

**RISK AND PROTECTION: ALCOHOL USE AMONG URBAN
YOUTH WITHIN THE BIRTH TO TWENTY (BT20) COHORT**

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Submitted in fulfilment of the requirements for the degree of

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Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, 2015

DECLARATION

I declare that the thesis entitled “Risk and Protection: Alcohol Use among Urban Youth within the Birth to Twenty Cohort”, submitted for the degree Doctor of Philosophy is my own work. It has not been submitted previously at this or any other University. All contributors have been fully acknowledged.

This thesis is being submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg.

Leane Ramsoomar

Signed at Johannesburg on the 20 July 2015

A handwritten signature in black ink, appearing to be 'Leane Ramsoomar', written in a cursive style.

DEDICATION

This thesis is dedicated to my father, the late Mr Ramesh Ramsoomar, who passed away in the course of my pursuing this PhD. *For you, dad.*

THESIS CONTENT

The research that emanated from this PhD was published in a series of papers and submitted manuscripts. Over the course of the PhD, findings were presented at various local and international conferences and colloquiums. In addition, a research grant was awarded to fund this study.

Peer reviewed publications

1. Ramsoomar, L., & Morojele, N. K. (2012). Trends in alcohol prevalence, age of initiation and association with alcohol-related harm among South African youth: Implications for policy. *South African Medical Journal*, 102 (7), 609-612.
2. Ramsoomar, L., Morojele, N. K., & Norris, S. A. (2013). Alcohol use in early and late adolescence among the Birth to Twenty cohort in Soweto, South Africa (SA). *Global Health Action, supplement 1* (6), 57-66.

Submitted manuscripts

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Conference presentations

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2. Ramsoomar, L., & Morojele, N. K. (2012). Trends in alcohol use, age of initiation and alcohol-related harm among South African youth: Implications for Policy. *Global Alcohol Policy Conference (GAPC2011), 3rd Annual Conference*, Nonthaburi, Thailand, 13-15 February 2012. Poster Presentation.

3. Ramsoomar, L., Morojele, N. K., & Norris, S. A. (2013). Trends in alcohol use, age of initiation and alcohol-related harm among South African youth: Implications for Policy. *South African Community Epidemiological Network on Drug use (SACENDU) bi-annual meeting, Phase 33*, Pretoria, South Africa, 15 May 2013. Oral Presentation.
4. Ramsoomar, L., & Morojele, N. K. (2012). Trends in alcohol prevalence, age of initiation and association with alcohol-related harm among South African youth: Implications for Policy. *South African Community Epidemiological Network on Drug use (SACENDU) bi annual meeting*, Pretoria, South Africa, 30 November 2012. Oral Presentation.
5. Ramsoomar, L., & Morojele, N. K. (2013). Interrelationships between community, family, peer and individual influences on late adolescent alcohol use: Implications for policy in South Africa. *Global Alcohol Policy Conference (GAPC 2013) 4th Annual Conference*, Seoul, South Korea, 7-9 October 2013. Poster Presentation.
6. Ramsoomar, L., Morojele, N. K., Musenge, E., & Norris, S. A. (2014). Community, family, peer and individual influences on alcohol use in late adolescence. *South African Community Epidemiological Network on Drug use (SACENDU) bi-annual meeting, Phase 35*, Pretoria, 15 April 2014. Oral Presentation.

Dissemination

Ramsoomar, L. (2015). The ban on alcohol advertising in South Africa. *Public Health Association of South Africa (PHASA) Newsletter*, Retrieved February 26, 2015, from <http://www.phasa.org.za/about/phasa-newsletter>.

Student's contribution to the publications

The PhD student was wholly responsible for conceptualizing the study, designing the entire alcohol-related component of the Birth to Twenty (Bt20) questionnaire, data management (including data cleaning and coding), and drafting of the manuscripts. The co-authors guided the conceptualization of the manuscripts, data analysis, and editing and/or reviewing drafts of the manuscripts and the thesis as a whole.

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ABSTRACT

Background: South Africa (SA) faces a formidable threat to public health attributable to alcohol use. The heavy burden of alcohol-attributable morbidity, mortality and social harms borne by SA youth is concerning. In a series of papers, this study examined: current national trends in adolescent alcohol prevalence; the associations of prevalence with alcohol-related mortality; and the implications of the overall findings for alcohol policy in SA. The study also investigated adolescent alcohol use and its determinants at key developmental stages (early and late adolescence), among 1 647 urban adolescents in Soweto, South Africa. Employing a socio-ecological framework, multiple risk and protective factors that determine adolescent alcohol behaviours at late adolescence were empirically tested.

Methods: Data originated from seven sources: two national household, (South Africa Demographic and Health Survey-SADHS); two school-based youth risk behaviours surveys (YRBS); and two phases of a mortuary-based sentinel surveillance study. Additionally, a cross-sectional survey of adolescent alcohol use and its determinants was nested within Birth to Twenty (Bt20), a birth cohort study which prospectively follows 3273 children and their mothers from its inception in 1990 to date. Following a review of national data among 13- 19 year olds, bivariate analysis of alcohol use and alcohol-related harm among 13- 19 year olds, and alcohol use and mortality among 15-19 year olds, respectively, pertinent policy implications are discussed. Descriptive statistical analyses examined alcohol prevalence at early (13 years) and late (17/18 years) adolescence in the Bt20 cohort, while bivariate and multivariate analyses determined the associations and predictive values of socio-demographic, individual, and interpersonal factors on adolescent alcohol behaviours. Multi-level generalised linear mixed modelling determined if community level variables explain variability in the likelihood of having engaged in alcohol behaviours at 17/18 years old.

Results: Nationally, alcohol use was stable but high among adolescents at 20 - 25% (SADHS) and 49 - 50% (YRBS) over the period 1998-2008. Twelve percent of adolescents initiated alcohol use before age 13. Significant gender differences existed in alcohol consumption, with a predominance of male drinking. Binge drinking increased

significantly among females from 1998 to 2003. Homicide, suicide and unintentional deaths among 15- 19 year olds were significantly* associated with positive blood alcohol concentration. Within the Bt20 cohort, lifetime and current alcohol use, and binge drinking, is prevalent, and increases with progression from early to late adolescence. Consistent with national findings, significantly* more males than females engaged in all alcohol behaviours. The frequency of lifetime alcohol use increased from 22% in early adolescence to 66% in late adolescence. Gender, maternal education, and socio-economic status (SES) predicted lifetime alcohol use in early adolescence, while marital status was an additional predictor of the same in late adolescence. In late adolescence, bivariate regression models indicated that alcohol refusal self-efficacy, alcohol expectations, peer influence, household SES, neighbourhood economic level and community level SES were significantly associated with lifetime alcohol use. However, multi-level analyses revealed no direct association between community SES and adolescent alcohol behaviours.

Discussion: The high prevalence of lifetime, current alcohol use, and binge drinking, together with early alcohol debut indicates that, alcohol use is a significant public health problem facing SA youth. Adolescent drinking behaviour is the result of a complex interplay between individual, interpersonal and community-related risk and protective determinants. Empirically validated risk and protective factors represent potential points of intervention for prevention and reduction of adolescent drinking. This necessitates multi-faceted responses for prevention on one end of the continuum and harm reduction on the other.

Conclusion: Findings challenge current regulatory alcohol policies, the implementation of which falls short of ensuring that minimum drinking age laws are adequately effected. In addition, regulatory policies appear inadequate in ensuring that strategies translate into a reduction in harmful alcohol use by SA youth. Authoritative and consistent implementation of regulatory policies, in addition to harm reduction strategies, is necessary.

** $p < 0.01$*

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DEFINITIONS OF TERMS

The definitions used in this thesis emerge from the work of Keller, McCormack & Efron, 1982; Babor, Campbell, Room & Saunders, 1994; Babor, Cataeno, Casswell, Edwards, Giesbrecht, et al., 2010, and the Global status reports on alcohol and health (WHO, 2011; 2014). These definitions are not exhaustive and differing or adapted definitions exist in abundance in the alcohol literature.

Adolescents: young people aged 10 to 19 years (WHO, 2001).

Alcohol consumption: the intake of any beverage that contains the substance ethanol (100% alcohol or pure alcohol). Alcohol consumption is expressed in terms of litres of ethanol per drinker, excluding abstainers (Babor et al., 2010).

Alcoholism: chronic ongoing drinking or periodic consumption of alcohol which is characterised by impaired control over drinking, frequent episodes of intoxication, and preoccupation with alcohol and the use of alcohol despite adverse consequences (Babor et al., 1994).

Alcohol use disorder: is the result of the combination of alcohol use and alcohol dependence into a single disorder called alcohol use disorder (AUD). AUD is diagnosed when an individual presents with hazardous use, social and interpersonal problems related to use and neglect of major roles, due to use. In addition, a diagnosis is made when an individual presents with at least *two* of the following six criteria in the past 12 months: tolerance, withdrawal, used larger amounts/longer, repeated attempts to quit/control use, much time spent using, physical/psychological problems related to use, activities given up to use and craving. (American Psychiatric Association, Diagnostic and Statistical Manual, 5th Edition DSM-IV, 2013).

Binge/heavy episodic drinking: refers to the regular average consumption of 20-40g of alcohol a day for women and 40-60 g a day for men (Rehm, Room, Monteiro, Gmel, Graham, et al. 2004). Related to hazardous drinking are harmful drinking, binge/heavy episodic, or binge drinking (defined below) is likely to result in harm.

Harmful drinking: a pattern of drinking that causes damage to one's physical or mental health. Related to harmful drinking are binge/heavy episodic, or binge drinking (defined below).

Coping: “constantly changing cognitive and behavioural efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person” (Lazarus & Folkman, 1984, pg. 141).

Intoxication: a short-term state of impairment in psychological and psychomotor functioning in the presence of alcohol in the body (World Health Organization [WHO], 1992).

Lifetime alcohol use: usually framed as a question to ascertain if an individual has ever consumed a drink containing alcohol in his/her lifetime.

Past month drinking: drinking of an alcoholic beverage in the past 30 days. This group is also commonly referred to as current users.

Protective factors: factors that reduce the likelihood of problem behaviour, either directly or by mediating or moderating the effect of exposure to risk factors. Protective factors alter, improve or modify a person’s response to some environmental hazard that predisposes to a maladaptive outcome (Fraser, 1997; Luthar & Zigler, 1991, Rutter 1985).

Recorded alcohol consumption: “official statistics (production, import, export, and sales or taxation data)” (WHO, 2014, pg. 30).

Resilience: “positive adaptation, or the ability to maintain or regain mental health, despite experiencing adversity” (Herrman, Stewart, Diaz-Granados, Berger, Jackson, et al. 2011, pg. 258).

Risk factors: attributes or characteristics of an individual which make it more likely that this individual, rather than someone randomly selected from the population, will develop a disease, disorder or injury (WHO, 2014; Mzarek & Haggerty, 1994; Rutter, 1985).

Unrecorded alcohol consumption: “... alcohol that is not taxed in the country where it is consumed because it is usually produced, distributed and sold outside the formal channels under government control. This includes consumption of home-made or informally produced alcohol (legal or illegal), smuggled alcohol, alcohol intended for industrial or medical uses, and alcohol obtained through cross-border shopping (which is recorded in a different jurisdiction)” (WHO, 2014, pg. 30).

Youth: historically defined as persons aged from 15 to 24 years (WHO, 1986).

LIST OF ABBREVIATIONS

APA:	American Psychological Association
APC:	Adult Per capita Consumption
ART:	Anti-Retroviral Treatment
AUDIT:	Alcohol Use Disorders Identification Test
BAC:	Blood Alcohol Content
BAL:	Blood Alcohol Level
BQF:	Beverage-specific Quantity Frequency
Bt20:	Birth to Twenty (cohort)
CAGE:	Cutting down Annoyance Guilt and Eye-openers
CASE:	Centre for Social Enquiry
CDC:	Centers for Disease Control and Prevention
CI:	Confidence Interval
CIDI:	Composite International Diagnostic Interview
CRA:	Comparative Risk Assessment
CRAFFT:	Car Relax Alone Forget Friends Trouble
DALY:	Disability Adjusted Life Years
DSM:	Diagnostic and Statistical Manual
DUI:	Drinking Under the Influence
ESPAD:	European School Survey Project on Alcohol and other Drugs
GDP:	Gross Domestic Product
GIS:	Geographical Information Systems
GF:	Graduated Frequency
GSHS:	Global school-based Student Health Survey
HSRC:	Human Sciences Research Council
HIV/AIDS:	Human Immunodeficiency Syndrome /Acquired Immune Deficiency Syndrome
ICD:	International Classification of Diseases
LMIC:	Low-and Middle-Income Countries
MRC:	Medical Research Council

MRI:	Magnetic Resonance Imaging
MTF:	Monitoring the Future
NIMSS:	National Injury Mortality Surveillance Systems
PDS:	Patterns of Drinking Score
PHD:	Doctor of Philosophy
QF:	Quantity Frequency
SABSSM:	The South African Behavioural Sero-Prevalence and Mass Media study
SADHS:	South Africa Demographic and Health Survey
SARS:	South African Revenue Service
SES:	Socio-economic Status
SOWETO	South Western Townships
SPSS:	Statistical Package for the Social Sciences
STI:	Sexually Transmitted Infection
TB:	Tuberculosis
USA:	United States of America
UK:	United Kingdom
WHO:	World Health Organization
WR:	Weekly Recall
WUI:	Walking Under the Influence
YRBS:	South African Youth Risk Behaviour Survey

PREFACE

Alcohol is a ubiquitous commodity in most traditional and modern day societies. It is usually consumed in the privacy of homes, at family gatherings, in neighbourhoods, communities, bars, shebeens¹, restaurants and at cultural festivals. Aside from being a source of pleasure to the individual consumer, alcohol has, since time immemorial, held social significance. It is used to celebrate the birth of children, rites of passage, marriage, and the commemoration of death. As such, there is a social embeddedness that characterises its use.

