wellness centres / truck stops could consider housing an exercise room with basic exercise equipment that drivers could use when they are not working.

Observations were made on the different patterns of utilisation, both in volume and type of services, depending on location. In this evaluation, although the Bloemfontein clinic was one of the last clinics to become operational, it had the highest number of people accessing the clinic because it is located on a busy national route and offers the most potential for service utilisation and uptake. This evidences the importance of location and visibility for provision and uptake of healthcare by truck drivers.

Truck drivers did report seeking help in a variety of settings. Conventional health care offerings need to be conscious of the overlap with less formal health care provision through traditional health workers and pharmacies.

Lastly, accessing healthcare is in part related to availability and this availability is related to a country's evidenced or perceived burdens of diseases. Therefore it

stands to reason that high burdened HIV countries will have a strong HIV response and healthcare utilisation will be favoured towards HIV services. However, it is crucial to note that the lack of detailed reporting hinders the development of appropriate country responses which ultimately influences patterns of utilisation, uptake and health outcomes not only in truck drivers but in all populations (priority and general). It is imperative that national ministries of health and M&E directorates work collaboratively to ensure that the monitoring, reporting and evaluation processes align with the service delivery models.

Other considerations

Road accidents remain one of the leading causes of death in the workplace [15] with truck drivers having the most exposure to work related road risk [16]. Drunk driving is a noteworthy occupational risk mentioned primarily related to it being a contravention of the law as well as the accompanying danger to other road users. From these results truck drivers were at risk of being driven into by drunk truck drivers and other motorists. Law makers and trucking industry stakeholders need to implement more interventions related to curbing drunk driving to improve road safety for all road users.

Further research

Our evaluation reported data availability, knowledge and service delivery gaps in healthcare provision for truck drivers in sub-Saharan Africa in general as well presented the limitations of this evaluation and the North Star model.

Although the main limitation in the assessment of the ART service was the lack of impact measurement the evidence portfolio that has been developed throughout the evaluation, renders the possibility of conducting secondary data analysis, whereby

extrapolation can be done from proof of deliverability at outcome and output level to impact at a population level. This will facilitate a cost-effectiveness assessment of this option for service delivery, in particular if investments in infrastructure are needed.

Additionally, truck driver healthcare seeking behaviour, beyond the North Star RWCs, for both HIV (and other communicable diseases) and other health services need to be explored and further explained. This could be assessed through a survey among a larger, representative sample of truck drivers. Information from such a survey would not only allow us to better understand healthcare seeking behaviour in truck drivers in general, but also the extent to which they make use of any RWCs/satellite service delivery points as compared to other types of healthcare service providers/facilities.

Overall, linkage to care for truck drivers who access care through RWCs or other satellite/mobile service delivery points remain poorly measured and described. It could be argued that truck drivers being screened/tested and/or diagnosed with a medical condition who start the treatment in facilities located close to their residence will have a higher chance of success for adherence and retention than a truck driver who starts their treatment at a satellite facility like the RWC. Comparative studies investigating the adherence and retention rates of both these groups need to be conducted to further inform the usefulness of settings like RWCs along transport corridors in increasing treatment (and appointment) adherence and retention rates.

Conclusion

Collaborative efforts among workplaces, governments, and trucking governing bodies are essential to the design and implementation of effective healthcare programmes. Given the mobility associated with this population's occupation, inter-governmental

collaboration is imperative to facilitate service delivery along the trucking corridors and ensure continuity of care. The interconnected nature of the transportation network provides a unique opportunity that should be taken advantage of to establish stronger linkages to healthcare programmes and provision of services for this important population. Without this, truck drivers will be left behind in the move to achieve the global targets for access and linkage to care in sub-Saharan Africa.

Overall, the integration of ART within the network of RWCs, which have good geographical coverage and client recording systems made programmatic sense, particularly for mobile populations. Therefore North Star Alliance RWCs represent a useful platform to expand access to testing, improve linkage to ART care for remote and vulnerable populations, and help monitor (uncomplicated) clients along transport corridors, thereby also contributing potentially to retention in care. As such it demonstrates the value of this platform (or similar) in helping countries achieve the 90-90-90 targets to help end the AIDS epidemic [2].

The utilisation analysis showed that tailored services do assist in alleviating healthcare access challenges faced by truck drivers. It is however important to ensure that service packages and clinics speak to the needs of truck drivers in terms of services offered and clinic location. Comprehensive care packages (incorporating services for mental health and other non-communicable diseases), which acknowledge the role of traditional healing and alternative medicine, delivered through accessible satellite facilities should form the foundation of service delivery models for truck drivers and other mobile populations. Finally, subsequent to the establishment of these accessible and appropriate healthcare delivery models there needs to be increased health promotion efforts to increase uptake among truck drivers for enhanced health outcomes. Comprehensive care and its increased use will simultaneously generate a healthier truck driver population, with subsequent economic benefits, and will address diseases that are public health priorities.

Has this initiative been successful?

The NSCDP was a successful initiative in the following aspects. First, the analysis of service access, utilization, and the needs of priority populations had an immediate effect on North Star Alliance service delivery planning and training. The iterative process of data extraction, analysis, and feedback between partners has improved data quality across participating North Star Alliance sites. Second, during the design and piloting of the North Star Alliance-specific ART service, operational and logistical lessons were learnt that would improve service expansion to other sites. In particular, trainings and standard operating procedures were developed for all staff to facilitate the scale-up of the service.

To date, a substantial body of evidence to support the contribution of North Star Alliance to better health of key populations has been produced. Through these outputs it was demonstrated that North Star Alliance has a model in place for improving access to healthcare in remote places. Although the complexity of stakeholder engagement was highlighted as a risk for future site ART accreditation, North Star Alliance RWCs represent a platform to successfully expand access to testing, provide a point of linkage to ART care, and help monitor (uncomplicated) patients along transport corridors. As such, it will be a tool available to help countries achieve the Global 90-90-90 objectives (by 2020, 90% of all people living with HIV will know their HIV status; 90% of all people with diagnosed HIV infection will receive sustained ART; 90% of all people receiving ART will have viral suppression)[17].

Lastly the findings of the evaluation have been successful in generating discussions about how healthcare programming for truck drivers in South Africa is considered. The systematic review and the findings of this process evaluation demonstrated that whilst there has been a large focus on HIV (and to a lesser extent other communicable diseases) prevention and screening interventions, globally, in accordance with the idea that truck drivers are one of the populations core to HIV transmission, healthcare programming for truck drivers need to shift in its offerings to

them. The prevalence of HIV in the truck driver population accessing healthcare at RWCs in South Africa is lower than anticipated with the healthcare needing to be centred on non-communicable diseases which are primarily occupationally related.

Do RWCs add value to truck drivers' healthcare?

Through this evaluation it is apparent that the RWC concept does contribute some value add to the healthcare of truck drivers. Whilst not specific to the North Star service delivery/ implementation model, RWCs introduce the possibility of increasing access to healthcare (by being appropriately located and having operating hours that speak to the long distance trucking industry). However, although facilitating easier access is a positive of the concept, as mentioned previously the linkage to care with other facilities for whatever required reason will need further examination.

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Appendices

Appendix A: Regulatory Documentation

Appendix A1: Ethics Approval

M140506



HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M140506

NAME: Mrs S T Lalla-Edwards
(Principal Investigator)

DEPARTMENT: Wits Reproductive Health & HIV Institute
Hillbrow Health Precinct

PROJECT TITLE: A Process Evaluation of Newly Implementing
South African Roadside Wellness for Truck
Drivers

DATE CONSIDERED: 30/05/2014

DECISION: Approved unconditionally

CONDITIONS:

SUPERVISOR:

APPROVED BY:

A handwritten signature in black ink, appearing to read 'PE Cleaton-Jones'.

Professor PE Cleaton-Jones, Chairperson, HREC (Medical)

DATE OF APPROVAL: 30/05/2014

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Secretary in Room 10004, 10th floor, Senate House University.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**

Principal Investigator Signature

M140506Date

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix A2: Data user agreement



5 May 2014

Data User's Agreement between Wits Reproductive Health and HIV Institute (RHI) and North Star Alliance – Southern Africa

P. O. Box 438
Gillits, 3603
South Africa

Tel: +27 31 7011258
Info@northstar-alliance.org
www.northstar-alliance.org

As part of the sub-award agreement – *HIV Innovations for Improved Patient Outcomes for Priority Populations WRHI-674A-12-00034-NS* – North Star Alliance – Southern Africa grants Wits Reproductive Health and HIV Institute (RHI) access to anonymised data from North Star Alliance databases/data sources including COMETS and Roadside Wellness Centre paper based and electronic registers.

RHI will be permitted to use the data for routine monitoring, evaluation and operations/implementation research purposes.

The use of these Data Sets in research communication, scholarly papers, journals and the like is encouraged, but the authors of these communications and documents are required to acknowledge/cite North Star Alliance as the source of the Data.

RHI will not be granted access to any data that may be used to identify individuals in the North Star Alliance Data Sets, nor to any personally identifiable records from any other source.

RHI is not permitted to attempt to use nor permit others to use the North Star Alliance Data Sets to establish the identity of any person included in any Data Set.

A handwritten signature in black ink, appearing to read "E. Sickle".

Dr Eugene Sickle

Deputy Executive Director

Wits Reproductive Health and HIV Institute

A handwritten signature in black ink, appearing to read "Paul Matthew".

Paul Matthew

Regional Director – Southern Africa

North Star Alliance

A handwritten date "6/5/2014" in black ink.

Date

A handwritten date "06-05-2014" in black ink.

Date

Visiting address
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Pinetown, 3610, South Africa

North Star Alliance
Registration 2007/01271208
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South Africa
Account number: 422985774
Branch/sort code: 018305
SWIFT/BIC: SBZAZAJJ

Executive Director
Luke Disney (ML)
Director Africa

Appendix A3: Declaration: Student's contribution to article(s) and agreement of co-author(s)

Declaration: Student's contribution to article(s) and agreement of co-author(s)

I, Samanta Tresha Lalla-Edward, student number 705854, declare that this Thesis is my own work and that I contributed adequately towards research findings published in the article(s) stated below which are included in my Thesis.

Signature of Student  Date 13.12.2017

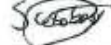
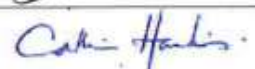
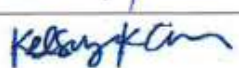
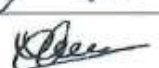
Name of Primary Supervisor: Gabriela B Gomez

Signature of Primary Supervisor  Date 12 December 2017

Agreement by co-authors: By signing this declaration, the co-authors listed below agree to the use of the article(s) by the student as part of her Thesis. In cases where the student is not the 1st author of a published article, the primary supervisor must explain (under comments) why the student is entitled to use the paper for his/her degree purposes.

Article 1: Title: Healthcare programmes for truck drivers in sub-Saharan Africa: A systematic review and meta-analysis

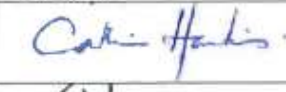
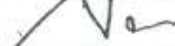
Journal name, year, volume and page numbers: PLoS ONE 11(6): e=e0156975. Doi 10.1371/journal.pone.0156975

Authors	Name	Signature	Date
1 st author	ST Lalla-Edward		13.12.2017
2 nd author	SC Fobosi		29/11/2017
3 rd author	C Hankins		December 11, 2017
4 th author	K Case		30/11/17
5 th author	WDF Venter		30 Nov 2017
6 th author	GB Gomez		12 December 2017

Comments by primary supervisor:

Article 2: Title: Uptake of health services among truck drivers in South Africa: analysis of routine data from nine roadside wellness centres

Journal name, year, volume and page numbers: BMC Health Services Research (2017) 17:649
Doi 10.1186/s12913-017-2595-3

Authors	Name	Signature	Date
1 st author	ST Lalla-Edward		13.12.2017
2 nd author	S Ncube		29/11/2017
3 rd author	P Matthew		29-11-17
4 th author	C Hankins		December 11, 2017
5 th author	WDF Venter		30 Nov 2017
6 th author	GB Gomez		12 December 2017

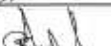
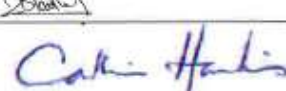
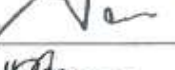
Comments by primary supervisor:

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Article 3: Title: Assessing accessibility and appropriateness of South African Roadside Wellness Centres

Journal name, year, volume and page numbers: Revision under review: Journal of Transport and Health

Authors	Name	Signature	Date
1 st author	ST Lalla-Edward		13.12.2017
2 nd author	P Matthew		29-11-17
3 rd author	C Hankins		December 11, 2017
4 th author	WDF Venter		30 Nov 2017
5 th author	GB Gomez		December 12, 2017
6 th author			

Comments by primary supervisor:

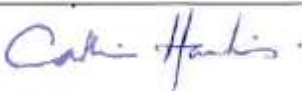
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Article 4: Title: Addition of antiretroviral therapy to a primary care health delivery model in South Africa for truck drivers and sex workers

Journal name, year, volume and page numbers: Draft Manuscript (Submission to Bulletin of The World Health Organization in January 2018)

Authors	Name	Signature	Date
1 st author	ST Lalla-Edward		13.12.2017
2 nd author	P Matthew		29-11-17

3 rd author	C Hankins		December 11, 2017
4 th author	GB Gomez		12 December 2017
5 th author	WDF Venter		30 Nov 2017
6 th author			

Comments by primary supervisor:

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Appendix A4: Turnitin Report

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Appendix A5: Supervisor support letter for Turnitin report

18 December 2017

To the examiner

Student: S T Lalla-Edward

Topic: A process evaluation of newly implementing South African Roadside Wellness Clinics for Truck Drivers

Explanation of similarity index obtained through Turnitin

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Appendix B: Published Outputs from Doctoral Research

Appendix B1: Systematic Review – PloS One

RESEARCH ARTICLE

Healthcare Programmes for Truck Drivers in Sub-Saharan Africa: A Systematic Review and Meta-Analysis

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Abstract

Background

Truck drivers have unique health needs, and by virtue of their continuous travel, experience difficulty in accessing healthcare. Currently, planning for effective care is hindered by lack of knowledge about their health needs and about the impact of on-going programmes on this population's health outcomes. We reviewed healthcare programmes implemented for sub-Saharan African truck drivers, assessed the evaluation methods, and examined impact on health outcomes.

Methods

We searched scientific and institutional databases, and online search engines to include all publications describing a healthcare programme in sub-Saharan Africa where the main clients were truck drivers. We consulted experts and organisations working with mobile populations to identify unpublished reports. Forest plots of impact and outcome indicators with unadjusted risk ratios and 95% confidence intervals were created to map the impact of these programmes. We performed a subgroup analysis by type of indicator using a random-effects model to assess between-study heterogeneity. We conducted a sensitivity analysis to examine both the summary effect estimate chosen (risk difference vs. risk ratio) and model to summarise results (fixed vs. random effects).

Results

Thirty-seven publications describing 22 healthcare programmes across 30 countries were included from 5,599 unique records. All programmes had an HIV-prevention focus with only three expanding their services to cover conditions other primary healthcare services. Twelve programmes were evaluated and most evaluations assessed changes in input,

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output, and outcome indicators. Absence of comparison groups, preventing attribution of the effect observed to the programme and lack of biologically confirmed outcomes were the main limitations. Four programmes estimated a quantitative change in HIV prevalence or reported STI incidence, with mixed results, and one provided anecdotal evidence of changes in AIDS-related mortality and social norms. Most programmes showed positive changes in risk behaviours, knowledge, and attitudes. Our conclusions were robust in sensitivity analyses.

Conclusion

Diverse healthcare programmes tailored to the needs of truck drivers implemented in 30 sub-Saharan African countries have shown potential benefits. However, information gaps about availability of services and their effects impede further planning and implementation of effective healthcare programmes for truck drivers.

Introduction

Transport workers, such as truck drivers, have specific healthcare needs. Globally, they bear a disproportionate health burden, including high rates of sexually transmitted infections (STI), cancer, cardiovascular diseases, chronic conditions (predominantly diabetes, obesity, backache, leg pains), respiratory diseases, and an array of mental health conditions (with the most common being depression, anxiety, chronic insomnia, personality disorders and post-traumatic stress disorder). Occupational factors that increase risk include irregular schedules, sedentary lifestyle due to long hours of driving/sitting, musculoskeletal and other injuries due to loading and unloading cargo, exposure to road accidents and deaths, extended periods of social isolation, unhealthy food choices on the road and poor access to healthcare [1–7].

In sub-Saharan Africa, transport corridors are essential for local economies due to lack of waterways and inadequate rail services. These corridors have been characterised as being affected by transience, unemployment, and poverty [8–10]. Because of the transcontinental nature of the transport industry, health programmes prioritising truck drivers require complementary national healthcare policies. Most countries in the region are aware of the susceptibility of transport workers to poor health outcomes and Ministries of Transport and Health have begun to develop strategic plans to address this issue [11]. However, public sector financial and human resources constraints have delayed progress [12].

The trucking industry in sub-Saharan Africa is predominantly privately-run and has attracted international donor and domestic funding for work-related programmes tackling different aspects of truck drivers' health needs. Increasingly, implementation has been proceeding across the region of healthcare programmes prioritising truck drivers and concentrating on services to increase awareness and identification of communicable (STI, HIV (including prevention of mother to child transmission (PMTCT), tuberculosis, and malaria) and chronic diseases (hypertension and diabetes), as well as general primary healthcare [13–36]. Nevertheless, further planning for efficient implementation, scale-up, and sustainability of healthcare programmes for truck drivers is hindered by knowledge gaps about this population's needs and the impact of existing healthcare services on health outcomes. In this review, our objective is to describe healthcare programmes implemented in sub-Saharan Africa prioritising truck drivers,

assess the methods used to evaluate them, and evaluate their impact on truck drivers' health outcomes.

Methods

We performed a systematic review of the published and unpublished literature following the registered protocol (CRD42014013327) on the international prospective register of systematic reviews, Prospero [37]. We adhered to the PRISMA guidelines for reporting of systematic reviews and meta-analyses; the PRISMA checklist is provided in [S1 Table](#) [38].

Search strategy and study selection

We searched scientific databases such as PubMed/Medline and ISI Web of Knowledge, institutional databases (University of Witwatersrand, Imperial College London, London School of Hygiene and Tropical Medicine, University of North Carolina), non-profit organisations and country-level reports (South African National AIDS Council, USAID-PEPFAR, NGO websites), and online search engines (google, google scholar) using a broad search strategy including both MeSH headings and free text (29 permutations of search terms related to: 1) the population (truck driver, lorry driver, long haul driver, long distance driver, driver); 2) intervention (health intervention); and 3) outcome (odds ratio, risk ratio, evaluation, cost-effectiveness, effect, impact, effectiveness)), with no date or language limitations. Experts and non-profit organisations working with truck drivers (or with migrant populations in general) were consulted separately to identify unpublished reports. We also reviewed country-level reports of funders and NGO (i.e. South African National AIDS Council, USAID-PEPFAR, NGO websites). Citations and bibliographies of records were reviewed to identify additional relevant material. All searches were run independently by two researchers (STLE and SCF). Results were downloaded, duplicates removed, and a database of all possible records organised for review by the end of January 2015.

Titles and abstracts were then screened by two independent reviewers (STLE and GG) to include all publications and reports describing a healthcare programme in sub-Saharan Africa providing services designed specifically for truck drivers. The full text records of all the material selected for further examination were assessed independently for inclusion. Two reviewers (STLE and GG) compared the final list of selected material.

Data extraction and analysis

We designed a pre-defined tool to extract data describing each programme, its evaluation method and reported results. Data included: implementation and evaluation years, implementation and evaluation locations, services provided, service providers, funders, evaluators, details of evaluation method, and reported results. One reviewer undertook the data extraction (STLE) and a second reviewer (GG) conducted a quality control check.

We present tabulated data describing current and past healthcare programmes, providing an overview of these programmes in the region by type and coverage over time. We then provide a critical assessment and a narrative review of the evaluation methods used. Methodological quality of each evaluation was assessed on the basis of study's internal validity (sites and population included, sample size, and sampling method), data reported, and whether a comparison group was included in the analysis. Due to variation across studies in the ways of reporting evaluation results, all indicators reported were mapped against a logic model for programme evaluation connecting the following elements: inputs (e.g., staff), activities (e.g., trainings, services), outputs (e.g., clients served, tests conducted), and results ranging from

intermediate outcomes (e.g., risk behaviour change) to long-term impact (e.g., reduction in STI incidence) [39].

Whenever possible, we calculated unadjusted risk ratios (RRs) and 95% confidence intervals (CIs) from data provided. We present these RRs and 95% CI for all impact and outcome indicator results in forest plots to provide an overview of the potential impact these programmes have had on truck driver health. We performed a sensitivity analysis to assess the robustness of our findings to the choice of summary statistic and calculated unadjusted risk differences and 95% CI from data provided as an alternative. Because the results presented in the forest plots presented significant heterogeneity, we assessed the sources of between-study heterogeneity through a subgroup analysis by type of indicator. Outcome indicators were assessed in two broad categories: 1) indicators of risk behaviour (condom use, number of sexual partners, alcohol and drug use) and 2) indicators measuring knowledge, attitudes, and perceptions. Impact indicators included reported measures of HIV prevalence and STI incidence. We applied a random-effects model to calculate summary RRs and 95% CI by subgroup. The robustness of our findings to this methodological decision was tested by re-running the analysis using a fixed-effects model to calculate summary statistics by subgroup. All analyses were conducted in STATA 12.

Ethics statement

The proposed study was approved by the University of the Witwatersrand Human Research Ethics Committee (M140506) as one of the objectives in a process evaluation project of North Star Alliance's services in Southern Africa.

Results

We included 37 publications from 5,599 identified unique records. The results of the searches and selection process are summarised in Fig 1.

Overview of healthcare programmes for truck drivers

The selected publications described 22 healthcare programmes across 30 countries. Table 1 presents a summary description of each programme.

Although we searched for healthcare programmes in general and aimed to include any programme providing services for any health-related issues, all programmes identified cover HIV-related interventions, with only three programmes expanding their services to cover malaria, tuberculosis, or general primary care services (i.e. ROADS II, Corridors of Hope, and North Star Alliance) [17, 18, 27, 36, 40–43]. The majority of the programmes rely strongly on peer educators and healthcare workers to offer HIV prevention services. These include behaviour change communication (BCC) ($n = 15$); condom marketing and distribution ($n = 16$); STI screening and/or syndromic treatment ($n = 11$); stigma reduction activities ($n = 10$); information, education, and communication (IEC) ($n = 9$); HIV testing and counselling (HTC) ($n = 9$) through outreach or site-based programmes, in addition to capacity building for community or local staff, PMTCT, family planning, income generation activities, and linkage to clinical and social support services in 11 programmes.

The African Medical and Research Foundation (AMREF) implemented the first healthcare programme for truck drivers in the region in 1989 in Tanzania [26]. This programme lasted four years and focused on IEC for HIV prevention. Shortly thereafter, in 1990, World Vision introduced a programme in Southern Africa (Mozambique, Swaziland, Zambia, and Zimbabwe) [30]. The World Vision programme is ongoing, making it the longest running truck driver healthcare programme in sub-Saharan Africa. Fourteen [21–26, 28, 30, 31, 33–35, 44–48] of the

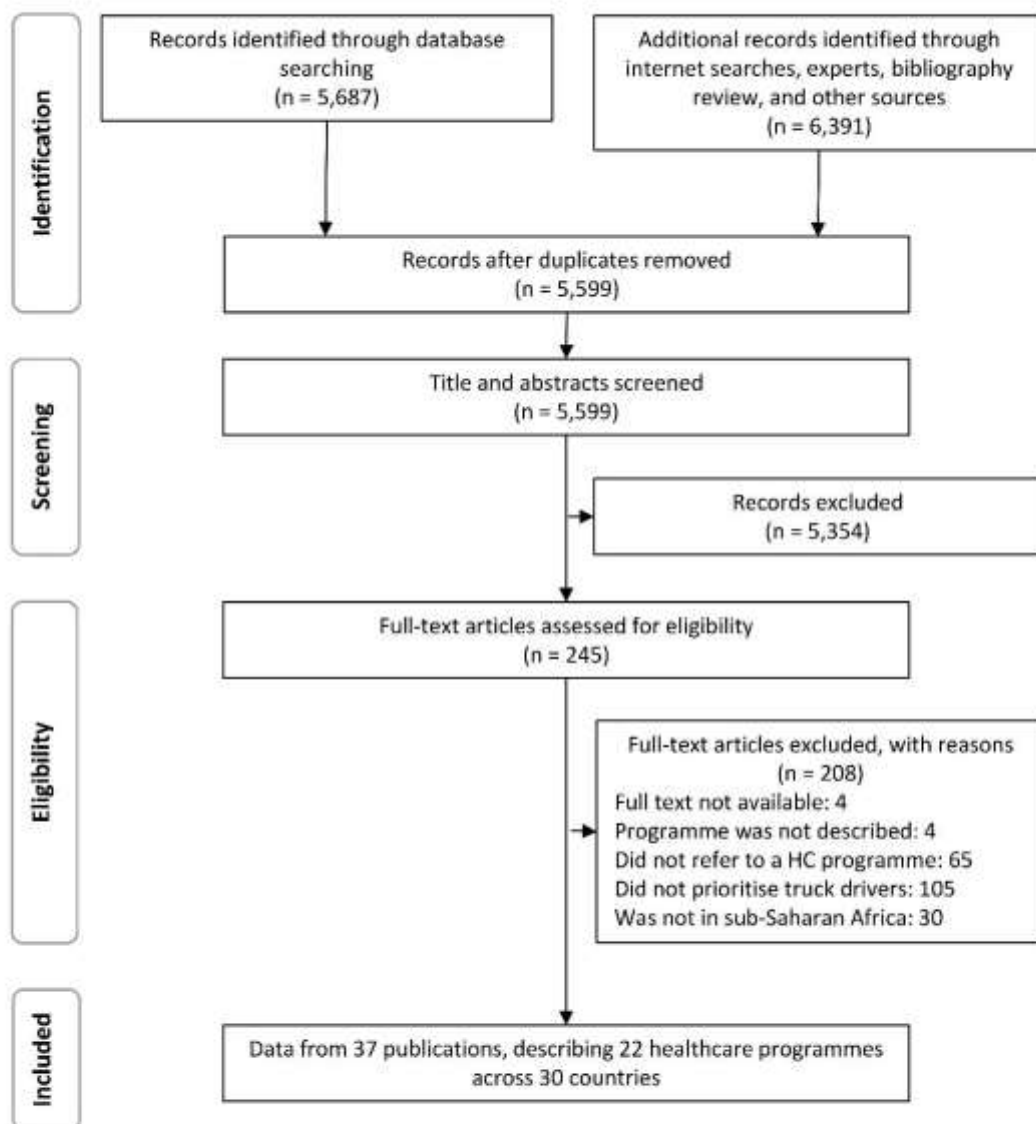


Fig 1. Flow diagram of study selection. n, number; HC, healthcare.

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Table 1. Description of healthcare programmes for truck drivers in sub-Saharan Africa.

Programme	Duration	Countries	Description	Funded by	Eval.
AMREF Truck Driver project [26, 45]	1989–1993	TZA	Implementers: PE. Clients: TD, FSW. Interventions: IEC	USAID/AMREF	Yes
World Vision [30]	1990–current	MOZ, SWZ, ZMB, ZWE	Implementers: PE, HCW. Clients: TD, FSW, OVC. Interventions: IEC, PMTCT, income generating activities	WFP, SADC	No
Prevention of sexual transmission of HIV through IEC [25]	1991–1994	MWI	Implementers: PE. Clients: TD, FSW. Intervention: IEC	European Commission	Yes
NECTOI's AIDS education program [22, 23]	1992–1997	ZWE	Implementers: PE. Clients: TD, FSW. Intervention: IEC, including drama, radio programmes	NECTOI, SIDA, USAID, FHI—AIDSCAP, NDA	Yes
Behavioural risk-reduction programme [21]	1993	KEN	Implementers: Mobile team*. Clients: TD. Intervention: IEC, HTC, condom distribution, STI testing and treatment	US NIH	Yes
The Nigeria STD control intervention [24]	1996–1997	NGA	Implementers: State University Ado-Ekiti. Clients: TD, SW, SW managers, students. Intervention: IEC, stigma reduction, condom distribution and demonstration	SIDA	No
Prévention du SIDA sur les Axes Migratoires de l'Afrique de l'Ouest (PSAMAO) [29]	1997–2000	BEN, BFA, CMR, CIV, MLJ, NER, TGO	Implementers: PE. Clients: TD, FSW, seasonal migrant workers. Intervention: IEC, mass media, condom demonstration, inter-educational cassettes	USAID	Yes
Chevron Workplace AIDS Prevention Programme [28]	1998–current	NGA	Implementers: HCW. Clients: TD. Intervention: IEC, poetry, drama, music video shows, moonlight storytelling, condom promotion, positive living, STI treatment, HTC, PMTCT	Chevron	No
Corridor Empower Project/Trucking Wellness [33]	1999–current	ZAF	Implementers: HCW, PE. Clients: TD. Intervention: STI treatment, HTC, IEC, condom distribution, PC, ART, nutrition supplements	PPP	No
Corridors of Hope [27, 40–43]	1999–current	DRC, ZMB	Implementers: HCW, PE. Clients: TD, FSW. Intervention: HTC, condom distribution, STI and malaria screening and treatment, FP, TB screening and referral, participatory learning, economic strengthening activities	USAID, JICA	Yes
	1999–current	ZMB	Expanded clients to out-of-school youth (10–24yrs)	USAID	Yes
	1999–current	ANG, BWA, LSO, MWI, MOZ, NAM, ZAF, SWZ, ZMB, ZWE	Expanded clients to traders	USAID	No
Reproductive Health services for populations at high risk of HIV in Mozambique [34]	2001	MOZ	Implementers: night-clinic HCW, PE. Clients: TD, SW. Intervention: STI testing and treatment, IEC, condom distribution, outreach, FP, HTC	FICA	Yes
Ugandan Transport Sector Workplace HIV Interventions [30, 44]	2001–2003	UGA	Implementers: HCW, PE**. Clients: TD, transport employees. IEC, condom distribution, forming CBOs at truck stops	UCTOA, ITF, AGTWW-URWU, Ugandan MoH	No
High Risk Corridors Initiative (HRCI) [30, 50]	2001–2008	DJI, ETH	Implementers: PE, HBC volunteers, HCW, spiritual counsellors. Clients: TD, transport workers, FSW, youth in and out of school, influential leaders, civil servants, OVC, PLWHA. Intervention: IEC, HTC, ART, STI screening, OI treatment/referral, livelihood enhancement	USAID	Yes

(Continued)

Table 1. (Continued)

Programme	Duration	Countries	Description	Funded by	Eval.
ADRA's HIV/AIDS Programme [31]	2002–2005	GHA	Implementers: PE. Clients: TD, mechanics, tailors, hairdressers. Intervention: drama activities, posters, radio talk shows, durbars	USAID	Yes
The T-MARC Project [30, 61]	2004–2010	TZA	Implementers (Formative phase): FHI360. Clients: counsellors and NGO workers. Implementers (Intervention phase): counsellors and NGO workers. Clients: TD, SW, tan boys and miners. Interventions: IEC (including "being faithful", male and female condoms, FP, ORS	USAID	No
WFP's HIV/AIDS training [30]	2004–current	BDI, DRC, DJI, ETH, ERI, KEN, RWA, SLE, TZA, UGA	Implementers: trainers. Clients: transport and contract workers. Intervention: IEC, stigma and discrimination reduction messages	WFP	No
HIV/AIDS project for the Abidjan-Lagos Corridor*** [32, 53]	2004–current	BEN, GHA, CIV, NGA, TGO	Implementers: HCW, PE. Clients: transport workers, migrants, SW, local populations. Intervention: IEC, social marketing of condoms, ART, HTC, STI and OI treatment, HIV grants to CSOs	World Bank (post 2007: Global Fund, USAID)	Yes
GDC Haulage workplace HIV/AIDS Programme [30]	2006	ZWE	Implementers: PE. Clients: TD. Intervention: outreach, video drama activities	GDC Haulage	No
ROADS II Project**** [13–20]	2006	DJI	Implementers: PE. Clients: TD, their assistants, SW, low income women, youth out of school, community men, bar/restaurant employees. Intervention: HTC, BCC, drama, film screening, stigma/GBV reduction, local CBO capacity building	USAID/FHI360	Yes
	2008	RWA	Expanded DJI model to OVC, PLWHA, fishermen, and homeless. Add'l interventions: ART referrals, OVC support, economic opportunities, FP, MCH, nutrition	USAID/FHI360	Yes
	2008	TZA	Expanded RWA model to MSM, IDU. Add'l interventions: condom promotion, IDU, palliative care, HS strengthening	USAID/FHI360	Yes
	2008	UGA	Expanded RWA model to uniformed services, people engaging in MCP. Add'l interventions: condom promotion	USAID/FHI360	Yes
	2009	ZMB	Expanded UGA model to discordant couples. Add'l interventions: male circumcision, screening for TB/ malaria, STI syndromic tx, FP	USAID/FHI360	Yes
	2009	BDI	Expanded TZA/ZMB models. Add'l interventions: IEC, PMTCT	USAID/FHI360	Yes
	2010	MOZ	Expanded TZA model. Add'l interventions: wellness clinics	USAID/FHI360, PPP	Yes
	2012	KEN	Expanded DJI model to married youth, older orphans. Add'l interventions: PC, referral	USAID/FHI360	Yes
North Star Alliance [36]	2007–current	BWA, DRC, KEN, MWI, MOZ, ZAF, SWZ, TZA, GMB, UGA, ZMB, ZWE	Implementers: HCW, PE. Clients: TD, their assistants, SW, local community. Interventions: HTC, BCC, condom promotion and distribution, STI testing and syndromic treatment, TB and malaria pre-screening, ART, general check-ups and referral	PPP	No

(Continued)

Table 1. (Continued)

Programme	Duration	Countries	Description	Funded by	Eval.
RTI International's HIV Prevention Interventions for Most-at-Risk Populations project [47]	2008–2013	BWA	Implementers: PE. Clients: TD, SW, SW clients, young women (15–29 yrs). Intervention: condom promotion and distribution; support of referral; HCW and PE capacity building	USAID	No
Improving HIV/AIDS knowledge and risk behaviours of drivers [48]	2011	NGA	Implementers: PE. Clients: TD. Intervention: three-day intervention (2–3 hours per day) on IEC	n/a	Yes

Notes:

* Mobile team consisting of a physician, nurses, health educator, clerical assistant, driver.