Alongside the recognition of its socio-cultural and subjective value, alcohol is recognized as having adverse effects on health and social well-being. After childhood obesity and unsafe sex, alcohol has been implicated as the third largest risk factor for disease burden globally (WHO, 2011). Its harmful use accounts for 3.3 million deaths (5.9 %) of total and 139 million (5.1 %) of total Disability-Adjusted Life Years (DALYs) every year (WHO, 2014). The negative social consequences associated with its use include domestic violence (Seedat, van Niekerk, Jewkes, Suffla, & Ratele, 2010), poor school performance (Sutherland & Shepherd, 2001), work absenteeism and productivity loss (WHO, 2011), unintentional accidents and deaths, violence (Matzopoulos, Myers, Butchart, Corrigall, Peden, et al., 2008), sexual risk (Morojele, Brook, Kachieng'A, 2006) and psychological harm to those around the drinker (Laslett, Callinan, Pennay, 2013; Laslett, Catalano, Chikritzhs, Dale, Doran, et al., 2010).

Four decades ago, alcohol was recognized as a problem mainly of the adult population. Previous research among adult populations focused on the physiological merits and demerits of its use, the former being largely associated with the cardio-protective effect of light to moderate regular drinking (Mukamal, Jensen, Grønbaek, Stampfer, Manson, et al., 2005).

Today, alcohol use is of particular concern for the younger population – and for good reason. In the age group 15-29 years, 320 000 people died annually from alcohol-related causes, resulting in nine percent of total deaths in that age category alone (WHO, 2011). Evidenced by global findings, youth are initiating alcohol use earlier than 13 years

¹ A shebeen refers to an informal (licensed or unlicensed) drinking establishment in a township setting in South Africa

old and continuing to drink into adolescence and early adulthood (WHO, 2014; Eaton, Kann, Kinchen, Shanklin, Flint, et al., 2012; CDC, 2009. Reddy et al., 2013). Early initiation is an established risk factor for progression into problem drinking (Grant & Dawson, 1998; Grant 1998; Myers, Van Heerden, Grimsrud, Myer, Williams, et al., 2011). Youth drinking is also characterized by binge/heavy episodic drinking patterns, demonstrated by scientific findings (Reddy et al., 2013; WHO, 2014, Fuhr, Fleischmann, Riley, Kann & Poznyak, 2013), as well as anecdotal evidence in traditional and social media spaces. “Neknomination”, a drinking game that encourages rapid drinking or “necking” of alcohol while being recorded on video (Zonfrillo & Osterhoudt, 2014) is the most recent example of extreme drinking among youth.

In light of increasing use, early initiation and harmful patterns of alcohol use among youth in low-middle income (LMIC) countries, concern for the younger population is merited. As a sub-group of the population who in the next decade will likely comprise the adult drinking population, understanding initiation and current drinking, progression, and its associated influences is vital for informing prevention and harm reduction interventions. The dominant approach to examining the determinants of adolescent alcohol use has been centred on individual and interpersonal factors. Less work has been done on factors in the broader situational environments, and on how they work in concert with multiple factors to determine the initiation, prevalence and patterns and of adolescent alcohol use. Most of the existing research has been led by countries in the developed world (Ary, Duncan, Biglan, 1999; Donovan, 2004; Hawkins, Catalano, Arthur, 1995; Arthur, Hawkins, Pollard, Catalano, Baglioni, et al., 2002), although interest and evidence is emerging from the developing world (Peltzer, Malaka, Phaswana, 2002, Brook, Morojele, Pahl, Brook, 2011; Onya, Tessera, Myers, Flisher, 2012).

Following well established research which indicates that preventing disease and disability among populations is best initiated early in the life course if one expects to see health gains (Swayer, Afifi, Bearinger, Blakemore, Dick, et al., 2012), this PhD study is suitably placed to identify initiation, prevalence and patterns of alcohol use along the developmental life cycle from pre-adolescence to early adulthood among a birth cohort in Soweto, South Africa.

Several factors in the individual, interpersonal, community and societal domains have been shown to be associated with alcohol use. How do these multiple determinants converge to influence alcohol initiation, progression, patterns of drinking and a general increasing trend of *youth* alcohol use?

This PhD also comes at an opportune moment in the history of alcohol policy development in South Africa. The Cabinet of South Africa is currently considering a proposal to ban all alcohol advertising and sponsorship (see Appendix A), and a reduction in the blood alcohol content (BAC) when driving, from the current 0.05 g of alcohol per 100 millilitres of blood to zero (WHO, 2014). In addition, discussions are underway regarding increasing the legal drinking age from 18 to 21 years. These changes in the alcohol policy environment are encouraging, especially in light of the increasing alcohol consumption among SA youth, its strong association with road traffic accidents and fatalities, and social and behavioural risk factors. How does/will the South African policy environment impact on youth drinking? How will the proposed policy changes and increased political will towards reducing alcohol-related harm and implementation challenges impact on the landscape of drinking in South Africa (SA)?

These questions have occupied my thinking since my early career of working with alcohol and substance abuse patients. I have always had a keen awareness of the individual determinants (attitudes and beliefs) and interpersonal influences (family settings and peers) on alcohol use. However, given that such individual and interpersonal factors are couched within broader contexts, my curiosity about what determinants exist beyond the individual and interpersonal levels piqued.

The Birth to Twenty (Bt20) project, through its 20 year-long birth cohort study of children in Soweto, South Africa, presented me with the opportunity to explore some of these questions; and this PhD was birthed.

“IT’S MORE THAN JUST TALKING
TO YOUR CHILDREN, I THINK IT’S
TALKING TO YOUR CHILDREN’S
COMMUNITY AND HAVING SOME
INFLUENCE ON THAT.”

John Frick



The thesis covers a broad scope ranging from: examining the prevalence and trends of adolescent alcohol use over a 10 year period; and its implications for policy; to examining the prevalence of alcohol use, and its associated risk and protective factors in a birth cohort.

The aim of the PhD was to determine the prevalence of alcohol use in SA following a period of rapid policy development (1998-2009). In addition it aimed to examine prevalence among adolescents in a longitudinal birth cohort of urban youth in Soweto, Johannesburg, South Africa. In addition to drawing on historical data on adolescent alcohol use, self-report measures to examine alcohol prevalence at year 17 and 18 were developed specifically for this PhD. Finally, employing a socio-ecological framework (Bronfenbrenner, 1979), this thesis empirically tested the direction and interrelationships among multiple factors in the microsystem (individual, family, peer, school) and at the community level (community SES) on alcohol behaviours in the cohort. In order to achieve these aims, this thesis is structured to include a literature review, a measurements chapter, a series of publications and submitted manuscripts, and an integrated narrative chapter.

Chapter one of the thesis presents a literature review that describes: global and national alcohol use and its implications for public health in broad brush strokes; a description of the theoretical framework that informs the thesis. In addition, the gaps in the international and national literature are identified, and a description of how this thesis

aims to address some of those gaps is presented. Finally, the overall aims, testable hypotheses and specific objectives of the thesis are stated.

Chapter two presents a measurements section that includes common measurement techniques used in alcohol research; a summary of the methodological challenges in measuring alcohol use; and descriptions of the study setting/context, the study design and the ethical approval process undertaken for this study.

Chapters three to five contain a series of publications and submitted manuscripts which address the following questions:

- What is the national drinking landscape among young South Africans? How does alcohol prevalence among adolescents compare across national surveys during a period following rapid alcohol policy development in SA (1998-2008)? What are the associations between prevalence and alcohol-related harm? What do these findings mean for the current state of national alcohol policy?
- What are the individual and maternal socio-demographic correlates of alcohol prevalence in a birth cohort of adolescents at two key developmental stages (pre-adolescence – 13/14 years) and late adolescence - 18 years)?
- What is the influence of factors in the microsystem (individual, interpersonal, school, neighbourhood) and in the community on the alcohol behaviours of youth in the Bt20 Cohort at 18 years old?

Chapter six presents an integrated discussion of the thesis, drawing out the main consolidated research findings and conclusions, emergent themes, and the strengths and limitations of the research. It also revisits the theoretical framework and approach and discusses the implications of the thesis findings for current alcohol policies in South Africa, the broader low-middle income contexts. The chapter concludes with recommendations and future research directions in the area of adolescent alcohol use.

CHAPTER ONE: INTRODUCTION

BACKGROUND

Alcohol and public health

This chapter presents a literature review of alcohol research in the form of a broad-brush stroke of global alcohol use and its implications for public health; the drinking situation of South Africa, and among youth; a description of the theoretical framework that informs the thesis. In addition, the gaps in the international and national literature are identified, as well as a description of how this thesis aims to address some of those gaps. Finally, the overall aims, testable hypotheses and specific objectives of the thesis are presented.



Source: <http://netdna.coolthings.com/wp-content/uploads/2009/09/globe-bars1.jpg>

Global picture

Alcohol is a risk factor for a significant number of leading causes of mortality and morbidity worldwide. Harmful alcohol use alone accounts for 3.3 million deaths (5.9 %) of total and 139 million (5.1 %) of total Disability-Adjusted Life Years (DALYs) every year, even when the beneficial effects of light to moderate drinking are accounted for (WHO, 2014). Recent systematic analyses of the comparative risk assessment (CRA) for

the burden of disease and injuries attributable to 67 risk factors, underscores alcohol as a key risk factor for global morbidity and mortality. Specifically, in 2010, alcohol is shown to be the world's fifth most important risk factor for DALYs, moving from its previous eighth position in 1990. An increase of 37% is also noted in alcohol-attributable DALYs lost in a 20 year period (1990-2010). Alongside this increase, alcohol has been responsible for an increased number of deaths from two million in 1990 to 2.7 million in 2010 (Lim, Voss, Flaxman, Danaei, Shibuya, et al., 2012).

While childhood underweight is the leading risk factor for the disease burden in most of sub-Saharan Africa, in Southern sub-Saharan Africa, alcohol use holds the top position (Lim et al., 2012). These CRA results must be tempered with a critical reflection on the fact that a number of changes have occurred in the period between 1990 and 2010 that influence the calculation, including: methodological changes; the inclusion of additional disease categories (most notably infectious diseases inclusion); calculation of disability and injury; and the addition of new alcohol-attributable disease categories (Rehm, Borges, Gmel, Graham, Grant, et al., 2013). Nevertheless, independent of methodological changes and challenges, alcohol emerges as a key risk factor for global morbidity and mortality. These findings call for serious and immediate attention to preventive action on the one hand, and harm reduction efforts on the other hand.

The World Health Organization (WHO) *Global Status Report on Alcohol and Health (2014)* (WHO, 2014) measures adult per capita consumption (APC) of alcohol and captures patterns of drinking among 194 of its member states. It currently provides the most global picture of alcohol consumption and is discussed below.

Abstainers

According to the WHO (2014), almost half of the world populations (48.8%) are lifetime abstainers from alcohol use. In addition, more women are lifetime abstainers than men. The highest overall abstention rates can be found in North African and South Asian countries, which are home to large Muslim populations, where religious sanctions exist on alcohol use (WHO, 2014). In contrast, the Northern Hemisphere currently houses the highest consumers of alcohol, though high consumption levels are also found in Australia

and New Zealand, in parts of sub-Saharan Africa, and parts of West Africa (WHO, 2014) (see Figure 1).

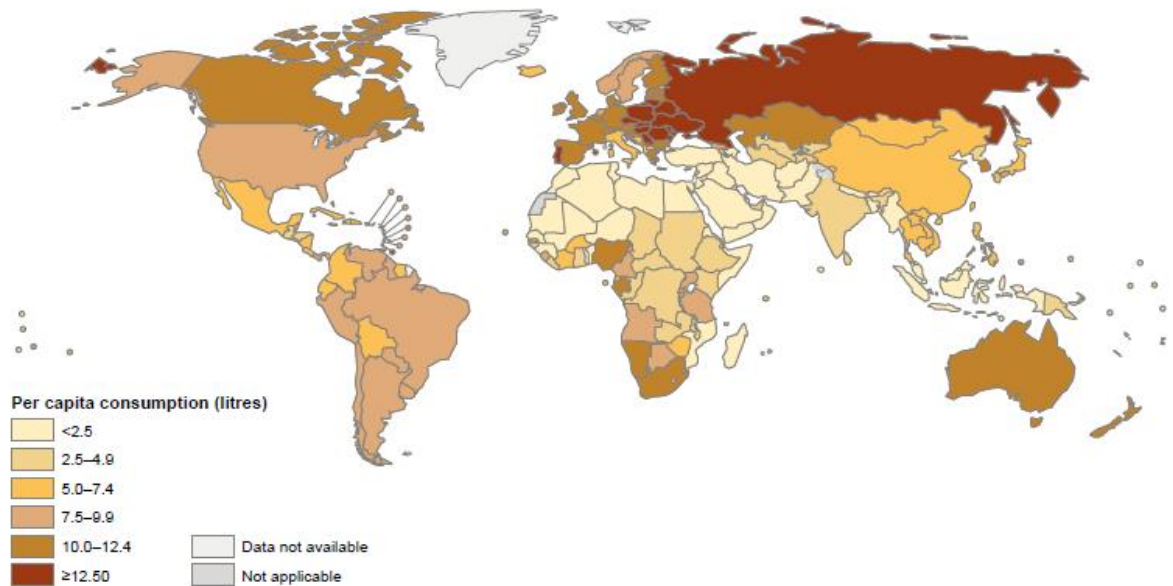


FIGURE 1
Total Adult Per Capita Consumption (15 Years and Older, in Litres of Pure Alcohol)
in 2010 (WHO 2014)

It is notable that, while the WHO is uniquely placed to report on global alcohol use, there is substantial variation in each country’s sample size, methodological design and recruitment methods (WHO, 2014). Substantial variations occur in both APC and patterns of drinking *across* the globe, as well as *within* the member states from which the WHO collates data. Moreover, the WHO relies on information provided to it by its member states, the timeliness, quality and accuracy of which may vary. This is reflective of some of the methodological challenges in alcohol-related research (see Chapter Two). Nonetheless, it does provide the most revealing picture of global variation in alcohol use to date.