** Not listed but implicit from intervention service delivery package

*** Currently named "Organisation du Corridor Abidjan-Lagos (OCAL) project";

**** Limited accessible programme information on ROADS I. ROADS I was implemented in south Sudan, Ethiopia, Democratic Republic of Congo and ROADS II countries. Countries: ANG, Angola; BEN, Benin; BWA, Botswana; BFA, Burkina Faso; BDI, Burundi; CMR, Cameroon; DRC, Democratic Republic of Congo; CIV, Côte d'Ivoire; DJI, Djibouti; ERI, Eritrea; ETH, Ethiopia; GHA, Ghana; KEN, Kenya; LSO, Lesotho; MWI, Malawi; MLI, Mali; MOZ, Mozambique; NAM, Namibia; NER, Niger; NGA, Nigeria; RWA, Rwanda; SLE, Sierra Leone; ZAF, South Africa; SWZ, Swaziland; TZA, Tanzania; GMB, The Gambia; TGO, Togo; UGA, Uganda; ZMB, Zambia; ZWE, Zimbabwe.

Abbreviations: Eval, evaluated; PE, peer educator; HCW, healthcare worker; TD, truck driver; FSW, female sex worker; IEC, information, education and communication; USAID, United States Agency for International Development; AMREF, African Medical & Research Foundation; OVC, Orphans and Vulnerable Children; HIV, human immunodeficiency virus; PMTCT, prevention of mother to child transmission; WFP, World Food Program; SADC, Southern African Development Community; NECTOI, National Employment Council for the Transport Operating Industry; AIDS, acquired immunodeficiency syndrome; SIDA, Swedish International Development Agency; FHI (FHI360), Family Health International; NGO, non-governmental organisation; AIDSCAP, AIDS Control and Prevention Project; NDA, Norwegian Development Agency; HTC, HIV testing and counselling; STI, sexually transmitted infection; US NIH, United States National Institutes of Health; ART, antiretroviral treatment; PPP, public-private partnership; FP, family planning; TB, tuberculosis; yrs, years; JICA, Japan International Cooperation Agency; FICA, Flemish International Cooperation Agency; UCTOA, Uganda Commercial Truck Owners Association; ITF, International Transport Forum; AGTWU-URWU, Amalgamated Transport and General Workers' Union-Uganda Railway Workers Union; ADRA, Adventist Development and Relief Agency; CBOs, community-based organisations; MoH, ministry of health; PLWHA, people living with HIV/AIDS; NGO, non-governmental organisation; ORS, oral rehydration solution; OI, opportunistic infection; CSO, community service officers; GBV, gender-based violence; MCH, maternal and child health; BCC, behaviour change communication; MSM, men who have sex with other men; IDU, injection drug users; MCP, multiple and concurrent partnerships; PC, primary care; Add'l, additional; HS, health system.

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22 identified programmes were delivered within a single country setting, whilst four [13–20, 27, 30, 36, 40–43] programmes have broader geographical coverage, covering eight or more countries.

Programmes with a broad geographical coverage vary in their objectives and approach. The Corridors of Hope project, implemented in 11 countries, provides services to key populations (including truck drivers, female sex workers, and members of surrounding communities) along transport corridors and at border sites. The main focus of the project is comprehensive HIV prevention services and improved linkages and referral networks [43]. The ROADS II project, operational in eight countries, aims primarily to address HIV and other health issues in the communities around transport corridors by engaging with the communities and community leadership to ensure uptake of services provided at the programme's SafeTstops [13]. The World Food Program's HIV training programme, implemented in ten countries, is a train-the-trainer initiative for truck drivers and contract workers with a focus on BCC and activities to reduce stigma and discrimination [30]. The North Star Alliance Programme, active in 12 countries, is a primary healthcare programme delivered through stationary and mobile clinics operated by healthcare workers and peer educators [36]. Countries in Southern Africa with high

HIV prevalence, such as Zambia, Zimbabwe, Tanzania, and Mozambique, had five or more programmes active nationally. Fig 2 illustrates the distribution of programmes per country against adult HIV prevalence in the general population and along main transport corridors in 2014 [49]. We observed a variety of funders, with domestic investments constituting a minority. Among international funders, USAID represents the largest investor, with just under half of the programmes ($n = 9$) funded or co-funded by this agency.

Evaluations of healthcare programmes for truck drivers

Of the 22 programmes identified, just over half ($n = 12$) were evaluated in 17 countries [21–23, 25–27, 29–32, 34, 40–43, 45, 48–52]. A detailed description of the evaluation methods is provided in Table 2.

Evaluations were conducted between 1990 and 2012 in single countries, with the exception of two programmes that were evaluated across several countries [32, 51]. Programmes tended to be evaluated only once, excluding the Corridors of Hope project that underwent five evaluations, three external and two internal, during the period 2000 to 2009 [27, 40–43]. External evaluators performed five of the 12 evaluations [31, 32, 34, 50, 51]. Methodological approaches and their quality varied across studies from qualitative appraisals, including focus group discussions and interviews, to quantitative designs such as pre- and post-intervention surveys, statistical analysis of routinely-collected data, and trend analysis of repeated cross-sectional surveys. Sampling strategies, when used, and sample sizes also varied across evaluations. Due to the mobility of this population, most of the evaluations had to adjust their sample size and sample method to make use of simple random or purposive sampling. We assessed major limitations in the majority of evaluation studies. These included: 1) absence of control or comparison groups ($n = 10$) [21, 22, 26, 27, 29, 31, 32, 34, 40–43, 45, 48, 50, 51] hindering the attribution of any effect observed to the programme, and 2) the lack of biological data measurements (e.g. HIV/STI testing), introducing biases in reporting of some of the evaluated outcomes ($n = 4$) [22, 23, 26, 27, 32, 40–43, 53].

A detailed description of the 75 indicators reported in 12 programme evaluations can be found in Table 3, with the reported results in Table 4. Four programmes reported on inputs and activities available within programmes (i.e. number of sites established, staff trained and resources used) [32, 34, 50, 51]. Only two programmes [50, 51] provided information on costs, however they did not evaluate the programme's cost-effectiveness. All programmes reported output ($n = 42$) or outcome indicators ($n = 16$). Output indicators generally described the volume of services provided and clients reached. Six programmes provided sufficient data on outcome or impact indicators to be included in the meta-analysis. A total of five programmes, evaluated in Benin, Ethiopia, Ghana, Ivory Coast, Kenya, Nigeria, Tanzania, Togo and Zambia, reported one or more impact indicator results [21, 26, 32, 42, 50]. These impact indicators included changes in HIV prevalence for one programme and STI incidence for four [21, 26, 32, 42] programmes. However, only one study conducted biological STI testing. It provided syphilis serology for all patients and further investigation for symptomatic patients, including culture for *Neisseria gonorrhoeae* and *Haemophilus ducreyi*, and antigen detection of *Chlamydia trachomatis* [21]. The other programmes relied on self-reported symptoms. One programme reported changes in AIDS-related mortality, stigma, and social norms using qualitative data [50].

Impact of healthcare programmes

In Figs 3 and 4 we provide an overview of the potential impact on truck driver health by programme by plotting the RRs and 95% CI for all reported outcomes and impact indicators.

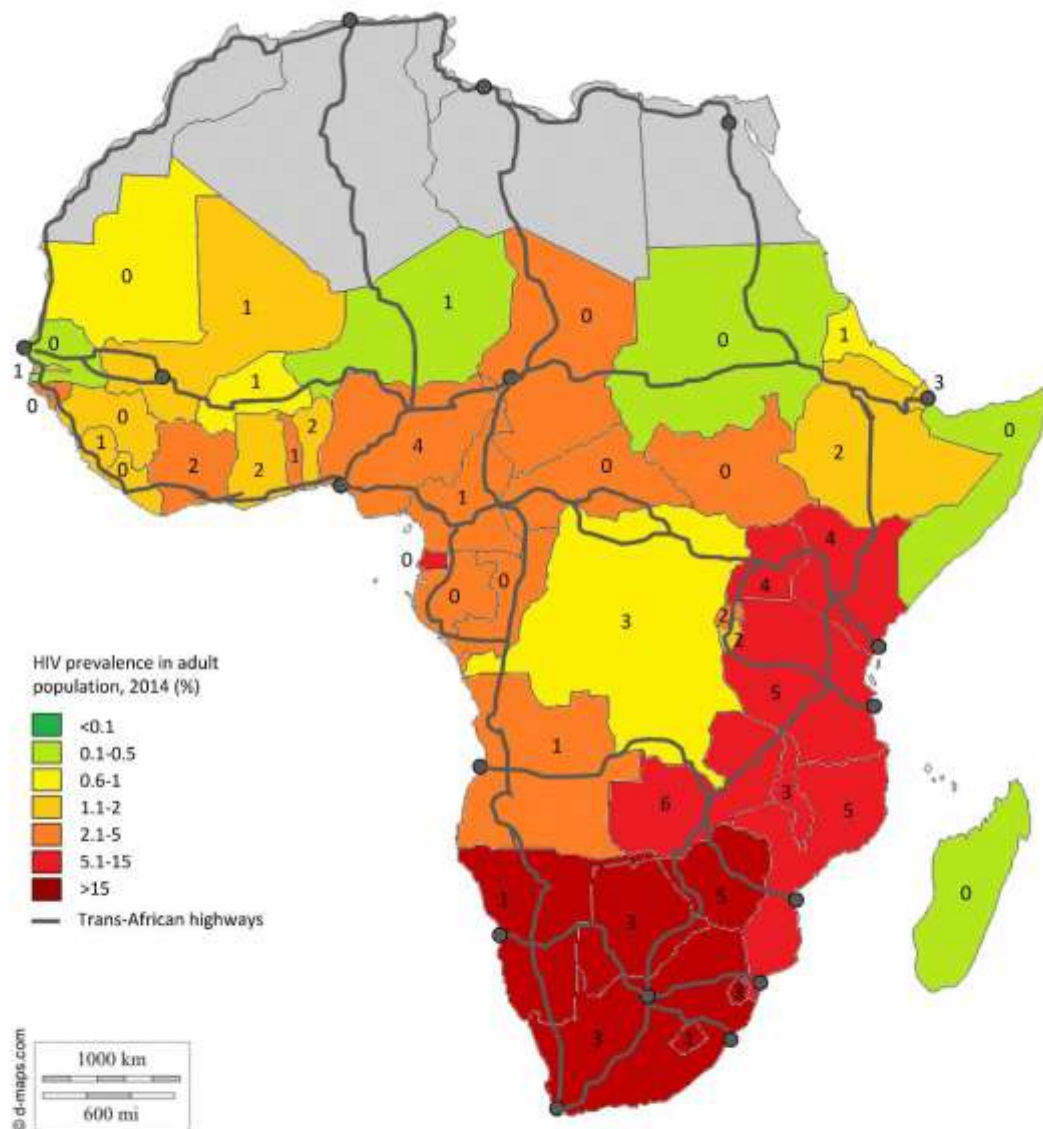


Fig 2. Country-level HIV prevalence and number of healthcare programmes for truck drivers [62]. The numbers shown per country represent the total number of healthcare programmes available in each country for truck drivers.

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Table 2. Description of methods used during programme evaluations.

Programme	Year	Country	Sites	Population	Sample size	Sampling	Method and limitations
AMREF Truck Driver project [26, 45]	1990, 1991, 1993	TZA	Seven major truck stops and three trucking companies sites	TD	1990, n = 425 1991, n = 198 1993, n = 305	Random	Internal evaluation. Cross-sectional surveys (KAP) at three time points: baseline, 18 m, 24 m. Limitations: No HIV testing, reported prevalence of STI, lack of comparison group
				FSW	1990, n = 304 1991, n = 121 1993, n = 318	Two-stage cluster	
Behavioural risk-reduction programme [21]	1993–1994	KEN	Depots of six trucking companies	Men, HIV-negative, employed at trucking companies	n = 556	All eligible	Internal evaluation. Prospective cohort study, follow up visits every 3m for 12 m. Limitations: Selective population. N = 133 screened but not enrolled; N = 215 lost to follow-up. Symptomatic STI evaluation only, lack of comparison group
NECTO's AIDS education programme [22, 23]	1995, 1997	ZWE	21 sites on major highways, border crossings, and at the edges of large cities	Transport workers**	N/A	N/A	Internal evaluation. Cross-sectional surveys (KAP) at two time points: baseline, 24 m. Limitations: lack of comparison group, lack of biological data on testing and limited questions on behaviour
				FSW	N/A	N/A	
Prevention of sexual transmission of HIV through IEC[25]	1996	MWI	All Blantyre's trucking companies	TD	n = 347, one focus group	Random	Internal evaluation. Mixed methods (focus groups, questionnaires). Three groups: 1) active PE, 2) no PE, 3) average (no PE, HCW visits). Limitations: Poor PE retention for follow up assessment, social desirability bias***
			Six districts from two regions	FSW	n = 424, six focus groups	All eligible, bar-based	
Prévention du SIDA sur les Axes Migratoire de l'Afrique de l'Ouest (PSAMAO) [29]	1997, 2000	BFA	One site	TD	1997, n = 631 2000, n = 1032	Two-stage random	Internal evaluation. Cross-sectional surveys (KAP) at two time points: baseline, 36 m. Limitations: lack of comparison group, unique site
Corridors of Hope (CoH) [27, 40–43]	2000	ZMB	Three sites	TD	n = 867	All eligible	External evaluation. Cross-sectional BSS. Limitations: lack of comparison group, lack of biological data on testing
	2003	ZMB	Two sites	TD	n = 686	All eligible	External evaluation. Cross-sectional BSS. Limitations: lack of comparison group, lack of biological data on testing
				UP	n = 349		
				M+Light TD	n = 228		

(Continued)

Table 2. (Continued)

Programme	Year	Country	Sites	Population	Sample size	Sampling	Method and limitations
	2005	ZMB	One site	TD	n = 146	All eligible	External evaluation. Cross-sectional BSS. Limitations: unique site, lack of comparison group, lack of biological data on testing.
				UP	n = 206		
				M+Light TD	n = 150		
	2006	ZMB	Three sites	TD	n = 1,006	All eligible (2 sites), cluster (1 site)	Internal evaluation. Cross-sectional BSS. Trend analysis on behaviour indicators (2000, 2003 and 2006). Limitations: lack of comparison group, lack of biological data on testing.
	2008–2009	ZMB	Four sites	TD	n = 1,863	Time-location cluster	Internal evaluation. Cross-sectional BSS. Trend analysis on behaviour indicators (2000, 2003, 2006 and 2009). Limitations: lack of comparison group, lack of biological data on testing.
The HIV/AIDS project for the Abidjan-Lagos Corridor* [32, 53]	2005	BEN, GHA, CIV, NGA, TGO	Eight border crossing points	TD	2005, n = 594 2007, n = 533	N/A	External evaluation. Three population-based surveys (KAP + behaviour + reported STI and HIV prevalence). Limitations: lack of comparison group. Lack of biological data on STI testing.
	2007			FSW	2005, n = 235 2007, n = 188	N/A	
ADRA's HIV/AIDS Programme [31]	2006	GHA	One municipality	TD	n = 5	Stratified random	External evaluation. Cross-sectional survey (questionnaire, discussion checklist). Limitations: lack of comparison group, small sample including PE.
				Mechanics	n = 68		
				Hairdressers	n = 61		
				Tailors/DM	n = 66		
High Risk Corridor Initiative (HRCI) [30, 50]	2007	ETH	Six sites	TD, HCW, PE, PLWHA, community†	n = 291	N/A	External evaluation. Mixed method (focus groups, interviews, analysis of routinely-collected data). Limitations: lack of comparison group. Small sample. Routinely collected data not disaggregated by population reached, results presented only in narrative.
Reproductive Health services for populations at high risk of HIV in Mozambique [34]	2007–2009	MOZ	One site	TD	n = 32	Purposive	External evaluation. Mixed method (focus groups, structured interviews, analysis of routinely-collected data, costs). Limitations: lack of comparison group, unique site, small sample
				FSW	n = 16		
				KI	n = 28		

(Continued)

Table 2. (Continued)

Programme	Year	Country	Sites	Population	Sample size	Sampling	Method and limitations
Improving HIV/AIDS knowledge and risk behaviours of drivers [48]	2011	NGA	One site	TD	n = 140 (each group)	Multi-staged	Internal evaluation. Cross-sectional surveys (before and after). Included a control group. Limitations: unique site
ROADS II [51]	2012	BDI, DJI, DRC, KEN, MOZ, RWA, sSUD, TZA, UGA, ZMB	Five sites (Burundi, Kenya, Mozambique, Rwanda, and Tanzania) across three types of programming	TD	n = 20	Purposive	External evaluation. Mixed methods (document review, key information interviews, analysis of routinely-collected data, costs). Limitations: lack of baseline, lack of comparison group, cannot determine impact—1) qualitative evaluation of visited sites; 2) conducted a year prior to project and
				Other	n = 433		

Notes:

* Currently named "Organisation du Corridor Abidjan-Lagos (OCAL) project";

** transport workers include truck drivers, bus drivers and their assistants;

*** difference in reported condom usage data between interviews and focus groups;

† Community includes teachers, spiritual leaders, general community members, and volunteers. Countries: BDI, Burundi; BEN, Benin; BFA, Burkina Faso; CIV, Côte d'Ivoire; DJI, Djibouti; DRC, Democratic Republic of Congo; ETH, Ethiopia; GHA, Ghana; KEN, Kenya; MWI, Malawi; MOZ, Mozambique; NGA, Nigeria; RWA, Rwanda; sSUD, south Sudan; TZA, Tanzania; TGO, Togo; UGA, Uganda; ZMB, Zambia; ZWE, Zimbabwe.

Abbreviations: n, number; KAP, Knowledge, attitudes and practices; m, months; HIV, human immunodeficiency virus; TD, truck drivers; FSW, female sex workers; STI, sexually transmitted infections; n/a, not available; ADRA, Adventist Development and Relief Agency; IEC, information, education and communication; PE, peer educator; HCW, healthcare worker; M+Light TD, minibus and light truck drivers; BSS, behavioural surveillance survey; DM, dressmakers; PLWHA, people living with HIV/AIDS; KI, key informant.

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The programmes reported mixed results on impact indicators with two [26, 32, 53] out of four programmes [21, 26, 32, 42, 53] showing an increase in reported prevalence of STIs. Results for outcome indicators were consistent across the programmes, with decreases in reported risk behaviours or misconceptions and negative attitudes towards people living with HIV. All programmes reported substantial increases in output indicators, such as the number of HTC sessions or the numbers of condoms distributed (Table 4).

Finally, in Fig 5 we present a subgroup analysis exploring the heterogeneity in the results by type of indicator reported. While the indicators reported did not explain all the heterogeneity present in the results (with all p values <0.001 for all subgroups analysed), the main impact of these programmes can be shown as a significant reduction in risk behaviours and negative attitudes and misconceptions reported against people living with HIV, with all RRs below one. Alternative S1, S2 and S3 Figs are presented in the supplementary material plotting risk differences and 95% CI for all outcomes and impact indicators and using a fixed-effects model as an alternative to the random effects model, respectively. Our results were robust to these sensitivity analyses.

Discussion

In this systematic review we describe 22 healthcare programmes prioritising truck drivers that have been implemented in 30 countries across sub-Saharan Africa. These healthcare programmes included short-term interventions of narrow scope, such as limited primary health

Table 3. Mapping of programme results using a programme evaluation framework [39].

Input/Activities		Output		Outcome		Impact	
Indicators	N	Indicators	N	Indicators	N	Indicators	N
Facilities/ services available	2	HTC services (number of sessions, number of patients reached or referred, uptake of PICT)	5	Risk behaviour (condom use, number of sexual partners, alcohol and drug use)	9	Health-related	5
n checkpoints per 100 km [32]	1	n HTC sessions and patients receiving HIV test results [34, 40–43, 51]	3	Frequency with sex workers [21, 42]	2	STI incidence [25, 26, 40–43, 45]	4
% sites reporting adequate supply of ABX for STIs [32, 53]	1	n having access to HTC [27, 32, 34, 50, 53]	4	Condoms usage [21, 23, 25–27, 29, 32, 40–43, 45, 48, 50, 53]	9	n AIDS deaths [50]	1
n sites providing HIV-related palliative care [50]	1	% men reporting access to HTC [40–43]	1	Extramarital sex [21]	1	HIV prevalence [53]	1
n sites outlets providing HTC [50, 53]	1	n households referred for HTC [50]	1	Alcohol and drug use [40–43]	1		
n sites accessing QA [50]	1	n individuals receiving PICT [50]	1	n participants using condoms [27]	1		
n targeted condom service outlets [50]	1	n individuals reached through outreach HTC [50]	1	n reported sexual partners [27]	1		
n youth clubs established [50]	1	n pregnant women with known HIV status [51]	1	Knowledge, attitudes, and perceptions	9		
% HTC sites supervised [50]	1	Condoms distribution services	4	Stigma/ discrimination towards people with HIV [40–43]	1		
Staff employed/ training provided	1	n condom distributed [23, 32, 34, 53]	3	Risk perception [23, 26, 45]	2		
n trainings conducted [50]	1	n individuals receiving condoms [50]	1	HIV/AIDS awareness and knowledge [26, 29, 31, 32, 42, 45, 48, 50, 53]	6		
n peer educators in the programme [50]	1	Referral services	1	Perceptions of, and attitudes towards HIV/AIDS [26, 45]	1		
Materials developed and resources used	3	n HBC programs linked with health centres and hospitals [50]	1	Condom knowledge [22, 48]	2		
n IEC materials developed [50]	1	% HIV-positives referred [50]	1	Knowledge of STIs [40–43]	1		

(Continued)

Table 3. (Continued)

Input/Activities		Output		Outcome		Impact	
Indicators	N	Indicators	N	Indicators	N	Indicators	N
Average running cost of the clinic [34]	1	Clients served	5	Clinical outcomes	2		
Waiting times [34]	1	n satisfied clients [34]	1	% positive among PICT [50]	1		
Budgets/ expenditure [51]	1	% target audience reached [50]	1	% positive among HTC [50]	1		
		% reporting exposure to COH [40–43]	1	n having STIs [27]	1		
		Change in clinic attendance [34]	1	% reporting STIs [40–43]	1		
		Sexual health services	2				
		n visiting for STI management [34]	1				
		n visiting for contraception [34]	1				
		n counselling visits for RH/FP as a result of USG assistance [51]	1				
		Behaviour change services	2				
		n IEC materials distributed [50]	1				
		n reached with outreach promoting abstinence and/or being faithful [50]	1				
		n reached with outreach promoting behaviour change beyond abstinence and/or being faithful [50]	1				
		n counselled on adherence [50]	1				
		n targeted population reached with individual and/or small group level HIV prevention interventions that are based on evidence and/or meet the minimum standards required [51]	1				
		n MARPS reached with individual and/or small group level HIV prevention interventions that are based on evidence and/or meet the minimum standards required [51]	1				
		n counselling visits for RH/FP as a result of USG assistance [51]	1				
		Staff trained	1				

(Continued)

Table 3. (Continued)

Input/Activities		Output		Outcome		Impact	
Indicators	N	Indicators	N	Indicators	N	Indicators	N
		n trained in programmes promoting abstinence and/or being faithful [50]	1				
		n trained in programmes promoting behaviour change beyond abstinence and/or being faithful [50]	1				
		n individuals trained to provide HIV related palliative care [50]	1				
		n individuals trained in HTC [50, 53]	1				
		n trained in FP/RH with USG funds [51]	1				
		Other services	2				
		n provided with HIV-related palliative care [50]	1				
		n screened for TB symptoms [50]	1				
		n on cotrimoxazole prophylaxis [50]	1				
		n on food and nutrition support [50]	1				
		n receiving insecticide-treated bed nets [50]	1				
		n receiving safe water treatment [50]	1				
		n circumcised [42]	1				
		Change in ART access [50]	1				
		n people who have seen or heard a specific USG supported FP/RH message [51]	1				
		n PLHIV reached with a minimum package of PwP interventions [51]	1				
		n eligible adults and children provided with a minimum of one care service [51]	1				
		n eligible clients who received at least 1 PLHIV care and support service [51]	1				

Abbreviations: n, number; prog, programme; HTC, HIV testing and counselling; PICT, provider-initiated counselling and testing; STI, sexually transmitted infections; AIDS, acquired immunodeficiency syndrome; HIV, human immunodeficiency virus; ABX, antibiotics; QA, quality assurance; %, percentage; HBC, home-based care; IEC, information, education and communication; COH, corridors of hope; TB, tuberculosis; ART, antiretroviral treatment; PwP, prevention with positives; PLHIV, people living with HIV.

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Table 4. Evaluation results of programmes reporting changes in indicator results for TD populations only.

Indicators	Programme	Country	Reported change
Output indicators			
Change in HTC uptake and receiving test results	Corridors of Hope [42]	ZMB	Increase (2000–2009) in TD who had reported ever doing HTC: from 33.5–49.4 Increase (2000–2009) in TD who received HTC results: from 90.4 to 98.9%
Change in HTC access	Reproductive Health services for populations at high risk of HIV in Mozambique [34]	MOZ	Increase (2004–2009) in average number of tests performed observed in all populations: from 54.0 to 115.0 per month
	High Risk Corridor Initiative [53]	ETH	Increase (2005–2007) in number of people who used HTC centres along the corridor: from 1,000 to 27,639
			Increase (2005–2007) in number of border crossing points with HTC centres: from 3 to 16
Change in condom distribution volume	Prevention of sexual transmission of HIV through IEC [25]	MWI	Relative increase compared to baseline (1996): 33.0% in active PE arm, 2.5% in no PE arm, 8.5% in average arm (HCW visits but no PE)
	Reproductive Health services for populations at high risk of HIV in Mozambique [34]	MOZ	Increase (2004–2009) in total volume for the period from 3,151 to 9,200
	High Risk Corridor Initiative [53]	ETH	Increase (2005–2007) in condoms distributed throughout the corridor: from 0.97 million to 8.8 million
Change in ART access	High Risk Corridor Initiative [50]	ETH	Increase (2005–2007) in number of people accessing ART post HTC or HBC referrals (no reported statistics—narrative)
Change in clinic attendance	Reproductive Health services for populations at high risk of HIV in Mozambique [34]	MOZ	Increase in all clinic visit (2004–2009) from 206 to 475 per month; in STI visits from 20 to 28
Outcome indicators			
Change in sexual partners	Corridors of Hope [42]	ZMB	<i>Increase in protective sexual behaviours</i> (2000–2009) Did not have sex with a regular SP in last 12m: from 0.4% to 43.0%; reported not having sex with FSW in last 12m: from 68.0% to 78.0%; reported not having sex with a non-regular, non-commercial SP in last 12m: from 73.0% to 99.0% <i>Decrease in risk sexual behaviours</i> (2000–2009) Reported two or more regular SP in last 12m: from 21.0% to 4.0%; reported two or more commercial SP in last 12m, from 22.0% to 15%; reported sex with two or more non-regular, commercial SP in last 12m: from 8.0% to 1.0%
	Behavioural risk-reduction programme [21]	KEN	Decrease in % reporting extramarital sex (1993–1994): from 49% to 36%
Change in condom use	Corridors of Hope [42]	ZMB	(2000–2009) Reported using a condom during last sex with a SW: from 93% to 97%; reported consistent condom use with SW: from 84% to 91%; reported condom use on last occasion with a regular SP in last 12 months: from 43.0% to 73.0%; reported consistent condom use with regular SP: from 8.0% to 60.0%
	NECTO's AIDS education programme [29]	ZWE	Increase (1995–1997) in % reporting consistent condom use: from 72.0% to 82.0%. (SW: Increase (1995–1997) in consistent condom use: from 82.2% to 88.6%)
	AMREF [26, 45]	TZA	Increase (1990–1991) in ever using condoms: from 56.1% to 73.7%. Decrease (1991–1993) in ever using condoms: from 73.7% to 71.5%.

(Continued)

Table 4. (Continued)

Indicators	Programme	Country	Reported change
	The HIV/AIDS project for the Abidjan-Lagos Corridor* [32, 53]	BEN, GHA, CIV, NGA, TGO	Increase (2005–2007) in reported condom use during last sex act with non-regular SP in last 12 months: from 59.0% to 78.8% (among SW: from 58.8% to 70.5%)
	Prevention of sexual transmission of HIV through IEC [25]	MWI	(Increase (1996) in having ever used condoms among SW: from 66.5% to 100.0%)
	Behavioural risk-reduction programme [21]	KEN	Decrease (1993–1994) in consistent condom use during extramarital sex: from 34.0% to 29.0%
	Prévention du SIDA sur les Axes Migratoire de l'Afrique de l'Ouest (PSAMAO) [29]	BFA	Increase (1997–2000) in condom use with occasional sexual partners: no reported statistics—narrative
	Improving HIV/AIDS knowledge and risk behaviours of drivers in Nigeria [48]	NGA	Increase (2011) in current condom use: from 34.3% to 51.9%
	High Risk Corridor Initiative [50]	ETH	Increase (2005–2007) in condom use: no reported statistics—narrative
Change in alcohol and drug use	Corridors of Hope [42]	ZMB	Decrease (2000–2009) in alcohol and drug use: from 11.0% to 3.0%
Change in HIV/AIDS awareness and knowledge	ADRA's HIV/AIDS Programme [31]	GHA	Increase (2006) in knowledge about difference between HIV and AIDS; transmission modes and signs and symptoms of HIV infected persons: no reported statistics—narrative
	AMREF [26, 45]	TZA	Increase (1991–1993) in % reporting accurate knowledge about intercourse as mode of transmission: from 97.4% to 99% (SW: from 93.4% to 97.2%) Decrease (1991–1993) in % reporting misconceptions about modes of transmission: shaking hands, from 40.7% to 17.4% (SW: from 42.4% to 19.2%); mosquitos, from 55.5% to 43.3% (SW: 61.8% to 45.3%)
	Corridors of Hope [42]	ZMB	Increase (2000–2009) in % TD who know that abstinence can prevent HIV: Livingstone, from 93.0% to 99.3%; Chirundu, from 88.2% to 97.9%; Kapiri Mushi, from 92.1% to 98.6%. Decrease (2000–2009) in % TD who think that HIV can be transmitted by mosquitos: Livingstone, from 15.8% to 7.3%; Chirundu, from 17.6% to 7.8%; Kapiri Mushi, from 26.1% to 9.1%. Change (2000–2009) in % TD who think that HIV can be transmitted through sharing a meal: Livingstone, from 5.5% to 4.0%; Chirundu, from 9.0% to 10.3%; Kapiri Mushi, from 23.1% to 12.9%
	High Risk Corridor Initiative [50]	ETH	Increase (2005–2007) in TD being able to identify at least two ways to prevent HIV/AIDS: from 68.0% to 82.7%. (Increase (2005–2007) in SW being able to identify at least two ways to prevent HIV/AIDS: from 59.5% to 87.9%)
	Improving HIV/AIDS knowledge and risk behaviours of drivers in Nigeria [48]	NGA	Increase (2011) in knowledge about HIV/AIDS: from 89.3% to 100.0%
	Prévention du SIDA sur les Axes Migratoire de l'Afrique de l'Ouest (PSAMAO) [29]	BFA	Increase (1997–2000) in HIV/AIDS knowledge: no reported statistics—narrative
	The HIV/AIDS project for the Abidjan-Lagos Corridor* [32, 50, 53]	BEN, GHA, CIV, NGA, TGO	Increase (2005–2007) in TD identifying at least two ways to prevent HIV: from 68.0% to 90.0% (SW: from 59.5% to 90%)

(Continued)

Table 4. (Continued)

Indicators	Programme	Country	Reported change
Change in risk perception	AMREF [26, 45]	TZA	Increase (1991–1993) in perceiving self at risk: from 54.5% to 62.1% Increase (1991–1993) % reporting positive attitudes: willing to live in the same house, from 66.7% to 90.8% (SW: from 43.3% to 79.9%); willing to eat together, from 57.6% to 69.5% (SW: 33.5% to 52.5%); willing to share toilet, from 53.1% to 56.1% (SW: from 81.9% to 97.2%)
	NECTOI's AIDS education programme [22]	ZWE	Decrease (1995–1997) in % perceiving self at risk: from 52.7% to 30.2% (SW: from 44.6% to 13.2%)
Change condom knowledge	Improving HIV/AIDS knowledge and risk behaviours of drivers in Nigeria [48]	NGA	Increase (2011) in awareness of condom use as a preventive practice: from 81.4% to 100.0%
	NECTOI's AIDS education programme [22]	ZWE	Increase (1995–1997) in HIV awareness and condom use: no reported statistics—narrative
Change in knowledge of STIs	Corridors of Hope [40, 42]	ZMB	Increase (2006–2009) in % knowing two or more STI symptoms: in men, from 73.0% to 81.2% and in women, 44.0% to 59.6%
Impact indicators			
Change in STI incidence	Corridors of Hope [42]	ZMB	Decrease in proportion reporting genital discharge in the last 12m: from 6.4 (2000) to 5.7 (2003) to 4.9 (2006) to 3.4% (2009); genital ulcers/sores in the last 12m: from 5.3 (2000) to 8 (2003) to 2.8 (2006) to 2.2% (2009)
	AMREF [26]	TZA	Increase in proportion of TD reporting ever having had an STI: from 40.2% to 56.7% (SW: from 15.5% to 36.8%)
	The HIV/AIDS project for the Abidjan-Lagos Corridor* [32, 53]	BEN, GHA, CIV, NGA, TGO	Increase in reported STI incidence: from 6.7 to 11.5/100 person-yrs. (Decrease in STI prevalence among SW: from 8.9% to 3.8%)
	Behavioural risk-reduction programme [21]	KEN	Decrease in STI incidence: from 34.0 to 10/100 person-yrs
Change in HIV prevalence	The HIV/AIDS project for the Abidjan-Lagos Corridor* [32, 53]	BEN, GHA, CIV, NGA, TGO	Decrease in HIV prevalence: from 5.0% (Feb 2005)/2.7% (Dec 2005) to 1.7% (2007). (Uncertain trend in HIV prevalence among FSW: from 30.1% (Feb 2005)/12.7% (Dec 2005) to 20.7% (2007)).
Change in AIDS deaths	High Risk Corridor Initiative [50]	ETH	Decrease in AIDS deaths among all MARP from routinely-collected data. Only narrative description

* Currently: Organisation du Corridor Abidjan-Lagos (OCAL) project. Countries: BEN, Benin; BFA, Burkina Faso; CIV, Côte d'Ivoire; ETH, Ethiopia; GHA, Ghana; KEN, Kenya; MWI, Malawi; MOZ, Mozambique; NGA, Nigeria; TZA, Tanzania; TGO, Togo; ZMB, Zambia; ZWE, Zimbabwe. Abbreviations: HTC, HIV testing and counselling; HIV, human immunodeficiency virus; IEC, information education communication; PE, peer educator; HCW, healthcare worker; ART, antiretroviral treatment; STI, sexually transmitted infection; SP, sexual partner; m, months; (F)SW, (female) sex worker; NECTOI, National Employment Council for the Transport Operating Industry; AMREF, African Medical & Research Foundation; AIDS, acquired immunodeficiency syndrome; STD, sexually transmitted disease; ADRA, Adventist Development and Relief Agency; yrs, years; MARP, most-at-risk-populations; FGC, female genital cutting.

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care and diagnosis of communicable diseases. A minority of healthcare programmes expanded the scope to include gender based violence reduction and palliative care. While most countries had or have healthcare programmes for truck drivers that provide services of HIV prevention and diagnosis, no antiretroviral treatment (ART) services have been offered on site. This provision of vertical services reflects the overall regional HIV disease burden and the particular focus of donors, while the lack of ART provision reflects the logistical challenges of

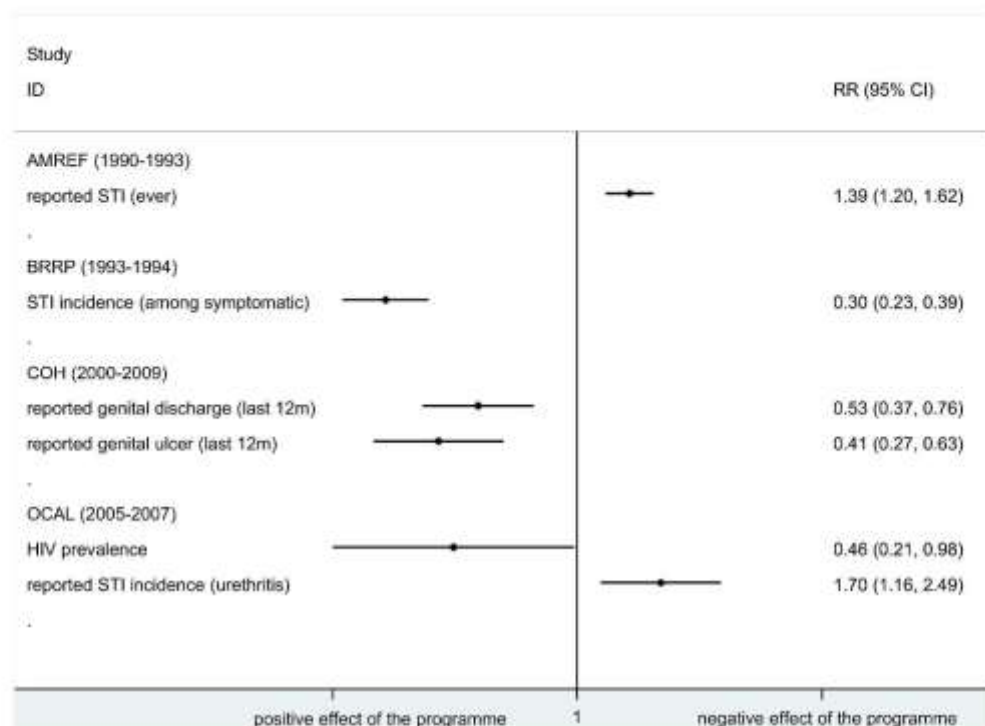


Fig 3. Relative risk in impact indicators by programme. ID, Identification; RR, relative risk; 95% CI, 95% confidence interval; HIV, human immunodeficiency virus; STI, sexually transmitted infection; OCAL, The HIV/AIDS project for the Abidjan-Lagos Corridor, currently Organisation du Corridor Abidjan-Lagos project; AMREF, African Medical & Research Foundation; BRRP, Behavioural risk-reduction programme; COH, Corridors of Hope.

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treatment provision across borders. Regionally, HIV prevalence estimates among truck drivers have been reported as high. Studies from Nigeria show a 10% HIV prevalence among truck drivers [54] while South African surveys have reported HIV prevalence estimates in truck drivers who were clients of female sex workers as high as 56% [55] and in truck drivers in general as 26% [56], in 2001 and 2003/4 respectively [57]. This increased vulnerability to acquiring and transmitting HIV among truck drivers has prompted UNAIDS and national governments to identify them as a key population, prioritising this group in their HIV programmes, as does South Africa's National Strategic Plan on HIV, TB and STIs 2012–2016 [11], for example. However, the majority of the programmes in this review did not actively seek to identify people living with HIV (through HTC) and link them to care, but rather focussed on healthcare messaging and BCC. Although this is in keeping with findings of the 2012 review of sex worker programmes in Africa [58], healthcare programmes for truck drivers have seen a progression in scope from 2001 onwards reflected in the increasing (though still insufficient) number of services delivered from satellite and mobile clinics. The World Health Organisation and UNAIDS focus on increasing testing and linkage to ART care can be translated, among truck

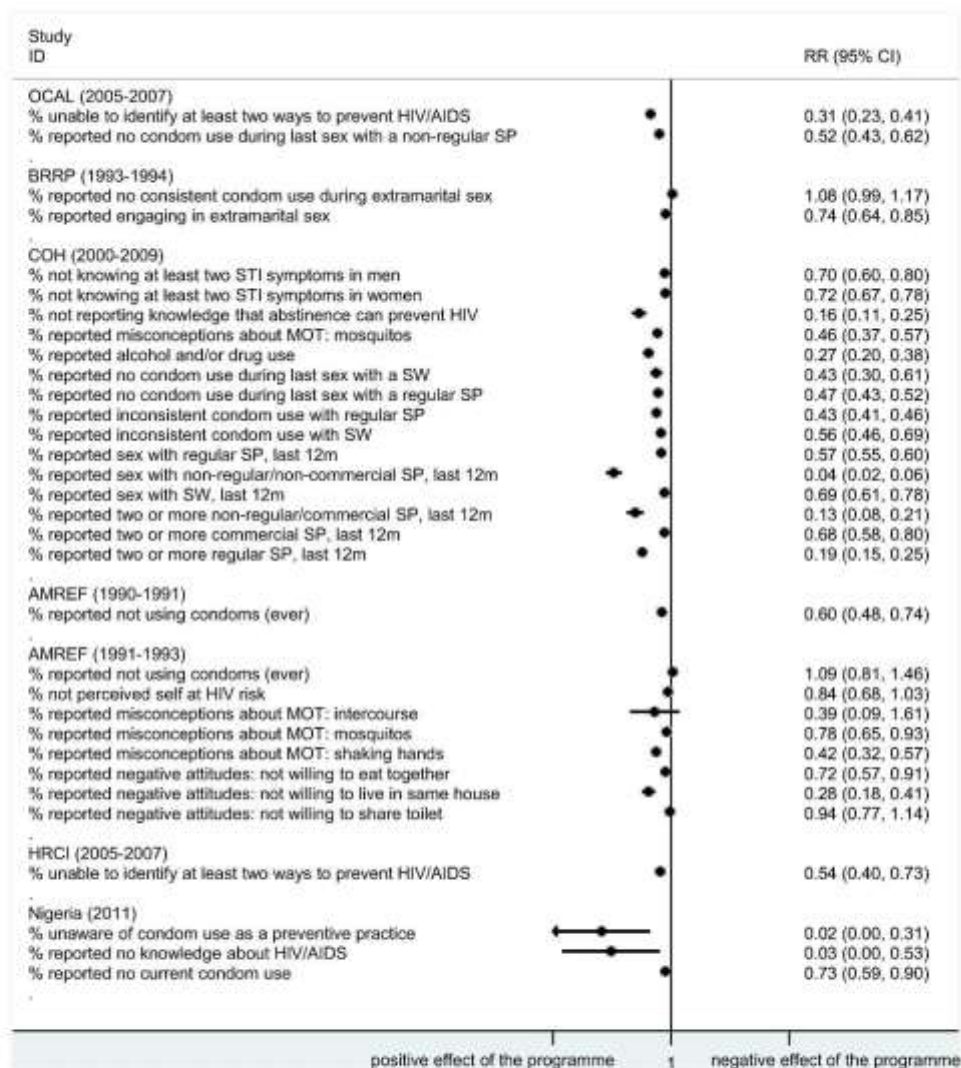


Fig 4. Relative risk in outcome indicators by programme. ID, identification; RR, relative risk; 95% CI, 95% confidence interval; HIV, human immunodeficiency virus; STI, sexually transmitted infection; OCAL, The HIV/AIDS project for the Abidjan-Lagos Corridor, currently Organisation du Corridor Abidjan-Lagos project; AMREF, African Medical & Research Foundation; BRRP, Behavioural risk-reduction programme; COH, Corridors of Hope; HRCI, High Risk Corridor Initiative; Nigeria, Improving HIV/AIDS knowledge and risk behaviours of drivers; m, months; SP, sexual partner; MOT, modes of transmission; SW, sex worker; AIDS, acquired immunodeficiency syndrome.

doi:10.1371/journal.pone.0156975.g004

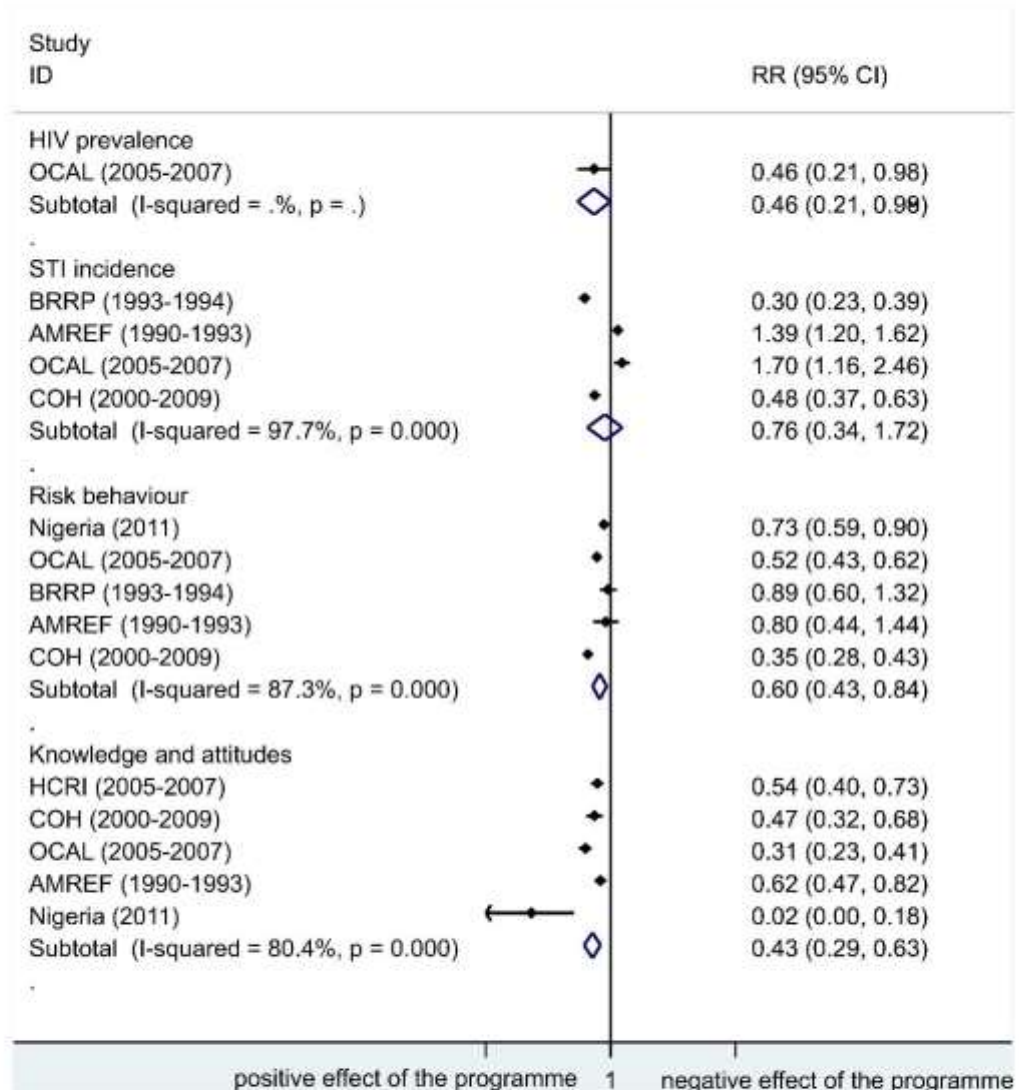


Fig 5. Subgroup analysis, summary relative risk estimates by type of indicator. ID, identification; RR, relative risk; 95% CI, 95% confidence interval; HIV, human immunodeficiency virus; OCAL, The HIV/AIDS project for the Abidjan-Lagos Corridor, currently Organisation du Corridor Abidjan-Lagos project; STI, sexually transmitted infection; BRRP, Behavioural risk-reduction programme; AMREF, African Medical & Research Foundation; COH, Corridors of Hope; Nigeria, Improving HIV/AIDS knowledge and risk behaviours of drivers; HCRI, High Risk Corridor Initiative.

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drivers, into 90% of truck drivers living with HIV being aware of their HIV-positive status, 90% of HIV-positive truck drivers being on ART, and 90% of truck drivers on ART achieving viral suppression [59]. In the absence of data, and with the very limited coverage of these programs, it seems that there is a considerable way to go from what appears to be a low baseline for all three of these indicators in truck-driver populations in sub-Saharan Africa.

We also observe that, in terms of evaluations, just above half of these programmes have been evaluated to date and, of these, most looked only at input or outcome indicators. The evaluation methodologies relied on routinely-collected data and were constrained by low evaluation budgets. In planning for scale-up of programmes, Ministries of Health need to know which interventions, delivered in which way, and at what cost were more effective and efficient. Rigorous measurement of programme outcomes and impact is therefore needed to be able to support wider implementation of programmes. Yet, only six programmes reported sufficient data to analyse outcome or impact indicators. Moreover, programmes prioritising truck drivers have failed to demonstrate an attributable impact on STI incidence or HIV prevalence, due to study designs that lack control arms and heterogeneous trends in HIV risk reduction. However, the programmes overall could be considered to have had a positive effect on risk behaviours, knowledge, and attitudes, albeit the issue of attribution also remains open for these outcomes. For continuous improvement of programme delivery, monitoring and evaluation (M&E) needs to be built into all programmes at the design stage [60]. In the absence of good M&E frameworks, these programmes lose out on valuable process information and are less able to identify and address gaps and make informed decisions regarding operations management and service delivery, including effective and efficient use of resources.

The majority of the programmes were funded by agencies external to the country of implementation and for limited periods of time. Only three programs were funded by trucking companies/bodies. This funding situation influences the evaluation aim and objectives. Firstly, the need to report specific indicators for programme monitoring and reporting is donor-dictated, influencing the evaluation design and generally streamlining data collection to be compliant with donor priorities. Since main indicators are input, output, and outcome monitoring data, programmes remain deficient in measures to evaluate impact unless a separate study is envisaged. Secondly, programmes that are proven efficient and have an impact should be scaled-up. Yet scalability and sustainability are real concerns where implementing countries and relevant stakeholders are not closely involved and have no ownership of programmes.

Our study presents several limitations. First, we aimed to describe healthcare programmes prioritising truck drivers based on information available. Due to the nature of the documents reviewed, we were unable to assess the quality of services provided in these programmes and we limited our quality assessment to the methodologies employed where an evaluation was conducted. Additionally, we focused on reports and programme descriptions available publicly. This might have limited the completeness of our mapping. However, we contacted stakeholders and efforts were made to include all grey literature. We performed a meta-analysis to summarise the results of programme evaluations. We aimed therefore to quantify the impact these programmes have had on truck driver health indicators. However, due to the diversity of indicators reported, we were able to use the meta-analysis results to make qualitative statements as to where the programmes had a positive impact. Finally, we found an important heterogeneity in the results presented. We explored this heterogeneity in a subgroup analysis by type of indicator reported. Other covariates that could help explain the heterogeneity observed include the study setting, study type or even the choice of measurement. Due to the limited number of studies in each of these sub categories, we were unable to produce subgroup analyses for all covariates or to run a meta-regression to quantify their impact on the variance.

Conclusion

Diverse healthcare programmes prioritising truck drivers have been implemented in 30 sub-Saharan African countries since 1989. Just over half of these healthcare programmes have been evaluated. Among those evaluated, potential benefits to truck drivers have been shown. However, information gaps about availability of services and their effects impede further planning and implementation of effective healthcare programmes for truck drivers.

Collaborative efforts among workplaces, governments, and trucking governing bodies are essential to the design of effective programmes. Given the mobility associated with this population's occupation, inter-governmental collaboration is imperative to facilitate service delivery along the trucking corridors and ensure continuity of care. The interconnected nature of the transportation network provides a unique opportunity that should be taken advantage of to establish stronger linkages to healthcare programmes and provision of services for this important population. Without this, truck drivers will be left behind in the move to achieve the global targets for access and linkage to care in sub-Saharan Africa.

Supporting Information

S1 Fig. Risk differences in impact indicators by programme.
(TIF)

S2 Fig. Risk differences in outcome indicators by programme.
(TIF)

S3 Fig. Subgroup analysis, summary relative risk estimates by type of indicator (fixed effects model).
(TIF)

S1 Table. PRISMA Checklist.
(PDF)

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Author Contributions

Conceived and designed the experiments: STLE WDFV GG. Performed the experiments: STLE SCF KC GG. Analyzed the data: STLE GG. Contributed reagents/materials/analysis tools: STLE SCF KC GG. Wrote the paper: STLE SCF KC CH WDFV GG.

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Appendix B2: Healthcare for truck drivers: Assessing accessibility and appropriateness of South African Roadside Wellness Clinics



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Healthcare for truck drivers: Assessing accessibility and appropriateness of South African Roadside Wellness Centres

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ABSTRACT

Background: Truck drivers occupy a pivotal role in the economies of southern Africa, due to limited rail, water and other forms of transport of goods. The occupational nature of truck driving limits access to healthcare. North Star Alliance (North Star) offers a tailored primary healthcare service for truck drivers along the sub-Saharan trucking corridor.

Objectives: The overall objective of this study was to explore truck drivers' views regarding access to, and appropriateness of, selected South African North Star Roadside Wellness Centres (RWCs) coupled with understanding their health-seeking behaviour.

Methods: We conducted semi-structured interviews with two groups of purposively-sampled truck drivers: 24 who accessed North Star RWCs and 22 who knew about the centres but did not use them. The interviews explored access, health-seeking behaviour, and healthcare experiences. Additional information on risk perceptions emerged. Qualitative data were organised into four themes: client satisfaction, health-seeking behaviour, risk perception and behaviour, and service delivery strengthening.

Results: The majority of those interviewed were older (36–65 years old), South African, with secondary education, employed full-time, in stable relationships, and having children.

Overall users were satisfied with RWC locations, operating hours, infrastructure, and healthcare worker attitudes. Half of the non-users did not access routine healthcare anywhere. Non-users primarily did not access the RWCs because they did not know the operating times and preferred local facilities. Both groups used traditional healers and pharmacies. RWC users accessed traditional healers and pharmacies for services not available to them at the RWCs. Both groups reported not using private general practitioners or specialists. Both groups provided recommendations for strengthening the service delivery model including an increased focus on non-communicable diseases and occupationally-required health services including vaccinations.

Conclusion: Comprehensive care packages delivered through accessible satellite facilities should form the foundation of service delivery models for truck drivers and other mobile populations.

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1. Introduction

Long working hours present limited opportunities for truck drivers to access healthcare facilities with limited opening hours, and make them vulnerable to unfavourable clinical outcomes (Lalla-Edward and Gomez, 2015; Lalla-Edward et al., 2016; DeVries et al., 2013; Olson et al., 2016; Robb and Mansfield, 2007; Apostolopoulos et al., 2013; Greenfield et al., 2016). Similar to its role in the United States economy (Harrison, 2009), the South African trucking industry has a major impact on the health and well-being of the overall economy, as it facilitates the movement of products nationally and internationally and contributes to social development (Fourie and Schoeman, 2006). With an approximate total of over 70 000 truck drivers in South Africa (Lalla-Edward and Gomez, 2015), efforts need to be directed towards prioritised healthcare interventions to maintain a healthy truck driver work force.

In response to this priority, several funders and implementers have developed interventions to address truck driver health needs. North Star Alliance (North Star) is a non-governmental organisation that engages in several public-private partnerships to alleviate healthcare challenges faced by truck drivers, sex workers and local communities around sub-Saharan transport corridors by providing services in Roadside Wellness Centres (RWCs) (North Star Alliance, 2014). RWCs are located in hotspots (identified through mapping exercises). These hotspots are typically areas where there would be a congregation of truck drivers daily; including areas on the trucking route, near depots (or hubs for freight and logistics companies) and within truck stops. They make use of converted shipping containers painted in blue (thus known in the communities they serve as the *blue box*) to provide an array of outreach and primary healthcare services, including sexual reproductive health services. Although largely focussing on screening clients for diseases and referring them to the nearest appropriate fixed healthcare facilities (where prior referral relationships have been established), North Star has partnered with organisations like Wits Reproductive Health and HIV Institute (Wits RHI) to expand and strengthen HIV and ART clinical services. North Star uses a networked patient record system (COMETS) which facilitates paperless retrieval of client records at any RWC along the corridor. Data for nine South African RWCs showed that at the end of September 2015 34 237 separate visits were recorded. Of this 16 784 were visits made by 13 328 different truck drivers (Fobosi et al., 2017).

Little is known about the health, health seeking and risk behaviour profiles of truck drivers in South Africa. A survey conducted in 1999 reported HIV prevalences of 69% in the 55–59 year age group (Ramjee and Gouws, 2002) while others reported 26% in 2003/4 (Delany-Moretlwe et al., 2014) and a sexually transmitted infection (STI) prevalence of 66% (Ramjee and Gouws, 2002). The lack of truck driver health evidence is compounded by the paucity of available, reported information on the acceptability and appropriateness of RWCs for the truck driver population. Using the North Star model of service delivery as a case study we gathered in-depth qualitative information on truck drivers' views about access to, and appropriateness of, the RWC concept for selected President's Emergency Plan for AIDS Relief (PEPFAR) supported South African RWCs. To be able to comprehensively understand truck drivers' views we chose to collect information from both users and non-users of the RWCs. The aim of this paper is to therefore present all these truck driver perspectives of, opinions about, and recommendations for, RWCs in South Africa. To contextualise recommendations the data on risk perceptions that emerged during the interviews are also reported on in this paper.

2. Methods

2.1. Setting

Six South African sites in six provinces (Cato Ridge (KwaZulu Natal), Bloemhof (North West), Ngodwana (Mpumalanga), Musina (Limpopo), City Deep (Gauteng) and Upington (Northern Cape)) were included in this evaluation. These sites were chosen because they were operational at the start of the evaluation.

Clinics became operational at different time points. Cato Ridge, City Deep and Ngodwana were all opened in September 2013. For logistic reasons City Deep was closed in September 2014 (and relocated to a more accessible location in Pomona). Musina, Upington and Bloemhof were opened in January 2014, February 2014 and March 2014 respectively (Fobosi et al., 2017).

All clinics operate on weekdays and are typically open for a minimum of six hours. Operating hours for some clinics have changed in the period after this research. However at the time of the data collection, Cato Ridge and Bloemhof were operating 14:00–22:00; Upington 18:00–22:00; Ngodwana 11:00–19:00 and Musina 07:00–15:00. The City Deep site primarily functioned as a mobile clinic. Healthcare workers are proficient in the vernacular mostly spoken in the location of the RWC that they co-ordinated and offered services from, as well as other South African official languages including English. This facilitates communication and service provision to both local and international clients.

All RWCs are classified as urban and located on busy routes in the South African trucking corridor. Cato Ridge and Upington are located slightly parallel to the major N3 and N10 highways respectively. Bloemhof and Ngodwana are situated on the very busy N12 and N4 highways respectively. Musina RWC is located close to the South Africa/ Zimbabwe border and is recognised as the busiest border crossing in Southern Africa. City Deep RWC was located in a retail centre which was a hub for the transport and freight industry using the N17 highway.

2.2. Pilot

Pilot interviews were conducted with five truck drivers at the City Deep RWC to ensure that the contents of the semi-structured interview guide were being interpreted (and administered) correctly by both the interviewer and truck drivers. During this pilot process we found that questions and discussions could not always be as long and in-depth as preferred because, in the case of the City Deep RWC which was located in a retail park central to many fast moving consumer goods (FMCG) companies, some truck drivers

Table 1
Outline of topics included in the semi-structured interview.

Who	Topic	Probes
Users	Access	Location Operating hours Services offered
Users and Non-users	Health seeking behaviour	General Health Healthcare access points Intrinsic health seeking decision making Occupational health Services accessed
User and Non-users	Overall experience	RWC awareness Overall experience Opinion on non-usage Recommendations

needed to load (mainly meat and fresh produce) and leave. Truck drivers did not have any objections to the topics covered neither did they have suggestions for inclusions to or exclusions from the guide. Instead of removing items from the guide, interviewers got experience on how to explain and conduct the discussion a bit faster if the situation required.

2.3. Data collection

Data collection took place over four months from December 2014 to March 2015. We used purposive sampling to recruit participants. Truck drivers were recruited from the truck stops and the immediate area surrounding the RWCs. These truck drivers were either classified as users (truck drivers who access(ed) any of the South African North Star RWCs) and non-users (truck drivers who knew about the South African North Star RWCs but chose not to use them). A total of 96 truck drivers were approached. 1 in every 1.5 truck driver users ($n = 35$) and 1 in every 2 non-users ($n = 44$) approached agreed to participate. The remaining 17 were not familiar with the RWCs. One major recruitment barrier was that truck drivers lacked time during the day to participate in the interviews.

Data were collected by a male interviewer using the final semi-structured interview guide and covered three main areas as outlined in Table 1. Since the primary function of the interviews was to gather information on access to care and appropriateness of the RWC in meeting the healthcare needs of truck drivers we probed on healthcare experiences, assessing access on the three components of geographic location, operating hours and package of services offered, and appropriateness. To enhance our understanding of service delivery gaps for all truck drivers and the user truck drivers' perspectives on access and appropriateness, we collected information on their health seeking behaviour.

Given the nature of truck driving, non-conventional methods of data collection had to be employed to overcome recruitment challenges. These included conducting interviews in the truck while truck drivers were waiting in the depot line (City Deep) to load or while having layovers late in the evening at truck stops. Additionally truck drivers were asked to complete a demographic questionnaire after the interviews. There was no reimbursement for participating in the interviews.

2.4. Data analysis

Interviews were audio-recorded and transcribed verbatim. Interviews that were conducted in isiZulu were translated into English and then back translated by a second transcriber. Timeous quality checking of all transcripts permitted real time changes to be made to the interview and transcribing/translation processes. All transcripts were imported and analysed using NVIVO 10. Our analytical process was guided by the framework method of analysis (Gale et al., 2013), in which we applied inductive reasoning using the grounded theory approach. After independently following the three steps of coding (1. open coding – data reduced to units of analysis/codes; 2. axial coding – focussing on themes as opposed to the actual codes and 3. selective coding – data is paired with the relevant theme for comparison and contrast) (Neuman, 2006) two members of the study team compared and finalised the coding framework. For reliability, data were coded independently by two researchers and reviewed by a third. Transcripts were reviewed, coded and organised into themes outlined in Table 2. Fig. 1 shows the interrelatedness of the themes. A selection of supporting statements are included in the results.

2.5. Ethical considerations

Ethical clearance was provided by the University of the Witwatersrand Human Research Ethics Committee (M140506) on 30 May 2014. Participants signed individual consent forms to participate in the interviews and completed demographic questionnaires. All consent forms, demographic questionnaires, voice files, field notes and transcripts are stored by Wits RHI in accordance with good clinical practice (GCP) standards.

Table 2
Description of themes, sub-themes and categories.

Themes	Sub-themes/Concepts	Categories
Client satisfaction	Access Healthcare worker attitudes	Location, operating times, service delivery Friendly, judgemental, helpful, nice, good, bad
Health seeking behaviour	Services accessed Non-RWC facilities accessed Alternate care	HIV, blood, sugar/diabetes, urine, flu, headache Hospitals, clinics, pharmacy Traditional healers, church, God, Christian, modern medicine
Risk perception and behaviour	Health Occupational Sexual	Physiological, kidney failure, swollen feet, fat, unhealthy food, diet, physical, psychological Accidents, hijacking Sex worker engagement, condom
Service delivery strengthening		Recommend, improve, change

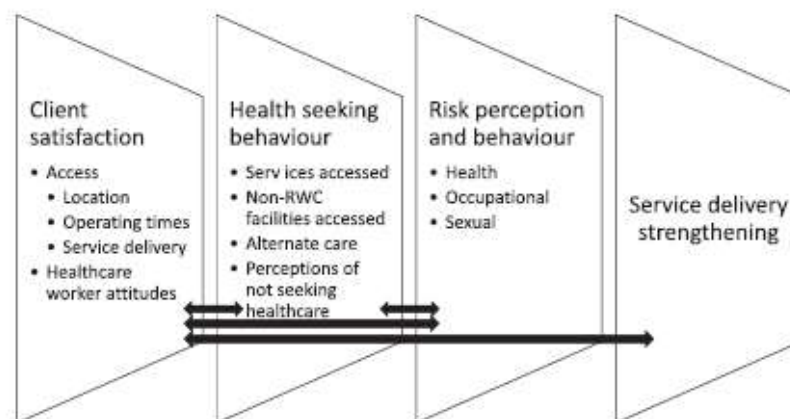


Fig. 1. Relationship between themes. RWC: roadside wellness centre.

3. Results

3.1. Socio-demographic information

We conducted 46 interviews across the six RWCs with 24 users and 22 non-users. All the truck drivers were male. Non-users were older, had more English speakers, had more children and were more likely to be in the R5000–R10000 income bracket. Both groups were comprised mainly of married South Africans who had completed some secondary education and were employed on a full-time basis. There were no widowers. With the exception of one South African truck driver, all listed their partners as female. A summary of the demographic characteristics of the participating truck drivers has been included in the supplementary material (see Table A1).

3.2. Main themes

The main themes that emerged from the analysis were client satisfaction, health seeking behaviour, risk perception and behaviour, and service delivery strengthening.

All individuals provided information on health seeking behaviour while 59%, 48%, and 30% of individuals provided information on client satisfaction, service delivery strengthening and risk perception and behaviour, respectively. A table showing the thematic distribution of responses disaggregated by RWC and category of participant, derived during the thematic analysis, has been included in the supplementary material (see Table B1).

3.2.1. Client satisfaction

3.2.1.1. Access – location: The majority of the truck drivers knew and were happy with RWC locations. Users and non-users (although not directly asked) of the RWCs stated:

Yes, it is in a right location because many truck drivers sleep here. (Cato Ridge, Non-user)

Where it is actually is very accessible to anyone, because it is on a National road. Everyone can go there, not specifically the truck drivers. Now that I know what times it opens, I can come anytime. (Bloemhof, Non-user)

The clinic is in a good place. (Upington, User)

However, there were some (e.g. from Ngodwana RWC) who had not seen the RWC itself but had accessed mobile/outreach services (e.g. HIV counselling and testing, education sessions) offered by the centre staff.

No, I don't go there. Those sisters come to us. (Ngodwana, User)

No I don't hear from anyone. Those sisters came and asked me if I don't want to know my status. I said I want, then they tested me. (Ngodwana, User)

A total of 7 truck drivers (3 non-users (Bloemhof, Cato Ridge, Musina)) and 4 users (3 City Deep, 1 Cato Ridge) mentioned the lack of visibility/ poor signage whereby centres could not be seen from the road/entrance of the truck stops. Comments included:

Maybe a sign directing people to where the clinic is situated. When the clinic is visible it would really help. Even if I walk past, I would just decide to go in and be checked. (City Deep, User)

It's actually fine if you put up a sign there (reference to a spot). People will be more educated, that's more information, that's enough, when I am sick I know where to go. (Musina, Non-user)

The drivers noted that locations that facilitated them parking their trucks close by were highly valued (this was all facilities we surveyed, except City Deep RWC). They mentioned that this is not possible with local fixed facilities and is a barrier to accessing conventional healthcare for truck drivers.

3.2.1.2. Access – operating times: There was varied knowledge about the operating times. Some truck drivers did not know the operating hours and found the centres open by chance while others were fully aware of the operating hours due to the positive marketing of the RWCs by the healthcare workers. There was also a group of non-users who did not know the operating hours but used the interview as an opportunity to gain more information about the wellness centres.

There were mixed opinions on the times that RWCs should operate, depending on the RWC location and whether a long-or short-haul driver was providing the suggestion. Some truck drivers felt that the evening worked best (*If they can try to work from 4 p.m. up to 10 p.m. at night, because there are plenty of trucks (Upington, User)*) while many were in favour of 24 hour (*I think for 24 h (Bloemhof, User); 24 h like a whole sweet (Cato Ridge, User); ...however it is limited in operating hours. Preferably if the clinic was 24 h (Cato Ridge, Non-user)*). Several felt that the clinic should be accessible all the time (*24 h 7 days a week (Musina, User)*). One non-user in Cato Ridge emphasized the convenience of a 24 hour centre citing that driving times vary and having the option of being able to go into a RWC even at midnight might be appealing for truck drivers.

3.2.1.3. Access – service delivery: Overall, truck drivers did not complain about the package of services delivered. Some dissatisfaction was expressed about medication, with two users complaining about unavailability of the hypertension medication dosage they specifically required and one non-user not finding malaria medication available. The majority said that they did not have to wait to be seen and for the truck drivers who did wait, they reported waiting times to be between five to fifteen minutes. The only recommendations provided concerning RWC infrastructure were having more covered seating space in the case of rain, controlled temperature (warmer in winter), and multiple consultation rooms to avoid waiting. All truck drivers felt that the wellness centre set up did not pose any issues to their privacy.

3.2.1.4. Healthcare worker attitudes: Globally healthcare workers attitudes have been linked to barriers of healthcare access for mobile and at risk populations. Based on the commentary, RWCs are an enabling environment for healthcare for truck drivers. Truck drivers who accessed the RWCs praised healthcare workers for their knowledge, professionalism (*It was right. I never had stress, they never forced me (Ngodwana User)*) and patience (*Their sense of caring is right to me (Ngodwana, User)*). They felt comfortable with the healthcare workers and that they could discuss their healthcare needs without being judged. When asked how they would rate the healthcare workers out of a score of five, most gave ratings of either four or five. They supported their ratings with statements of recommendation of the clinic and nurses to other truck drivers and motivation for their own continued use of the RWCs.

3.2.2. Health seeking behaviour

3.2.2.1. Services accessed: Over three quarters of the truck drivers accessed the RWCs for 3 services: HIV testing, blood pressure measurement, and diabetes screening. A small percentage went to get chronic medication refills on route travelling across the border and an even smaller number presented at the centres because they had pain and flu symptoms. This pattern of service utilisation was similar in non-users who did report accessing care at other facilities. Approximately half of the non-users said that they do not access routine care (though available) but only seek medical attention if they are sick (*I only go to the clinic when I am sick, I do not go to the clinic for check-ups (Cato Ridge)*).