Drinkers

For individuals who do not abstain, alcohol consumption is defined along two dimensions, namely, volume of consumption -adult per capita consumption (APC) and patterns of drinking. APC is defined as the per capita amount of alcohol consumed in litres of pure alcohol in a given population (WHO, 2014). Patterns of drinking refer to the manner in which people drink, that is, to abstain, or to engage in heavy episodic drinking (see Chapter Two). In many countries where APC of alcohol is high, this does not always translate to high levels of alcohol-related harm. In contrast, in low consumption countries, alcohol-related harm largely results from the high episodic levels in which alcohol is consumed (WHO, 2014).

Africa is a region that attests to the heterogeneity of both adult per capita consumption of alcohol and patterns of drinking. In keeping with the demographic representation of large populations of Islamic faith (where alcohol consumption is prohibited), the lowest consumption levels can be found in many countries of Africa, including Mauritania, The Comoros, Niger, Senegal and Guinea. In contrast, Africa also houses countries which have among the highest adult per capita (AP) consumers (South Africa, Gabon, Namibia, Nigeria and Uganda/Rwanda) and the riskiest drinkers in the world (South Africa and Namibia) (WHO, 2014). No doubt the African region represents stark contrasts with respect to alcohol consumption and patterns of drinking. Table 1 indicates the top five highest consumers of alcohol, as well as the top five lowest consumers, by WHO region and country.

Global patterns of heavy episodic drinking

The regions for which the highest rates of episodic drinking are found among drinkers are the WHO European Region, WHO Region of the Americas, WHO Western Pacific Region, and the Southern African Region (WHO, 2014) (see Table 2). Existing global reports are candid in their approaches and intervention efforts to focus on alcohol use as a public health problem, due *primarily* to the harmful effects on health and social well-being (WHO, 2014). The 2012 Comparative Risk Assessment in the Global Burden of Disease Study applied the patterns of drinking score - a composite measure that

TABLE 1
Top Five Highest and Lowest Consumers of Alcohol (APC) by WHO Region, 2010
(Litres of Pure Alcohol; 15+ Years Population)

Region	Highest Consumers		Lowest Consumers	
	Country	Total APC (recorded and unrecorded)	Country	Total APC (recorded and unrecorded)
Africa	South Africa	11.0	Mauritania	0.1
	Gabon	10.9	Comoros	0.2
	Namibia	10.8	Niger	0.3
	Nigeria	10.1	Senegal	0.6
	Uganda/Rwanda	9.8	Guinea	0.7
Americas	Grenada	12.5	El Salvador	3.2
	Saint Lucia	10.4	Guatemala	3.8
	Canada	10.2	Honduras	4.0
	Chile	9.6	Jamaica	4.9
	Argentina	9.3	Nicaragua	5.0
Eastern Mediterranean region	United Arab Emirates	4.3	Kuwait	0.1
	Sudan	2.7	Libya	0.1
	Lebanon	2.4	Pakistan	0.1
	Bahrain	2.1	Yemen	0.3
	Qatar/Tunisia	1.5	Egypt	0.4
Europe	Belarus	17.5	Turkey	2.0
	Republic of Moldova	16.8	Azerbaijan	2.3
	Lithuania	15.4	Tajikistan	2.8
	Russian Federation	15.1	Israel	2.8
	Romania	14.4	Turkmenistan	4.3
SEAR	Thailand	7.1	Bangladesh	0.2
	India	4.3	Indonesia	0.6
	Democratic People's Republic of Korea	3.7	Timor-Leste	0.6
	Sri Lanka	3.7	Bhutan	0.7
	Nepal	2.2	Myanmar	0.7
WPR	Republic of Korea	12.3	Brunei Darussalam	0.9
	Australia	12.2	Malaysia	1.3
	New Zealand	10.9	Vanuatu	1.4
	Niue	8.0	Tuvalu	1.5
	Palau	7.9	Tonga	1.6

^aRecorded consumption refers to alcohol that is taxed and is within the usual system of governmental control

^bUnrecorded consumption refers to alcohol that is not taxed and is outside the usual system of governmental control

^cSEAR refers to the South East Asian Region

^dWPR refers to Western Pacific Region

reflects not only how much people drink, but also how they drink (e.g. the usual quantity of alcohol consumed per occasion, festive drinking, or drinking with meals) (Lim et al., 2012). Consistent with the literature across demographic regions and age groups, they found that men engage in more harmful drinking than women, evident from the higher patterns of harmful drinking and the higher alcohol-attributable morbidity and mortality among men (WHO, 2014; Lim et al., 2012). In sum, understanding how much people drink (APC) is related to overall prevalence of alcohol consumption, while examining how people drink (patterns) is related to the effects of such patterns on health and well-being.

TABLE 2
Total Prevalence of Heavy Episodic Drinking (HED) (%) (15+ Years) and
Among Drinkers by WHO Region and the World, 2010

WHO Region	HED prevalence
Europe	22.9
Americas	22.0
Africa	16.4
WPR	16.4
SEAR	12.4
Eastern Mediterranean region	1.6

On a global scale, 16% of drinkers have heavy episodic drinking occasions (WHO, 2014). Using the patterns of drinking score (Rehm, 2004), countries with the most negative ratings, that is the highest patterns of drinking score, are Ukraine, Russian Federation, Kazakhstan, South Africa, Namibia and Mexico (WHO, 2014).

Alcohol, health and socio-economic effects

The patterns and volume of alcohol consumed have important implications for the health and social well-being of populations. This relationship is best explained by the conceptual model proposed by Rehm et al., 2004 as depicted in Figure 2.

Rehm and colleagues argue for three mechanisms by which alcohol relates to health, namely, toxic and beneficial effects, intoxication, and dependence. In terms of the beneficial effects, it is generally accepted that moderate drinking can have beneficial effects for coronary heart disease by increasing levels of high-density lipoprotein cholesterol, decreasing levels of low-density lipoprotein cholesterol and dissolving blood

clots (Shield, Parry, Rehm, 2014). However, these protective effects occur only in the context of moderate drinking and may disappear with erratic heavy drinking episodes (Roerecke & Rehm, 2010). Further, the harmful effects of heavy episodic drinking have been associated with acute diseases, e.g. atrial fibrillation, clotting and acute cardiac events (Samokhvalov et al., 2010a). Other harmful effects of heavy drinking relate to chronic disease onset e.g. elevated blood pressure, pancreatic damage and liver disease (Rehm et al., 2003a; 2009 Lim et al., 2012).

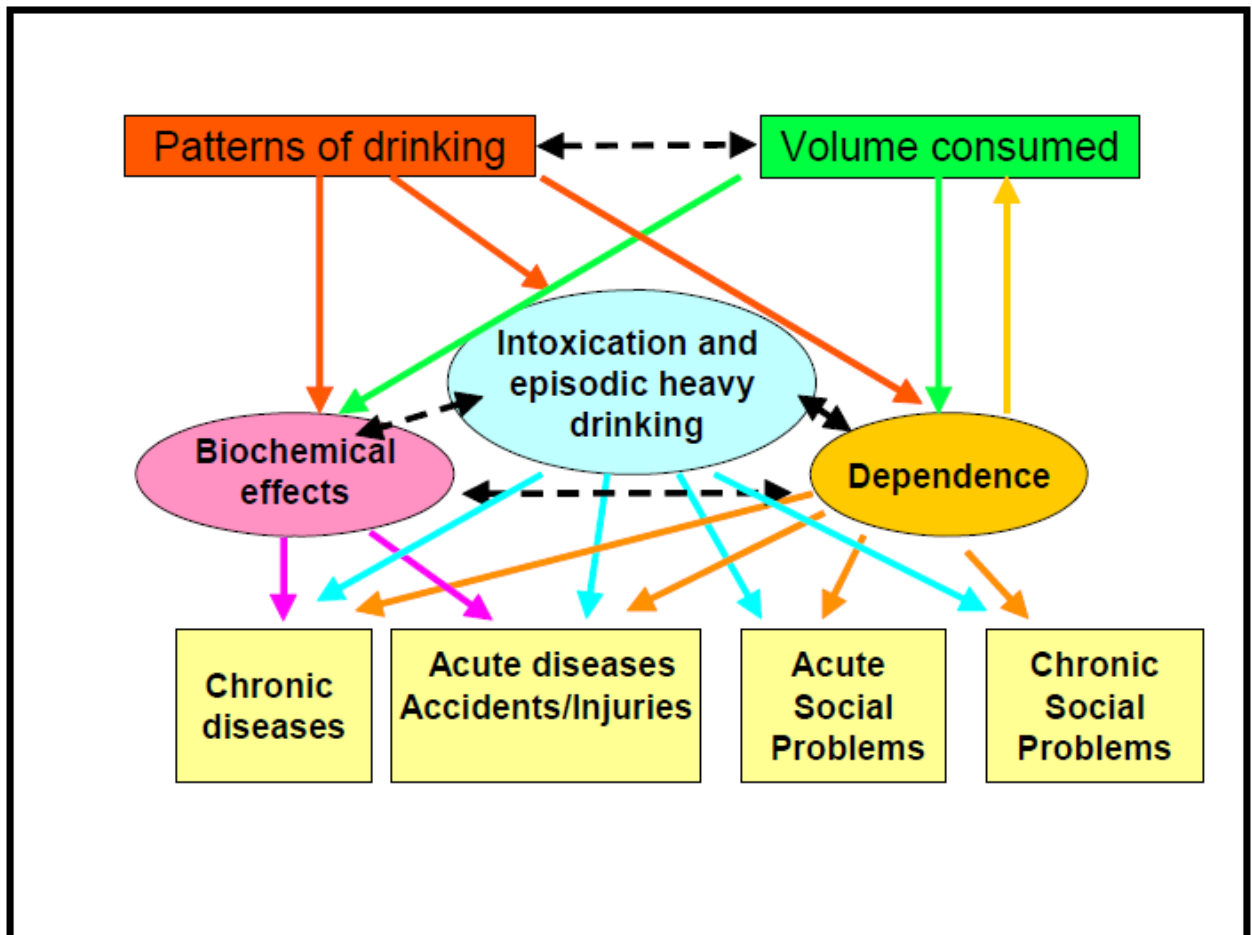


FIGURE 2
The Relationship of Alcohol to the Health and Social Effects (Rehm et al. 2004)

In the context of the burgeoning non-communicable disease burden in LMICs, alcohol features prominently. It is causally associated with non-communicable diseases, including eight different types of cancers, diabetes mellitus, hypertensive diseases,

ischaemic heart disease, liver cirrhosis, chronic pancreatitis, and injuries and violence. (Parry, Patra & Rehm, 2012, Corrao, Bagnardi, Zambon, La Vecchia, 2004). It has also been implicated in maternal and perinatal problems (low birth weight, foetal alcohol syndrome) and neuropsychiatric conditions (Rehm et al., 2009a). Ranking alcohol-attributable mortality, global deaths are accounted for by cardiovascular diseases and injuries, gastrointestinal disorders and cancers, respectively (WHO, 2014). For cardiovascular disease, alcohol use *jointly* (with tobacco use, high blood pressure, high body mass index, high cholesterol, high blood glucose, low fruit and vegetable intake and physical inactivity) accounts for 61% of all cardiovascular deaths.

Notwithstanding the alcohol-attributable implications for the non-communicable disease burden, alcohol disease and injury burden, alcohol has also been identified as a risk factor for communicable diseases, including sexually transmitted diseases (STIs), Human Immunodeficiency Virus (HIV), and Acquired Immune Deficiency Syndrome (AIDS) (Morojele et al., 2006; Shuper, Neuman, Kanteres, Baliunas, et al., 2010). While alcohol use has been shown to have a consistent relationship with HIV prevalence and incidence, a direct causal relationship has not been established (Parry, Rehm, Poznyak & Room, 2009). However, alcohol may act as an important precursor to many of the behaviours that result in communicable diseases (particularly, engaging in unprotected sex or incorrect condom use after heavy drinking, or engaging in sex with multiple partners). Further work is required to advance our understanding of the causal effects of heavy drinking on these behaviours.

Two communicable diseases for which a direct causal link with alcohol can be explained are tuberculosis (TB) and pneumonia (Rehm et al., 2009b; Samokhvalov et al., 2010b). This causality is understood to occur through the weakening of the immune system and other organs including the lungs due to heavy drinking. Meta-analytic findings indicate a threefold increased risk of active TB in the presence of alcohol in excess of 40g/day (Parry et al., 2009). In addition, heavy drinking has been associated with compromised health seeking and compliance with a TB treatment regimen (Rehm et al., 2009b; Samokhvalov et al., 2010b), and a consequent outcome of multi-drug resistant TB (Gelmanova, Keshavjee, Golubchikova, Berezina, Strelis, et al., 2007). Evidence is also emerging on alcohol's negative effects on treatment compliance for anti-retroviral

treatment (ART) (Lim, 2012) and TB treatment, particularly in Sub-Saharan Africa where these diseases largely co-exist (Morojele, Kekwaletswe & Nkosi, 2014).

Following the understanding of alcohol intoxication as the short term loss of psychological and psychomotor functioning due to the presence of alcohol in the body, intoxication is explained within the model to relate largely to acute events, such as accidents or intentional injuries.

Alcohol dependence stands alone as a clinical disorder, but is also seen to mediate the prolonging of alcohol use and consequently relates to both acute and chronic physical and social harms (Rehm et al., 2009a).