3.2.2.2. Non-RWC facilities accessed: When they did not access the RWCs truck drivers accessed care at their local clinics and hospitals. The local clinics were primarily to receive chronic medication. They accessed hospitals if they had to undergo procedures ranging from dentistry to minor operations. Both user and non-user groups reported using pharmacies if they had headaches. Noticeably none of the drivers mentioned accessing care at a private general practitioner or specialist.

3.2.2.3. Alternate care: traditional healing and religious support: Many truck drivers reported the past and current use of traditional healers. Some acknowledged both the differences and complementarity between traditional healing and conventional medical services.

.... Modern medicine has side effects. (Upington, User)

Most of the time I use a traditional healer, but the problem is that they can't check for high blood pressure and sugar diabetes. This is why sometimes I go to the clinic for my blood to be checked. (Ngodwana, User).

Other truck drivers explained that accessing traditional healing was in conflict with their religious beliefs and practices.

To be honest, since growing up I have never visited one because at my home we are Jehovah's Witnesses. (Upington, User)

There was more use of traditional healers among the RWC non-users. One non-user highlighted that truck drivers do believe in traditional healers.

We go there so that we can get the traditional medicine, so that it can help us with our kidneys, and truck drivers believe in traditional medicine. (Bloemhof, Non-user)

Another non-user spoke about the frequency and reasons for visiting traditional healers.

Many times... No, I do not remember. I do go to a traditional healer, especially when we have problems or something traditional that we have to do at home... Sometimes, when there is a disease in the family. Sometimes a kid gets sick – things like that. I go to the traditional healer and get something to heal the sick person. I am a man of culture, man; I service myself. (Ngodwana, Non-user)

Two of the truck drivers from the City Deep non-user group sought assistance from their churches when they had problems (*When I don't feel well I go to church; Like, when I don't feel well – that something is not right – I go and see the church*).

3.2.2.4. Perceptions of not seeking healthcare: Truck drivers who accessed care at the RWCs and RWC non-users expressed similar views on why their colleagues did not seek healthcare. Both groups were of the opinion that fear was the barrier to accessing care for those truck drivers who did not go to any clinics or doctors. A non-user from Bloemhof said *...And then there is a group that has a phobia – their phobia is the fear of what people will say when they see me going to the clinic, you understand*. Many felt that truck drivers are conscious of both non-communicable and communicable diseases. Although a few mentioned testing for HIV was scary, many, unexpectedly, listed truck drivers being afraid of finding out that they are diabetic or hypertensive. Knowing the state of one's health seemed to present complications in the life of the truck driver. Aside from the explicit knowledge that being off the road (either to get diagnosed or when one is ill) means there is no pay, there were a few implicit complications to knowing that one was ill. Firstly, majority of the men were married and because of this, men knew that if they were diagnosed with illnesses they would need to make a concerted effort to remain healthy for the sake of their families. Also dependent on what they were diagnosed with they would need to inform their partners. Secondly, there was a sense of vulnerability. Although truck drivers knew the effects of their sedentary lifestyle they knew that the nature of the job was not conducive to always eating healthily, getting adequate exercise and resting when required. Therefore it was pointless to know what was wrong with them as they were partially helpless in executing a solution. Lastly, there was the issue of the challenge to their masculinity. Once diagnosed, it was confirmed that the man was sick and this illness did not lend well to those truck drivers who subscribed to hegemony.

Nevertheless amid all this mention of fear there was the feeling that truck drivers needed to take charge of their health (*... Such people I say they are not strong enough, because it is your own life. I for one am saving also my wife, because when I am at home I go and check (Bloemhof, Non-user); People need to change their minds (Upington, Non-user)*). Not all the truck drivers in this study explicitly expressed themselves as being afraid of getting help when they were sick. However, through a little self-reflection, there were hints that support (*What made me to come to this clinic is that you came to me... and my wife has been telling me to go to the clinic and get tested. I felt that fear that I had disappear (Bloemhof, User)* and persuasion (*...they know that there is a Wellness Centre there to get tested, for someone to get up and go and get tested it brings some fear. Maybe they need influence, if you know what I am saying (Musina, Non-user); You should talk to them and be friendly and convince them that they should come for 1, 2, 3 reasons (Ngodwana, Non-user)*) could assist with improving the numbers of truck drivers who access any form of healthcare.

3.2.3. Risk perception and behaviour

Risk presented itself in the interviews from the perspectives of health, non-health related occupational risks, and sexual behaviour. In speaking about the perceived risks of their jobs, the truck drivers showed their vulnerabilities and the challenges of balancing being a breadwinner, man and family person against being physically and mentally happy.

3.2.3.1. Health (physiological, physical, psychological): There was recognition that truck drivers in general have poor health linked to sedentary lifestyles and poor diet. The majority viewed themselves at risk for hypertension and obesity. One Bloemhof (Non-user) driver elaborated further that *kidney failure is first. It is caused by driving for a long time, swollen feet, you see swollen feet can be gout, high blood and sugar diabetes. We drink cool drink and we don't drink water. Also, too much sugar and food that has too much oil in it because we don't eat food that is cooked from home*. Another user spoke about the disadvantages of the nature of their work on their health – *Most of our guys are overweight and the risk of HIV is too much...We are not taught on what to eat and on what not to eat. Maybe we lack information, those are the disadvantages of our work. We are not aware of anything about risks and STIs. I eat every food that I get because I*

have no choice (Musina, User).

Some drivers also touched on exercise. *Exercises, because some of the drivers when they are sleeping here and sitting inside the truck for 24 hours are not good and that's why we are sick because we don't exercise (Cato Ridge, User).*

Many truck drivers work under agents who allocated jobs to them. In order to make the maximum amount of money they have to avail themselves to all opportunities. This therefore affects how much time drivers have available to go home/see family as well as sleep (*You see, I do not have a time to spend with my family, because most of the time I am on the road (Ngodwana, Non-user); Sometimes, it's not all the time. You see, all the time we are wasting on the road, loading point, offloading point; at home you can rest two days only. It's not right but we have to if we want a job (City Deep, User)*). Implicit in these narrations is the psychological strain from the lack of comfort associated with family, home and rest (*That's the main thing that I told you, that this transport to get home is difficult. Even now I have a load that is going to Nelspruit, even to see my wife is difficult...now I am getting stress because of this (User, Cato Ridge)*).

3.2.3.2. Occupational: The major occupational risk cited was accidents. Reasons offered included; non-South African drivers lacking familiarity with South African road signs and road rules, drivers getting sleepy and losing concentration, drivers having vision and visibility issues – especially linked to seeing bright lights and oncoming traffic, and truck malfunctions (*...the body of the truck capsizing as a result of a burst tyre (Cato Ridge, Non-user)*). An additional reason offered was drunk driving (*The first thing related to risks when driving is drunk driving, and the problem of money (Ngodwana, User)*). Responses around drunk driving indicated that truck drivers were referring to their colleagues being drunk causing them to 1) not be able to react timeously to events on the road (e.g. braking); 2) speed and 3) have altered judgement (speed bumps, potholes, roadworks etc.) as well as being victims of drunk non-truck drivers. Hijacking was the other occupational risk mentioned. Cargo is expensive and placed them at risk.

3.2.3.3. Sexual: All men spoke freely about sex worker engagement. When probed they responded without hesitation or reservation giving the impression that they were answering truthfully since they were not deliberating about what the desirable answer (for either them or the interviewer) would be. The varied justifications gave insight into the truck drivers' insecurities, knowledge and values. All men confirmed sex worker availability on the truck routes, even if they did not use their services. Together with City Deep, Cato Ridge participants reported very easy access to sex workers (*...when they are with these magoshas (sex workers) because they are plenty of them, even here outside (Cato Ridge, User); They are everywhere – they are some of the people that the government should really deal with (Cato Ridge, Non-user)*). Although some men reported having engaged with sex workers at some stage in their early truck driving career none of the men reported engaging with sex workers in the six months prior to and at the time of the interviews. Majority of the men were in stable relationships and knew about the risks of multiple sexual partners. Some went as far as saying that they do not interact with females while on the road because they could engage in consensual sex or even give ladies a lift and then be accused of rape (*You would be lucky when there are police around, for she would cry and say you raped her (City Deep, Non-user)*) and the men feared going to jail. Risky sexual behaviour was also linked to death. Truck drivers were aware that sex without a condom is risky (*Another risk is that of sleeping with girls without a condom (Ngodwana, User)*) and can lead to STIs (*STIs still torments truck drivers...if we can't control ourselves we should use a condom and they (the clinic) do supply them (Upington; User)*). One truck driver in Bloemhof cited non-engagement with sex workers being related to his empathy for them, sharing his thoughts on the type of circumstances that would force young women into prostitution. He could not be comfortable with himself knowing that he had potentially taken advantage of a vulnerable woman and the fact that once the woman was done with him she seamlessly moved on to the next customer.

3.3. Service delivery strengthening

Truck drivers were aware of their healthcare needs. The majority of the recommendations came from users ($n = 14$) and from the Cato Ridge RWC ($n = 8$ truck drivers). Supplementary to the prior mentioned suggestions there was the recurring idea of the availability of vaccinations at RWCs – especially for yellow fever, particularly as it is a requirement for cross-border travel (*If they have vaccination, most of the drivers would come and join, I am sure (Cato Ridge, Non-user); ...I don't know how you are going to solve it...about this vaccination of this fever, the yellow fever, we are having this problem...Why don't you guys put this vaccination in your what you call North?(Musina, Non-user)*). Predominantly non-users indicated that this would speak to their healthcare needs. While users were happy with the healthcare workers there was a strong recommendation from both users and non-users to have a doctor available to deal with illnesses outside the scope of nurses and counsellors. There was an implicit suggestion that doctors would add more credibility to the whole concept of the RWCs (*...because it is only the doctor who can know the problem I have (Musina, User); There should be a full time doctor, that will make this clinic to be a proper clinic (City Deep, User)*).

4. Discussion

4.1. Comparison to existing evidence

While there is limited published information about the socio-demographic profile of truck drivers in South Africa, the mean age of our respondents was similar to those who participated in two earlier South African studies in 1992 (average age of 39 years) (Karim et al., 1995) and 1999 (mean age of 37 years) (Ramjee and Gouws, 2002), and to our analyses in another component of this evaluation (Lalla-Edward et al., 2017). We can assume that the respondents in our study may be representative of the general South African trucking population however this result also highlights that there has not been a shift in the average age of truck drivers in South Africa over a long period of time. A survey conducted in South Africa using 1528 data sources including employees, employers

and recruitment points reported that the average monthly salary for a truck driver in South Africa is ZAR13 387 (Truck Driver Salaries in South Africa, 2017) with the average monthly gross salary in South Africa as at July 2017 being ZAR19 170 (South Africa Average Monthly Gross Wage, 2017). We found that the majority of our clinic users reported earning more than ZAR10 000 while the majority of the non-users reported earning between ZAR 5000 and ZAR 10 000.

Truck drivers were cognisant of the consequences of risky sexual behaviour. Converse to findings in some other African (Aniebue and Aniebue, 2009; Gysels et al., 2001; Morris et al., 2009) and Indian (Khan et al., 2015; Chaturvedi et al., 2006) studies, our findings indicate that there was little interaction with sex workers prior to, and at the time of the interviews. This could be attributed to more of the truck drivers being in stable relationships. Where ages were reported (Aniebue and Aniebue, 2009; Chaturvedi et al., 2006) we could not definitely conclude that age was a common contributing factor to risky behaviour. In relation to our study, the Indian study had a younger group of men reporting risky sexual behaviour while the African study had older men mostly likely to engage with commercial sex workers. We did observe that aside from the one Indian study (Khan et al., 2015) all the others were conducted and reported prior to 2010. This could be indicative of a shift in truck driver sexual behaviour in the recent years attributed to increased exposure to behaviour change communication interventions and healthcare information. Irrespective of the comparisons, we do acknowledge the negligible possibility of reporting bias in our study with the truck drivers not being completely honest about their interactions with sex workers.

It was evident that truck drivers recognized that both their fellow truck drivers and they were in poor health. Further they understood some of the key underlying determinants with many speaking about the fact that they had to sit for long periods, their work was controlled by others, and the stress caused by several aspects of their job. Although there is a dearth of supporting data from national studies in South Africa on these health risk behaviours and the rates of obesity, diabetes, cardiovascular disease or mental health in truck drivers, these truck drivers are clearly highlighting factors which affect their health. These factors require consideration to develop broader (health and governance) solutions to improve their health.

Road accidents remain one of the leading causes of death in the workplace (Boyce, 2016) with truck drivers having the most exposure to work related road risk (Fort et al., 2016). Drunk driving was a noteworthy occupational risk mentioned primarily related to it being a contravention of the law as well as the accompanying danger to other road users. From our results truck drivers were at risk of being driven into by drunk truck drivers and other motorists. Further there was reference to the truck drivers themselves being drunk and having poor judgement to timeously react to events on the road. Drunk driving coupled with them speeding placed them at risk of causing accidents (and possible fatalities) with any other road user in close proximity. Lastly, there were instances of fatigue and lapses in concentration cited as risks of the job. It clearly came across that these last-mentioned factors were strongly related to the monetary aspect of truck driving. Time on the road is directly proportional to the amount of money a truck driver would earn. Therefore they forgo sleep in order to fulfil the requirements of their job. Law makers and trucking industry stakeholders need to implement more interventions related to curbing reckless driving and enforcing stricter policies on the number of hours a motorist is allowed to drive, to improve road safety for all road users.

4.2. Considerations for health programming for truck drivers

Our findings suggested that truck drivers are generally aware of the occupational health risks of long distance truck driving and have clear ideas about how health services should be tailored to their needs. Some truck drivers (similar to the general population) are less proactive in seeking healthcare (although available) and will need to be attracted into attending clinics. One potential opportunity to increase utilisation of services would be the offering of occupation-relevant services including vaccinations and routine screenings required for professional driving permits.

Exercise and sport are recognised as being beneficial to health and wellbeing (Nesti, 2016). Since truck drivers said that they sleep at truck stops while they wait for their loading instructions, wellness centres could consider housing an exercise room with basic exercise equipment that drivers could use when they are not working. The advantages of this are two-fold; 1) increased visibility and utilisation of the RWCs and 2) improved overall health of truck drivers.

Generally, the burden of chronic illnesses in low-and middle-income countries is increasing (Goudge et al., 2009). Self-reports in this study were no different with the major healthcare needs focussing on hypertension and diabetes. Truck drivers mainly accessed services for hypertension, followed by diabetes, and spoke about how these services together with services for musculoskeletal illnesses would be appropriate for them.

The nature of trucking lends to long periods away from home and increased loneliness (Gomez et al., 2013). Although not an explicit finding, truck drivers exhibited some emotional tension when speaking about the trade-offs between spending time with their families and generating income to provide for those families. Our findings of the presence of mental health stresses is in keeping with the work of Shattell et al., (2012) conducted in the United States. This anxiety is exacerbated by the physical strain that accompanies overworking the body and mind. Therefore additional to exploring non-communicable disease treatments related to cardiovascular and musculoskeletal diseases it is important for truck driver healthcare to incorporate aspects of mental health screening and treatment. Focussing on the mental health aspect will also assist with allaying fears and address the many vulnerabilities that truck drivers have but may not be able to deal with.

Participatory approaches have been successfully used in advancing the development of health programmes (Kawakami et al., 2004; Lee et al., 2016). Noting the vulnerabilities truck drivers expressed around not being able to improve their health (eating healthily, getting adequate sleep and exercising) due to the obligations of their job, healthcare interventions aimed at improving truck driver health needs to be remodelled with large considerations for engaging in a participatory approach to development and leveraging on sources like the Fundamentals of Total Worker Health Approaches (which is aimed at collectively addressing health,

wellbeing and safety of workers) (Lee et al., 2016).

Truck drivers did report seeking help in a variety of settings. Conventional health care offerings need to be conscious of the overlap with less formal health care provision through traditional health workers and pharmacies.

4.3. Limitations

The study's limitations include conducting interviews with only a small sample of male-only truck drivers. This limits the generalizability of our findings in terms of gender (albeit there being a small female truck driver population) and the wider population. Truck drivers had limited amounts of time as they needed to load and get on the route. The shorter than anticipated interview durations did not lend themselves to the gathering of in-depth information. Recruitment was only done near and about the North Star RWCs. Finally, we did not interview the same number of truck drivers per site therefore the opinions about satellite services and other RWCs may be different.

5. Conclusion

Overall we found that truck drivers are willing to access healthcare at RWCs and they found the concept a RWC suitable. However, currently, access is sometimes hindered by minor operational factors (e.g. signage and operating times) that can easily be addressed to increase utilization. Inclusion of truck drivers who did not access the clinic highlighted the need for conscious recognition that mobile populations' health care needs extend beyond infectious diseases. Comprehensive care packages (incorporating services for mental health and other non-communicable diseases), which acknowledge the role of traditional healing and alternative medicine, delivered through accessible satellite facilities should form the foundation of service delivery models for truck drivers and other mobile populations. Finally, subsequent to the establishment of these accessible and appropriate healthcare delivery models there needs to be increased health promotion efforts to increase uptake among truck drivers for enhanced health outcomes.

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Competing interests

The following author has competing interests: PM is the Regional Director, Southern Africa at North Star Alliance. All other authors have declared that they have no competing interests.

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Authors' contributions

Designed the study: STLE, WDFV and GBG. Analysed the data and interpreted results: STLE. Wrote the initial draft: STLE. All authors critically reviewed and approved of the final draft.

Appendix A. Supplementary material

Supplementary data associated with this article can be found in the online version at <https://doi.org/10.1016/j.jth.2018.01.007>.

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Appendix B3: Uptake of health services among truck drivers in South Africa

RESEARCH ARTICLE

Open Access



Uptake of health services among truck drivers in South Africa: analysis of routine data from nine roadside wellness centres

Samanta Tresha Lalla-Edward^{1*}, Sydney Ncube¹, Paul Matthew², Catherine A. Hankins^{3,4}, W.D. Francois Venter¹ and Gabriela B. Gomez^{3,5}

Abstract

Background: Long-distance truck drivers are occupationally susceptible to poor health outcomes. Their patterns of healthcare utilisation and the suitability of healthcare services available to them are not well documented. We report on truck driver healthcare utilisation across South Africa and characterise the client population of the clinics serving them for future service development.

Methods: We analysed anonymised data routinely collected over a two-year period at nine Roadside Wellness Centres. Associations between services accessed and socio-demographic characteristics were assessed using univariable and multivariable logistic regression models.

Results: We recorded 16,688 visits by 13,252 individual truck drivers (average of 1.26 visits/person) who accessed 17,885 services for an average of 1.07 services/visit and 1.35 services/person. The mean age of truck drivers was 39 years. Sixty-seven percent reported being in stable relationships. The most accessed services were primary healthcare (PHC) (62%) followed by HIV (32%). Low proportions (≤6%) accessed STI, TB and malaria services. Most visits were characterised by only one service being accessed (93%, $n = 15,523/16,688$). Of the remaining 7% of visits, up to five services were accessed per visit and the combination of TB/HIV services in one visit remained extremely low (<1%, $n = 14/16,688$). Besides PHC services at the beginning of the reporting period, all service categories displayed similar seasonal utilisation trends (i.e. service utilisation peaked in the immediate few months post clinics opening and substantially decreased before holidays). Across all service categories, younger truck drivers, those with a stable partner currently, and those of South African origin were the main clinic attendees. Older truck drivers (≥40 years) were more likely to access TB and PHC services, yet less likely to access HIV and STI services. Those with stable partners were less likely to access STI and TB services but more likely to access malaria and PHC services. South African attendees were more likely to access PHC, while attendees from other nationalities were more likely to access HIV and malaria services.

Conclusions: This utilisation analysis shows that tailored services assist in alleviating healthcare access challenges faced by truck drivers, but it underscores the importance of ensuring that service packages and clinics speak to truck drivers' needs in terms of services offered and clinic location.

Keywords: Truck drivers, Healthcare, Service delivery, South Africa, Roadside Wellness Centre, Access, Programme

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Background

Long distance truck drivers, due to their occupational circumstances, can be susceptible to worse health outcomes compared to the general population [1–6]. Research shows that truck drivers bear a disproportionate burden of both communicable (HIV, sexually transmitted infections (STI), tuberculosis (TB)) and non-communicable (chronic, mental, respiratory, cardiovascular, muscular) diseases [5, 7–13]. In particular, it is their potential contribution to the HIV epidemic [14–18] that has prompted countries and donors to support healthcare services specifically catering for this population [13]. As a result, existing healthcare programmes for truck drivers have introduced or re-oriented their services to HIV prevention and antiretroviral treatment, with a few programmes providing a broader variety of services. However, little is known about patterns of healthcare utilisation among truck drivers and whether this focus on HIV/AIDS is appropriate to client demand or whether other services should be provided, with these specialised programmes encouraged to expand their service provision.

An example of healthcare programmes for truck drivers is North Star Alliance, a non-governmental organisation providing healthcare to mobile populations and communities along transport corridors and at border crossings through a network of Roadside Wellness Centres (RWCs) across sub-Saharan Africa [19]. These RWCs are adapted shipping containers staffed with trained clinical and outreach teams. North Star Alliance provides a comprehensive menu of services, covering primary healthcare (PHC), HIV prevention and screening for a variety of infectious diseases (STI, TB, malaria...). With the exception of antiretroviral therapy (ART) services, the North Star Alliance RWCs in South Africa do not make use of paper-based client files; instead they are supported by a networked electronic data administration system called COMETS. This system was designed to facilitate the capture of clinical information, allowing clients to access their health records at every clinic within the network along transport corridors. In this study, we aim to describe healthcare utilisation among truck drivers across South Africa, using routinely collected data obtained by the COMETS system as well as to characterise clinic attendees to inform future service planning and development.

Methods

Setting

Nine RWCs across seven provinces in South Africa were included in this analysis. These clinics are located in Cato Ridge and Pongola (KwaZulu Natal), Bloemfontein (Free State), Bloemhof (North West), Ngodwana (Mpumalanga), Musina (Limpopo), Upington (Northern Cape), and Pomona and City Deep (Gauteng). Currently, eight of these clinics are operational. The City Deep site in the

Gauteng province was closed due to challenges experienced by truck drivers in accessing the location and was relocated to another district. It now operates at the Pomona site (Gauteng province). North Star Alliance does not have RWCs in the remaining two provinces (Western Cape and Eastern Cape). In all RWCs, services are offered to truck drivers, sex workers and the immediate communities surrounding the RWCs.

Data extraction

Anonymised data were last extracted on 11 April 2016 from North Star Alliance's COMETS database for a two-year period from 1st October 2013 to 30th September 2015. Information extracted included site name, COMETS unique identification number, socio-demographic variables (such as age, sex, occupation, nationality and marital status) and visit information (including visit date and type of service accessed). Information such as educational level or income is not routinely collected in this system; therefore, this information could not be included in the analysis. After data extraction, we excluded duplicate and incomplete records. Records were then organised to provide both unique attendee and unique visit information.

Analysis

We analysed all data using STATA 12. We restricted the analysis to a sub-set of records pertaining to truck drivers aged 18 to 65 years, as age could not be verified and there were some instances of unreliable information.

Continuous data (age) were described by mean and standard deviation (SD), then grouped into categories. Categorical data such as nationality and marital status were categorised in two groups each. For nationality, we defined South African and other nationalities. Other nationalities reported included a wide range of countries: Angola, Botswana, Congo and Democratic Republic of Congo, Ethiopia, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Niger, Nigeria, Rwanda, Saint Helena, Senegal, Somalia, South Sudan, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, and Zimbabwe. For marital status, we defined a group of truck drivers with no stable partner, including those who were currently divorced, single, or widowed; and a group with a stable partner, including those who reported being currently married or cohabiting.

We examined services accessed by type of service: HIV, STI, TB, malaria, and PHC. PHC comprises an array of services, including but not limited to respiratory, chronic, cardiovascular and muscular illnesses (more detail of services provided is given in Table S1 of the Additional file 1). We described the distribution by attendees and by visits across different socio-demographic characteristics and services accessed.

Finally, we assessed associations between services accessed and socio-demographic characteristics using

univariable and multivariable logistic regression models. Robust standard errors were calculated for all models to allow for intragroup correlations and the sample structure, i.e. visits by individuals nested in sites. All variables were included in the multivariable models. We reported both unadjusted and adjusted odds ratios, 95% confidence intervals and *p* values. *P* values less than 0.05 were considered significant.

Ethical considerations

Ethical clearance was provided by the University of the Witwatersrand Human Research Ethics Committee (M140506) on 30 May 2014. In addition, North Star Alliance and Wits Reproductive Health and HIV Institute signed a data user's agreement on 5 May 2014 to ensure that data were appropriately handled throughout the data management cycle.

Results

We extracted information for 36,405 records. After excluding duplicate records ($n = 675$) and incomplete records ($n = 1493$), we had 34,237 records. Of these, almost half (49%, 16,784/34,237) were records from truck drivers' visits. After excluding truck drivers aged

above 65 years, we observed 13,252 individual truck drivers who made 16,688 visits (an average of 1.26 visits/person) and accessed 17,885 services (an average of 1.07 services/visit and 1.35 services/person) across nine clinics during the 2 year reporting period (Fig. 1).

Service utilisation

In Table 1, we present the distribution of individuals and services accessed by socio-demographic characteristics and type of services. The mean age of truck drivers accessing the sites was 39 years (SD 9.9). More than half (56%) of them were less than 40 years old ($n = 7403/13,252$), followed by 27% ($n = 3551/13,252$) in the 40–49 year age category, while less than 1% ($n = 96/13,252$) were younger than 20 years. Considering stability of partnerships, 67% ($n = 8887/13,252$) of truck drivers reported being either married (monogamy or polygamy) or cohabitating, with a large majority of these men being in a monogamous marriage (96%, $n = 8575/8887$). The majority of the truck drivers accessing services across the clinics was South African (82%, $n = 10,825/13,252$).

The most accessed category of services provided by the clinics was PHC, accounting for 62% of the

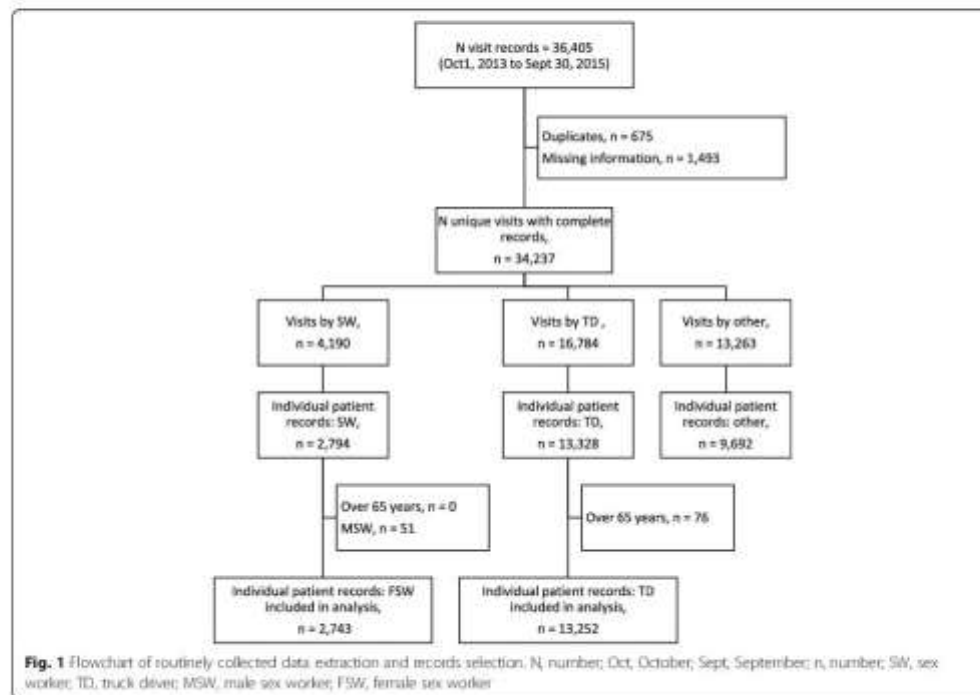


Table 1 Services accessed disaggregated by socio-demographic characteristics of truck drivers

	Clients	Services accessed (n = 17,885)				
		HIV, n (%)	STI, n (%)	TB, n (%)	Malaria, n (%)	PHC, n (%)
Total	13252	5660 (31.6)	1092 (6.1)	62 (0.3)	70 (0.4)	11001 (61.5)
Age, mean (SD)	39.2 (9.9)	37.2 (9.4)	36.2 (8.7)	40.4 (9.3)	39.2 (8.4)	41.3 (10.0)
Age						
< 20 years	96 (0.7)	59 (1.0)	11 (1.0)	0	0	45 (0.4)
20–29 years	2114 (16.0)	1131 (20.1)	232 (21.2)	8 (12.9)	7 (10.0)	1330 (12.1)
30–39 years	5195 (39.2)	2470 (43.6)	511 (46.8)	23 (35.5)	36 (51.4)	3879 (35.3)
40–49 years	3531 (26.8)	1310 (23.1)	254 (23.3)	18 (29.0)	19 (27.1)	3273 (29.7)
50–65 years	2298 (17.3)	690 (12.2)	84 (7.7)	14 (22.6)	8 (11.4)	2474 (22.5)
Sex						
Female	182 (1.4)	68 (1.2)	14 (1.3)	1 (1.6)	0 (0.0)	119 (1.1)
Male	13070 (98.6)	5592 (98.8)	1078 (98.7)	61 (98.4)	70 (100.0)	10882 (98.9)
Marital status						
SP	8867 (67.1)	3807 (67.3)	639 (58.5)	39 (62.9)	61 (87.1)	7626 (69.3)
No SP	4365 (32.9)	1853 (32.7)	453 (41.5)	23 (37.1)	9 (12.9)	3375 (30.7)
Nationality						
South Africa	10825 (81.7)	4209 (74.4)	780 (72.3)	47 (75.8)	18 (25.7)	9373 (85.2)
Other	2427 (18.3)	1451 (25.6)	303 (27.7)	15 (24.2)	52 (74.3)	1628 (14.8)

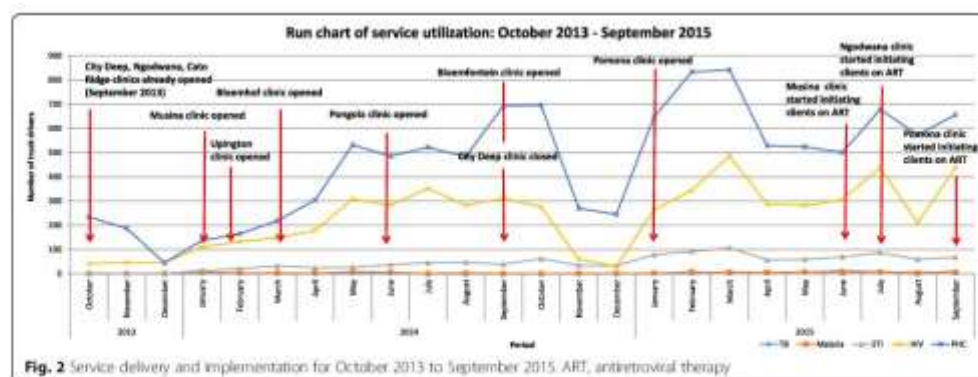
HIV Human immunodeficiency virus, STI Sexually transmitted infection, TB Tuberculosis, PHC Primary healthcare, n Number, No SP No stable partner, SP With stable partner

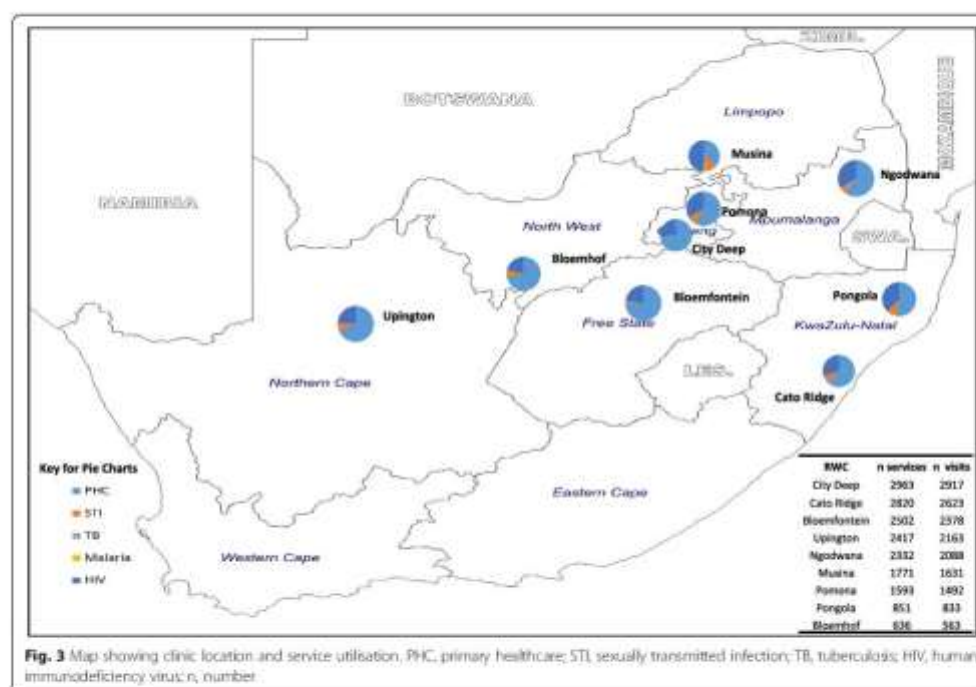
workload ($n = 11,001/17,885$). This was followed by HIV services at 32% ($n = 5660/17,885$). Lower proportions of services were accessed for STIs and less than 1% of services were accessed for TB and malaria, respectively. Across all service categories younger truck drivers, with a stable partner currently, and those of South African origin were the main clinic attendees.

Figure 2 represents the variation across time of services accessed together with the opening of clinics. PHC services are consistently the type of service most accessed, with HIV services showing the same trends as PHC services over time. With the exception of PHC services at the beginning of the reporting period, all categories of services

displayed the same trend of utilisation: service utilisation peaked in the immediate few months following the opening of new clinics, with a substantial decrease in demand seen in the period leading up to the end of year holidays. In the first fiscal year (from October 2013 to September 2014), 6569 services were accessed with an approximate 75% increase observed during the second fiscal year (from October 2014 to September 2015) in which 11,316 services were rendered to truck drivers.