In summary, the average volume of consumption is thought to be associated with chronic health harms (such as cancer or ischaemic heart disease), while the patterns of drinking are thought to be associated with acute physical and social problems, such as accidents, interpersonal violence, and acute cardiac events (Rehm et al., 2009a).

Social consequences

The negative social consequences associated with alcohol use include intentional injury (violence) and unintentional injury and death. The consistent relationship found between alcohol and intentional injury is largely explained by quasi-experimental research which points to a causal relationship (that may be gender and personality specific) between alcohol and aggression (Bushman, 1997). Alcohol is thought to act on neurotransmitters in the brain, which regulate stimulatory responses that increase aggression. Stated simply, the so-called disinhibitory effect of alcohol may result in a lack of constraint in the face of physical, social and legal circumstances, resulting in increased risk taking.

Other negative social consequences strongly associated (though not directly causally related) to alcohol use include interpersonal violence (including gender-based violence and sexual assault) (Jewkes, Levin & Penn-Kekana, 2002; Jewkes, Dunkle, Nduna, & Shai, 2010), and crime, unemployment and welfare dependence (Bouchery, Harwood, Sacks, Simon, & Brewer, 2011; Anderson & Baumberg, 2006).

Alcohol use is also largely implicated in traffic-related injuries and deaths. This link is explained by the presence of alcohol in the blood which is understood to slow

down reaction time and voluntary motor control (Davis, Quimby, Odero, Gururaj & Hajar). Given that blood alcohol concentration (BAC) levels are readily available at the scene of accidents, as well as through mortuary surveillance systems, the link between alcohol use and drink driving are usually made within short recall periods and greater precision (though causal effects are still unable to be established) in the presence of confounding factors, such as road or weather conditions, and speeding. Other sources of evidence for the link between alcohol and drink driving emerge from geographical information systems (GIS) and spatial analytic studies on the proximity of road traffic accidents to alcohol outlets (De Boni, do Nascimento Silva, Bastos, Pechansky, & de Vasconcellos, et al., 2012; Ponicki, Gruenewald, & Remer, 2013). The link between alcohol use and traffic-related injuries and death is potentially one of the most convincing, evident even by global public health responses to the problem. These include drink driving counter measures, reduced BAC limits, random breath testing, and sobriety check points (Babor et al., 2010). This is particularly topical in the South African context, where policy discussions are underway to consider reducing the BAC from 0.24 milligrams (mg) per 1 000 millilitres (ml) or 0.05 grams per 100 ml (National Road Traffic Act, 1996) to 0.00 mg per 1,000 ml or 0.00 ml per 100 ml respectively (WHO, 2014).

The literature related to the social consequences of alcohol use has laudably focused on many of the above-mentioned harms: drinking and driving, violence, injury and health-related consequences. Notwithstanding these consequences, less has been written about alcohol's harm to others particularly harm to those in the social environment of the drinker (friends, family, and colleagues). These include, psychological stress, the effects of premature morbidity and mortality, disrupted family and friend relationships and an overall diminished quality of life. (Laslett, Catalano, Chikritzhs, Dale, Doran, et al., 2010; Manton, MacLean, Laslett, & Room, 2014). The scant literature on this topic (Laslett, Catalano, Chikritzhs, Dale, Doran, et al., 2010; Manton, MacLean, Laslett, & Room, 2014) is not a reflection of the inconsequence of these effects, but rather on pragmatic concerns, such as, the methodological challenge of measuring such effects and the consequent challenge of presenting the empirical evidence from these investigations to leverage health budgets. Room and colleagues (2010) amply

capture these issues, discussing the reasons for the lack of focus on the harm to others, e.g. an over-emphasis on measuring individual perspectives of drinking to the exclusion of those affected by their drinking, and a tendency to focus on the social ills of alcohol which are catastrophic. They argue that, in order to fully capture the effects of alcohol, one must focus beyond the drinker, the statistics and police reports to those around the drinker who quietly or (perhaps not so quietly) suffer harms from their drinking.

Economic consequences

The economic consequences of alcohol use on public health occur largely through health-care costs, legal costs, loss of property, direct administrative costs, and social work costs (Rehm et al., 2009a). Economic costs attributable to alcohol use in high and middle income countries account for 1% of the gross domestic product (GDP) (excluding social costs) (Rehm et al., 2009a). The other economic consequence of alcohol use relates to indirect costs through a loss of productivity.

In the USA, Bouchery et al. (2011) estimate that the economic costs of excessive alcohol use in 2006 was \$22.5 billion. Binge drinking costs the country \$170 billion, underage drinking \$27.0 billion, pregnancy-related drinking \$5.2 billion, and alcohol-attributable crime accounted for \$73.3 billion. In the UK, alcohol-attributable morbidity costs the National Health System £3.3 billion. These costs are mainly related to chronic diseases of lifestyle, including cancers, mental health disorders, and coronary heart disease (Scarborough, Bhatnagar, Wickramasinghe, Allender, Foster, et al., 2011).

In South Africa recent research on the cost of harmful alcohol use to society estimated total tangible and intangible costs at about 10-12% of the GDP, with tangible costs estimated at R37.9 billion or 1.6% of the 2009 GDP in South Africa (Matzopoulos et al., 2014). This challenges previous research which estimated the alcohol-attributable cost to be approximately R9 billion, about 1% of South Africa's GDP (Parry, Myers, & Thiede, 2003), with provincial and national expenditure estimated to be close to R7 billion and R10 billion, respectively (Budlender, 2009). Other economists in South Africa estimate that alcohol-related violence, injuries, deaths, disease, losses to the economy,

lost productivity and law enforcement cost the country R38 billion (Truen, Ramkolowan, Corrigall, & Matzopoulos, 2011). These economic costs are the mainstay of current policy debates between the alcohol industry and public health advocates on the need to adopt policies to reduce alcohol-related harm.

Taken together, alcohol use poses a significant challenge to public health. Despite evidence for the benefits of light to moderate drinking on cardiac health and diabetes, its beneficial effects appear to be largely outweighed by the negative consequences of its use. These negative consequences include among others, tangible costs such as, health care, prevention and treatment costs and road traffic accidents, as well as intangible costs (premature mortality, and morbidity which impacts on less income, absenteeism and non-financial welfare costs) (Truen et al, 2011). The available evidence on alcohol-attributable disease burden, its negative social and economic consequences, and the tangible and intangible costs attests to the significant challenge posed to public health.

Alcohol consumption in South Africa

South Africa, an upper middle income country (World Bank, 2014) has a population of approximately 54 million people, of which 70% are aged 15 years and older (Statistics South Africa, 2014). The drinking situation in South Africa today is characterised by abstinence from alcohol use juxtaposed with an indulgence in binge/heavy episodic drinking. From a global perspective, almost half of the South African population (42% of people 15+ years old) are lifetime abstainers of alcohol, 17.3% are former drinkers and 59.4% are past 12 month abstainers (WHO, 2014). Females abstain more than males in all categories of abstinence, accounting for 54.9% of lifetime abstainers, 18.7% of former drinkers, and 73.7% of past 12 month abstainers, respectively (WHO, 2014).

In contrast, for total alcohol per capita, South African drinkers in the age group 15+ years (both sexes) consume 27.1 litres of alcohol in pure alcohol (APC). When disaggregated by gender, 32.8 litres of pure alcohol are consumed by males and 16 litres of pure alcohol are consumed by females (WHO, 2014). Recent national estimates of pure alcohol consumption place South Africa at 9.5 litres per annum (Parry, 2013). In comparison to the highest consuming countries, this figure is not alarmingly high. However, South Africans rank as the highest APC consumer of alcohol in the African region and are on par with many countries in the Western Pacific regions (WHO, 2014)

(see Table 2). What is more, the heavy drinking episodes, particularly at weekends, that characterise the South African drinking situation, remain worrying (Parry, Plüddemann, Steyn, Norman, et al., 2005; Peltzer, David and Njuho, 2011). Over the last two global reporting periods, the WHO (2011; 2014) has ranked South Africa as having one of the most negative ratings on the index of risky drinking in the world. The most recent WHO (2014) global survey reports that among drinkers, 32% of males and 14% of females engaged in heavy episodic drinking in the 2010 reporting period. As a country among those with the highest levels of episodic drinking, our patterns of drinking have labelled us as a “hard drinking” country (Seggie, 2012) and a "nation of boozers" (Lesufi, 2015).

Five national surveys are notable in providing the current landscape of population level drinking in South Africa, namely, the South Africa Demographic and Health Survey (SADHS) (Department of Health, 2003; 2007), The South African Behavioural Seroprevalence and Mass Media study (SABSSM) (Shisana et al., 2005), household surveys, and the Centre for Social Enquiry (CASE, 2006) survey (see Table 3).

Lifetime and current (past 30 day) alcohol use

The most recent WHO figures indicate that 27% of South Africans are lifetime consumers of alcohol (WHO, 2014). A review of national data found that, among the adult population, lifetime alcohol use has remained relatively stable at 20% and 25% in the 1998 and 2003 SADHS surveys respectively. Data from the South African Youth Risk Behaviour Surveys similarly found that lifetime current use and drinking patterns remained stable among adolescent in 2002 (49.1%), 2008 (49.6%) and 2013 (49%), respectively (Reddy et al., 2002; 2010; 2013), (see Table 4).

Early initiation of alcohol use

Early initiation of alcohol use has been associated with an increased risk for future alcohol abuse (Grant and Dawson, 1997), lifetime risk for injury (Hingson, 2009), alcohol dependence and disorders (DeWitt, Adlaf, Offord and Ogborne, 2000). The literature on youth drinking has widely accepted that an individual is an early initiator when they start drinking before the age of 13 years old (Eaton et al., 2012; Reddy et al., 2014). National studies have indicated that early alcohol initiation is prevalent and stable among the SA

population. More males initiate alcohol before the age of 13 years old than females (see Table 4). The household surveys indicate increases (albeit with varying methodologies and sampling designs), while the youth school based surveys indicate stable but high prevalence of early alcohol initiation among South Africans.

TABLE 3
National Studies on Alcohol Consumption in South Africa

Study Name/Author	Year	Location	Scope	Age group (yrs)	Sample size
South Africa Demographic and Health Survey 1998	1998	National household survey	Tobacco and Alcohol consumption	15 +	13 826
South Africa Demographic and Health Survey 2003	2003	National household survey	Tobacco and Alcohol consumption	15+	10 214
CASE 2006	2003	National Household survey, multi-stage stratified sampling	Alcohol and Tobacco consumption	18+	2 351
SABSSM 2005	2004	National Household survey, multi-stage stratified sampling	Substance use	20+	20 626
SABSSM 2005	2005	National Household survey, multi-stage stratified sampling	Substance use	15+	23 236

Adapted from Peltzer & Ramlagan, 2009

TABLE 4
Alcohol Drinking Status among South Africans by Age and Sex (%)

	1998 (SADHS) ^a		2005 SABSMMII [WHS 2003]		2002 YRBS ^b		2008 YRBS ^b		2013 YRBS ^b	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Initiation age <13 yrs. (%)	n/a	n/a	n/a	n/a	15.8	9.0	15.3	8.6	16.3	8.7
Lifetime alcohol use (%)										
13-19	-	-	-	-	56.1	43.5	54.4	45.1	53.8	44.9
15-19	25.3	15.0	21.3	11.9	-	-	-	-	-	-
20-24	-	-	47.7	18.7	-	-	-	-	-	-
15-24	35.5	15.9	32.4	15.4	-	-	-	-	-	-
25-34	65.7	24.5	52.3	19.9	-	-	-	-	-	-
35-44	71.9	29.4	58.3	22.4	-	-	-	-	-	-
45-54	72.7	31.6	60.5	26.9	-	-	-	-	-	-
55-64	67.2	29.8	54.3	27.3	-	-	-	-	-	-
65+	65.3	33.4	42.0	19.0	-	-	-	-	-	-
Total	58.1	25.7	45.7[43.1]	20.6[17.3]	-	-	-	-	-	-
Overall total	40.3		30.0		49.1		49.6		49.2	
Current use (%) ^c										
13-19	-	-	-	-	38.5	26.4	40.5	29.5	36.6	28.2
15-19	25.3	14.7	17.2	8.4	-	-	-	-	-	-
20-24	-	-	42.0	14.6	-	-	-	-	-	-
15-24	23.3	8.5	27.6	11.6	-	-	-	-	-	-
25-34	51.7	15.6	45.2	13.9	-	-	-	-	-	-
35-44	58.9	20.9	49.7	17.4	-	-	-	-	-	-
45-54	60.0	23.4	53.2	22.5	-	-	-	-	-	-
55-64	54.2	20.5	46.4	20.8	-	-	-	-	-	-
65+	45.7	20.3	34.9	14.4	-	-	-	-	-	-
Total	44.6		39.2[41.3]	15.7[16.7]	-	-	-	-	-	-
Overall total	28.0		24.5[29.9]		31.8		35.0		32.0	

^aSADHS sample 15-65+; ^bYRBS sample 13-19; ^cpast month use

Heavy episodic drinking

The patterns by which South Africans drink represent, by far, among the biggest concerns for the current discipline and practice of public health in the country. Apart from achieving global status as one of riskiest drinking countries, a recent national review indicates the high levels of binge/heavy episodic drinking patterns (Peltzer, Davids, & Njuho, 2011). Furthermore, it is notable that national and international statistics mask variations in subgroups. These variations are very clear in the South African drinking landscape. Peltzer and colleagues (2011) found varying patterns of drinking between South African subgroups, by gender, race and province. Binge/heavy episodic drinking has been shown to be prevalent, regardless of settlement type and socio-economic status. Specifically Peltzer and colleagues (2011) found that current drinking was the highest among White² males (69.8%), followed by White females (61.7%) and Coloured Males (57.4%). The lowest current drinking rates were found among Black African and Indian (Asian) females at 10% and 15.2%, respectively. Binge drinking was the highest among Coloured males (31.6%) and Coloured females (9.7%), followed by White males (19.9%). In terms of locality, for both sexes there was a predominance of current, binge and hazardous alcohol use in urban areas as opposed to rural areas of South Africa, with the Western Cape and Northern Cape provinces housing the highest current, binge and hazardous drinkers.