Figure 3 shows service utilisation for services by location. The majority of the sites served a similar volume of clients; of the operational facilities, the newest of the RWCs, Bloemfontein RWC, reported the highest

**Fig. 2** Service delivery and implementation for October 2013 to September 2015. ART, antiretroviral therapy



headcount. Although there were challenges in providing services to truck drivers at the City Deep clinic, it reported the highest service volume (2963 services in 2917 visits). This was facilitated by healthcare workers providing mobile outreach services to truck drivers as opposed to truck drivers coming into the clinic. Clients of RWCs in high HIV prevalence border communities (e.g. Pongola; KwaZulu-Natal HIV prevalence = 28% [20]) or neighbouring high HIV prevalence areas (e.g. Musina (Limpopo) with a farm worker HIV prevalence = 28% [21]) accessed proportionally more HIV-related services, while other RWCs such as Bloemhof and Bloemfontein mainly dispensed PHC services.

The vast majority of visits saw only one service being accessed (93%, $n = 15,523/16,688$). Of the remaining 7% of visits, up to five services were accessed per visit. The most sought after multiple service combination was PHC and HIV (5%, $n = 835/16,688$) followed by PHC and STI (less than 1%, $n = 145/16,688$). The combination of TB and HIV services in one visit remained extremely low at less than 1% ($n = 14/16,688$).

Factors associated with service utilisation

In Table 2, we present the results of both univariable and multivariable analyses. Older truck drivers were

more likely to access PHC services and less likely to access TB, HIV or STI services. Those with stable partners currently were less likely to access STI and TB services than those without a stable partner currently. South African attendees were more likely than non-South Africans to access PHC, while attendees from other nationalities were more likely to access HIV and malaria services.

Discussion

To our knowledge, this is the first report of comprehensive health service utilisation among truck drivers in South Africa. Our main results show that truck drivers attending RWCs are mainly middle-aged and in stable relationships. While HIV services are important to truck drivers from other countries, PHC services are most in demand among South African truck drivers. It could be argued that North Star Alliance's comprehensive service package suits the majority of South African clinic attendees and that further development of PHC services might be an important consideration for future health-care planning in South Africa.

As anticipated, as the number of RWCs increased over time, the absolute number of clients accessing services increased. However, changes in service delivery such as

Table 2 Determinants of service uptake across all sites

	HIV (n = 16,688 records; n = 5860 services)			STI (n = 16,688 records; n = 1092 services)			TB (n = 16,580 records; n = 62 services)			MALARIA (n = 16,580 records; n = 70 services)			PHC (n = 16,688 records; n = 11,001 services)		
Age	UOR [95% CI]	reference	reference	UOR [95% CI]	reference	reference	UOR [95% CI]	reference	reference	UOR [95% CI]	reference	reference	UOR [95% CI]	reference	reference
<20 years															
20-29 years	0.67 [0.25-1.84]	reference	0.67 [0.23-1.92]	0.89 [0.50-1.58]	reference	0.82 [0.45-1.48]	reference	reference	reference	1.56 [0.55-4.44]	reference	1.62 [0.53-4.92]	reference	reference	reference
30-39 years	0.52 [0.18-0.48]	0.49 [0.17-1.38]	0.76 [0.43-1.36]	0.75 [0.42-1.34]	1.08 [0.41-2.82]	0.91 [0.72-1.16]	2.03 [0.66-6.24]	1.59 [0.46-5.48]	2.14 [0.78-5.86]	2.30 [0.83-6.36]	reference	2.30 [0.83-6.36]	reference	reference	reference
40-49 years	0.34 [0.13-0.84]*	0.31 [0.13-0.77]*	0.52 [0.28-0.98]*	0.56 [0.30-1.03]	0.68 [0.32-0.89]**	0.68 [0.32-0.89]**	1.50 [0.61-3.71]	1.30 [0.46-3.62]	3.56 [1.46-8.70]**	3.75 [1.54-9.12]**	reference	3.75 [1.54-9.12]**	reference	reference	reference
50-65 years	0.24 [0.09-0.65]**	0.24 [0.09-0.63]**	0.25 [0.13-0.49]**	0.29 [0.15-0.57]**	0.35 [0.22-0.58]**	0.35 [0.22-0.58]**	0.94 [0.29-3.02]	1.24 [0.40-3.88]	5.76 [2.32-14.30]**	5.62 [2.30-13.72]**	reference	5.62 [2.30-13.72]**	reference	reference	reference
Marital status															
No SP	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference
SP	0.95 [0.65-1.37]	1.10 [0.76-1.60]	0.64 [0.42-0.98]*	0.68 [0.42-0.98]*	0.68 [0.55-1.15]	0.68 [0.57-0.82]**	3.19 [1.89-5.40]**	1.54 [0.84-2.81]	1.18 [0.78-1.81]	1.01 [0.73-1.41]	reference	1.01 [0.73-1.41]	reference	reference	reference
Nationality															
South African	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference
Other	1.87 [1.18-2.96]**	1.72 [1.13-2.60]*	1.70 [0.92-3.14]	1.77 [0.95-3.28]	1.36 [0.70-2.65]	1.72 [0.92-3.28]	12.50 [4.44-35.19]**	11.04 [3.89-31.29]**	0.47 [0.25-0.88]*	0.50 [0.27-0.90]*	reference	0.47 [0.25-0.88]*	reference	reference	reference

HIV Human immunodeficiency virus, STI Sexually transmitted infection, TB Tuberculosis, PHC Primary healthcare, n Number, UOR Unadjusted odds ratio (refers to adjusted for all variables in table); 95% CI, 95% confidence interval. No SP: no stable partner includes the following categories: divorced, single or widowed. SP: with stable partner includes married and cohabiting. *Indicates a p value < 0.05. **p value < 0.01. ***p value < 0.001

^arecords with <20y (n = 108) were dropped in this analysis, because there were no TB/malaria visits recorded

increased efforts to promote the clinics through outreach, the introduction of ART services for HIV-positive clients, and the increase in scope of the PHC services offered are likely to have contributed to increasing service uptake. The same yearly patterns of utilisation overall were mirrored across service type, i.e. peaks during the second quarter of the year and troughs in the last quarter. This pattern of utilisation is in keeping with trends seen among other service providers in the South African public healthcare system. The last quarter decreases are usually attributed to companies slowing down work as the year end approaches and closing for holidays.

STI prevalence in the truck driver population has been estimated to be higher than in the general population [22]. Our results showed that STI service utilisation in this mobile population was low. However, this might be related to the profile of clinic attendees (i.e. older and in stable partnerships) who might be at lower risk.

The low malaria service utilisation could be explained by South Africa's low malaria prevalence [23] and resulting low risk perception. While HIV services were second highest in demand, the TB and HIV combination remained extremely low (less than 1%). Although the entry point for services cannot be determined from the database, it is apparent that there is an opportunity to improve provider-initiated testing and counselling [24] services and to promote screening for multiple diseases in a single visit, such as TB screening for HIV clients and vice versa but also in combination with non-communicable disease screening.

Lastly, we observe different patterns of utilisation, both in volume and type of services, depending on location. Although the Bloemfontein clinic was one of the last clinics to become operational, it had the highest number of people accessing the clinic because it is located on a busy national route and offers the most potential for service utilisation and uptake. The absence of RWCs in Western and Eastern Cape does not allow us to comment on truck driver healthcare utilisation in those provinces. However, based on the arrangement of the South African trucking corridor, the Bloemfontein RWC could be used as a proxy for utilisation trends. From the geographical size and infrastructure perspectives, we expect that truck driver utilisation would be much higher in the Western Cape as compared to the Eastern Cape.

Our characterisation of clinic attendees indicates that the cross-border mobile population was mostly likely to access services for communicable diseases, such as malaria and HIV services, whereas South African drivers were most likely to access PHC services. This could imply that transiting truck drivers may feel more comfortable accessing communicable disease services outside their home country while on the road, with North Star

Alliance possibly filling a gap in service provision for this population. Programmatically this begs the question of whether non-South Africans access services in this way to avoid stigma, discrimination, and unnecessary disclosure in their home countries – especially in the case of positive results for HIV and STIs. However, linkage to care and treatment for them remains a challenge.

North Star Alliance also provides services to local communities both in Zambia and Zimbabwe. However, routinely collected data from other countries show that patients in South Africa tend to come to North Star Alliance services more regularly than in the other countries. There is a similar pattern of utilization by truck drivers both by country and over time. In South Africa, truck drivers tend to attend PHC services and these visits have increased over the two-year period. In Zambia, truck drivers mostly access HIV-related services while in Zimbabwe, they access both PHC and HIV-related services. The numbers of services accessed have remained stable in Zambia and Zimbabwe. Albeit the variable data quality across countries utilisation is more likely to be attributed to the overall healthcare services, facilities and general infrastructure available to the general populations in Zambia and Zimbabwe.

Formally contextualising and generalising findings from this study to the African trucker population is limited by the dearth of available comprehensive truck driver healthcare utilisation data; possibly linked to services offered to them (the emphasis on sexually transmitted diseases in truck drivers has influenced health programming for truck drivers to focus on HIV (behaviour change communication, outreach, condom distribution and testing) and STIs) and programmes' general lack of recording and reporting [13]. However a Nigerian survey reported that commercial truck drivers in the age range 30–39 years were most likely to use HIV services [25], where we found no significance in our study. Moreover, a survey conducted in the US among long distance truck drivers similarly found that the middle aged, married truck drivers had the most interest in PHC related services and less interest in STIs; dissimilarly finding that HIV was the second least of interest [5]. Accessing healthcare is in part related to availability and this availability is related to a country's evidenced or perceived burden of diseases. From the observations mentioned above it stands to reason that high burdened HIV countries will have a strong HIV response and healthcare utilisation will be favoured towards HIV services. However, it is crucial to note that lack of reporting hinders the development of appropriate country responses which ultimately influences patterns of utilisation, uptake and health outcomes not only in truck drivers but in all populations (priority and general).

This study presents some limitations. Firstly, with routinely collected information only, there is the possibility that utilisation is actually higher than that reported and misreporting is possible. However, when paper records were also available, data quality checks were performed periodically as part of quality assurance programmes for external funders. Secondly, the data describe healthcare utilisation among attendees of North Star Alliance's RWCs and thus exclude both truck drivers who require health services but have not been accessing them at all and those accessing services from providers other than RWCs. Nevertheless, our results highlight the need for programme planners to consider the following vital aspects when designing healthcare packages for this priority population. Firstly, given that truck drivers mostly access services for non-communicable diseases, the lack of provider-initiated testing and counselling illustrates an important missed opportunity. Comprehensive care service delivery packages and training for staff to deliver them in these settings will increase the quality and impact of services available to truck drivers, which in turn might increase service demand. Attracting more truck drivers into the clinics provides further opportunities for healthcare providers to offer screening, testing, and/or management of other communicable diseases. This comprehensive care and its increased use will simultaneously generate a healthier truck driver population, with subsequent economic benefits, and will address diseases that are public health priorities.

Conclusion

This utilisation analysis shows that tailored services do assist in alleviating healthcare access challenges faced by truck drivers. It is however important to ensure that service packages and clinics speak to the needs of truck drivers in terms of services offered and clinic location. A comprehensive package of care will tackle both communicable and non-communicable disease burdens and provide South Africa with a healthier truck driver workforce.

Additional file

Additional file 1: Lalla-Edward_Sup mat S1_Uptake of health services, Table S1. North Star Alliance Tier 1 core service package implementation guidelines. Narrative description of core services/service categories offered by North Star Alliance Roadside Wellness Centres. (DOCX 38 kb)

Abbreviations

AIDS: Acquired Immune Deficiency Syndrome; AOR: Adjusted Odds Ratio; ART: Antiretroviral Therapy; CI: Confidence Interval; COMETS: Corridor Medical Transfer System; HIV: Human Immunodeficiency Virus; n: Number; PHC: Primary Healthcare; RWC: Roadside Wellness Centre; SD: Standard Deviation; SP: Stable Partner; STI: Sexually Transmitted Infection; TB: Tuberculosis; UOR: Unadjusted Odds Ratio

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Availability of data and materials

All databases of anonymised clinic attendee data are stored at the Wits Reproductive Health and HIV Institute.

Authors' contributions

STLE, WDFV and GGB conceived and designed the study. SN did data extractions and data cleaning for analysis. STLE, SN and GGB analysed the data. STLE wrote the first draft. All authors critically revised the manuscript for intellectual content and approved the final draft.

Ethics approval and consent to participate

Ethics approval was obtained from the University of the Witwatersrand Human Research Ethics Committee (M140506) on 30 May 2014. In addition, North Star Alliance and Wits Reproductive Health and HIV Institute signed a data user's agreement on 5 May 2014 to ensure that data was appropriately handled throughout the data management cycle.

Consent for publication

Not applicable.

Competing interests

The following author has competing interests: Paul Matthew is the Regional Director, Southern Africa at North Star Alliance. All other authors have declared that they have no competing interests.

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Appendix C: North South Corridor Demonstration Project Outputs

Appendix C1: Final Report



North-South Corridor Demonstration Project: FINAL REPORT

Prepared by Gabriela B Gomez, Samanta T Lalla-Edward, Sydney Ncube, Siyabulela Fobosi, Alinda Vos, Stephan Rupert, Catherine A Hankins, and WD Francois Venter

February 2017

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Abbreviations

AIGHD	Amsterdam Institute for Global Health and Development
CHAI	Clinton Health Access Initiative
COMETS	Corridor Medical Transfer System
CRP	C-reactive protein
DHO	District health office
ECG	electrocardiogram
FSW	Female sex workers
HCT	HIV Counselling and Testing
HIV	Human Immunodeficiency virus
M&E	monitoring and evaluation
MoH	Ministry of Health
MOU	Memorandum of Understanding
N/A	Not applicable
NCD	non communicable disease
NIMART	Nurse Initiated and Managed Antiretroviral Therapy
NSP	National Strategic Plan
PHC	Primary healthcare
PrEP	Pre-exposure prophylaxis
RWC	Roadside Wellness Clinics
SADC	Southern African Development Communities
SAMEA	South African Monitoring and Evaluation Association
SANAC	South African National AIDS Council
STI	Sexually transmitted infections
TB	Tuberculosis
Wits RHI	Wits Reproductive Health and HIV Institute

Executive summary

Transport workers (such as truck drivers), sex workers and border communities have specific healthcare needs and health vulnerabilities. Currently, the (predominantly privately-run) trucking industry in sub-Saharan Africa has attracted international donor and domestic funding for corridor-based programmes tackling different aspects of the health needs of these populations with healthcare programmes implemented in 30 countries across sub-Saharan Africa since 1989. Just over half of these programmes has been evaluated to date. These evaluations have shown increases in output indicators, such as the number of HIV counselling and testing sessions, and a positive change in outcome indicators, e.g. decreases in reported risk behaviours. However, results on impact indicators have been inconsistent and attribution to any specific programme has been a challenge across all evaluations.

North Star Alliance, a non-governmental organization, runs one of these programmes providing healthcare to mobile populations and communities along transport corridors and at border crossings through a network of roadside wellness clinics (RWCs). In this report, we present the background, methods and results of North Star Alliance's North-South Corridor Demonstration Project. Our aim was two-fold: 1) to build a body of evidence showing the impact of the RWC model on the health of mobile populations such as truck drivers; and 2) to design, pilot and evaluate a tailored antiretroviral treatment (ART) service for North Star Alliance.

Our evaluation adopted a programme logic model as a comprehensive framework for a mixed methods approach. It helped build evidence along the causal pathway leading to impact. However, the measurement of impact at a population level was outside the scope of this evaluation due to logistical and methodological constraints. During this evaluation, we collected programme data for (South African) Department of Health reporting, routinely collected data, individual interviews, and longitudinal data. We included nine sites in South Africa, four sites in Zimbabwe and one in Zambia.

Non-ART services

We observed a variation by country both in the type of key populations accessing RWCs and the services accessed: In South Africa, truck drivers are the main clients of the North Star Alliance RWCs; however, both in Zambia and Zimbabwe North Star Alliance is providing a needed service to local communities. In South Africa, all RWCs attendees tend to attend mainly PHC services. In Zambia, they tend to access mainly HIV-related services; while in Zimbabwe, they access both PHC and HIV-related services. The overall number of visits has remained stable in both Zambia and Zimbabwe, while increased over the last two years in South Africa. In particular, in South Africa, both truck drivers and sex workers reported accessibility and satisfaction with North Star Alliance services. North Star Alliance is currently providing services that help tackle two structural barriers previously reported by sex workers in access to care: 1) negative experiences with staff and 2) fragmentation of available healthcare services.

For most non-ART services, North Star Alliance provides a screening service and referral for appropriate cases. It is expected that a successful referral system will be North Star Alliance's mechanism for impact. Across all sites in South Africa, the main reported reason for referral was primary healthcare. Currently, routine follow-up of referrals is not efficient. However, for patients followed up, we observed high rates of successful linkage, i.e. those referred did attend the referral sites. Therefore, we conclude that RWCs assist as satellite services in alleviating healthcare access

challenges faced by truck drivers, sex workers and local communities. It is important for North Star Alliance to ensure that service packages and clinics speak to the needs of the population serviced and that the integration of services is improved.

ART services

Free ART services were designed, developed and integrated, following the South African Department of Health policies, including between-site and cross-border monitoring with follow-up through electronic data sharing. Site preparation included the development of policy documents, standard operating procedures, and the recruitment and training of staff. There were important operational challenges in the implementation of this service, including delays in site accreditation, long turnaround time for lab results, and the dependence of sites on drug supply from the Government.

We evaluated ART service up to 31st May 2016. While the majority of patients initiating ART came from the community and North Star Alliance achieved 285 ART initiations (target of 300), the average number of initiations per month was low across all sites. The North Star Alliance ART service was implemented during a period where national guidelines in South Africa recommended the initiation of ART at a CD4 threshold of 500 cells/mL. At this threshold, we observed that most patients presenting for testing and found to be positive were eligible for treatment, indicating late presentation to care. We obtained 145 informed consents from HIV-positive participants to be followed up, of which we were able to contact 57%. Among those followed up, by the end of the North-South Corridor Demonstration project, more than 60% had been retained in national care, similar to rates currently observed in the national general population.

Truckers Health Survey

The Trucker Health Survey (a cross sectional survey) established a baseline of common health problems regarding truck drivers in South Africa. We had recruited 521 truckers by the end of 2016. We conducted this survey in response to the observation that the number of visits for primary healthcare has been increasing over the last two years across sites. It was, however, not clear what the actual healthcare needs are. During this survey, we found that HIV service provision still needs to be prioritised, given relatively low condom use and ART coverage of 50% in our sample. Risk factors for non-communicable diseases and mental health issues indicate that both screening and linkage to care need to be prioritised for these two areas.

Conclusion

The North-South Corridor Demonstration project was a successful initiative in the following aspects. First, our analysis of service access, utilization, and the needs of truck drivers, sex workers, and communities in border sites had an immediate effect on North Star Alliance service delivery planning. Second, the iterative process of data extraction, analysis, and feedback between partners has improved data quality across participating sites. Third, during our design and piloting of the North Star Alliance-specific ART service, we learnt and communicated to North Star Alliance operational and logistical lessons that will improve service expansion to other sites. In particular, Wits RHI developed trainings and standard operating procedures to facilitate the scale-up of the service. The North-South Corridor Demonstration project also had a significant component of capacity building, both individual and organizational. We strengthened research capacity across all partner institutions and developed processes for the monitoring and evaluation of data quality.

To date, we have produced a substantial body of evidence to support the contribution of North Star Alliance to better health in HIV care, as well as more broadly in non-communicable and occupational health. The research has also shown the potential for North Star Alliance to have a model for improving access to healthcare to remote places. Although the complexity of stakeholder engagement was highlighted as a risk for future site ART accreditation, North Star Alliance RWCs represent a platform to successfully expand access to testing, provide a point of linkage to ART care and help monitor (uncomplicated) patients along transport corridors. Following the North-South Corridor Demonstration project, participating sites in South Africa were independently evaluated and have been included in the National pre-exposure prophylaxis pilot. All this evidence points towards the positive role North Star Alliance could play in helping countries achieve the 90-90-90 objectives.

Project background

The Dutch Ministry of Foreign Affairs has been a long-term funder of North Star Alliance. When the Ministry undertook an end-of-term review of North Star Alliance services and performance, the main recommendations were:

- North Star Alliance must ensure that it remains relevant to the health, safety and wellness needs and concerns of mobile populations and, in particular, to those of its core target group of truck drivers;
- North Star Alliance should continue to strengthen its focus on the value-add that it brings to the transport sector, and work to expand its existing competencies, skills set and the service excellence, products, and innovations that it is known for;
- North Star Alliance should strengthen its capacity to analyse the Corridor Medical Transfer System (COMETS) data so that it provides a basis for stronger evidence-based decision making.

In response to these recommendations, North Star Alliance presented a proposal for service expansion and research to the Dutch Ministry of Foreign Affairs. In this proposal, a “ground-breaking longitudinal study” was put forward to build evidence of North Star Alliance health impact and to strengthen North Star Alliance’s service delivery platform. This original proposal included PharmAccess and Wits RHI as implementation partners and AIGHD as an academic partner. During the contracting phase of the research project, it became clear that the initially envisioned approach of having PharmAccess fulfil the programme management role was impractical. Furthermore, it also became clear, after further discussions among partners and preliminary site visits along the North-South Corridor (from Durban, South Africa to Lubumbashi, Democratic Republic of Congo (DRC), that a randomized controlled trial design (involving the longitudinal follow-up of cohorts – control and intervention – and needed to attribute health impact to North Star Alliance activities) was not viable due to logistical and research considerations and financial limitations. These discussions and observations led to a subsequent proposal being put forward entitled “Corridor-based provision of antiretroviral treatment to mobile populations – February 2012”. It was this research proposal that was the main subject of discussion during a meeting between partners and the Dutch Ministry of Foreign Affairs in March 2013. During this meeting, it was agreed that:

- The primary intention of the research component of North Star Alliance’s second core funding grant is to build a body of evidence showing the impact of North Star Alliance’s roadside wellness centre model on the health of mobile populations such as truck drivers.
- The current study design is focused on expanding North Star Alliance’s capacity to provide antiretroviral therapy for these populations, both in line with the current national guidelines, as well as the anticipated shift to earlier treatment guidelines. While acknowledging the potential importance for scientific research of the study design, as well as the potential long-term benefits to North Star Alliance, the Ministry/Embassy regards this as being of secondary importance to the above-mentioned primary objective.
- North Star Alliance is free to make changes to the study design as long as the aims remain in line with the primary objective.

Following this meeting, North Star Alliance, AIGHD and Wits RHI re-designed the North-South Corridor Demonstration Project (The Demo project) as a collaboration among the three partners. Its

overall purpose was to support the expansion of health services provided by North Star Alliance to include nurse-initiated management of antiretroviral treatment (NIMART), while documenting the extent of implementation and the quality of North Star Alliance's non-ART services.

If the findings were positive, this body of evidence could then be used to argue the role of North Star Alliance services in improving the health of mobile populations, including truck drivers. Contracts were signed in December 2013 for a project of three years (from 1 January 2014 to 31 December 2016). The research proposal followed an implementation science framework, and was designed as an iterative process whereby the research findings were fed back to North Star Alliance with the aim of facilitating ongoing improvements in data collection and data quality. The research proposal also aimed to provide insights into the acceptability and uptake of healthcare services by key populations and to document the implementation of the new ART service.

By July 2014, a comprehensive protocol of health services research was developed. We reviewed and approved it during a workshop among partners held in Johannesburg (August 2014). This protocol received ethical approval from South Africa in 2014 (ethical approval was not secured in Zimbabwe and Zambia) and activities started early 2015. In June 2015, the project progress was thoroughly evaluated during a partner meeting in Utrecht and an adjusted timeline and milestone chart were set up. Two further progress evaluation meetings among partners were held in Durban in November 2015 and in Utrecht in March 2016. After the progress evaluation meeting in March 2016, the partners of the Demo project proposed additional research that would benefit the overall aim and could be accommodated in the original budget with no increased cost. These activities were to be executed in 2016 and to be fully in line with the original research and programme activities.

The proposed cross-sectional survey aimed to provide in-depth information on the overall health of approximately 500 long-distance truck drivers in South Africa. The research would gather data on basic demographics; occupational health issues, such as sleeping disorders, backache; mental health questions, such as anxiety and depression scores; non-communicable diseases and risk factors such as weight, blood pressure, cholesterol and glucose levels; and sexual behaviour, HIV, STI screening, hepatitis B and tuberculosis. It was expected that this research would inform North Star Alliance in shaping their primary healthcare interventions and tailoring their service package (including HIV-related interventions) for the future, to stay in a leading position to best serve truck drivers.

A final workshop to summarize all activities and results and to prepare financial reporting and closure of the project was held in Johannesburg, end November 2016. A secondary objective of the final workshop was to encourage institutional learning and knowledge transfer between teams. As a result, the workshop was opened to staff other than the core Demo project staff from partner organizations. These included people involved in continuing collaborations in follow-on projects such as expansion of chronic care and the establishment of a chronic disease cohort, along with people involved in evaluations of the national pre-exposure prophylaxis programme and the South African Ministry of Health's expanded antiretroviral treatment roll-out.

Of note, while the original ambitious research protocol ("Corridor-based provision of antiretroviral treatment to mobile populations – February 2012") was not implemented, we published a communication on the ethical and logistical challenges encountered during its design for the benefit of the wider research and implementation community(1).

Introduction

"Evaluation is the systematic investigation of the quality, worth and/or significance of a programme" (Professor Michael Scriven). There are five central questions guiding an evaluation:

1. What will be evaluated? (i.e., what is "the programme" and in what context does it exist?)
2. What aspects of the programme will be considered when judging programme performance?
3. What evidence will be used to indicate how the programme has performed?
4. What conclusions regarding programme performance are justified by comparing the available evidence to the selected standards?
5. How will the lessons learned from the inquiry be used to improve public health effectiveness?

This report aims to provide answers to these five questions and is structured as follows:

In section 1 (context), we introduce the public health context of previous evaluation research methods and results from other programmes providing care to similar populations in similar settings. We then describe in detail the programme and services provided by North Star Alliance.

In section 2 (methods), we discuss the aspects of the programme to be evaluated, the data gathered and the methods selected, including their limitations.

In section 3 (results), we present the results of the evaluation for two types of services: non-ART services and ART services, as well as for the Truckers Health Survey. Activities such as capacity building are also reported in this section.

Finally, section 4 (conclusion) provides the conclusions of the body of research as a whole, a description of lessons learnt and recommendations including dissemination strategies and future research.

Section 1: CONTEXT

Transport workers (such as truck drivers), sex workers and border communities have specific healthcare needs and health vulnerabilities. Globally, they bear a disproportionate health burden, including high rates of sexually transmitted infections (STIs) and HIV; and in the case of truck drivers – cancer, cardiovascular diseases, chronic conditions, respiratory diseases, and an array of mental health conditions. In sub-Saharan Africa, transport corridors are essential for local economies due to lack of waterways and inadequate rail services. Because of the transcontinental nature of the transport industry, health programmes prioritizing truck drivers, border populations, and key populations (including sex workers) along these corridors require complementary national healthcare policies. Most countries in the region are aware of the susceptibility of transport workers and border populations to poor health outcomes, and Ministries of Transport and Health have begun to develop strategic plans to address this issue. However, public sector financial and human resources constraints have delayed progress(2,3).

The trucking industry in sub-Saharan Africa is predominantly privately run and has attracted international donor and domestic funding for work-related programmes tackling different aspects of the health needs of truck drivers and populations along corridors. Increasingly, implementation has proceeded across the region of healthcare programmes prioritizing truck drivers and border communities(4), one of which is North Star Alliance. However, further planning for efficient implementation, scale-up, and sustainability of these setting-specific healthcare programmes may be hindered by knowledge gaps about the needs of prioritized populations and the impact of existing healthcare services on health outcomes(3).

In describing the context for the Demo project, we present an overview of the landscape of healthcare programmes implemented in sub-Saharan Africa prioritizing truck drivers, along with our assessment of both the methods used to evaluate their impact and the evidence documenting that past or current programmes have had an impact on truck driver health outcomes. To accomplish this, we conducted a systematic review of published and grey literature(3). Subsequently, we describe the North Star Alliance model and core service package, as well as discrete initiatives.

Past and current healthcare initiatives prioritizing truck drivers in sub-Saharan Africa

We performed a systematic review of the literature available on healthcare programmes prioritizing truck drivers in sub-Saharan Africa (description, evaluation methods, and impact results)¹. We describe 22 healthcare programmes implemented in 30 countries across sub-Saharan Africa since 1989. These programmes provide(d) mainly HIV prevention and diagnosis services. No ART services have been offered on site and only three programmes expanded their services to cover malaria, tuberculosis, and general primary care services (i.e. ROADS II, Corridors of Hope, and North Star Alliance). This provision of vertical services reflects both the overall regional HIV disease burden and the particular focus of donors, while the lack of ART provision reflects the logistical challenges of treatment provision across national borders. Of the 22 programmes identified, just over half (n = 12) were evaluated in 17 countries. Both the methodological approaches and their quality varied across studies from qualitative appraisals, including focus group discussions and interviews, to quantitative

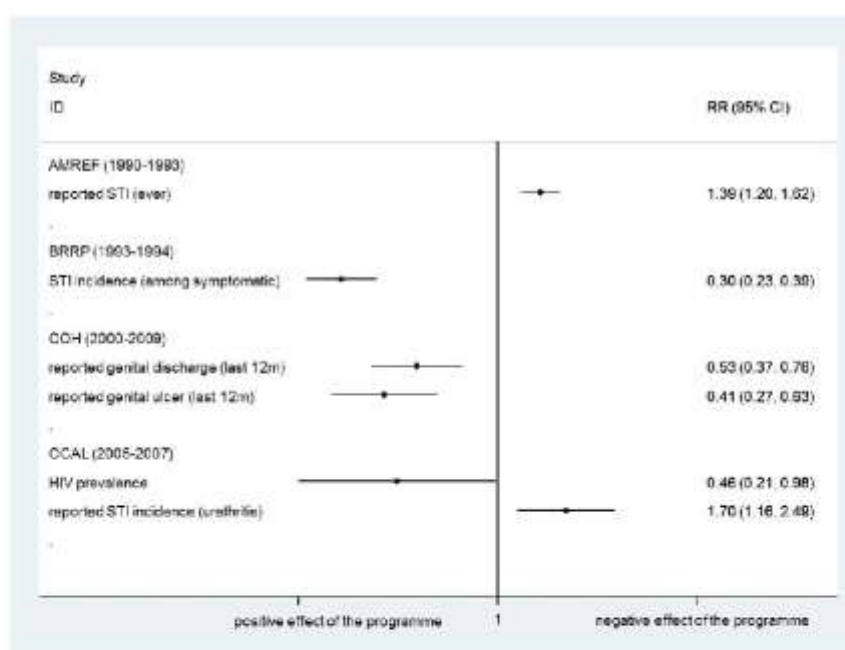
¹ We registered a protocol (CRD42014013327) on the international prospective register of systematic reviews, Prospero(5). We published the review in PLOS ONE(3), adhering to the PRISMA guidelines for reporting of systematic reviews and meta-analyses(6).

designs, such as pre- and post-intervention surveys, statistical analysis of routinely collected data, and trend analysis of repeated cross-sectional surveys.

Sampling strategies, when used, and sample sizes also varied across evaluations. Due to the mobility of this population, most of the evaluations had to adjust their sample size and sampling method to make use of simple random or purposive sampling. We assessed the major limitations found in the majority of evaluation studies. These included: 1) absence of control or comparison groups ($n = 10$), hindering attribution to the programme of any observed effect and 2) the lack of biological data measurements (e.g. HIV/STI testing), introducing biases in reporting of some of the evaluated outcomes ($n = 4$).

All programmes reported output ($n = 42$) or outcome indicators ($n = 16$). Output indicators generally described the volume of services provided and clients reached. Six programmes provided sufficient data on outcome or impact indicators. In Figure 1, we present the forest plot of impact indicators including changes in HIV prevalence for one programme and STI incidence (most of them self-reported symptoms) for four programmes (7–10). One additional programme reported changes in AIDS-related mortality, stigma, and social norms using qualitative data and was not included in the figure (11).

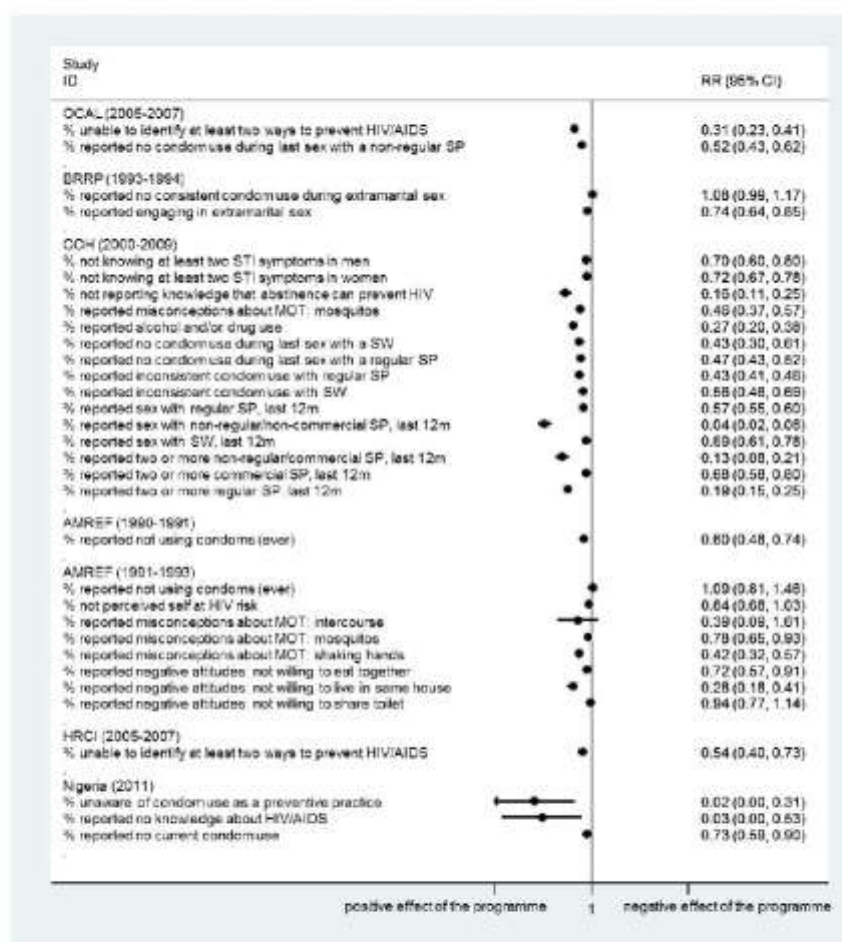
Figure 1 – Changes observed in impact indicators



In Figure 2, we present the forest plot of outcome indicators. Results for outcome indicators were consistent across the programmes, with decreases in reported risk behaviours or misconceptions and

negative attitudes towards people living with HIV(7–10,12,13). All programmes reported substantial increases in output indicators, such as the number of HIV counselling and testing sessions or the numbers of condoms distributed.

Figure 2– Changes observed in outcome indicators



The majority of the programmes were funded by agencies external to the country of implementation and for limited periods of time. Only three programmes were funded by trucking companies/bodies. The funding sources influenced the aims and objectives of evaluations. The need to report specific indicators for programme monitoring and reporting is donor-dictated, with both the evaluation design and general streamlining of data collection having to be compliant with donor priorities. Since the main indicators are input, output, and outcome monitoring data, programmes remain deficient in measures to evaluate impact unless a separate study is envisaged.

In terms of services, North Star Alliance provides a comprehensive menu across their RWCs. These services cover a range of primary healthcare (PHC) and prevention and screening services for a variety of infectious diseases (HIV, STI, tuberculosis (TB), malaria). Table 1 presents a detailed description of standard services across RWCs.

North Star Alliance also runs additional services to improve diagnosis (GeneXpert machines available in selected sites and laboratory services on-site in Kenya), adherence (a programme of SMS reminders) and retention (a programme of loyalty points). These services were not part of the programme evaluated for this report.

Table 1 – Core services provided by North Star Alliance at RWCs

	PREVENTION	SCREENING	DIAGNOSIS AND TESTS	CARE AND TREATMENT	REFERRAL
HIV/AIDS	Health promotion and education; Condom distribution and demonstration; Male circumcision*; Outreach; PEP*; Counselling on PMTCT	Medical history; Sexual behaviour; Physical examination	HIV rapid testing; advise on return visit/window period; on partners testing	Nutritional supplements; Basic care of OI and side effects of ART; Emergency supply and provision of ART*; Counselling; adherence and disclosure; CTZ	Referral to hospital for complementary and periodic investigations (CD4, viral loads, screening for ART side effects); nutrition/psychological support
STI	Health promotion and education; Condom distribution and demonstration; Male circumcision*; Outreach; Partner contact tracing	Medical history; Sexual behaviour; Physical examination	Syphilis rapid test	Syndromic management; Counselling for partner treatment; Advise on follow-up and return date	Referral to hospital for recurrence, non-responsive and complicated cases
TB	Health promotion and education; Infection control*	Medical history; Social background; Physical examination; symptomatic screening	Weight/BMI; HIV rapid testing	Counselling on adherence to treatment and periodic follow-up for treated cases	Referral to hospital for further investigations
Malaria	Health promotion and education (excl. vector control at domestic level); Provision of preventive treatment to traveller from malaria-free to endemic countries*; Distribution of mosquito nets*	Medical history; Personal social and professional background; Travel history; Physical examination	Malaria rapid test	Malaria and symptomatic treatment; Advise on second course of treatment one week after travelling to high incidence countries and on preventive actions	Referral to nearest hospital for complicated cases (neurological, vomiting, uncontrolled temperature >40°C)
PHC	Health promotion and education (personal and food hygiene); Public health education and sensitization	Medical history; Physical examination (signs of dehydration); Preventive screening (cervical cancer): all women STI cases and age 25-50	HIV rapid testing; blood pressure, weight, BMI, urine test	Symptomatic management of un-complicated cases (antibiotics)	Referral to nearest hospital for severe symptoms or suspected notifiable diseases

Primary healthcare includes care related to gastro-intestinal; respiratory tract; ear, nose, and throat; eye; and skin infections; hypertension; diabetes; cervical cancer; bone-joint/neuro-psychological disorders; substance abuse; emergency/first-aid; family planning; safety; immunisation. Abbreviations: HIV, human immunodeficiency virus; AIDS, acquired immune-deficiency syndrome; PEP, post-exposure prophylaxis; PMTCT, prevention of mother to child transmission; OI, opportunistic infection; CTZ, Cotrimoxazole; ART, antiretroviral therapy; BMI, body mass index; BP, blood pressure.

*Not available at all RWCs.

Section 2: METHODS

Evaluation framework

In order to build a body of evidence showing the impact of North Star Alliance's roadside wellness centre model on the health of mobile populations such as truck drivers, we defined the following objectives:

1. To describe the healthcare-seeking needs and behaviours of North Star Alliance clients.
2. To evaluate improvements in the effectiveness of RWC networks in delivering frontline prevention, treatment, and care services to key populations.
3. To evaluate improvements in the effectiveness of RWC networks in enhancing adherence to sexual and reproductive health treatment programmes among key populations accessing North Star Alliance services.

We defined indicators for these objectives by adopting a programme logic model as a comprehensive framework for mixed methods evaluation, Figure 5(15).

Figure 5 – Logic model



In this model, inputs represent resources used by the programme (for example, staff or costs); activities are actions in which resources are used (for example, training sessions, recruitment, site accreditation). The first level of results associated with a project are the outputs. These are direct immediate-term results (e.g. ART initiations, PHC visits). The second level of results associated with a project and representing medium-term consequences are outcomes (e.g. changes in the proportion of HIV-positive people diagnosed or the proportion of eligible patients on ART). Finally, the third level of project results and long-term consequences are impact indicators, such as changes in HIV prevalence. This third level of results is particularly challenging to measure (see text box).

Issues measuring impact

Attribution: How do the observed changes in the target unit (e.g., individual, community, or region) compare with the changes that would have been observed without the intervention, holding all other factors constant? To be able to attribute an effect we need a comparison group – this can be a control arm in a trial; a statistical control from the population; or a modelled counterfactual. The main issue is to ensure that the only variable is our programme, all other factors being the same. This is particularly challenging when our programme is not the only healthcare programme being accessed.

Measurement: What to measure? Impact indicators such as HIV prevalence at population level have long timeframes in order to observe changes and underlying trends in the epidemic. Our ability to measure changes in impact indicators is dependent on programme coverage. This is challenging in our case as we have no indication of North Star Alliance coverage among this population or whether this coverage is enough to enact a change at population level.

Having defined indicators using the logic model, we then proceeded to map them along the cascade of care for both ART and non-ART interventions (other prevention HIV services but also TB, malaria, STI and primary healthcare) in order to measure the project objectives. The resulting evaluation framework is presented in Table 2.

Table 2 – Evaluation framework

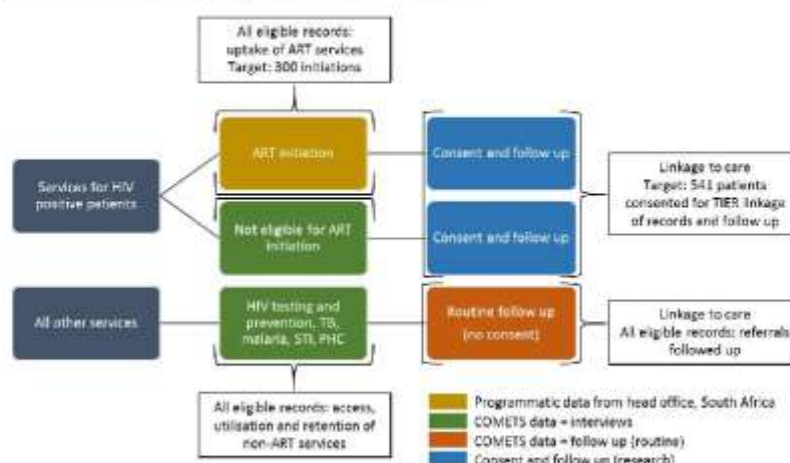
	Objective 1	Objective 2	Objective 3
Inputs/Activities	(qualitative research on access to care and truckers' health survey to establish healthcare needs) ¹	Adapted NIMART ² service development Number of nurses recruited and trained Accreditation of sites Costs	Services provided Opening hours
Outputs	Number and type of services accessed	Number on ART Number linked to Tier.net ³ Number linked to care among referred	Number repeat visits
Outcomes	Number tested positive	Number eligible patients started ART	Number ART patients retained in care

¹ Inputs and activities in objective 1 are not measured in terms of a qualitative indicator but evaluated as a body of qualitative evidence. ² NIMART: nurse-initiated and managed antiretroviral treatment. ³ Tier.net is the South African National ART Monitoring & Evaluation system

Data sources

We designed this project as a mixed-methods research. As such, we collected data from different sources (Figure 6). This included: descriptive analysis of programme data for Ministry reporting, descriptive and statistical modelling of routinely-collected data in COMETS, qualitative analysis of individual interviews, and establishment of two cohorts for descriptive statistics (one cohort using routinely collected follow-up data and one cohort of HIV-positive patients actively followed up through phone calls and record linkage to Tier.Net system - South African National ART Monitoring & Evaluation system).

Figure 6 – Data sources by type of service and analysis



The section below describes each data source and the data process.

Programmatic data from Regional Office, South Africa

Data from patients being treated with ART in South Africa need to be collected and reported to the Department of Health. These data are reported from the RWCs to the Regional Office in South Africa weekly and are also recorded in paper records at each site. These data were used to evaluate the uptake of North Star Alliance NIMART.

COMETS routinely collected data

We included in this report data from 14 sites across Zambia, Zimbabwe, and South Africa:

- South Africa: nine RWCs across seven provinces. These clinics are located in Cato Ridge and Pongola (KwaZulu Natal), Bloemfontein (Free State), Bloemhof (North West), Ngodwana (Mpumalanga), Musina (Limpopo), Upington (Northern Cape), and Pomona and City Deep (Gauteng). Currently, eight of these clinics are operational. The City Deep site in Gauteng province was closed due to challenges experienced by truck drivers in accessing the location and was relocated to another district. It now operates at the Pomona site (Gauteng province).
- Zambia: Beitridge, Chirundu South, Forbes, and Victoria Falls
- Zimbabwe: Chirundu North

Anonymised data were last extracted on 11 April 2016 from North Star Alliance's COMETS database for the two-year period from 1st October 2013 to 30th September 2015. Information extracted included site name, COMETS unique identifier, socio-demographic variables (such as age, sex, occupation, nationality, and marital status), and visit information (including visit date and type of service accessed). Information such as educational level or income is not routinely collected in this system; therefore, this information could not be included in the analysis. After data extraction, we excluded duplicate and incomplete records. Records were then organized to provide both unique attendee and unique visit information. All data were analysed using STATA 12.

Continuous data (age) were described by means, and then grouped into categories. Categorical data such as nationality and marital status were categorised in two groups each. For nationality, we defined South African and other nationalities. 24 more nationalities were included : Angola, Botswana, Congo and DRC, Ethiopia, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Niger, Nigeria, Rwanda, Saint Helena, Senegal, Somalia, South Sudan, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, and Zimbabwe. For marital status, we defined a group of truck drivers with no stable partner, including those reporting they were currently divorced, single or widowed, and a group with a stable partner, including those reporting they were currently married or cohabiting.

We reported all services accessed by type of service. Types of service included: HIV, STI, TB, malaria and PHC. We described the distribution for both our sample of attendees and for visits across different socio-demographic characteristics and services accessed. We assessed associations between having multiple visits and socio-demographic characteristics using uni-variable and multi-variable logistic regression models.

We also extracted and analysed referral information. Referral outcome was defined as the patient attending the referral site (successful linkage to care). For those whose referral outcome was not recorded, we followed up with a phone call to determine referral result.

The data had some limitations. The main classification of clinic attendees into occupational groups depended largely on accurate and complete reporting by patients. With some people meeting the criteria for sex work not self-identifying as sex workers, we might have underestimated the total volume of visits and services accessed by sex workers. As with any analysis of routine data, we are dependent on the quality of the routine reporting. Significant efforts were made to achieve an adequate level of recording, with several rounds of audits and validation checks described in the next section "Data quality".

Data quality

Wits RHI provided monitoring and evaluation support, co-funded by USAID, to select South African North Star Alliance RWCs. The monitoring and data quality activities, together with findings from the PEPFAR site improvement through monitoring (SIMS) assessments, are detailed below.

RWC data were reported to Wits RHI on a monthly basis. These data were quality checked and all discrepancies were queried with the clinics until the data were signed off. Wits RHI's access to databases of the North Star Alliance database COMETS was used as an additional mechanism to verify the reported data. Lastly, the Wits RHI team, together with core monitoring staff from North Star Alliance visited the clinics on a quarterly basis to conduct SIMS assessments. Table 3 describes findings for SIMS assessments conducted between July and August 2016 for five clinics that were included in this evaluation.

After the assessments, planning meetings were conducted and it was decided that, due to the number and type of data discrepancies found (despite continuous technical support), a data technical working group (comprising members from Wits RHI and North Star Alliance) would be formed. This working group has met on a monthly basis, operating according to agreed-upon terms of reference. This is an activity that will continue beyond the life of this grant as it was decided at the technical working group meeting in quarter 4, 2016 that site assessments will resume in quarter 1, 2017. All data quality issues, however, have been resolved since the quarter 3, 2016 assessments.

Table 3 – Findings from site assessments, July-August 2016

RWC	Stationery	Data verification	Tier.net assessment tool	SIMS – M&E Corrective Action Required
Bloemfontein	Department of Health registers in use. North Star Alliance stationery completed. COMETS in use. All data sources completed by the counsellors and/or primary healthcare nurses	(n = 10 files) 70% of clients entered into HCT register. 60% were captured into COMETS database as HCT clients. 60% were captured with positive HIV status and 40% negative status even though the status on the consent form is positive. 60% had 1 st test captured into COMETS. 40% had 2 nd test captured	N/A	Regular data verification. Follow-up of HIV-positive referred clients. Regular staff meetings to review progress against targets.
Bloemhof	Department of Health stationery out of stock. North Star Alliance stationery completed. North Star Alliance HCT consent forms used. COMETS in use. All data sources completed by the counsellors and/or primary healthcare nurses	(n=24 files) 80% had consent forms for HCT. 60% were captured with a positive status in COMETS. Remaining 34% reflected a negative status although documented as positive. 79% of the clients were documented on the consent form as HIV-positive and 21% negative – captured as positive in COMETS. 42% have no COMETS number on the consent form or HCT register. Of the positive clients only 71% had a 2 nd test documented. 50% of the positive clients had a 2 nd test documented in COMETS	N/A	Regular data verification. Daily quality checking of capture. Regular staff meetings to review progress against targets. Document all data queries and resolutions
Cato Ridge	Department of Health stationery in use. North Star Alliance stationery completed. North Star Alliance HCT consent forms used. COMETS in use. All data sources completed by the counsellors and/or primary healthcare nurses	(All positive status entries in COMETS and HCT registers were reviewed for January to May 2016. A comparison was also made against client consent forms). The total positives per month did not match across documents or electronic database. Some of the consent forms did not have a client signature. Many of the consent forms were completed by the clients and this made it difficult to read because of poor hand writing of the clients	N/A	Regular data verification. Regular staff meetings to review progress against targets. Document all data queries and resolutions. Retraining on consenting and documentation completion
Pomona	Department of Health stationery in use. North Star Alliance stationery completed. North Star Alliance HCT consent forms used. COMETS in use. Tier.net and ART clinical stationery in use. All data sources completed by the counsellors and/or primary healthcare nurses	(All client HCT records for the period January – June 2016 were reviewed). Discrepancies between the consent forms and the documenting in the HCT register for every month reviewed. Page tallies not completed	Clinical record keeping had a score of 68% and data capturing 74%. The facility achieved an overall score of 72% for Tier.net implementation	Regular data verification. Regular staff meetings to review progress against targets. Retraining on register completion

Uginton		(All client records for the period January – June 2016 were reviewed.) Discrepancies between the consent forms, COMETS database and the documenting in the HCT register for every month reviewed. Illegible consent forms. (photocopied). No COMETS number on consent forms. Duplicate entries in COMETS. HCT testing information incomplete. Confirmatory tests not documented	Start dates missing in clinical stationery. CD4 and viral load data missing. Incorrect documentation of regimens	Regular data verification. Daily quality checking of capture. Regular staff meetings to review progress against targets. Document all data queries and resolutions. Retraining documentation completion. Develop and maintain a client folder filing system
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Research-specific data

Individual interviews

After obtaining informed signed consent from all participants (information sheets and consent forms were provided in local languages), we conducted 25 semi-structured interviews of FSWs who had access to the RWCs (South African: 16; Zimbabwean: 8; Namibian: 1). We interviewed these sex workers in five sites across South Africa: Cato Ridge (KwaZulu Natal), Bloemhof (North West), Ngodwana (Mpumalanga), Musina (Limpopo), and Upington (Northern Cape). They either had some secondary school, completed secondary school, or had some post-secondary education. Almost all sex workers earned a monthly income of less than <R5000.

For truck drivers, we interviewed two groups of truck drivers: users (n=24) and non-users (n=22) of RWCs in six sites: Cato Ridge (KwaZulu Natal), Bloemhof (North West), Ngodwana (Mpumalanga), Musina (Limpopo), City Deep (Gauteng), and Upington (Northern Cape).

All interviews were audio-taped only to support written data capture and lasted between 45 and 60 minutes. The participants' anonymity was ensured outside the interview setting. Voice records have been stored according to good clinical practice (GCP) standards. Training of interviewers consisted of a number of theory and practical modules on interviewing. Interviews were conducted in English or in local languages and took place a minimum of six months after the RWCs began operations. This timing allowed for information to be collected from people who had accessed services for a period of time. Interview data were analysed following the categories: nature of sex work, client satisfaction with the services/clinic, opening and operating hours, scope of services accessed, health risk factors related to sex work, and health-seeking behaviour.

Follow-up data

We followed up a cohort of truck drivers and FSWs to assess the contribution of North Star Alliance services to the successful linkage to care of HIV-positive patients in South Africa. Consecutive clients, over 18 years of age, found to be HIV-positive and who had been referred for ART services or had initiated onsite were asked to participate until the sample size was reached. Informed consent and contact details were obtained from participants. Three methods for obtaining follow-up information were described to the participant: 1) they could be contacted directly by study researchers; and/or 2) their data could be accessed from the National Health Laboratory Service (NHLS) database; and/or 3) the referral clinic could be contacted to determine whether they had presented for further assessment at the clinic to which they were referred.

The sample size was calculated from the scientific literature estimating, in South Africa, the median proportion of patients enrolling in care after a positive HIV test: 44% (range 31%–68%)(16). Therefore, a sample size of 541 participants found to be HIV-positive and referred to care would be needed to estimate the expected 44% with a precision of 5% (i.e. 44% and a confidence interval from 39% to 49%). This assumes a 30% loss to follow-up within our cohort.

Data were collected from the NHLS database to determine whether patients were ART eligible and the name of the clinic at which they presented. Follow-up was done with the referral clinic to determine whether clients initiated ART. For HIV-positive patients initiated onsite, aggregated uptake data from the Regional Office were used for analysis and comparison. Study researchers contacted those patients without data in COMETS or NHLS directly. ART data were extracted from the South African National ART Monitoring & Evaluation system (Tier.net) after matching participants giving

consent for access to their Tier.Net records. Matching was done on several criteria, including date of birth, name, and date of diagnosis.

Ethics approval

Ethics approval was secured in South Africa from the Human Research Ethics Committee (Medical) at the University of Witwatersrand (reference M140506). In addition, North Star Alliance and Wits Reproductive Health and HIV Institute signed a data user's agreement on 5 May 2014 to ensure that data were appropriately handled throughout the data management cycle.

In Zimbabwe, we secured conditional ethics approval from the Biomedical Research and Training Institute (AP110) in Harare as suggested by the Southern Africa Development Community (SADC). This approval was subject to a local institution partnering with us in this project. We successfully approached Family AIDS Caring Trust (FACT) Zimbabwe. They proceeded to apply, on our behalf, for registration by the Medical Research Council of Zimbabwe, as we needed to secure a foreign researcher permit before activities could start. We secured this registration (reference MRCZ/A/1726). However, we were not able to secure an approval from the Ministry of Health and Child Welfare, the last step needed for the foreign researcher permit. This was due to the requirement that a local academic partner, not a local charity, apply to secure permits for foreign researchers. We approached Professor Exnevia Gomo from the University of Zimbabwe, who was keen to partner with us as an academic partner. However, at this point we faced two additional challenges: 1) the provisional ethics approval was approaching the expiration date and would need to be renewed and 2) the University of Zimbabwe wanted a proportion of the budget amounting to at least 20% for local facilitation tasks.

In Zambia, we secured a conditional approval by the ERES Converge (private research ethics board) (ref Sept-012), subject to registration with the University of Zambia and the local research council. There were delays in the registration with the local research council, with the result that after a year we needed to re-apply for ethics approval. During a progress meeting of partners in June 2015, we evaluated ethics approval processes in Zambia and Zimbabwe as well as progress made in ART service establishment in these countries. The following changes to the scope of the research were discussed and approved:

1. Expanding the total number of sites included in the linkage-to-care component in South Africa in order to allow us to recruit more patients into the cohort over a shorter time. We proposed expanding recruitment from six sites to possibly all sites in South Africa (n=9).
2. Reducing the scope of research across countries by limiting the linkage-to-care and acceptability of care components of the research to South Africa, where we had secured ethics approval and data collection was ongoing at the time. However, it was expected that the analysis of routine utilization data (covering all services provided and an in-depth analysis of repeat visits) would continue and would be presented at the end of the research project. Because we have not secured ethics clearance in Zambia and Zimbabwe, these analyses will not be published.

Section 3: RESULTS

The current document follows the President's Emergency Plan for AIDS Relief (PEPFAR) implementation science framework(17) and aims to explore how RWCs respond to the healthcare needs of truck drivers and FSWs travelling along the North South trucking corridor. We seek to assess the contribution of North Star Alliance's activities to the improvement of indicators along the continuum of care (access, uptake, linkage, and retention).

Non-ART services

Access to services in South Africa

During interviews with female sex workers in South Africa, not all participants self-identified as sex workers, yet all participants reported feeling at higher risk of poor health than the general population due to their involvement in sex work. Participants also reported satisfaction with site accessibility, location, and operating hours. Sex workers accessing sites described services as being suitable and accessible with friendly staff. Female sex workers interviewed reported seeking care at North Star Alliance sites to collect condoms and for other reproductive and sexual health services. This access, together with the perception of the RWCs as suitable and accessible, with friendly and approachable staff, provides an excellent opportunity to reach out to and retain local sex worker communities in care. Our findings also show that North Star Alliance is currently providing services that help to tackle two structural barriers previously reported by sex workers in access to care: 1) negative experiences with staff, including discriminatory attitudes from staff, open hostility, and reluctance to treat them among others and 2) fragmentation of healthcare services available to sex workers(18).

A specific recommendation from these interviews would be to build on North Star Alliance's healthcare service delivery model to offer sex worker attendees provider-initiated and complementary health services when they access specific services (e.g. offering TB and STI screening for those accessing HIV testing). While sex worker-specific services represent a tailored solution for healthcare delivery, our results suggest that an all-inclusive approach to healthcare service delivery with empathetic staff is perceived as "accessible" and is suitable to retain this population group in care.

The majority of truck drivers interviewed found the location of RWCs suitable; yet the sites of Musina and Ngodwana lacked visibility. Most participants did not know the operating hours. While all clients were satisfied with the services that they received and with healthcare worker attitudes, they noted the clinics to be small. From our sample, more than half visited the clinic to have their blood pressure checked, followed by just under half testing for HIV or diabetes. Importantly, although these truck drivers appear during the interviews to understand their occupational risks, they only access care for acute illnesses. For routine check-ups, they prefer to access care at home. Expanding the scope of service to dispense more medication, including vaccinations (which could then be used as an entry point to care), was the main recommendation of users of North Star Alliance services. Those not using the services declared to not know the services, and therefore their main recommendation was better marketing of services, clinics, and locations.

Service utilization in South Africa, Zambia and Zimbabwe

Currently, little is known about the patterns of healthcare utilization among truck drivers, sex workers, or the communities attending healthcare sites along transport corridors. The idea behind a RWC is that they are run by local staff and are easy for priority populations to access. The goal is for

RWCs, which are mostly located at truck stops, to see at least 20 patients per day; with some sites providing services for up to 40 visits per day. We present data for a two-year period on utilization of North Star Alliance services across South Africa, Zambia, and Zimbabwe.

We analysed patterns of utilization by population sub-group and type of service accessed. We provide a detailed picture of utilization profiles as well as qualitative data on access to and satisfaction with services in South Africa for truck drivers and sex workers. As shown in Table 4, we extracted records for just under 130 000 visits over two years in three countries. After excluding duplicate and incomplete records, we analysed almost 65 000 unique visits. In South Africa, truck drivers are the main clients of North Star Alliance. However, we observe that both in Zambia and Zimbabwe North Star Alliance is providing a needed service to local communities. However, patients in South Africa tend to come to North Star Alliance services more regularly than in the other countries. Data quality (measured as the proportion of complete records) is highly variable across countries, with better quality observed in South Africa.

Table 4 – Data extracted from COMETS in South Africa, Zambia and Zimbabwe

	South Africa	Zambia	Zimbabwe	ALL
Total number of visits	36 405	13 162	80 330	129 897
Duplicates	675 (1.9%)	591 (4.5%)	9 672 (12.0%)	10 938 (8.4%)
Missing information	1 493 (4.1%)	10 248 (77.9%)	42 668 (53.1%)	54 409 (41.9%)
Total unique visits	34 237	2 323	27 990	64 550
Sex workers	4 190 (12.2%)	136 (5.9%)	4 242 (15.2%)	8 568 (13.3%)
Truck drivers	16 784 (49.0%)	763 (32.8%)	7 009 (25.0%)	24 556 (38.0%)
Community	13 263 (38.7%)	1 424 (61.3%)	16 739 (59.8%)	31 426 (48.7%)
Total individual patients	25 814	2 118	25 070	53 002
Sex workers	2 794 (10.8%)	127 (6.0%)	3 683 (14.7%)	6 604 (12.5%)
Truck drivers	13 328 (51.6%)	684 (32.3%)	6 462 (25.8%)	20 474 (38.6%)
Community	9 692 (37.5%)	1 307 (61.7%)	14 925 (59.5%)	25 924 (48.9%)
All: visit/patient	1.33	1.10	1.12	1.22
Sex workers	1.50	1.07	1.15	1.30
Truck drivers	1.26	1.12	1.08	1.20
Community	1.37	1.09	1.12	1.21

Note: period from 1st October 2013 to 30th September 2015.

We observe similar patterns of utilization by population sub-group (truck drivers, Figure 7 and sex workers, Figure 8) both by country and over time. In South Africa, patients tend to attend PHC services and these visits have increased over the two-year period. In Zambia, patients tend to access HIV-related services while in Zimbabwe, they access both PHC and HIV-related services. The numbers of services accessed have remained stable in both countries.

Figure 7 – Services accessed across countries, truck drivers

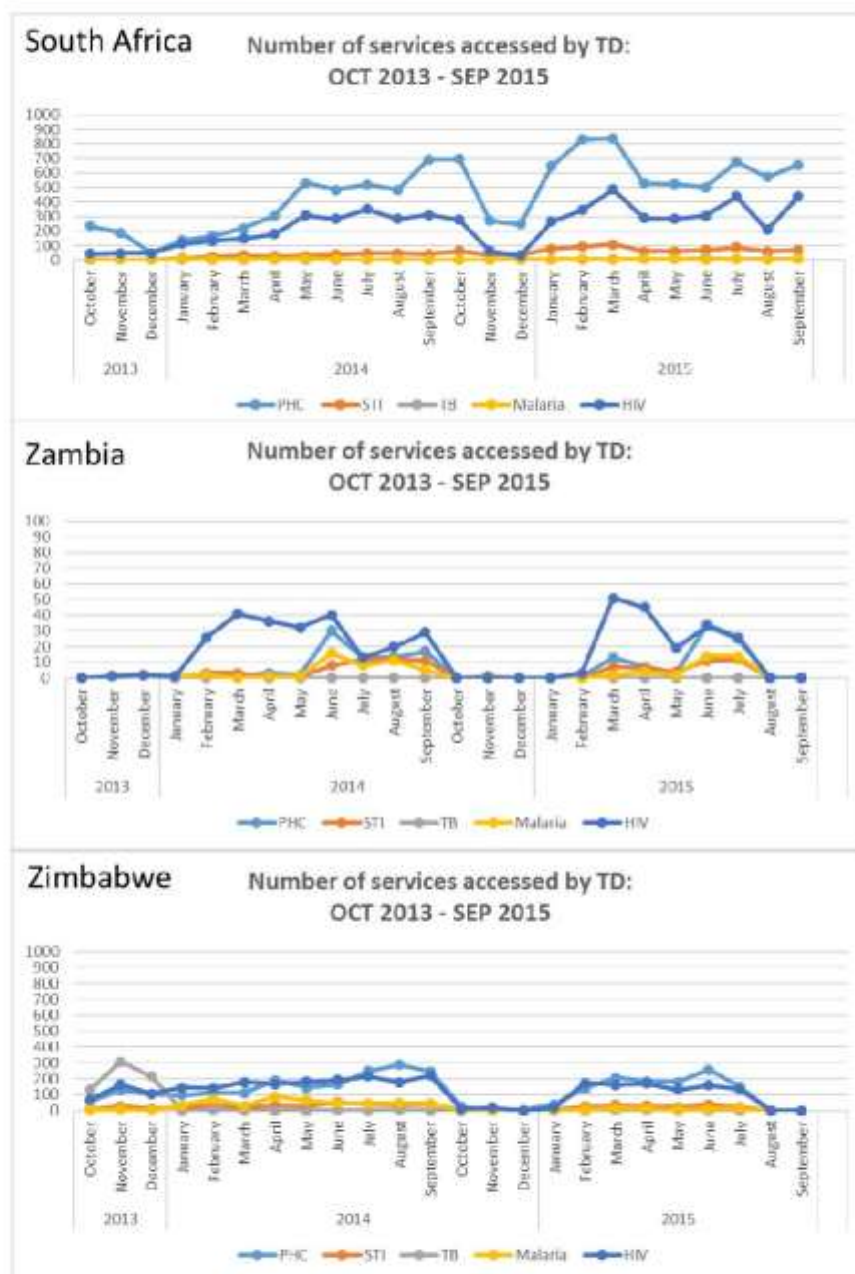


Figure 8 – Services accessed across countries, sex workers

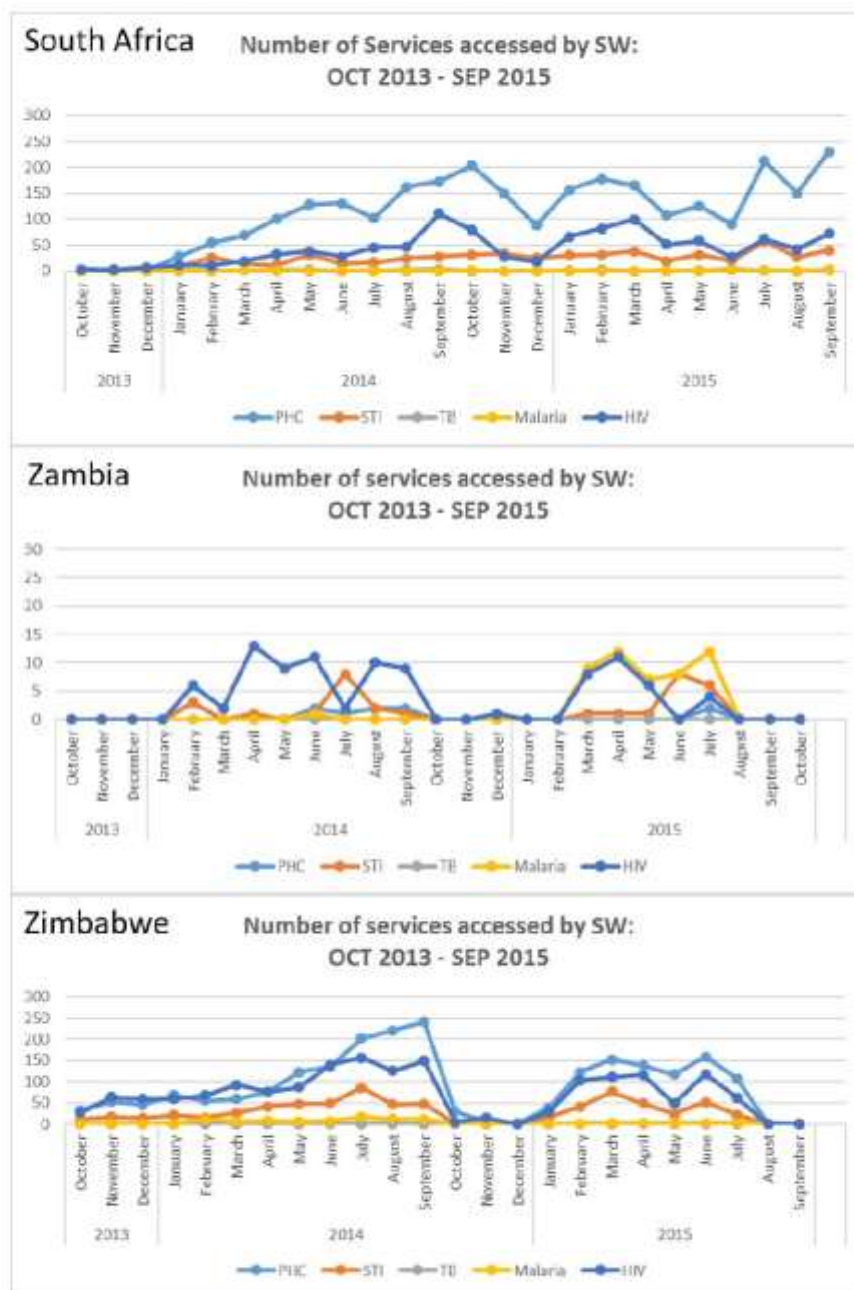


Table 5 – Sex workers: utilization of North Star Alliance services

	Zimbabwe (n sites = 4)	Zambia (n sites = 1)	South Africa (n sites = 9)	ALL (n sites = 14)
Individual patients	3,683	127	2,794	6,604
Sex, female	3,549 (96%)	126 (99%)	2,743 (98%)	6,418 (97%)
Age				
mean	27,3	28,3	30,8	28,8
18-24	1,344 (37%)	40 (31%)	749 (27%)	2,133 (32%)
25-39	2,194 (60%)	81 (64%)	1,593 (57%)	3,868 (59%)
40-49	131 (4%)	6 (5%)	369 (13%)	506 (8%)
50+	13 (0,3%)	0 (0%)	83 (3%)	96 (1%)
Marital status				
Missing	75 (2%)	2 (2%)	0 (0%)	77 (1%)
Cohabitation	194 (5%)	19 (15%)	135 (5%)	348 (5%)
Married monogamy	344 (9%)	5 (4%)	160 (6%)	509 (8%)
Married polygamy	10 (0,3%)	2 (2%)	6 (0,2%)	18 (0,2%)
Single	2,639 (72%)	48 (38%)	2,288 (82%)	4,975 (75%)
Divorced	384 (10%)	43 (34%)	186 (6%)	613 (9%)
Widow	36 (0,9%)	8 (6%)	19 (0,6%)	63 (0,9%)
Country of origin				
South Africa	3 (0%)	2 (2%)	2,341 (84%)	2,346 (36%)
Zambia	12 (0,3%)	107 (84%)	4 (0,14%)	123 (2%)
Zimbabwe	3,588 (97%)	16 (13%)	388 (14%)	3,992 (60%)
Other	79 (2%)	2 (2%)	61 (2%)	142 (2%)

We explored in detail service utilization by truck drivers in South Africa (Table 6). Here, we also observe a different pattern of utilization by demographic characteristics, with older patients more likely to access PHC services and less likely to access HIV, STI or TB-related services. Non-South African truck drivers were more likely to access malaria services and less likely to access PHC services, suggesting that demand for PHC services is generally local in nature.