Global youth alcohol use

Alcohol use among adolescents and young people is the explicit focus of this PhD. The magnitude of alcohol-attributable deaths globally among young people (15-29 years) is alarming. In this age group, 320 000 people die annually from alcohol-related causes, resulting in 9% of total deaths in this group (WHO, 2011). In addition, other young people are afflicted by alcohol-attributable acute injuries (e.g. accidents and violence) and social consequences (e.g. truancy, school dropout and incarceration) and premature death. These mortality, increased morbidity and negative social outcomes represent a loss of human capital, loss of healthy years among what is

² The terms “White, Black, Indian/Asian, and Coloured” originate from the *apartheid* era. They refer to demographic markers and do not signify inherent characteristics. Their continued use in South Africa is retained to track transformation and to identify vulnerable sections of the population to be targeted for prevention and intervention programmes.

usually the healthiest subgroup of the population, and a reduced quality of life for young people.

Despite the fact that alcohol use is higher among people aged 25 years and over compared to the younger groups (see Table 4), prevalence of alcohol use among younger groups remains a concern, particularly in terms of lifetime risk for alcohol use. This concern is evidenced by the early initiation of alcohol (<13 years old) found in the YRBS studies. Therefore, increased attention is being paid to alcohol consumption among young people, especially with a view to intervene early in the drinking trajectory. The past three decades have seen an emergence of studies focusing on young people’s risk behaviour, including alcohol use, such as the Youth Risk Behaviour Surveillance Systems (YRBSS), the European School Survey Project on Alcohol and other Drugs (ESPAD), the Monitoring the Future Survey (MTF), and the Global School-based Student Health Survey (GSHS). Table 5 highlights some global youth-focused studies and their methods.

The Youth Risk Behaviour Surveillance Study (YRBSS) was initiated in 1991 in the United States of America, and conducts surveys every two years. Among its focus areas are: youth behaviours that contribute to unintentional injuries and violence; sexual risk behaviours; unintended pregnancies; tobacco use; alcohol and other drug use; unhealthy dietary behaviours; and physical inactivity. Notably, alcohol features prominently in its association with at least four of these health risk behaviours, albeit as a precursor to many.

TABLE 5
Global Youth-Focused Alcohol and other Drug Studies

Study Name/Author	Year	Location	Scope	Age group (yrs)	Sample size
Youth Risk Behaviour Survey United States of America (YRBS USA)	2013	Multiple Sources including, national school-based, state, tribal, and large urban school district surveys in the USA	Alcohol and behavioural risk factors	10-21	15 425
European School Survey Project al Alcohol and other Drugs (ESPAD)	2011	School-based surveys in 36 European countries	Alcohol and other drug use	13-15	100 000
World Global Survey on Alcohol and Health	2013	School-based surveys globally in all WHO regions	Alcohol and behavioural risk factors	13-17	450 000
Monitoring the Future Survey (MTF)	2009	Repeated series of surveys of 8th, 10th, and 12th graders; college students;	Drug and Alcohol Use	13-19	50 000

In the European region, the ESPAD study monitors trends in alcohol use among 13-15 year olds, within and between 37 countries in the region. The most recent ESPAD study, based on data from 100 000 students in 36 European countries shows that, with the exception of Iceland, in 2011 an average of 87% of students were lifetime consumers of alcohol (that is, they had drunk alcohol at least once during their lifetime) (Hibell, Guttormosson, Ahlstrom, Balakireva, Bjarnason, et al., 2012). The lowest consumptions occurred in Iceland (17%), Sweden (32%) and Norway (36%), respectively. The highest proportions of lifetime alcohol consumption are found in the Czech Republic (93%), Denmark (82%) and Latvia (87%) (Hibell et al., 2012).

The Monitoring the Future Survey (MTF) is another study that focuses on youth risk behaviours, including alcohol use. It is the longest running youth-based study, having been initiated in 1975. The MTF survey comprises nationally representative surveys of American populations (13-50 years old), and defines young adults as those aged 19-28 years. The most recent MTF survey reports that 66% of students had consumed alcohol in their lifetime, 27% had consumed alcohol by the time they were in the 8th grade. In addition, 50% of grade 12 students and 11% of grade 8 students respectively, reported having been drunk at least once in their life. (Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2015). These findings are worrying, given that alcohol is illegal among adolescents and some college students in many countries captured in the MTF surveys.

The Global school-Based Student Health Survey (GSHS), a WHO-initiated collaborative project, was developed to measure and assess behavioural risk factors, including alcohol, among 13-17 year olds (CDC, 2009). It currently provides the most global picture of alcohol consumption in this age group. The most recent data on alcohol is available for the period 2003-2010 from 94 countries. As a standard measure of current use (percentage of students who drank at least one drink containing alcohol on one or more days in the past 30 days), the survey shows that the *highest* current consumption of alcohol among school-going youth (13-15 year olds) by region occurs in the African region. See Table 6.

TABLE 6
Alcohol Drinking Status and Patterns among Youth (%)

Life time	YRBS USA 2011		YRBS SA 2011		ESPAD 2011		GSHS	
	Men	Women	Men	Women	Men	Women	Men	Women
Initiation age <13	23.3	17.4	15.8	9.0				
13-19	60.9	66.1	15.8	44.9	88.0	86.0	-	-
Overall use	70.8		49.2		87.0 ^a		-	
Current use ^a								
15-19	25.3	14.7	36.6	28.2	59.0	54.0	-	-
Overall total	38.7		32.3		57.0 ^a		-	
Current binge drinking ^a								
15-19	23.8	19.8	30.3	20.1	43.0	38.0	16.8	6.2
Overall total	21.9		25.1		39.0 ^a		11.7	

^aaverage consumption figures; ^bpast month

In spite of the emergence of youth-focused studies on alcohol use globally, systematic comparison still remains a challenge. This is due, in part to the multiple data sources that feed into the global survey from one country, contrasted to countries for which data may be completely absent. The Global school-based student health survey is one such example. It is notable that South African data are absent from this Global school-based student health survey. This is an important omission that challenges the systematic recording and comparison of youth drinking among South Africans on a global scale.

Furthermore, varying definitions of “youth” and “adolescence” results in a lack of standardization in age groups, again limiting comparability between adolescent alcohol consumption globally. In a related vein, Fuhr and Gmel (2011) evaluated, on a global scale, whether the recorded alcohol APC among adults was associated with drinking among adolescents. They hypothesized that recorded alcohol APC among adults is associated with drinking (and smoking) among adolescents. Overall findings from this investigation revealed that there was a highly significant and linear relationship between adult APC and youth APC. What this suggests is that countries with high APC among adults may also rank high in APC among youth.

This association may be explained by risk factors that are common to both the adult and adolescent populations such as, population socio-economic status, the availability and implementation of alcohol policies, as well as religious sanctions, the latter being the case in largely Muslim populations (Fuhr & Gmel, 2011).

Alcohol use among South African youth

Following Fuhr and Gmel (2011) findings above, that a linear relationship may exist between adult APC and adolescent APC, alcohol use among the South African adult population, may be linked to high APC among adolescents. As indicated above, this linear relationship may be explained by shared risk factors at the population level. This is indicated by the YRBS and SADHS surveys (Reddy et al., 2003; 2008; 2013 and Department of Health 2003; 2007). In addition, stable but high alcohol use was found among adult South Africans in the SADHS and SABSMM studies in Table 4. Note that APC among adults is merely one indicator of APC among youth. Multiple, complex and unique factors at many levels of influence may determine alcohol use among adolescents. In SA unique factors related to geo-locality, socio-political and economic contexts, and developmental transitions may serve to influence youth alcohol consumption. As a transitional society, South African drinkers are faced with broader influences on alcohol including the proliferation of illegal taverns, "shebeens" and drinking houses, weaker implementation of alcohol policies and regulations to curb youth drinking, and a culture of drinking associated with historical SES disparities and geopolitical and ethnic disparities associated with the apartheid regime.

Notwithstanding these unique socio-political challenges, adolescence marks a fragile period when young people battle to negotiate several developmental and social challenges. It is simultaneously a period when several physiological changes occur in the brain, physical changes occur in the body (e.g. onset of puberty) and young people experience other socio-psychological transitions. In addition, adolescence is marked by experimental behaviours, including alcohol and other drug use (Sneed, Morisky, Rotheram-Borus, Ebin, Malotte, 2001; Windle, Mun, & Windle, 2004; Patton, Coffey Lynskey, Reid, Hemphill, et al., 2006), sexual risk behaviours (Fergus, Zimmerman, & Caldwell, 2007); and psycho-social issues, which place young people at risk for a range of problems.

Concern for the prevalence of alcohol use and earlier initiation among adolescents and young people is eclipsed only by the concern for the harmful patterns by which these age groups drink. In spite of demographic and geo-locality variations in drinking and drinking patterns (most notably binge drinking), South African youth drink at binge/heavy episodic levels. From a global perspective, almost twelve percent (11.7%) of young people drink at binge/heavy episodic levels (WHO, 2014). In comparison to global figures, 3% of European youth binge drink, the YRBSS (USA)

indicates a figure 22% of binge drinking among American youth. The South African YRBS 2011 indicates that SA youth surpass that figure at 25% (see Table 6).

TABLE 7
South African Studies on Youth Alcohol Consumption (%) by Gender

	2002 YRBS		2008 YRBS		2011 YRBS	
	Male	Female	Male	Female	Male	Female
Ever used alcohol	56.1	43.5	54.4	45.1	53.8	44.9
Current alcohol use (past 30 days)	38.5	26.4	40.5	29.5	36.6	28.2
Past month binge drinking	29.3	17.9	33.5	23.7	30.3	20.1
Age of initiation <13 yrs	15.8	9.0	15.3	8.6	16.3	8.7

Source: Reddy et al., 2002; 2010; 2013

As indicated, early initiation of alcohol use has been established as a risk factor for progression to alcohol dependence (Grant & Dawson, 1998). Given that alcohol use amongst South Africans appears to be initiated in early adolescence (Reddy et al., 2002; 2010; 2013), it follows that examining alcohol use initiation, and progression at as early as 11 years of age merits research. First, as early initiation is a powerful predictor of progression to alcohol dependence, increased risk for injury and social problems, identifying alcohol use and its associated influences can inform intervention strategies that can delay initiation. Second, identifying and reaching early initiators may disrupt the progression to alcohol dependence. Third, intervening with this sub-group of early initiators may reduce the risk of co-risk behaviours such as other substance use and sexual risk behaviour, smoking and violence.

THEORETICAL FRAMEWORK

Going beyond the individual

Multiple factors influence adolescent development and the initiation of new behaviours, including alcohol use. An ecological framework provides a systematic and useful lens through which to view these multiple factors, and this is discussed below.

Ecological frameworks, which recognise that behaviour is affected by and affects multiple levels of influence, are part of a rapidly developing discipline of systems thinking. Conceived in the 1950s by Kurt Lewin (1951) and advanced by Moos (1980); Bronfenbrenner (1979); McLeory (1988); and Stokols (1992), the application of socio-ecological models continues to be used in current health

behaviour and health education research and practice (Sallis, Owen, & Fisher, 2008) Ecological frameworks acknowledge the importance of factors at the different levels of the ecology in influencing behaviour at a single level (WHO, 2014). The basic premise of ecological models marks a shift away from purely individually-oriented thinking about health behaviour to include interpersonal, environmental and behavioural factors in understanding behaviour. Described as a culture change by Stokols (1996), ecological models represent a shift from the 1979 US Surgeon General's report on Health Promotion and Disease Prevention (United States Institute of Medicine United States, 1979) - which emphasised individual-focused changes in behaviour- to adopting a multifaceted approach. The implication of this shift in thinking is that the multiple influences and their interrelatedness must be considered when explaining the onset and progression of behaviours, particularly problem behaviours.

Applied to alcohol use behaviour, this thesis proposes that adolescents' alcohol use and its related influences exist in their family, peer, school, and neighbourhood/community environments and, ultimately, within their values and cultural belief system. Addressing alcohol use as a public health concern thus requires consideration of factors which operate within these varying domains.

The socio-ecological perspective conceived by the seminal work of Urie Bronfenbrenner (1979), and advanced by later work (McLeroy et al., 1988), forms the basis of this study. Figure 3 illustrates the multiple systems of influence over an individual's behaviour.

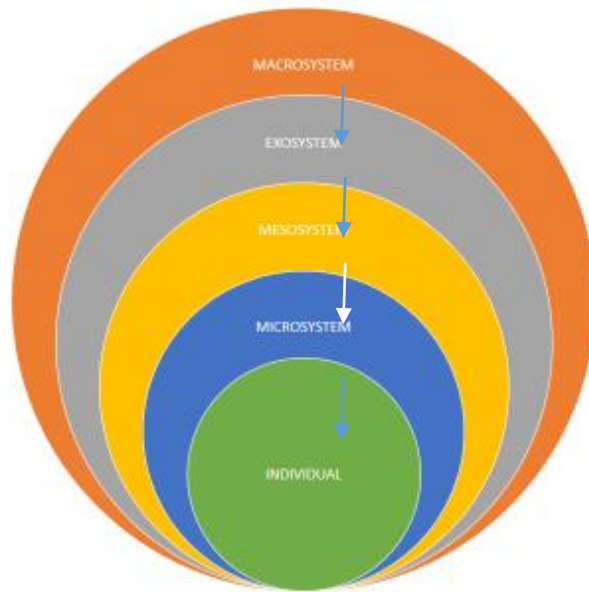


FIGURE 3
Socio-ecological Model (Bronfenbrenner, 1979)

The socio-ecological perspective divides environmental influence on behaviour into the micro system presented in Table 8.