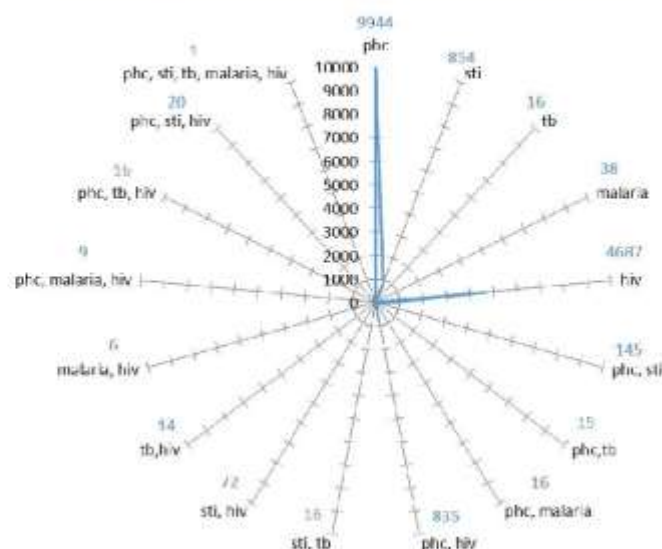
Finally, in Figure 9, we focused on the type of services accessed at each visit. In this case, 93% (15 523/16 688) of visits only recorded one service. Only in 5% (835/16 688) of records, did we observe a PHC/HIV combination. A TB/HIV combination of services was observed in less than 1% of visits.

Table 6 – Determinants of service utilization in South Africa, truck drivers

	HIV (n=5 660 services)		STI (n=1 062 services)		TB (n=62 services)		MALARIA (n=70 services)		PNC (n=11 003 services)	
	UOR [95% CI]	AOR [95% CI]	UOR [95% CI]	AOR [95% CI]	UOR [95% CI]	AOR [95% CI]	UOR [95% CI]	AOR [95% CI]	UOR [95% CI]	AOR [95% CI]
Age										
<20 years	reference	reference	reference	reference	-	-	-	-	reference	reference
20-29 years	0.67 [0.25-1.64]	0.67 [0.23-1.92]	0.89 [0.50-1.58]	0.82 [0.45-1.48]	reference	reference	reference	reference	1.56 [0.55-4.44]	1.62 [0.53-4.92]
30-39 years	0.52 [0.18-0.48]	0.49 [0.17-1.34]	0.76 [0.43-1.36]	0.75 [0.42-1.34]	1.08 [0.41-2.82]	0.91 [0.72-1.16]	2.03 [0.66-6.24]	1.59 [0.46-5.44]	2.14 [0.78-5.84]	2.30 [0.83-6.36]
40-49 years	0.34 [0.13-0.84]*	0.31 [0.13-0.77]*	0.52 [0.28-0.98]*	0.56 [0.30-1.03]	1.25 [0.54-2.88]	0.68 [0.52-0.89]**	1.50 [0.81-3.71]	1.30 [0.46-3.62]	3.56 [1.46-8.70]**	3.75 [1.54-9.12]**
50-59 years	0.24 [0.09-0.65]**	0.24 [0.09-0.63]**	0.25 [0.13-0.49]**	0.29 [0.15-0.57]**	1.44 [0.63-3.28]	0.35 [0.22-0.58]**	0.94 [0.28-3.02]	1.24 [0.40-3.89]	5.76 [2.32-14.30]**	5.62 [2.30-13.72]**
Marital status										
No SP ¹	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference
SP	0.95 [0.05-1.37]	1.10 [0.76-1.60]	0.64 [0.42-0.98]*	0.68 [0.57-0.81]**	0.80 [0.55-1.15]	0.68 [0.57-0.82]**	3.19 [1.89-5.40]**	1.54 [0.84-2.81]	1.18 [0.78-1.81]	1.01 [0.73-1.41]
Nationality										
South African	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference
Other	1.87 [1.18-2.96]**	1.72 [1.13-2.60]**	1.70 [0.92-3.14]	1.77 [0.95-3.28]	1.36 [0.70-2.65]	1.72 [0.92-3.23]	32.50 [4.44-35.19]**	13.04 [3.89-51.29]**	0.47 [0.25-0.88]*	0.50 [0.27-0.96]*

¹ records with <20y (n=108) were dropped in this analysis, because there were no TB/malaria visits recorded; * indicates a p value<0.05; ** p value<0.01; *** p value<0.001.

Figure 9 – Type of services accessed in each visit, truck drivers (South Africa)



We concluded that satellite services do assist in alleviating the healthcare access challenges that are faced by truck drivers, sex workers, and local communities. It will be important for North Star Alliance to ensure that service packages and clinics speak to the needs of truck drivers with respect to services offered and clinic locations. While integration of services is essential, there is currently a missed opportunity in terms of promoting provider-initiated service delivery (for example, initiating TB symptom screening for those accessing HIV services).

Linkage to care for non-ART services in South Africa

For most of non-ART services (see Table 1), North Star Alliance provides a screening service and referral for complicated cases. It is expected that a successful referral system will be the main mechanism through which the North Star Alliance will contribute to improving the health outcomes of the populations served. There have been improvements within the North Star Alliance services during the Demo project, one of which is the mapping of referral sites along the corridor. This mapping has been integrated into COMETS, assisting the nurse or counsellor at the RWC to provide information about the closest places where the patient can access care through their referral.

In this analysis, we aimed to describe the population being referred and the number and type of referrals, as well as the outcome of referrals. Across all sites in South Africa (Table 7), the main reported reason for referral was primary healthcare. PHC referrals include instances of high blood pressure, uncontrolled blood sugar, for example. We observed a total of 745 referrals corresponding to 697 unique people who were referred. HIV services accounted for the second highest number of referrals, 290 referrals for 268 patients. In contrast, only 7 people were referred once for malaria, 49 patients were referred once for TB, and 68 referrals were made for 62 patients with STIs.

When exploring the distribution of referrals by site for sex workers and truck drivers, we highlighted the high burden of three sites (Musina, Ngodwana, and Upington) compared to others.

Table 7 – Number of referrals by site, type of service and population

	HIV	Malaria	PHC	STI	TB	Total
<i>Sex workers</i>	76	1	140	13	9	239
[Closed] City Deep	2		2			4
Bloemhof			2			2
Cato Ridge	4		1			5
Musina	13		23	2	1	39
Ngodwana	46		38	2		86
Upington	11	1	74	9	8	103
<i>Truck drivers</i>	105	4	201	19	18	347
[Closed] City Deep	21	1	30	2		54
Bloemfontein			20	9	11	40
Bloemhof	1		15	2	2	20
Cato Ridge	15		17		2	34
Musina	12	2	48		1	63
Ngodwana	50		38	2		90
Pomona	1	1	3		1	6
Upington	5		30	4	1	40
Total	181	5	341	32	27	586

Follow-up of referrals is done routinely by North Star Alliance staff according to service-specific standard operating procedures. However, we observed that this follow-up is not efficient. There were no records of follow-up for malaria, whereas only 17 (6%), 2 (4%) and 2 (3%) patients were followed up successfully across HIV, TB and STI services. High rates of successful linkage (i.e. those patients referred attended the referral sites) were observed for HIV and TB. The same patterns were found when looking at data from PHC referrals by type of patients (Table 8) – low follow-up (average 8%) but successful referral established for 63% of referrals, when follow-up was achieved.

Table 8 – PHC referral follow-up results

Subgroup	Number of referrals	Follow-up successful	Referral clinic accessed
Community	357	26 (7%)	12 (54%)
Sex worker	140	13 (9%)	12 (92%)
Truck driver	200	18 (9%)	10 (56%)
Total	697	57 (8%)	36 (63%)

Repeat visits across the corridor

A patient accessing North Star Alliance's services can access continuous care at any of their centres. The purpose of this analysis is to determine to what extent, and for what services, clients are using North Star Alliance's centres repeatedly.

In Table 9, we present the socio-demographic characteristics of those patients with repeat visits. In Table 10, we summarize the profile of these patients. While in South Africa and Zambia similar patterns are observed with women, older patients, and those in stable partnerships more likely to

have repeat visits, in Zambia, only those of South African nationality were more likely to attend repeatedly.

Table 9 – Socio-demographic determinants of repeat visits, by country

Characteristic		uOR [95% CI]	p	aOR [95% CI]	p
SOUTH AFRICA					
Sex	female	ref	-	ref	-
	male	0.71 [0.66-0.76]	<0.000	0.86 [0.78-0.95]	0.004
Age	<20 years	ref	-	ref	-
	20-29 years	1.48 [1.22-1.78]	<0.000	1.52 [1.26-1.85]	<0.000
	30-39 years	1.58 [1.32-1.91]	<0.000	1.76 [1.45-2.12]	<0.000
	40-49 years	1.63 [1.34-1.97]	<0.000	1.90 [1.56-2.32]	<0.000
	50-65 years	1.80 [1.47-2.19]	<0.000	2.22 [1.81-2.72]	<0.000
Marital status	Stable partner	ref	-	ref	-
	No stable partner	0.88 [0.83-0.94]	<0.000	0.91 [0.84-0.98]	0.014
Occupation	Other	ref	-	ref	-
	Sex worker	1.18 [1.07-1.31]	0.001	1.18 [1.05-1.33]	0.006
	Truck driver	0.76 [0.71-0.81]	<0.000	0.74 [0.68-0.81]	<0.000
Country	South Africa	ref	-	ref	-
	Zimbabwe	1.86 [1.71-2.02]	<0.000	1.18 [1.65-1.96]	<0.000
	Zambia	0.91 [0.55-1.51]	0.715	0.97 [0.59-1.62]	0.920
	Other	0.55 [0.44-0.70]	<0.000	0.57 [0.45-0.73]	<0.000
ZIMBABWE					
Sex	female	ref	-	ref	-
	male	0.80 [0.74-0.86]	<0.000	1.02 [0.93-1.13]	0.666
Age	<20 years	ref	-	ref	-
	20-29 years	1.45 [1.21-1.73]	<0.000	1.36 [1.14-1.63]	0.001
	30-39 years	1.18 [0.99-1.42]	0.062	1.21 [1.01-1.47]	0.037
	40-49 years	0.98 [0.80-1.19]	0.835	1.05 [0.86-1.30]	0.623
	50-65 years	0.87 [0.68-1.10]	0.249	0.93 [0.73-1.19]	0.571
Marital status	Stable partner	ref	-	ref	-
	No stable partner	1.08 [0.99-1.17]	0.058	0.84 [0.76-0.93]	0.001
Occupation	Other	ref	-	ref	-
	SW	1.29 [1.16-1.43]	<0.000	1.36 [1.20-1.55]	<0.000
	Truck driver	0.70 [0.64-0.76]	<0.000	0.69 [0.62-0.78]	<0.000
Country	South Africa	ref	-	ref	-
	Zimbabwe	1.10 [0.73-1.66]	0.648	0.79 [0.52-1.19]	0.257
	Zambia	0.92 [0.57-1.50]	0.740	0.86 [0.53-1.40]	0.537
	Other	0.71 [0.43-1.19]	0.195	0.59 [0.31-1.14]	0.117
ZAMBIA					
		ref	-	ref	-
	male	1.33 [1.00-1.76]	0.046	1.30 [0.92-1.83]	0.143
Age	<20 years	ref	-	ref	-
	20-29 years	1.63 [0.88-3.02]	0.117	1.50 [0.80-2.80]	0.202
	30-39 years	1.54 [0.84-2.83]	0.162	1.22 [0.64-2.34]	0.547
	40-49 years	1.49 [0.78-2.83]	0.224	1.13 [0.57-2.25]	0.733

	50-65 years	1.35 [0.64-2.83]	0.426	0.98 [0.45-2.15]	0.958
Marital status	Stable partner	ref	-	ref	-
	No stable partner	0.80 [0.60-1.06]	0.123	0.84 [0.60-1.16]	0.293
Occupation	Other	ref	-	ref	-
	Sex worker	0.83 [0.44-1.53]	0.544	0.86 [0.44-1.67]	0.654
	Truck driver	1.22 [0.93-1.61]	0.154	0.84 [0.58-1.23]	0.378
Country	South Africa	ref	-	ref	-
	Zimbabwe	0.58 [0.17-1.93]	0.375	0.52 [0.16-1.76]	0.296
	Zambia	0.30 [0.09-0.96]	0.043	0.26 [0.07-0.85]	0.027
	Other	0.32 [0.06-1.73]	0.189	0.91 [0.12-6.84]	0.928

Table 10 – Profile of patients with repeat visits to North Star Alliance

South Africa	Zimbabwe	Zambia
Female	-	-
Older more likely	Older (up to 40) more likely	-
In a stable partnership	In a stable partnership	-
Zimbabwean more likely than South African	-	South African more likely than Zambian
Sex worker more likely than community	Sex worker more likely than community	-
Truck drivers less likely than community	Truck drivers less likely than community	-

ART service

Implementation

In partnership with Wits RHI, North Star Alliance pursued the following strategy for ART service delivery:

- 1) ART services developed and integrated with National Department of Health policies
- 2) ART services provided free of charge (country-specific regimens) with referral to National Health Laboratory Systems
- 3) RWCs serving as sites for refills for mobile populations (in high transmission areas)
- 4) Between-site and cross-border monitoring and follow-up provided through electronic data sharing (COMETS)

Site preparation

Site preparation to start an ART service included the development of policy documents, standard operating procedures, and staff training. We supported these activities as well as the development of quality management systems, personnel recruitment, and necessary infrastructure, equipment, and supplies. RWCs had to upgrade monitoring and evaluation tools, including the upgrade of COMETS, adoption of Tier.Net (South African ART monitoring and evaluation tool for ART patients) and

expansion of clinical stationary/patient charts. With the development of the Mesedi.org mobile app (not included in this evaluation but developed during the project – an app indicating closest referral sites to users), RWCs provided patients with a mapping of referral sites.

Capacity strengthening, training and mentoring

The Wits RHI Training and Teaching Department developed the NIMART curriculum (comprising material for trainers and trainees) (Figure 10). Additionally, on request from the South African Department of Health, they rolled out the National training for primary care (PC 101 training).

Figure 10 – NIMART training manual



Wits RHI clinical trainers trained and mentored the North Star Alliance clinical staff using these two curricula. Since NIMART is ART-focused and PC 101 is primary healthcare-focused, North Star Alliance clinical staff received comprehensive clinical care training equipping them to be able to deliver and effectively manage clients accessing their services for either ART or PHC services. Additionally, staff received monthly e-learning sessions. These comprised of case studies that were presented via conferencing facilities to staff at all Roadside Wellness Centres. The content covered cases that were more unusual/complicated. This was done to assist staff with thinking through medical situations that might be outside the conventional and to provide them with information on how to handle complicated cases. Counsellors and other non-clinical site staff were trained on Counselling and Basic HIV, respectively. This was to ensure that all staff present at Roadside Wellness Centres were aware of the services offered and could appropriately deal with clients' questions, while promoting use of the Roadside Wellness Centre. Curricula for these two courses were developed by the Wits RHI team which also conducted the trainings.

Figure 11 is a representation of the training tracking log that Wits RHI developed and used to record North Star Alliance staff learning portfolios. These were particularly useful in certifying competence – especially for the NIMART and Counselling trainings that required participants to successfully complete and submit a portfolio of evidence prior to being certified as competent.

Figure 11 – Example of a training tracking log

PROFESSIONAL NURSES									
NO.	NAME	SURNAME	SITE	STATUS	MONTHLY F – TRAINING CLINICAL UPDATE				
1	Dylis	Mupfuma	Musina		Feb 15	Mar 15	Apr 15	Jun 15	Jul 15
2	Rosina	Ngangweni	City Deep/ Pomona		Feb 15	Mar 15	Apr 15	Jun 15	Jul 15
3	Stacey	Moyana	Bloemfontein		Feb 15	Mar 15	Apr 15	Jun 15	Jul 15
4	Floyd	Koto	Ngodwana				Apr 15	Jun 15	Jul 15
5	Thapelo	Masapeli							
6	Radikwa	Chutimouda	Uptington		Feb 15	Mar 15	Apr 15	Jun 15	Jul 15
7	Theresele Precious	Nkosi	Ngodwana						
8	Phum Ngweni	Masapeli	Pomona (Pomona)	Reskored					
9	Kabore	Makauli	Bloemhof						
10	Prudence	Khanyile					Apr 15	Jun 15	Jul 15

Site accreditation

Wits RHI provided support in various aspects of site readiness/preparation including meetings with local and provincial Departments of Health, meetings with local businesses, clinical training and mentoring, protocol development, monitoring and evaluation, technical assistance on drug and equipment procurement, and staff recruitment. Challenges in stakeholder engagement and securing permissions delayed site start dates. This is shown in Table 11 below. Due to the long periods between staff training and sites starting ART initiations, staff had to be given refresher training.

Table 11 – Site preparation timeline

Roadside Wellness Centre	Opened (started ART preparation)	Started ART services	Preparation period
Bloemfontein	Sept-2014 (Sept-2014)	Still in preparation	-
Bloemhof	Mar-2014 (Mar-2014)	Nov-2015	20 months
Musina	Jan-2014 (Jan-2014)	Jul-2015	18 months
Ngodwana	Oct-2013 (Jan-2014)	Aug-2015	19 months
Pomona	Jan-2015 (Jan-2015)	Oct-2015	9 months
Pongola	Jun-2014 (Jun-2014)	Feb-2015	8 months
Uptington	Feb-2014 (Feb-2014)	Feb-2016	24 months

Evaluation

In the following text, we present the evaluation of the ART service up to the 31st May 2016. This is due to changes introduced on 1st June 2016 in the ART provided in RWCs with the roll out of early treatment and PrEP as part of a national pilot(19). Figure 12 shows the different sites accredited during the demonstration project and the duration of services included in this evaluation.

Figure 12 – Timeline of ART service delivery by site

	2015						2016				
	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Hoedspruit											
Musina											
Pomona											
Ngodwana											
Bloemhof											
Upington											
Pongola											

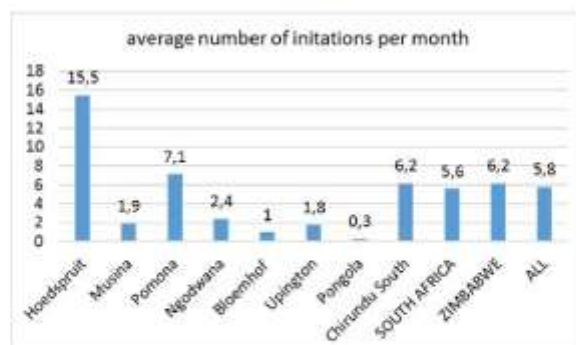
During the Demo project and up to the end of May 2016, we achieved a total of 285 ART initiations in South African sites, only 15 initiations short of our 300 initiations target (Table 12). In table 12, we also include an indication of the initiations achieved in Zimbabwe as part of North Star Alliance service expansion but not included in the Demo project data.

Table 12 – Number of ART patients initiated per site

ART	months	Truck drivers	Sex workers	Community	TOTAL
Hoedspruit	11	17	7	146	170
Musina	11	8	11	2	21
Pomona	8	26	31	0	57
Ngodwana	10	5	18	1	24
Bloemhof	1	1	0	0	1
Upington	6	3	2	6	11
Pongola	4	1	0	0	1
SOUTH AFRICA	51	61	69	155	285
Chirundu South	21	11	42	78	131
ZIMBABWE	21	11	42	78	131
ALL	72	72	111	233	416

While the majority of patients initiated was from the community and mainly in Hoedspruit, the average number of initiations per month was low across all sites (Figure 13). The Hoedspruit site was officially opened on the 1st June 2015 and the setup is different from other RWCs, which might explain the larger number of ART initiations in the community. It is situated approximately 10km outside the town of Hoedspruit and is currently managed by Hlokomela (NGO). The container was donated by Phalaborwa mines and North Star Alliance paid for transportation to the site and general site works. COMETS was installed at the site and the staff trained on the system and ART monitoring. The site is not included in table 11 as site preparations happened separately from the Demo project. The ART initiations in this site are included in Table 12 as they were monitored and training took place as part of the Demo project. However, we present ART initiations by site for clarity in both table 12 and Figure 13.

Figure 13 – Average number of ART initiations per month, by site



To evaluate this service more in detail, we analysed the data across the ART care cascade.

Testing

Across South African sites, we observe heterogeneity in positivity rates among those accessing tests at RWCs. In general, sex workers tend to have a higher positivity rate than the other categories, but these differences were site-dependent (Figure 14 and table 13 for more detail).

Figure 14 – Proportion of HIV-positive among those accessing testing by site

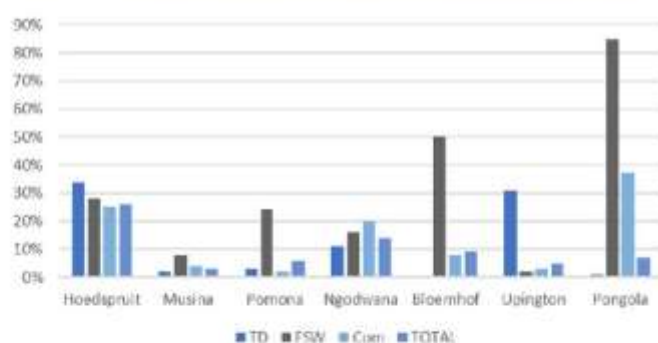


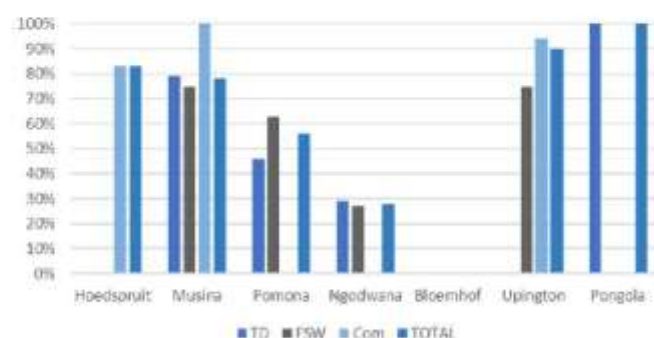
Table 13 – Number tested and proportion of HIV-positive among those accessing testing by site

	months	Truck drivers		Female sex workers		Community	
		n/N	%	n/N	%	n/N	%
Hoedspruit	11	12/35	34%	5/18	28%	148/592	25%
Musina	11	47/2279	2%	36/473	8%	29/699	4%
Pomona	8	50/1464	3%	85/361	24%	13/612	2%
Ngodwana	10	92/806	11%	72/438	16%	40/205	20%
Bloemhof	1	0/6	0%	1/2	50%	2/25	8%
Upington	6	23/75	31%	5/270	2%	12/404	3%
Pongola	4	7/883	1%	22/26	85%	41/111	37%

Eligibility to start ART

North Star Alliance ART services were implemented during a period where national guidelines in South Africa recommended initiation of ART at a CD4 threshold of 500 cells/mL(20). At this initiation threshold, we observed that most patients presenting for testing and found to be positive were eligible for treatment (Figure 15). This indicates that most patients presented to care late.

Figure 15 – ART eligibility among those testing positive for HIV infection



Linkage and retention in ART care

We obtained 145 consents; of these only 40% were matched in Tier.net. After following up through phone calls, we completed questionnaires on follow-up for an additional 17%. The total proportion of the 145 participant consented that were followed up was 57% (Table 14). Among those eligible and followed up, by the end of the Demo project, we had established that 65% (n=53/82) were had started and were retained in ART care at six months.

Table 14 – Follow-up of HIV-positive patients consented

	Consented	In Tier.net	% In Tier.net	Follow-up	% follow-up
Bloemfontein	8	-	0%	4	50%
Sex workers	3	-	0%	0	0%
Truck drivers	5	-	0%	4	80%
Musina	93	32	34%	48	52%
Community	1	1	100%	1	100%
Sex workers	50	18	36%	27	54%
Truck drivers	42	13	31%	20	48%
Ngodwana	9	4	44%	5	56%
Sex workers	5	3	60%	3	60%
Truck drivers	4	1	25%	2	50%
Pomona	35	22	63%	25	71%
Community	1	1	100%	1	100%
Sex workers	9	8	89%	9	100%
Truck drivers	25	13	52%	15	60%
Grand Total	145	58	40%	82	57%

Operational challenges

There were important operational challenges that should be noted as having been encountered during the development and roll out of North Star Alliance's ART service. Due to lack of continuity in (SADC) funding, the site in Zambia had to be excluded from this demo project. The City Deep site had to be relocated to Pomona, Kempton Park, in the usual converted shipping containers and we no longer had access to a spacious complex required for laboratory services. The partnership with the South African Department of Health also represented some logistical and operational challenges. Different provinces responded differently to the ART service at the RWCs, hence the roll out followed varying timelines.

There are long turnaround times for NHLS results and site dependence on the Government for drug supply resulted in an ART stock out in one site (Ngodwana). Finally, enrolment of patients on ART was slow and, in order to achieve the target of 300 initiations, North Star Alliance ran several testing outreach campaigns. Although these campaigns were successful in identifying people needing ART, they were resource-intensive. Of note, we planned and collected data for a micro-costing exercise to produce unit costs per person initiating ART and this analysis is ongoing at the time of this report.

Truckers Health Survey

Truck drivers are facing various occupation-related health challenges. We stated in the service utilization section that the number of visits for primary healthcare is increasing. It is, however, not clear what services truck drivers are using or what their actual healthcare needs are. While PHC services can cover a wide range of conditions, it is important for North Star Alliance to plan for a suitable service expansion. The Trucker Health Survey was developed to establish a baseline of major health issues and their determinants in male truck drivers in South Africa.

Design

A cross-sectional survey was conducted from October to December 2016 to recruit 500 male long-distance truck drivers aged 18 and above at truck stops in South Africa. The survey included questions assessing work conditions, eating and sleeping behaviour, sexual behaviour, medical history and risk factors for diseases, and assessment of mental health and quality of life. Medical assessment focused on screening of both communicable and non-communicable diseases (NCDs) and included HIV counselling and testing, as well as an assessment of cardiac function with ultrasound, electrocardiogram, and a carotid intima-media thickness measurement. Blood was drawn for analysis of lipid levels, glucose, liver and kidney function, hepatitis B antigen, and C-reactive protein (CRP).

Preliminary results

521 truckers were recruited from 13 October to 23 December 2016 at and around the North Star Alliance RWCs at Pomona Road, Kempton Park and at Shell Ultra City in Bloemfontein. Of those recruited, we observed a majority of Zimbabweans (65.5%), followed by South Africans (13.4%). Median age was 35 years (interquartile range (IQR) 30-40), median years of employment as a truck driver was 9 years (IQR 5-14), and almost 90% crossed borders on a regular basis. 50% of the drivers had visited a North Star Alliance RWC in the past year. A community health centre or a hospital was visited by 37.6% and 8.6%, respectively, but no truck drivers reported the use of any counselling or mental health service. Most drivers had a regular partner. Condom use varied between regular and casual partners and sex workers, with the highest coverage during sex worker visits (70%). 48 (9.2%) drivers were HIV-positive, of whom 14 were newly diagnosed in the survey. Almost 50% of the

known HIV-positive drivers were on ART. Only 10 drivers reported an infection with tuberculosis in the past. Participants cardiovascular disease profile is shown in Table 15.

Table 15 – Cardiovascular disease profile

Characteristic (N = 521)	n (%)
Current smoker	58 (11.1%)
Alcohol, past 30 days	158 (30.3%)
Daily alcohol use	18 (3.5%)
Body mass index	
<18.5	8 (1.6%)
18.6-25.0	155 (31.6%)
25.1-30.0	181 (36.9%)
>30.0	147 (29.9%)
Hypertension (>140/90mmHg)	72 (14%)
Impaired glucose tolerance (7.8-11.0 mmol/L)	20 (3.8%)
Diabetes (>11.0 mmol/L)	3 (0.6%)
Depression (PHQ-9)(21)	
mild depression (5-9)	138 (26.5%)
moderate depression (10-14)	38 (7.3%)
moderately/severe depression (15-19)	7 (1.3%)
severe depression (≥20)	0

The most prominent risk factors for NCDs such as cardiovascular disease were overweight/obesity, impaired glucose tolerance, and high blood pressure. Screening for depression revealed moderate to moderate/severe depression with 8.6% of the drivers.

This survey established a baseline of common health problems among truck drivers in South Africa. HIV counselling and testing is still an area that needs to be prioritized given relatively low condom use, the % of newly diagnosed HIV-positive drivers and an ART coverage of only 50%. Risk factors for NCDs and mental health problems suggest that both screening and linkage-to-care for these need to be prioritized.

The main challenges during this survey were recruitment of South African truck drivers and HIV-positive truck drivers. One explanation could be that long-distance driving is mainly undertaken by foreign drivers. It was difficult to get access to companies with mainly South African drivers as healthcare programmes are strictly regulated and controlled by unions. This survey was often regarded as competing with existing wellness programmes. Besides, there was less urgency for South African drivers to participate in the survey, as the majority of them already undergo health check-ups at their company on a regular basis. Another further explanation for the diminished participation of South Africa truck drivers is that we provided a small payment in recognition of their time. This payment might be more attractive to out-of-town drivers.

HIV prevalence in the survey is lower than the prevalence in the general population. It is likely that sampling bias plays a role as truck drivers with high risk behaviour may avoid HIV testing.

Full analysis of all available data is currently ongoing. ECG data were collected from almost all participants, cardiac ultrasounds in 131- and carotid intima-media thickness (CIMT) measurements in 225 participants. Analysis of ECGs, cardiac scans and CIMTs is expected to be finished by the end of March 2017. Meetings with diverse experts are planned to discuss interpretation of the findings. Analysis of the full dataset will take place in April and final reports are expected in the period May-July 2017.

We deem the results of this survey important as they provide insight into common mental and physical healthcare needs of truck drivers. Results will be used to inform policy makers about how to take healthcare services for truck drivers to scale. Key areas should include screening for and treatment of risk factors for non-communicable diseases and mental health issues, in addition to HIV counselling and testing. The next important steps will be assessment of linkage-to-care and retention in care. We intend to turn this survey into a cohort study with screening intervals of two to three years. This will not only allow us to collect observational data on the occurrence of NCDs, but it will also serve as a platform to implement and test linkage-to-care and retention strategies.

Capacity building

The North-South corridor demonstration project was built as a partnership between academic institutions and implementing organizations. As such, we focused on capacity building at two levels: individual and organizational.

Individual level

Beyond the clinical training described in the ART implementation section, we developed an extensive programme of research capacity building. One doctoral candidate was funded as part of the Demo project in South Africa. PhD thesis submission is expected for the third quarter of 2017. Two more junior research assistants at Wits RHI were also able to lead discrete pieces of analysis, and to present to peers, submit abstracts for conferences, and draft and submit two papers for publications.

Organizational level

The main outcome of this Demo project has been the establishment of efficient structures and processes for ART service delivery and data quality management. The design and implementation of the Truckers Health Survey also allowed the expansion of this partnership to include Utrecht UMC, via the joint running of the survey by a Dutch PhD candidate student seconded to Wits RHI.

Section 4: CONCLUSION

Has this initiative been successful?

The North-South Corridor Demonstration project was a successful initiative in the following aspects. First, our analysis of service access, utilization, and the needs of priority populations had an immediate effect on North Star Alliance service delivery planning and training. The iterative process of data extraction, analysis, and feedback between partners has improved data quality across participating North Star Alliance sites. Second, during our design and piloting of the North Star Alliance-specific ART service, we learnt operational and logistical lessons that will improve service expansion to other sites. In particular, we developed trainings and standard operating procedures for all staff to facilitate the scale-up of the service.

The Demo project has had a significant component of capacity building, both individual and organizational. We strengthened research capacity at partner institutions and developed processes for the monitoring and evaluation of data quality within North Star Alliance. To date, we have produced a substantial body of evidence to support the contribution of North Star Alliance to better health of key populations. We have shown that North Star Alliance has a model in place for improving access to healthcare in remote places. Although the complexity of stakeholder engagement was highlighted as a risk for future site ART accreditation, North Star Alliance RWCs represent a platform to successfully expand access to testing, provide a point of linkage to ART care, and help monitor (uncomplicated) patients along transport corridors. As such, it will be a tool available to help countries achieve the Global 90-90-90 objectives (by 2020, 90% of all people living with HIV will know their HIV status; 90% of all people with diagnosed HIV infection will receive sustained antiretroviral therapy; 90% of all people receiving antiretroviral therapy will have viral suppression)(22).

Recommendations

Dissemination strategy

We put forward recommendations with regards to the identification of appropriate channels to transfer the acquired knowledge to external parties outside the consortium and of possible scientific publications. Key audiences for the process and results of the Demo project are: the trucker unions, the Ministry of Health in South Africa, the South African National AIDS Council (SANAC), and sex worker groups. The local Dutch representation (Regional Embassy) as well as the central Dutch Government (Ministerie van Buitenlandse Zaken) should also be briefed. Communications should be coordinated by North Star Alliance.

Conferences are interesting opportunities to present the findings while developing research capacity of partners. Some examples of upcoming relevant conferences are: the 11th INTEREST Workshop in Malawi, the IAS HIV Science Conference, the Transport Conference, and the Health Care Africa Summit.

The results presented could be presented as a stand in the exhibition area or a sponsored session of the AIDS Conference in Paris (2017) or, more likely, Amsterdam (2018). The track on implementation science might be interesting for abstract submission. A bridging session could also be an option for describing populations contributing to the corridor hotspots and programmes for/by/about them. Finally, there is also an M&E conference in South Africa organized by the South African Monitoring and Evaluation Association (SAMEA) where we could present findings on quality improvements.

The National Strategic Plan, second phase launch, is a platform where we could give valuable input. To input into this policy cycle, we will develop a concept note to distribute to both the South African Department of Health and the trucker industry. An e-mail containing the report will also be sent to department heads at Ministries in other countries. The report can also be posted on the websites of our organizations. A summary will be sent to the head of SADC as this could also serve as feedback to governments of countries.