TABLE 8
Socio-ecological Model (Bronfenbrenner, 1979)

System Level	Definition
Micro-system	The microsystems associated with adolescents and young adults commonly include interactions with one's immediate family, informal networks or work groups. These are contexts in which face-to-face interactions occur
Meso-system	The meso system is conceived of as a system of microsystems, includes interactions among these microsystems, e.g. communication in the family may influence peer group interaction or interaction at school, neighbourhood or community contexts.
Exo-	The exosystem includes the larger contexts within which the individual operates, such as the social community or socio-economic status
Macro-	The macro system includes the broader cultural beliefs and values systems that exert influence on the meso and micro systems of the individual.

Risk and protective factors

In order to contain and reduce the risk of alcohol use to public health, interventions to address prevention of alcohol use must remain a priority. In keeping with a focus on preventing alcohol use among adolescents, researchers, community

prevention planners and governments alike have focused their efforts on studying a combination of risk and protective factors to prevent adolescent alcohol use. Risk factors can be broadly categorised as attributes or characteristics of an individual which make it more likely that this individual, rather than someone arbitrarily selected from the population, will develop a disease, disorder or injury (WHO, 2014; Mzarek & Haggerty, 1994; Rutter & Garmezy, 1983). Historically, risk factors were largely understood to occur within the individual and were usually associated with clinical and medical terms, such as disease and injury (see above definition). However, with the shift from individually-oriented thinking and prevention efforts to a more holistic understanding of human development, risk factors today are justifiably understood to occur at the individual, interpersonal, community and societal levels. This thesis subscribes to the holistic understanding that risk factors occur within the individual as well as from the interactions with peers, family, social networks, community and societal levels, to influence development and behaviour.

The multiple influences on youth alcohol use

Employing a socio-ecological framework, the multiplicity of risk factors that exist to influence alcohol use on the one hand, and the multiple protective factors, which could potentially mediate, moderate or buffer the effects of alcohol use on the other, are presented in Figure 4. The figure is the result of a literature review of influences on youth alcohol use globally.



FIGURE 4

Evidence Based Review of Multiple Influences on Youth Alcohol Use

Applied to alcohol use, risk factors exist in the adolescent’s **societal** (laws, social norms, taxation, legislation, low socio-economic status, poverty, unemployment), and socio-cultural contexts. Other risks are present in the **community** (community problems, community disorganisation, and community poverty). Still other risk factors occur in the **interpersonal environments** (low family socio-economic status, parental drinking, low parental monitoring, low parental bonding, poor parent-child communication, poor school performance, low school commitment, peer norms, peer drinking, peer influence, peer delinquency). In addition, several factors within the **individual** (age, gender, genetic factors, positive alcohol attitudes, and positive alcohol beliefs, low self-efficacy to refuse alcohol, impulsivity, tolerance, and sensation seeking) increase young people’s risk for alcohol use.

Conversely, protective factors serve to “reduce the likelihood of problem behaviour, either directly or by mediating or moderating the effect of exposure to risk factors” (Arthur et al., 2002, pg. 576). Within the context of this thesis, protective factors are understood and measured as factors that reduce the likelihood of problem behaviour. While protective factors can mediate or moderate the effect of the exposure to risk, it was not within the scope of the thesis to measure moderating and

mediating effects. Protective factors, like risk factors are also understood within this thesis to exist within the adolescent's societal, cultural, community, interpersonal and individual environments. Their roles are to significantly delay or prevent the onset of harmful alcohol use. For example, at a societal level, high alcohol taxation has been shown to reduce the consumption of alcohol for the general population (Levy & Sheflin, 1985; Anderson, Bruijn, Angus, Gordon, & Hasting, 2009). Hence, raising alcohol taxes can have a protective effect on alcohol use. At a community level, a highly organised community with few social and economic problems can also have a protective effect on young people against alcohol use, while family level factors, such as having parents who do not drink, are not permissive of alcohol use, and who monitor their children's whereabouts, have been shown to reduce the likelihood of adolescent alcohol use (Bot, Engels, Knibbe, & Meeus, 2005; Van der Vorst, Vermulst, Meeus, Deković, & Engels, 2006). At the interpersonal and individual levels, having parents who drink heavily, and/or are permissive of alcohol use, and having best friends who drink, places adolescent males at risk for heavy drinking (Bot et al., 2005; Van der Vorst et al., 2006; Hogue & Ghuman, 2012).

In international contexts, the roles of risk and protective factors have been well researched as a means to mitigate the effects of alcohol use (Hawkins, Catalano, & Miller, 1992; Dryfoos, 1991; Kliewer & Murrelle, 2007; Dryfoos, 1991; Arthur, Hawkins, Catalano, & Baglioni, 2002). These studies have focused on identifying both risk and protective factors for alcohol. Some studies have shown that protective factors can either significantly delay or prevent the onset of alcohol use, while risk factors can increase the early onset of alcohol use (Ary, Duncan, & Biglan, 1997; Kumpfer, Alvarado, & Whiteside, 2003). The limitation of many of these studies is the over-focus on the unique contribution of risk factors at the multiple levels, less focus on the interactions between the risk factors and very little attention to positive/asset based determinants of alcohol use.

In the African context, there is a very limited body of research on the multiple levels of influence on adolescent alcohol use. This study is one of very few such studies investigating the role of multiple factors on adolescent alcohol use in the South African context (Onya, et al., 2012; Brook, Rubenstone, Zhang, Morojele, & Brook, 2011).

The socio-ecological model provides a useful framework for understanding the multiplicity of influences on behaviour. The demonstrable effectiveness of its use is

evident through a variety of studies of health behaviour, including sexual identity change (Hollander & Haber, 1992); physical activity (Spence and Lee, 2003; Giles-Corti, Broomhall, Knuiiman, Collins, Douglas, et al., 2005); substance use (Dishion, Capaldi, & Yoerger, 1999; Mason, Cheung, & Walker, 2004); sexually transmitted diseases (Diclemente, Salazar, Crosby, Rosenthal, 2005); HIV prevention (Latkin & Knowlton, 2005); tobacco use (Yu, Stiffman, & Freedenthal, 2005); school connectedness (Waters, Cross, & Runions, 2009) childhood obesity (Galvez, Pearl, & Yen, 2010); healthy eating (Townsend & Foster, 2013; Christiansen, Qureshi, Schaible, Park, & Gittelsohn, 2013) and alcohol use and misuse (Marsden, Boys, Farrell, Stillwell, Hutchings, et al., 2010; Ennett, Foshee, Bauman, Hussong, Cai, et al., 2008).

A review of the literature applying Bronfenbrenner's socio-ecological model to adolescents' alcohol use yielded several important findings. Marsden et al. (2010) adopted the model to examine personal factors (age, gender, school recruitment site, age of initiation, intoxication history, age of first intoxication, lifetime tobacco use, and lifetime cannabis use); family factors (participants' perceptions of parental drinking, parental permissiveness of drinking, and extent of unsupervised drinking of which parents were unaware); psychological factors (mood alteration, social function, psychological well-being and positive drinking attitudes); social and peer factors (purchasing drinks and peer influence); and school problems (being in trouble at school, being involved in a fight at school, frequency of school truancy, temporary exclusion from school). They found that being male, a perception that parents encouraged drinking, drinking without parental knowledge, and drinking to alter mood, as well as buying alcohol beverages, increased time spent with drinking friends, perceived social pressure to drink, school exclusion, and truancy, were all associated with frequent drinking. In addition, cannabis use, parental encouragement to drink, spending time with drinking friends, school exclusion, and being in trouble with teachers, were associated with excessive drinking.

Another study, adopting the socio-ecological perspective on drinking, was conducted among a longitudinal sample of adolescents and parents in North Carolina (Ennett et al., 2008). They examined the association between family characteristics, peer, school and neighbourhood contexts, and alcohol use among 11-17 year olds. They found that all contexts were independently associated with adolescents' alcohol use, with the main findings being that, while the unique contribution of the

characteristics in the family, peer, school and neighbourhood contexts were implicated in adolescents alcohol use, it was the interactions within and between these contexts that were equally important in determining use.

Hong and colleagues (2011a) also adopted the socio-ecological model in their review, examining the risk and protective factors for substance use among Asian American youth. They found that substance use may be influenced by biological (genetic), psychological (depression and self-esteem), developmental (age of initiation), family (deviant siblings and parental expectations, as well as parent-child relationships), peer (friends substance use), academic (school performance), and cultural factors (original versus host culture). They concluded that, while depression may place young people at risk for substance use, positive relationships with parents may buffer these effects. Policy and practice to reduce substance use among Asian American youth, including inclusiveness of peer and family factors in the design of interventions; consideration of acculturation factors (cultural sensitivity) for interventions targeted at migrant youth, and conscientising government representatives about unique challenges (e.g. racism and prejudice) that may place migrant youth at increased risk for substance use were suggested.

In another study of alcohol and tobacco use among Asian American youth by the same authors, Hong and colleagues (2011b) presented a comprehensive literature review on predictors, consequences and prevalence of alcohol and tobacco use. They found that the high rates of alcohol and tobacco use were predicted by socio-demographic factors (age, gender and depression), interpersonal factors (family, peers and teachers), relationship factors (between family and school, parenting practices, academic stress) and the economic crises in Asia-Pacific in 1997.

Kelly and colleagues (2011) examined family influences (family relationship quality, parental disapproval of children's alcohol use, and parental alcohol use) on early adolescent alcohol use. They found that, for younger children, emotional closeness to the parent of the opposite sex was protective against early adolescent alcohol use. In addition, conflict in the family was associated with females drinking in very early adolescence and later early adolescence. This effect, however, was not found for males.

In other research which examined gender influences of family members on alcohol use (Kelly, Toumbourou, Flaherty, Patton, Homel, et al., 2011) found that emotional closeness to mothers regarding alcohol use was mediated by exposure to

high-risk peer networks. What is more, parental disapproval of alcohol use was protective to both genders, although the protective effect was greater for boys than for girls. Their study confirmed other research that had showed that peer social networks exerted a stronger influence on adolescent drinking than did parental factors.

More recently, Paschall and colleagues (2012) tested a socio-ecological model of alcohol use in 50 cities in the state of North Carolina in the US. They investigated the association between demographic factors (gender, age, education, marital status, ethnic group, immigration status, household size, age group, employment status, income), personality traits (impulsivity, tolerance, risky driving and DUI network), and drinking environments (on premise density per roadway mile, off-premise density per roadway mile, proportion of bars per roadway mile). The study found that higher density of on premise outlets was positively associated with drinking frequencies and volumes, while greater proportions of bars among on premise outlets was positively associated with an increase in drinking frequencies, heavy drinking and quantities and volumes of use. In addition, greater on premise outlet density was related to increased use of bars and restaurants. Further, increased frequencies and volumes were correlated with impulsivity, risk taking, and belonging to a social network of drinking drivers. Lastly, adolescents with greater impulsivity and risk taking were more likely to use alcohol at bars and parties, while those who socialised with a network of drinking drivers were more likely to drink at bars and less likely to drink at home.

Taken together, these studies emphasise the importance of factors at community, peer, parental, and individual level in explaining alcohol use. They also give impetus to the need to explicitly consider the inter-relatedness of factors at the multiple levels of influence in explaining adolescent alcohol use and comprehensively intervening to prevent and/or retard its progression.

Domains of influence on youth alcohol use

a) Contextual factors

Young people exist within the context of the values and norms of their societies, all of which inextricably influence their behaviour. The legal framework, cultural norms, and socio-economic factors that have been shown to influence youth alcohol use include taxation; regulation of sale; drink-driving laws; cultural

ceremonies marking birth, death and rites of passage; neighbourhood problems; and economic deprivation.

Laws

In South Africa, alcohol prices have been consistently increased since 2003, to reflect excise duty increases legislated by the National Treasury (Gordhan, 2013). These increases are motivated by research which shows that increases in alcohol pricing are associated with decreases in consumption (Anderson et al., 2009). In addition, South Africa is governed by laws stipulating to whom and by whom alcohol may be sold and drunk (Parry, 2010). The current legal purchase and drinking age is 18 years, as is the age at which someone is legally entitled to sell alcohol. Minimum drinking age laws have been supported by previous research which shows that the lower the minimum legal drinking age, the more likely it is that underage and teenage drinking and, particularly, drink-driving, will occur (Babor, Caetano, Casswell, Edwards, Giesbrecht, et. al., 2003). This is particularly concerning, given the high rates of underage drinking and drinking before the age of 13 years in South Africa (Reddy et al, 2013), which have been associated with substance abuse problems later in life (Grant & Dawson, 1998; Grant, 1998, Myers et al., 2011). While the medium term goal in South Africa is to increase the legal drinking age to 21 years, it is proving politically challenging in the current context, which may be partly due to two changes in political administration. Nonetheless, raising the minimum legal drinking age to 21 years is likely to have substantial positive effects, especially for mitigating alcohol-related social effects (e.g. road accidents, interpersonal violence).

Similarly, restricting the availability of alcohol to the public, and youth in particular, has been a goal of the current laws, including the regulation of the hours and days of sale. Previous international research has shown this to be an effective strategy in reducing alcohol consumption and related harm (Stockwell & Chikritzhs, 2009). Canadian and Icelandic studies found that an extension in the hours of sale was associated with an increase in alcohol-related problems (Vingilis, McLeod, Stoduto, Seeley, & Mann, 2007). In a youth-specific study, Baker et al. (2000) found that banning the sale of alcohol from midnight on Friday to 10am on Monday decreased cross-border drinking by young Americans. Among an Aboriginal community in Australia, the closure of pubs and off-premise outlets on pay day, in a campaign called “Feed the children first”, resulted in a 19.4% decrease in drinking over a period of two years, and accompanying decreases in arrests, hospital

admissions and females' refugee admissions (Gray, Saggars, Sputore, & Bourbon, 2000; Brady, 2000).