Other interesting platforms for dissemination could be: local USAID/PEPFAR offices, National Transport Board, INSEAD, Sida, DFID and USAID. A list of future publications is presented in the appendix. Authorship will follow standard international principles.

It was agreed that these recommendations will be evaluated by North Star Alliance's communication team and that they will lead the dissemination process.

Technical recommendations

Database building and maintenance

COMETS data are kept as a large number of relational databases. It is time consuming to create one single database with all the information needed for the analysis. We would recommend that North Star Alliance consider changes to the underlying structure of COMETS for future versions in order to result in a database of easy access for routine monitoring.

The COMETS database is currently developed and managed by a Dutch company at no charge. This is challenging when changes need to be made as they can only be done when the developer has time. Turnaround time on changes sometimes span a year. Therefore, further consideration should be given to the engagement of a local database developer who can timeously effect changes and troubleshoot.

Monitoring data quality

Data quality challenges observed primary centred on record keeping and included (but not limited to) missing information, duplicates and transcription errors. Additionally there were discrepancies between the North Star reports and the reports extracted from COMETS and Tier.Net. It is this recommended that data quality processes be instituted at RWCs and there be regular data verification, validation and clean up exercises conducted.

Referral services

Data on referrals are limited in that it is only recorded whether a client had a referral but not the kind of referral needed. Because North Star Alliance's services include pre-screening of TB and malaria, information on whether a referral has been made would be needed to evaluate the screening services and, in the future, for North Star Alliance to link patients in their system to the referral sites. Additionally, information on referrals that are made because North Star Alliance does not provide a particular service could provide valuable information for consideration of future service expansion, highlighting specific needs of clients in each site.

Outreach services

For North Star Alliance to be able to monitor outreach services, it will be important to expand data collected in COMETS to include the number of people attending outreach sessions (number of people contacted). It would also be useful to include a field to use during counselling and testing to document whether the patient is attending this service following a contact with an outreach worker.

Stock-outs of tests and medicines

Currently, stock-outs of tests are only recorded as a reason for not testing (text field) in each patient record. We have been unable to find out how to consult COMETS systematically with regards to stock-outs of medicines. It would be important for North Star Alliance to consider recording any stock-outs of both testing and medicines separately from the individual patient records. This is particularly important for those sites where ART is made available to clients. Supply chain early warning systems to indicate when medicine stocks are running low are critical for the prevention of stock-outs.

ART services

Ensuring that a clear Memorandum of Understanding including the names of those accountable is in place with the Department of Health will avoid delays in accreditation of future ART sites. Hiring of NIMART-trained clinicians might be considered to reduce waiting time and costs. We observed lower HIV-positivity rates among truck drivers than anticipated and there were issues with linkage to Tier.net: only ART patients and not the complete list of HIV-positive patients had been transferred. There are issues following up with consent and phone calls, as this is a population that is difficult to reach (this is important to keep in mind for cohort establishment).

Future research

Pre-exposure prophylaxis (PrEP) and early treatment pilot and ACCESS project

In June 2016, the Department of Health in South Africa announced a change in policy and a roll-out of PrEP and early treatment nationally⁽¹⁹⁾. In preparation for this roll-out, CHAI performed a systematic assessment of potential sites for selection. For this pilot, six North Star Alliance sites were assessed as being immediately ready for roll-out. This positive assessment was a direct consequence of the sites being part of the Demo project, and the positive quality improvement. ACCESS is an evaluation initiative to provide in-depth information to the Department of Health before the national roll-out. North Star Alliance is part of this initiative.

Non-communicable diseases collaborations

After completing the Truckers Health Survey, we identified a cohort of truck drivers and data at baseline have been collected. The next step would be to raise funds to continue following up on these truck drivers at regular intervals and thus establish an occupational cohort of male individuals at risk of non-communicable diseases.

Impact evaluation: role of modelling for future research

Finally, the main limitation of this piece of work is the lack of impact measurement. We were unable to do this due to a series of challenges both logistical (ART service design and implementation was long) and methodological (as explained above). However, with the evidence portfolio we have developed and time, it would be possible to develop a grant application for secondary data analysis aiming to undertake a modelling study, whereby we could extrapolate from our proof of concept at outcome and output level to impact at a population level. This is a suggestion for further research in the light of current knowledge base achieved in this project over three years.

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Appendices

Appendix 1: Deliverables and outputs by objective

Table A1 – Objectives, deliverables and outputs

OBJECTIVES	DELIVERABLES	OUTPUT
To prepare and deliver training to RWC staff and hubs in expanded service policy docs and standard operating procedures (SOPs) to harmonise STI/HIV/ART trainings	W1: training curriculum and proposal development for STI/HIV/ART harmonisation	Technical support was provided on country protocol compliance
	W2: Attendance registers from training workshops	Attendance registers were completed for all training sessions. Tracking logs were created and completed. These are available on request
	W3: training curriculum and proposal development for ART service provision	Technical support and training was provided in development of North Star Alliance-specific ART service
Identification and recruitment of staff for service expansion (ART)	W4: help with terms of reference for staff to be recruited	Wits RHI managers participated in the recruitment processes of select clinical and monitoring and evaluation personnel
Advise NSA on inventory and equipment needed for service expansion (ART)	W5: list of inventory and equipment needed for service expansion	Technical support was provided during site readiness/ start up phases. Assistance was provided for selection of point of care devices, ART regimens and PrEP implementation
Technical assistance in identification of referral sites	W6: list of preferred referral sites	Final referral lists were compiled by North Star Alliance. Wits RHI provided support on referral protocols
Interaction with referral sites	W7: training curriculum and schedule proposal	Wits RHI experienced challenges in completing this deliverable as many of the referral sites were out of South Africa
To describe the healthcare-seeking needs and behaviours of North Star Alliance clients	A1: research proposal for objective 1	Protocol submitted to North Star Alliance on June 30, 2014
	A2: research results for objective 1	Healthcare needs (includes systematic review and THS preliminary findings) Uptake (Access and uptake of services by female sex workers and truck drivers along the corridor) Qualitative research (Views on accessibility to care for female sex

To evaluate improvements in the effectiveness of RWC networks in delivering frontline prevention, treatment and care services to key populations	A3: research proposal for objective 2	workers and truck drivers in South Africa Protocol submitted to North Star Alliance on June 30, 2014
	A5: research results for objective 2	Research results for objective 2(a): non-ART services Non-HIV linkage to care along the corridor by key population Research results for objective 2(b): ART service ART cascade of care and costs, including recruitment (and follow-up of a cohort of ART patients linked to Tier.net system and on North Star Alliance's system)
To evaluate improvements in the effectiveness of RWC networks in enhancing adherence to sexual and reproductive health treatment programmes among key populations accessing North Star Alliance services	A4: research proposal for objective 3	Protocol submitted to North Star Alliance on June 30, 2014
	A6: research results for objective 3	Research results for objective 3(a): non-ART services Retention on NSA services: report on repeat visits along the corridor by key population Research results for objective 3(b): ART service ART cascade of care and costs, including recruitment and follow-up of a cohort of ART patients linked to Tier.net system and on North Star Alliance's system

Appendix 2: Publications published, submitted and in preparation

Table A2 – Peer-reviewed publications:

Publication	Authors	Status and notes
(1) Healthcare Programmes for Truck Drivers in sub-Saharan Africa: A Systematic Review and Meta-Analysis.	Lalla-Edward ST, Fobosi SC, Hanks CA, Coe K, Venter WDF, Gomez GB	Published: PLoS One. 2016; 22;11(6):e0156975
(2) Uptake of health services among truck drivers in South Africa: analysis of routine data from nine Roadside Wellness Clinics	Lalla-Edward ST, Ncube S, Matthew P, Hanks CA, Venter WDF, Gomez GB	Submitted, under review: BMC Health Service Research
(3) Access and utilization of healthcare services by sex workers in South Africa: North Star Alliance as a case study	Fobosi SC, Lalla-Edward ST, Ncube S, Buthelezi F, Matthew P, Kadyakapita A, Slabbert M, Hanks C, Venter WDF, Gomez GB	Submitted, under review: South African Medical Journal
(4) Linkage and retention in care for populations along transport corridors: repeat visits and referrals	Ncube S, Lalla-Edward ST, NSA author(s), Hanks C, Venter WDF, Gomez GB	In preparation
(5) Design and programme evaluation of an ART service delivery model for mobile populations in South Africa	Lalla-Edward ST, NSA author(s), Moorhouse M, Hanks CA, Gomez GB, Venter WDF	In preparation
(6) Overview of North South Corridor Demonstration Project: methods and summary results	Gomez GB, Lalla-Edward ST, NSA author(s), Hanks CA, Venter WDF	In preparation
(7) If you put them, they will come: assessing access to South African Roadside Wellness Clinics for Truck Drivers	Lalla-Edward ST, NSA author(s), Hanks CA, Venter WDF, Gomez GB	In preparation
(8) Epidemiological considerations: rethinking HIV transmission along corridors	Gomez GB, Lalla-Edward ST, Hanks CA, Venter WDF	In preparation
(9) Truckers' health survey: results from cross-sectional data	Vos A, Lalla-Edward ST, NSA author(s), Brewster L*, Hanks CA, LMC author(s), Venter WDF	In preparation *Luzzy Brewster, AIGHD, CVD epidemiologist
(10) Non-communicable diseases editorial	Vos A, Venter WDF	In preparation
(11) Letter on truckers' health	Lalla-Edward ST, Moorhouse M, Venter WDF	In preparation

Appendix 3: Other outputs

1. Article (not peer reviewed)

En route to a healthy truck driver population... Samanta Tresha Lalla-Edward and Gabriela B Gomez. HIV Nursing Matters – a publication of the Southern African HIV Clinicians Society. June 2015 6(2): 20.

2. Poster at 9th Interest Workshop, 5-8 May 2015, Harare, Zimbabwe

Fobosi, SC; Buthelezi, F; Gomez, GB; Hankins C; Hadingham J; Stadler, J; Lalla-Edward, ST. Accessing truck drivers and sex workers: Recruitment and data collection experiences from South African sites. Reviews in Antiviral Therapy and Infectious Diseases. 3: 2015. Available at: http://regist2.virology-education.com/abstractbook/2015_3.pdf

3. Poster at 8th IAS Conference on HIV Pathogenesis, Treatment and Prevention (IAS 2015), 19-22 July 2015, Vancouver, Canada

Lalla-Edward, ST; Fobosi, S; Stadler, J; Venter WDF; Gomez GB. Healthcare provision for truck drivers in sub-Saharan Africa: A systematic review of interventions, methods of evaluation and impact

4. Presentation at Wits Research day 2016, Johannesburg, South Africa, 19 September 2016

Lalla-Edward ST; Fobosi SC; Hankins CA; Case KK; Venter WDF; Gomez GB. Healthcare provision for truck drivers in sub-Saharan Africa: A systematic review and meta-analysis

5. Poster at Wits Research day 2016, Johannesburg, South Africa, 19 September 2016

Fobosi SC; Lalla-Edward ST; Mkwanazi E; Matthew P; Hankins C; Sickle E; Venter F; Gomez GB. Access and utilization of healthcare services by sex workers in South Africa: North Star Alliance as a case study

Appendix C2: Access to and utilisation of healthcare services by sex workers at truck-stop clinics in South Africa: A case study

Access to and utilisation of healthcare services by sex workers at truck-stop clinics in South Africa: A case study

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Background. Sex worker-specific health services aim to respond to the challenges that this key population faces in accessing healthcare. These services aim to integrate primary healthcare (PHC) interventions, yet most services tend to focus on prevention of HIV and sexually transmitted infections (STIs). North Star Alliance (North Star) is a public-private partnership providing a healthcare service package in roadside wellness clinics (RWCs) to at-risk populations along transport corridors in sub-Saharan Africa.

Objectives. To inform future service development for sex workers and describe North Star's contribution to healthcare provision to this population in South Africa, we describe services provided to and utilised by sex workers, and their views of these services.

Methods. Using a mixed-methods approach, we present quantitative analyses of anonymised North Star routine data for sex workers for October 2013 - September 2015, covering nine sites in seven provinces. Clinic visits were disaggregated by type of service accessed. We performed thematic analysis of 25 semi-structured interviews conducted at five clinics.

Results. A total of 2 794 sex workers accessed RWCs during the 2 years. Sex workers attending clinics were almost exclusively female (98.2%) and aged <40 years (83.8%). The majority were South African (83.8%), except at Musina, where the majority of clients were Zimbabwean. On average, sex workers visited the clinics 1.5 times per person. However, in most cases only one service was accessed per visit. PHC services other than for HIV and STIs were accessed more commonly than HIV-specific services and STI treatment. There was an increase in the number of services accessed over time, the figure almost doubling from 1 489 during the first year to 2 936 during the second year. Although during recruitment participants reported having had sex in exchange for goods or money during the past 3 months, not all participants self-identified as sex workers during interviews; however, all reported feeling at higher risk of poor health than the general population owing to their involvement in sex work. Participants reported satisfaction with site accessibility, location and operating hours. Sex workers accessing sites described services as being suitable and accessible, with friendly staff.

Conclusions. RWCs were highly appreciated by the users, as they are suitable and accessible. The sex workers who used the clinics visited them irregularly, mostly for PHC services other than HIV and STIs. Services other than the one for which the sex worker came to the clinic rarely appeared to be offered. We recommend areas for service expansion.

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Sex workers face a higher HIV burden and have less access to healthcare than the general population.^[1] In South Africa (SA), the prevalence of HIV among sex workers has been reported to be very high in urban areas,^[2] with overall odds of infection being up to five times higher among female sex workers than women in the general population.^[3] Recently, the SA National Department of Health recognised this vulnerability and published the South African National Sex Worker HIV Plan (NSWP).^[4] This plan aims to reach 70 000 sex workers over the next five years with a comprehensive package of care, and to ensure that at least 95% of sex workers use condoms with their clients and partners, that gender-based violence falls by 50%, and that the global targets of 90-90-90 are met for sex workers (i.e. 90% of sex workers know their HIV status, 90% of those testing positive are on antiretroviral treatment (ART), and 90% of sex workers on ART are virally suppressed). However, these targets may be difficult to attain if sex worker programmes have limited coverage and are poorly co-ordinated.^[5-7]

While access to healthcare for sex workers is critically important, healthcare services for this population are currently fragmented, with most sex worker projects focused on prevention of HIV and sexually transmitted infections (STIs).^[8] In addition, there is an opportunity to expand the scope of HIV services provided by these projects. For example, while HIV testing and counselling (HCT) is common in most clinics offering services prioritised for sex workers, only a few service providers offer, on site, the full range of services prescribed by the NSWP, including CD4+ count testing, co-trimoxazole prophylaxis and ART. To increase the scope of HIV services available to sex workers at sex worker-dedicated sites, the SA government is piloting pre-exposure prophylaxis (PrEP) and immediate treatment (called UTT: universal test and treat) at dedicated sex worker sites that are already offering ART to sex workers.^[9]

North Star Alliance (North Star) is a public-private partnership aiming to provide healthcare to at-risk populations along transport corridors in sub-Saharan Africa.^[10] These populations include truck

drivers, sex workers and their clients, and individuals from the surrounding communities that do not otherwise have access to clinics – therefore aiming to contribute to the improvement of service provision for sex workers nationally.

Objectives

To assess the extent of the use of North Star services by sex workers and satisfaction with the services, as well as to inform future service development for sex workers, we describe services provided by North Star in SA, their utilisation by sex workers, and sex workers' views on these services.

Methods

We used a mixed-method approach for this research. Quantitative and qualitative data were collected concurrently and analysed separately.

Setting

The study took place in nine sites in seven provinces of SA (Cato Ridge and Pongola (KwaZulu-Natal), Bloemfontein (Free State), Bloemhof (North West), Ngodwana (Mpumalanga), Musina (Limpopo), Upington (Northern Cape), and Pomona and City Deep (Gauteng)). All clinics operate on weekdays and are typically open for a minimum of 6 hours. Operating hours for some clinics changed during the period after this research. However, at the time of data collection, Cato Ridge and Bloemhof were operating from 14h00 to 22h00, Upington from 18h00 to 22h00, Ngodwana from 11h00 to 19h00 and Musina from 07h00 to 15h00.

Clinics became operational at various times during the October 2013 – September 2015 review period. Cato Ridge, City Deep and Ngodwana all opened in September 2013, while Musina, Upington and Bloemhof opened in January 2014, February 2014 and March 2014, respectively. Pongola opened in June 2014, while City Deep closed in September 2014 and Bloemfontein opened. Pomona (replacement for City Deep) opened in January 2015.

North Star clinics offer not only HIV/STI-specific services such as condom distribution, STI syndromic treatment, HCT and tuberculosis (TB) screening, but also other PHC services such as malaria screening and treatment, and in some instances cervical cancer screening, family planning, and diagnosis and treatment of common illnesses. During the past 4 years, North Star expanded its services to include initiation and provision of ART. It was recently announced that six North Star sites had been included as part of the national pilot programme to expand services further to provide UTT and PrEP. This ART information is being reported elsewhere and is not included in the HIV visit information reported in this article.

Quantitative approach

Anonymised routinely collected data were extracted in April 2016 from the Corridor Medical Transfer System (COMETS), the clinical information management system used by North Star across all its sites. The COMETS database has predefined occupation categories that are completed by the healthcare worker during the initial client visit. We extracted information for the 2-year period 1 October 2013 – 30 September 2015. Information was obtained at three levels: (i) individual-level characteristics of patients attending the sites (sex, age, marital status, occupation and country of origin); (ii) visit-level characteristics describing site and date of visit; and (iii) service-level information describing the type of service accessed during each visit (i.e. PHC, HIV, TB, STI, malaria). COMETS has separate fields for recording HIV services, STI syndromic treatment, TB screening and

referral, malaria (symptomatic treatment) and PHC services (listed under 'Setting'). Based on this, data were analysed and presented according to these categories. Since data were anonymised, visit-level information was paired to the sex worker using their COMETS identifier and date of birth. No names or country identity numbers were used or accessible.

The data recorded in COMETS were audited periodically as part of routine programmatic quality assurance. During these audits, the completeness, accuracy and correct transcribing of records were validated. All data were analysed using Stata version 12 (StataCorp, USA). Data on community members and truck drivers (published elsewhere) were excluded from this analysis.

Qualitative approach

Using a semi-structured interview guide, data were collected on access and utilisation at five SA sites in five provinces (Cato Ridge (KwaZulu-Natal), Bloemhof (North West), Ngodwana (Mpumalanga), Musina (Limpopo) and Upington (Northern Cape)). These sites were chosen because they were operational at the start of the research project and were approved for participation by the local ethics committee. We aimed to achieve 30 interviews, six per site. Participant recruitment was completed in two ways. Clients who came to the clinic were informed of the study on their exit and asked if they wanted to participate. For the sex workers who knew about the clinics but did not access them, the catchment areas around the clinics were visited by interviewers (one male and one female) to recruit sex workers. Eligibility criteria included age ≥18 years, either having accessed the clinic or knowing about the clinic and not accessing it, and reporting having had sex in exchange for goods or money during the past 3 months.

Interviews were conducted in accordance with what made the participant feel comfortable or was consented to: location (in the clinic consulting room or in the vicinity of the clinic), interviewer (male or female), recording (audio-recorded or note taking only) and language (English or vernacular).

Audio recordings were transcribed and quality checked. In the case of translation, transcripts were back-translated. All non-recorded interviews were typed up as transcripts and quality checked against the notes. All interview data were imported and analysed using NVivo 10 (QSR International). Interview data were analysed into themes (thematic analysis): (i) nature and risks of sex work; (ii) service access and utilisation; and (iii) patient satisfaction. Distinctive remarks from the interviews are given as quotations.

Ethics considerations

Ethics approval was obtained from the University of the Witwatersrand Human Research Ethics Committee (ref. no. M140506) on 30 May 2014. In addition, North Star Alliance and the Wits Reproductive Health and HIV Institute (Wits RHI) signed a data user's agreement on 5 May 2014 to ensure that data were appropriately handled throughout the data management cycle. No personal identifiers were extracted for the quantitative data analysis and no names were recorded during the interviews. All participants provided consent for interviews. These consents were stored separately from the voice recordings and transcripts. All voice recordings and transcripts were labelled numerically and could not be linked to clients through the consent forms. All electronically stored data were password protected and available to selected researchers on the project. All paper-based project information was stored in a secure data-filing room compliant with Wits RHI, the ethical review board and good clinical practice standards.

Results

Quantitative results

We extracted a total of 36 405 visit records for the 2-year study period at the nine sites (an average of >2 000 visits per site-year). We then excluded duplicates ($n=675$, 1.8%) and incomplete records ($n=1 493$, 4.1%) to finalise a database of 34 237 unique visits with complete records. Of these, 13 263 (38.7%) were visits by community members and 16 784 (49.0%) visits by truck drivers. In this analysis, we included 4 190 (12.2%) recorded visits by 2 794 sex workers, representing on average less than one visit per site-year by sex workers (Fig. 1).

The majority of sex workers attending North Star services were female ($n=2 743$, 98.2%), 83.8% were aged <40 years ($n=2 342$), and a minority ($n=301$, 10.8%) were married or in a stable relationship. The majority of sex workers were of SA origin ($n=2 341$, 83.8%), followed by those from Zimbabwe ($n=388$, 13.9%). Few sex workers from other countries (e.g. Angola, Malawi, Namibia, Senegal, South Sudan, Swaziland, Zambia) were recorded. Just under half ($n=1 227$, 43.9%) of all sex workers used the Upington clinic. Sex workers visited sites on average 1.5 times over the 2 years, accessing only one service at each visit for the majority of the visits (Table 1).

The demographic distribution of clinic attendees was similar across the sites, with the exception of sex workers presenting for care at Bloemhof and Musina. Women at Bloemhof were younger (18.0% <20 years old) than those at other sites, while women at Musina were mainly Zimbabweans ($n=293$, 81.8%), as opposed to other sites where South Africans formed the majority.

We observed an increase in the total number of services accessed over time, in particular for PHC services ($r^2=0.5704$) (Fig. 2). PHC services were the type most accessed across all sites, followed by HIV-related services and then those for STIs. There were minimal visits for either TB or malaria compared with PHC or HIV.

Qualitative results

We completed 25 (24 users and 1 non-user) interviews out of a target of 30 planned. All participants were female, and the majority ($n=16$, 64.0%) were South African. The mean age was 28.6 years. Only two women had a stable partner (married or cohabiting), and the average number of dependants across all women was 2.6. All the participants except one from Bloemhof clinic had completed primary-level

Table 1. Individual and service characteristics

Total number of sex workers, <i>N</i>	2 794
Gender female, <i>n</i> (%)	2 743 (98.2)
Age (yr), median (IQR)	30 (12.0)
Age group (yr), <i>n</i> (%)	
18–24	749 (26.8)
25–39	1 593 (57.0)
40–49	369 (13.2)
≥50	83 (3.0)
Partnership status stable, <i>n</i> (%)	301 (10.8)
Country of origin	
South Africa	2 341 (83.8)
Zimbabwe	388 (13.9)
Other	65 (2.3)
Site attended, <i>n</i> (%)	
Bloemfontein	157 (5.6)
Bloemhof	44 (1.6)
Cato Ridge	143 (5.1)
City Deep	41 (1.5)
Musina	358 (12.8)
Ngodwana	736 (26.3)
Pomona	48 (1.7)
Pongola	40 (1.4)
Upington	1 227 (43.9)
Visits by sex workers, <i>n</i>	4 190
Services accessed during visits, <i>n</i>	4 425
Type of service, <i>n</i> (%)	
PHC	2 805 (63.4)
STI	557 (12.6)
TB	23 (0.5)
Malaria	5 (0.1)
HIV	1 035 (23.4)

IQR = interquartile range; PHC = primary healthcare; STI = sexually transmitted infection; TB = tuberculosis.

education or higher, and the majority ($n=21$, 84.0%) reported their monthly income as <ZAR5 000.

Nature and risks of sex work

Most participants reported being self-employed and earning an income in addition to sex work. Some women reported sex work as their first

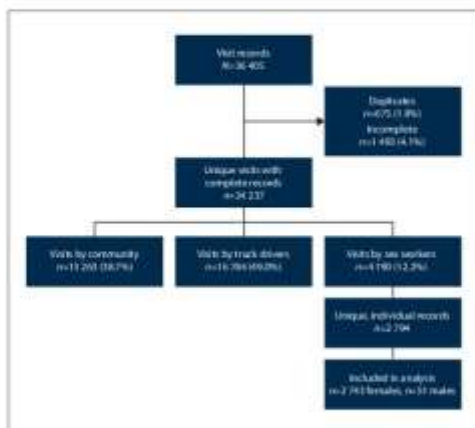


Fig. 1. Flowchart of routinely collected data.

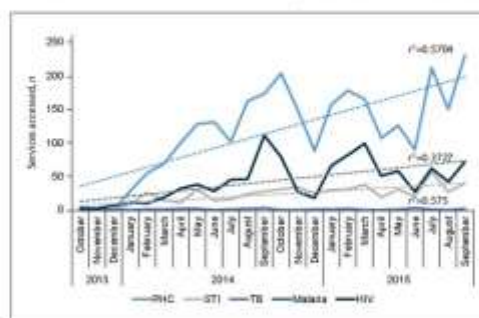


Fig. 2. Number of services accessed over time according to type of service. (PHC = primary healthcare; STI = sexually transmitted infection; TB = tuberculosis.)

job, citing lack of employment opportunities in the formal sector as the reason. Some participants did not identify with the label of sex worker; this group reported mainly part-time sex work. In general, working hours varied, with most women selling services in the evening.

'I started [being a sex worker] a long time ago. I think I was 13. I work anytime ... I work anytime, you find that a truck driver comes here and says I am looking for a person, every time there is a truck that arrives here. He will go up and find a person anytime.' (Ngodwana participant)

'I am a sex worker, but I am also a co-ordinator for some red umbrella programme at GRIP [Greater Nelspruit Rape Intervention Project], I am a paralegal, SA human rights advisor under the programme of SW's [probably referring to SWEAT, Sex Worker Education and Advocacy Taskforce] home of sex workers.' (Ngodwana participant)

Participants cited a number of risks related to their occupation. These included clients refusing to pay after having had sex, abandoning them in unsafe areas, and refusing to use condoms. Some participants reported being attacked while asking for payment after rendering their services. There were also reports of regular condom failures.

'You can be beaten up whilst asking for money, some are rough, you meet rough riders like the condom can burst, some do it in a way that the condom can burst so you have to be very careful, some won't give you money, some are ... It's very dangerous.' (Musina participant)

Service access and utilisation

Most sex workers accessed condoms, pregnancy and HIV tests, and STI syndromic management at North Star clinics. For primary healthcare, they attended mainly to treat a cold or flu and to have check-ups, including non-communicable disease services. Some participants expressed a need for post-exposure prophylaxis for HIV.

'Ahhhh ... it once happened that the condom burst and I came and asked the sister to help me, she said I should wait and see what happens because she doesn't know what to give me. The second time I came was to check my blood pressure and then I came back again to check my blood pressure again [voice of the interviewer: high blood] yah I can say I came about four times.' (Ngodwana participant)

'Just because of, sometimes I want to know if I'm in good health. [I] Also [go] to collect condoms; and when someone did not use a condom. (Bloemhof participant)

'It's like; maybe I am not feeling well or, feel like my urine is hot, something like that, and then go to the clinic and get help.' (Cato Ridge participant)

While for most of the participants being a sex worker did not influence their decision to seek healthcare, they understood the risks involved in the work and how this might affect their healthcare-seeking behaviour.

'No, it does not influence my decision of coming to the clinic. But, I do acknowledge that as a sex worker, I am very afraid of diseases such as STIs and AIDS. If I was not a sex worker, I would not come to the clinic as often. A lot of this is as a result of the lifestyle of sex workers which is money concentrated and being offered a lot of money not to use protection.' (Cato Ridge participant)

Sex worker satisfaction with services

The sex workers interviewed generally reported satisfaction with the location of the clinic, services offered, the operating hours, and

the services being free of charge. When asked for suggestions to increase sex worker access to the clinic, most of the participants cited a revision of the clinic opening hours. While some women found the hours suitable, others requested opening times to be extended to Saturdays and weekdays until 22h00/midnight, or a 24-hour service (especially for emergencies). They commended the healthcare workers/staff's good reception of them and noted that the staff treated them well. Most women reported satisfaction with the size of the clinic. Some of the participants tended to be shy about going to a public clinic/hospital, so the location of the RWC made it easy for them to use.

'I don't know, but it's right, it treats us well. So, I wouldn't say you should do this or remove it. I think it's right where it is, because there are some people who are shy of going to the clinic - so, I think it's good. It's right for people to go and test.' (Bloemhof respondent)

The majority of Cato Ridge participants noted that this particular clinic was not accessible to sex workers because of access restrictions at this truck stop. However, some of them mentioned that the clinic was within walking distance, which was convenient. At other sites (e.g. Musina, Ngodwana and Upington), the distance from workplace or home was considered suitable. In particular, at the Musina border centre, participants were satisfied with the location as they could access the clinic easily on the SA side.

'Yah, it's in the right place because we get helped a lot especially if you suffer from STIs, it helps a lot. I have known for a while now that this clinic is for sex workers. The sex workers get help a lot from the clinic. Even though some are not sex workers they do get helped a lot. I think it's right [voice of the interviewer: it's right]; just because it's in the rural areas it doesn't mean that it's not acceptable. It's far from blown and even me I come here to test.' (Ngodwana participant)

Some of the dissatisfactions with the clinic services among the users were related to the lack of certain specific services. Most sex workers felt that the clinics should provide all healthcare services needed; for example, in addition to HIV testing, screening for diabetes should be available.

Discussion

The distribution of visits across sites was heterogeneous, with two sites (Ngodwana and Upington) providing most services to sex workers. The heterogeneity in utilisation can be attributed to the clinics being established at different times during the reported period, the size of the community around the clinic (i.e. number of sex workers available to access the clinic), the number of truck drivers accessing/present at the truck stop (potential clients for the sex workers), and security/police threats around the clinic (fear of being arrested or not being allowed into the truck stop where the clinic is located by the truck-stop security personnel).

Utilisation of healthcare services by sex workers was low (on average 1.5 visits per sex worker for the reported period). Our clinic attendees constitute a population that is mainly accessing PHC services other than for HIV and STI syndromic treatment. They mostly reported seeking curative care for a range of illnesses. These non-HIV, STI and TB visits do present the opportunity for the clinics' healthcare workers to offer the additional HIV, TB and STI services. The clinics' utilisation data reflect that while sex workers do access services, the services accessed are not linked to their high-risk profile. This could be attributed to their low-risk/no-risk self-perception, or their indeed not being at risk. Owing to the lack of limited access to

services in their geographical locations, it is possible that female sex workers need to access other services in the same way that the general population does. This study could therefore be showing that female sex workers have similar (not restricted to sexual health only) health needs as the community, and North Star is assisting in addressing that gap.

Access together with the perception of the RWCs as suitable, appropriate and accessible, with friendly and approachable staff, provides an excellent opportunity to reach out and retain in care local sex worker communities. Since our study set out to explore access and describe utilisation, we cannot list definite reasons for low utilisation and infrequent visits. The proportion of sex workers in local communities is unknown, and it will be beneficial to conduct site-specific mapping and enumeration, mobility pattern analyses and/or behavioural surveillances combined with studies investigating reasons for low utilisation. This will assist North Star in planning for demand creation and improved linkage to and retention in care.

Our findings show that North Star is currently providing services that are helping to tackle two structural barriers previously reported globally by sex workers in access to care: (i) negative experiences with staff, including discriminatory attitudes from staff, open hostility and reluctance to treat them; and (ii) fragmentation of healthcare services available to sex workers.¹⁸ There is also a need to increase demand through outreach and information campaigns, building on perceived accessibility of sites and appreciation of staff attitudes.

Another recommendation is to build on North Star's healthcare service delivery model to offer sex worker attendees provider-initiated and complementary health services when they access services (e.g. TB and STI screening for those accessing HIV testing). While sex worker-specific services represent a tailored solution for healthcare delivery, our results suggest that an all-inclusive approach to healthcare service delivery with empathetic staff is perceived as 'accessible' and is suitable to retain this population group in care. Additionally, it is important to recognise that the clinics do not offer some essential sexual and reproductive health (SRH) services for the prevention and care of adverse SRH outcomes to which female sex workers are particularly vulnerable, including unwanted pregnancies (currently there is a limited offering of contraception and no termination of pregnancy services) and sexual and other types of violence. Revision of the healthcare service package to incorporate these areas of care will increase the appropriateness of the services available to female sex workers. Lastly, if service utilisation still remains after improved access and acceptable and appropriate service delivery, North Star may need to consider conducting cost-benefit analyses of the smaller, less utilised clinics.

Study limitations

Our study has some limitations. Initially we aimed to interview both users and non-users of North Star services. However, out of all the sites where data collection was conducted, only one interview could be conducted with a non-user. This is because sex workers were difficult to identify (sometimes hiding their trade to avoid abuse or repercussions). To access them and invite them to participate, we required the assistance of North Star's staff, which limited our sampling frame to those known to the staff. Moreover, as with any analysis of routine data, we are dependent on the quality of the routine reporting. Significant efforts were made to achieve a suitable level of recording, with several rounds of audits and validation checks. We noted that there were missed opportunities for integration of services/provider-initiated services, and we acknowledge that the analysed dataset may have been too small to draw many conclusions from it, and that sex workers may not have required

services in addition to what they requested, and/or that additional services may have been provided without being recorded. The main classification of clinic attendees into occupational groups depended largely on suitable and complete reporting from patients. With some sex workers not identifying themselves as such, we may have underestimated the total volume of visits and services accessed by this group. The demographics of the quantitative and qualitative samples did not match (i.e. there was a lower percentage of South Africans in the qualitative sample), but this was not too much lower than the quantitative sample. Lastly, although provincial-level sex worker population estimates are available, they cannot be used as an indication of the sex worker population in the catchment area of the truck-stop clinics.

Conclusion

RWCs were highly appreciated by the users, who reported them as being appropriate and accessible. Female sex workers visited the clinics irregularly, and when they did, they primarily accessed the clinic for PHC services other than HIV and STIs. Services other than the one for which the sex worker presented for were rarely offered. We therefore make several recommendations that can be further explored for service expansion in North Star.

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Author contributions. STL-E, WDFV and GBG designed the study; FB and SCF conducted interviews; SN extracted COMETS data; SCE, STL-E, SN, FB, PM, AK, MS, CAH, WDFV and GBG analysed the data and interpreted the results; SCE, STL-E and GBG wrote the initial draft and all authors critically reviewed and approved the final draft.

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Conflicts of interest. PM and AK are both employed by North Star Alliance. PM is currently regional director, southern Africa, and AK is a medical quality control officer. All the other authors have declared that they have no conflicts of interest.

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