High rates of alcohol-related traffic accidents have been met by a vast international response employing drink-driving countermeasures. These include lowering blood alcohol content limits, random breath testing, sobriety checkpoints, and restriction on novice drivers and graduated licensing, particularly in the developed world (Babor et al., 2010). Similarly, laws governing drink-driving in South Africa have been motivated by unacceptably high rates of alcohol-related traffic accidents (Seedat, Van Niekerk, Jewkes, Suffla, & Ratele, 2009; Matzopoulos, Norman, & Bradshaw, 2004). While countries in the developed world have seen copious evidence for the effectiveness of some of the above-mentioned measures, developing countries face unique challenges, such as higher densities of populations and vehicles, poor road and infrastructural conditions, poor implementation of drink-driving laws (e.g. anecdotal evidence of corruption and general lack of trust of the police), and resource constraints (e.g. lack of testing kits), to implement existing laws.

While South Africa has made significant strides in alcohol policy development in the last two decades, the rest of Africa lags behind in policy development and implementation. In addition, where policies are available, these are usually shrouded by industry involvement in policy development. A review of alcohol policies in Sub-Saharan Africa found, alarmingly, that in Lesotho, Malawi, Uganda and Botswana, alcohol policies were similarly worded, industry-focused and consciously selected to promote only a part of the evidence of alcohol prevention (Bakke & Engal, 2010). These findings suggest industry involvement in the development of alcohol policies for these countries.

The latest *WHO Global Status Report on Alcohol and Health (2014)* reveals that, with the exception of South Africa, Seychelles, The Democratic Republic of Congo, Côte d'Ivoire, Congo, Botswana and Kenya, African member states do not have written national alcohol policies. In addition, there is wide variation among these countries with regard to the development and implementation of taxation, and the legal minimum age for on- and off-premises sale of alcoholic beverages (beer / wine/ spirits) (WHO, 2014).

The issue of alcohol outlet density and regulation of outlets is a fraught issue, as it deals with both regulatory measures and legality of liquor outlet operations. Following the dismantling of the apartheid government in South Africa, the increased

availability of alcohol and other drugs, a profusion of both legal and illegal alcohol outlets, and a lack of recreational facilities in urban communities, were associated with increased alcohol use. Evidence points to the role of alcohol outlet density (Gruenewald, 2011; Campbell, Hahn, Elder, Brewer, Chattopadhyay, et al., 2009) in influencing excessive alcohol consumption and its related harm. In 2000, South Africa had approximately 23 000 licenced liquor outlets and 180 000 informal alcohol outlets, mainly "shebeens" (Schneider, Norman, Parry, Bradshaw, Plüddemann, 2007). This figure is likely to have increased in the 14 years since the data were reviewed. The assertion is that the greater the number of alcohol outlets, the greater the likelihood of alcohol consumption and alcohol-related harm. Given that it was illegal for Black South Africans to consume alcohol under the early apartheid law, many Black South Africans resorted to illegal and informal production of alcohol. This resulted in home-brewing of alcohol and the proliferation of an informal liquor sector. Consequently, the post-apartheid government inherited 70% of unlicensed liquor outlets from the apartheid government (Parry, 2010). Today, alcohol outlet density poses a significant challenge to public health efforts to regulate and reduce availability of alcohol.

Cultural norms

Cultural norms exert a significant influence over the lives and choices of people in general. Alcohol has been, and continues to be, used in social and cultural contexts to celebrate life, death, and rites of passage in many cultures. Apart from its symbolic meaning in religious services (e.g. the sipping of wine as part of Holy Communion in many Christian services), other cultures regard intoxication as a symbol of wealth and power. In some South African cultural beliefs systems, alcohol is seen as a sign of consolidating friendships, and beer drinking is viewed as sign of manhood (La Hausse, 1988). Recent research in rural South Africa found that religious and customary practices use alcohol as a means of honouring traditional and religious beliefs (Onya et al., 2012).

Neighbourhood disorganisation

Neighbourhoods are an additional source of influence on alcohol use. Leventhal and Brooks-Gunn (2000) have led much of the work on the effects of living

in poor neighbourhoods on the increased vulnerability of young people to alcohol use. They found that parents from disadvantaged communities may have an impaired ability to monitor, discipline or support their children, which places them at risk for damaging behaviours. Previous research has found that neighbourhoods with high levels of crime (Bouchery, 2011), social and economic problems (Winstanely, Steinwachs, Ensminger, Latkin, Stitzer, et al., 2008), and parents from disadvantaged communities (poor mental health, coping, and parenting behaviours) may indirectly affect adolescent drinking (Chuang et al., 2005).

Few studies in South Africa have focused on community level factors, such as poverty, limited alcohol policing, easy access to alcohol, and high density of alcohol outlets in urban areas (Morojele, Flisher, & Parry, 2005; Brook, Morojele, Pahl, & Brook, 2006), as risk factors for alcohol use. Other research in South Africa found that adolescents report being able to access liquor through liquor outlets in the community (Ziervogel, Ahmed, Flisher, & Robertson, 1997/1998).

b) Interpersonal factors

Being human assumes certain social relationships between individuals. These include relationships of individuals to those in their immediate environments (friends, family and peers). These interpersonal relationships serve to place adolescents at risk or protect them from alcohol behaviours.

Family relationships

Families are a salient presence in the lives of adolescents as they traverse the journey to adulthood. Previous research has found that parental drinking (Tildesley & Andrews, 2008; Messler, Lee, Quevillon, & Simons, 2015), parental attitudes toward alcohol (Mares, van der Vorst, Engels, & Lichtwarck-Aschoff, 2011; Kelly et al., 2011), permissiveness toward alcohol use (Reimuller, Hussong, & Ennett, 2011), parental bonding (Ryan, Jorm, & Lubman, 2010), and alcohol-specific communication (Reimuller et al., 2011) function to influence adolescent alcohol behaviours. Apart from a genetic predisposition toward alcoholism found among males (Cloninger, Bohman, Sigvardss, & von Knorring, 1985; Prescott & Aggen, 1999), parental expectations of alcohol use moderate the effects (such as peer influence, self-efficacy and stress) on alcohol use. Specifically, parental disapproval of alcohol use is associated with less involvement with peers who drink, and increased alcohol refusal

self-efficacy (Nash, McQueen & Bray, 2005; Kelly et al., 2011). Other research has found that mother's responsiveness and emotional closeness to their adolescents reduced their involvement with peers, which, in turn, reduced adolescent substance use (Bogenschneider, Wu, Raffaelli, & Tsay, 1998; Kelly et al., 2011).

In a systematic review of parental influences on adolescent alcohol use, initiation of adolescent alcohol use was found to be delayed by parental modelling alcohol behaviours, limiting availability of alcohol to the child, parental monitoring, parent-child relationship quality, parental involvement, and general communication (Ryan et al., 2010). Reducing the level of drinking later in adolescence was associated with parental modelling, limiting availability of alcohol to the child, disapproval of adolescent drinking, general discipline, parental monitoring, parent-child relationship quality, parental support, and general communication.

In the main, research conducted among South African adolescents concurs with international research on the role of parental level factors in influencing adolescent alcohol use. In addition to recognising the role of parental monitoring, parental drinking, parental attitudes toward alcohol use and parent-permissiveness (Ghuman, Meyer-Weitz, & Knight, 2012) as risk factors for adolescent alcohol use, local studies also acknowledge that parental factors are useful and realistic to target for prevention planning (Brook, Morojele, Pahl, & Brook, 2006).

Peers

Peer influence is salient during adolescence and must be considered when examining alcohol use and its related influences. Previous research has found that perceptions of peer drinking (Bosari & Carey, 2001; Komro & Toomey, 2002; Brooks-Russell et al., 2013), associating with peers who drink (Leung, Toumbourou, & Hempbill, 2014)), and having a best friend who drinks (Overbeek, Bot, Meeus, Sente, Knibbe, et al., 2011), place adolescents at increased risk of consuming alcohol. Furthermore, a study among secondary school students in Kwa-Zulu Natal, South Africa, found peers to be a significant influence on alcohol use (Ghuman et al., 2012) with the frequency of peer drinking being a significant predictor of both adolescent alcohol use and binge drinking. In addition, the study found that peers were the ones who offered adolescents their first drink, and that peers who perceived their friends to be drinkers also had an increased likelihood of having consumed alcohol in the past month.

Ziervogel et al. (1997/98) found that peer pressure influenced many young people's decisions to drink in a Cape Town based study. Similar findings in studies conducted in South Africa led to a focus on peer-led interventions to prevent adolescent alcohol use (Cupp, Zimmerman, Bhana, Feist-Price, Dekhtyar, et al., 2008; Resnicow, Cross, Wynder, 1993; Smith, Palen, Caldwell, Flisher, Graham, et al., 2008; Wechsberg, Luseno, Karg, Siobhan Young, Rodman, et al., 2008). These peer-focused studies give weight to the perceived influential role of peers in adolescent alcohol use. However, in spite of the significant effort and resources invested in such interventions, they proved only moderately successful in preventing the onset and/or progression of adolescent alcohol use (Protogerou, Flisher, & Morojele, 2012). This necessitates looking beyond just peer-led programmes to more multi-faceted efforts at adolescent alcohol prevention.

School-level factors

The evidence for the association between alcohol use and school problems remains inconsistent. This is due mainly to the reciprocal relationship between alcohol use and school performance. Yet, to ignore the role of school factors in alcohol and other risk behaviours will be to leave out an important explanatory link in adolescent alcohol use.

Previous research has found that school-going youth face prevalent alcohol use problems. Factors that exist in the school context that appear to be key determinants of adolescent alcohol use include the interrelated issues of poor academic performance (Hayatbakhsha, Najman, Bor, Clavarino, & Alati, 2011), low school commitment (Arthur et al., 2002), and school disengagement (Henry, Knight, & Thornberry, 2012). However, the evidence for the link between alcohol use and school drop-out has been mixed. In a longitudinal study of approximately 3500 adolescents in Australia, Hayatbakhsh et al. (2011) found that children who had lower school performance had an increased risk of drinking two or more glasses of alcohol per day in adulthood. Henry et al. (2012) found that school disengagement was related to school drop-out which, in turn, was related to substance abuse and other serious problems in the developmental life course. In contrast, a study on substance use and psychosocial predictors of high school dropout in Cape Town, South Africa, found that alcohol and illegal drug use did not predict school dropout (Flisher & Chalton, 1995).

Other research in the school domain found reciprocal relationships between school disengagement and problem behaviours (including alcohol use). Wang and Fredericks (2014) found that decreased school engagement resulted in increased delinquency and substance use over time, while increased substance use and delinquent behaviours were predictive of school dropout. Given that the school remains an important setting in which the determinants of alcohol use (e.g. academic achievement) may play out, the issue of reciprocity between academic achievement and adolescent alcohol use requires further research.

c) Individual factors

For decades, prevention planners and practitioners have focused their efforts on targeting individual level factors in preventing adolescent alcohol use. These include alcohol knowledge, beliefs, alcohol expectancies (Leigh, 1989; Jones, Corbin, & Fromme, 2001) attitudes towards alcohol use (Laflin, Moore-Hirschl, Weis, & Hayes, 1994; Marcoux & Shope, 1997; Keyes, Schulenberg, O'Malley, Johnston, Bachman, et al., 2012) and alcohol-refusal self-efficacy (Schulenberg & Maggs, 2002, Nash et al., 2005). The literature abounds with evidence on knowledge, attitudes and practices (KAP) surveys, based on these empirically validated factors. Previous research in South Africa has found that attitudes favourable towards anti-social behaviour (Morojele, Muller, Reddy, Lombard, Flisher, et al., 2002) are associated with increased substance use. Morojele et al. (2002) found that factors in the peer-individual domain were most strongly associated with alcohol use among grade 8-11 learners in South Africa, while Rocha-Silva (1989) found that, adolescents reported using alcohol because of a desire to change their moods, because it was viewed as “fun,” or simply as part of the experimental phase of adolescence.

Ziervogel and colleagues (1997/8), in their qualitative investigation among South African adolescents, found that a belief that drinking will reduce inhibitions, increase self-confidence, make them appear and feel more adult-like, and help them cope with interpersonal problems, were among the main reasons identified as influencing their decisions to drink. The belief in one's ability to refuse alcohol in a given a situation (alcohol/drinking-refusal self-efficacy) has been shown to be an important and modifiable individual level factor influencing alcohol use. Eaton and Flisher (2001) argue that the complex interplay of low self-esteem syndrome,

perceived external locus of control, and low self-efficacy – not believing in one’s ability to do things one would like to do - might lead to risk-taking behaviour. Despite the importance of alcohol refusal self-efficacy to understanding adolescent alcohol consumption and alcohol misuse, very little research exists in the South African context on the role of self-efficacy on adolescent alcohol use. As applied to alcohol, Scheier and colleagues (1999) found that individuals with higher levels of alcohol refusal self-efficacy had a slower alcohol use rate than those with lower alcohol-refusal self-efficacy. In addition, Connor and colleagues (2011) found that alcohol refusal self-efficacy was a salient factor in predicting future alcohol misuse. Specifically, they note that even when adolescents had positive alcohol expectancies, their future drinking was mediated by high alcohol refusal self-efficacy.

Not surprisingly, in the context of the HIV epidemic, most research in South Africa focuses on self-efficacy as a general construct for condom use or other safe sexual practices (Huis In't Veld et al., 2012; Dlamini et al., 2009; Karnell Cupp, Zimmerman, Feist-Price & Bennie, 2006). In the context of associations between alcohol use and anti-retroviral adherence, Morojele and colleagues (2014), however, suggested that HIV-positive patients should be supported to increase their self-efficacy as a means to change their drinking behaviour. However the direct effects of alcohol refusal self-efficacy on adolescent alcohol use in South Africa requires further investigation.

RESEARCH GAPS

While a number of studies have been conducted in South Africa on alcohol prevalence and its associated influences among young people, there is a dearth of studies that look comprehensively at individual, interpersonal and community level influences on youth alcohol use. This makes the current study an important contribution to the body of knowledge on youth alcohol use in South Africa. Previous studies are limited by small numbers, and differ in terms of their sampling techniques, research methods and measures. To the knowledge of the researcher, those studies did not employ longitudinal data from a specialised population (birth cohort) to examine the role of risk and protective influences at individual, family, peer, school and community levels on adolescent and youth alcohol use within the South African context. Moreover, very few studies currently exist in South Africa that adopt a socio-ecological approach to adolescent alcohol use, though a few studies exist that consider

environmental factors (Kalichman Seager, Viljoen, Potgieter, Rossouw, et al., 2006; Thomas, Seager, Viljoen, Potgieter, Rossouw et al., 1999; Brook, Morojele, et al., 2011).

In addition, youth-focused studies on alcohol use are largely school-based and often do not include youth outside of the school system, who may face different risk factors for alcohol use. The Bt20 study is able to track youth across the developmental course from pre-adolescence to late adolescence as they transition out of school, when risks and influences on their alcohol use may change.

Finally, very few studies exist which examine the more distal level factors, such as the effects of poverty and neighbourhood problems on youth alcohol use in South Africa, although there are a few exceptions. Kalichman et al. (2006) found associations between poverty, substance use and the transmission of HIV risk behaviours in three South African communities, while Thomas et al. (1999) found associations between being a victim of violence and poverty, and substance use. More recently, Brook and colleagues (2011) found that environmental stressors such as, high socio-economic inequalities, poverty and violent victimisation, were directly and indirectly (through low well-being) associated with alcohol use.

In response to the above-mentioned gaps, the current study sought to advance research in the field of youth alcohol use by empirically testing factors that impact youth alcohol use at multiple ecological levels. While it was unable to examine interactions, this thesis examined individual, interpersonal and community influences on adolescent alcohol use separately. Drawing on data from a birth cohort study, this study is able to provide an important means for identifying prevalence and patterns of drinking, and consequently identify subgroups of youth who may be at risk of harmful drinking. Therefore, researchers and practitioners alike may benefit from identifying these sub-groups to establish age-specific risk profiles, to identify signals of initiation of alcohol use disorders, and to inform policy and prevention programmes. Clinically, it is significant for early identification of drinking patterns, which can aid in early diagnosis and treatment (Flory, Lynam, & Milich, 2004). This is in keeping with global recommendations to adopt preventive programmes and policies to reduce harmful drinking and its associated causes (WHO, 2011).

Finally, this study is the first to examine a multi-level model of the determinants of alcohol use from a birth cohort within the South African context.

AIMS AND OBJECTIVES

This study aimed to examine national trends in alcohol use, consider associations with alcohol-related harm, and discuss implications for alcohol policy process in SA. Additionally, it sought to examine the profile of alcohol use among urban adolescents using a longitudinal birth cohort, identify risk factors at multiple levels and track progression in alcohol consumption from pre-adolescence to late adolescence and early adulthood.

In order to meet the overall aim of the study, the specific study objectives were:

1. To describe trends in alcohol use among South African youth following rapid policy development (1998-2008), and associations with alcohol-related harm, and to discuss implications for alcohol policy process in SA.
2. To calculate prevalence of alcohol use among the birth cohort during pre-adolescence (11/12 years) and late adolescence (18 years), in terms of individual factors (age, gender, SES) and maternal factors (maternal age, education and marital status).
3. To test a multi-level model of potential individual, family, peer, school and community level factors that impact on risky alcohol use at age 18.

HYPOTHESES

The overall study was conceptualised to test the following hypothesis:

1. Adolescent alcohol use in the Bt20 cohort is influenced by factors that exist within the individual, and his/her interpersonal and community level contexts.
2. Factors in the individual and interpersonal domains of the ecological framework are directly associated with adolescent alcohol use
3. Factors distal to the individual (community factors) are indirectly related to adolescent alcohol use.

CHAPTER TWO: MEASUREMENTS

This chapter outlines the common measurement techniques employed and the methodological challenges encountered in alcohol research. In addition, it briefly outlines data sources, the conceptualisation of the alcohol component of the Bt20 questionnaire, the ethics approval process and the data management process undertaken in the execution of this PhD study.

Attempts to understand alcohol consumption must begin with an examination of its measurement. Globally, a range of measurement techniques are presented in the literature. However, the most widely used indicators of alcohol consumption are understood to be measured in terms of: levels of alcohol consumption and patterns of drinking (WHO, 2014).

Level of alcohol consumption

Two common indicators of levels of alcohol consumption include adult per capita consumption in litres of pure alcohol per annum, and alcohol consumption in grams of pure alcohol per person per day (see Box 1).

BOX 1 Indicators of Alcohol Consumption

Adult per capita consumption (APC) is defined as the per capita amount of alcohol consumed in litres of pure alcohol in a given population (WHO, 2014).

Grams of pure alcohol per day is a common measure of alcohol consumption, used by a number of countries that have set guidelines for daily limits on alcohol consumption to minimise risks to health. Given the specific weight of alcohol of 0.793 g/cm³ (at 20 °C), per capita consumption in litres of pure ethanol per year can be converted into grams per day as follows: $\text{g/day} = \text{APC} \times 1000 \times 0.793/365$ days.

Source: WHO, 2014

Patterns of drinking

The common indicators of the manner in which people drink (patterns of drinking) include those whose pattern is to *abstain* from alcohol, those who *drink* in a heavy episodic pattern, and those whose drinking is measured to understand its effect on individual *health and well-being*. The effect of drinking patterns on health and well-being can be measured using a patterns of drinking score (PDS) (see Box 2).

BOX 2

Patterns of Drinking

ABSTAINERS

Lifetime abstainers: people who have never consumed alcohol in their lifetime.

Former drinkers: people who have previously consumed alcohol but who have not done so in the past 12-months.

Past 12-month abstainers: people who did not consume any alcohol in the previous 12-months. This includes former drinkers and lifetime abstainers.

HEAVY EPISODIC DRINKERS

Heavy episodic drinking (also known as binge drinking) refers to a pattern of drinking), where 60 or more grams of pure alcohol is consumed on at least one single occasion, at least monthly). The way heavy episodic drinking is defined varies, both at country level and by gender.

Patterns of drinking score (PDS): is used to measure the impact of alcohol use on individual health and well-being. “PDSs reflect how people drink instead of how much they drink within a population. Strongly associated with the alcohol-attributable burden of disease in a country, PDS is measured on a scale from 1 (least risky pattern of drinking) to 5 (most risky pattern of drinking). The higher the score, the greater the alcohol-attributable burden of disease in population groups with the same level of consumption.” (WHO, 2014, pg. 35)

Measurement techniques

A range of measurement techniques have been used to measure alcohol consumption. The decision about what measures to use for alcohol consumption are usually dependent on the purpose of the measurement, that is, why it is being done, how data will be used and which populations the measures being used for. Gmel & Rehm (2004) provide insight into the considerations one must make in determining the choice of alcohol consumption measures. First, the choice of any alcohol measure depends on the research question. Second, the purpose of the measurement must be considered, i.e. will the information on alcohol consumption be used for a) describing levels of alcohol intake, b) comparing consumption between different sub-groups or populations, or c) establishing an association between alcohol consumption and a particular outcome/s?

Among many different settings, alcohol consumption is measured in therapeutic, hospital, law enforcement, forensic autopsy, roadside surveys and social and clinical research settings. Common measurement techniques include:

Blood Alcohol Content (BAC): the content of alcohol in the blood, calculated by dividing grams of alcohol by 100 millilitres of blood.

Breathalyser: a device used to *estimate* blood alcohol content (BAC) or blood alcohol level (BAL) from a breath sample.

Biomarkers: refer to biochemical features that provides information about recent drinking activity and genetic predisposition to alcoholism (Peterson, 2004/2005)

MRI-based hippocampal volume: an *in vivo* magnetic resonance imaging (MRI) technique used to measure the volume of the hippocampus in alcoholics (Agartz, Momenan, Rawlings, Kerich, & Hommer, 1999). It is based on previous evidence which shows that the hippocampal volumes in the brains of alcoholics are often decreased. Thus, decreased hippocampal volumes may provide one indicator of alcoholism.

Self-report measures: used commonly in research settings to measure average consumption, frequency and short-term alcohol consumption.

Alcohol measures in survey Research

As alcohol in the current context is measured in a research setting, the most common measurement techniques pertaining to research will be discussed below.

In research settings, surveys employing self-report measures are commonly used to provide information on prevalence, trends and burden of disease estimates. Quantity-frequency (QF), Graduated Frequency (GF) and short-term recall measures are typically the main forms of alcohol consumption measurement (Bloomfield, Hope, & Kraus, 2012). GF measures are based solely on the frequency of alcohol consumption, and are intended to principally measure frequency of drinking. However, GF measures do not allow one to calculate the volume of alcohol consumed. More recent GF measures include questions about the maximum number of drinks he/she has consumed in a specified period.

QF measures, which asks about drinking for the recall period of anytime from one week to one year, allows for both calculation of volume and the frequency of drinking (Bloomfield et al., 2012).

Weekly recall measures typically ask respondents to recall all the alcohol consumed in a short period, usually the past week (Bloomfield et al., 2012). This method is based on the assumption that the shorter the recall period, the more likely it is that respondents will be able to accurately recall their drinking. There is no absolute consensus on a single best measure of alcohol consumption in research settings. GF measures have been criticised for overly focusing on frequency to the exclusion of

quantity. In contrast, QF are commended for their ability to record both volumes and patterns of drinking. Weekly recall methods, while having low recall bias, are criticised for being unable to gauge occasional heavy and light consumption days.

In addition to the unique strengths and weakness of specific GF, QF and weekly recall methods, researchers appraise the methods by which these measures are administered, most notably self-report. Critics refute the validity of self-report alcohol measures on the basis that “the drinker” is likely to deny use or the extent of use or even over-estimate their use (Skinner, 1984).

However, other researchers (Babor, Stephens, & Marlatt, 1987) argue that the validity of self-report measures improves and social desirability bias decreases when self-report measures are properly administered, participants are given clear instructions, and there is a private space in which measures are recorded (Babor et al., 1987).

Table 9 indicates the most commonly used methods of measurement for alcohol consumption and patterns of drinking, and their advantages disadvantages.

Methodological limitations in survey research

Conducting research on alcohol consumption using survey data presents unique challenges to researchers. First, a cursory review of the literature on alcohol research reveals varying study designs employed to measure alcohol consumption. This makes comparability in terms of prevalence and patterns of alcohol use across the studies and contexts very challenging (Turner & McLelland, 2009).

Second, the cross-sectional nature of many survey designs limits its ability to predict future patterns of drinking and to identify changes in trajectories (patterns) over time. Cross-sectional studies are also limited in their abilities to accurately recall historical alcohol use and to infer any causality or temporality between alcohol intake, communicable and non-communicable diseases and social problems.

TABLE 9
Commonly used Alcohol Measures and their Advantages and Disadvantages

Method of measurement	Advantages	Disadvantages
Definition of each approach		
Average volume of consumption measures		
Biomarkers Biochemical feature used to measure recent drinking activity or hereditary predisposition to alcohol abuse	High sensitivity and specificity Precise Objective	Costly Impractical, due mainly to a relatively short half-life of alcohol
Quantity Frequency approach (QF) Estimation approach to measuring alcohol, which asks people to report their “average” consumption	Useful for understanding overall alcohol consumption Useful for comparisons to other studies	Recall bias Self-report Cannot gauge occasional heavy and light consumption days
Graduated Frequency approach (GF) Frequency of consuming alcohol at different quantity levels	Theoretically one of the best measures of drinking patterns and volume	Practically difficult to implement and burdensome to respondents Recall bias Self-report
Weekly recall (WR) Asks respondents to recall all the alcohol consumed in a short period, usually the past week	Low recall bias	Short measurement interval Cannot capture patterns of drinking for infrequent drinkers or unusually heavy drinkers
Beverage specific quantity frequency (BQF) Measures quantity frequency for each type of beverage	Allows for specificity of beverages to be known (e.g. malt, wine, beer) Useful for comparison of drinking by sex and culture	Increased possibility of misinterpreting questions on overall consumption Does not provide an overall measure of frequency Self-report
Pre-coded frequency questions	Less embarrassing to participants	Limits the number of possible responses, e.g. those in the upper range of frequency
Diary methods Uses a diary to record alcohol consumption over short period of time	High degree of recall accuracy	Short reference period Cannot capture patterns of drinking
Patterns of consumption measures		
Biomarkers Biochemical feature used to measure recent drinking activity or genetic predisposition to alcohol use	Gold standard- for measuring harmful and hazardous alcohol use Very accurate Precise Objective	Costly Time consuming Impractical, due mainly to a relatively short half-life of alcohol
Alcohol Use Disorders Identification Test (AUDIT) ^a (Babor, Higgins-Biddle, Saunders and Monteiro, 2001) A tool used to screen for persons with hazardous or harmful alcohol consumption	Very accurate Easy to use Culturally sensitive	Lengthy for primary health care settings Needs adaption to local contexts where what constitutes a “standard” drink is specified. Complex scoring
Composite International Diagnostic Interview (CIDI) (Andrews & Peters, 1998) Diagnostic tool that replicates and operationalises DSM-IV and ICD 10	Accurate reflection of the diagnostic criteria for alcohol abuse and dependence	Lengthy

criteria for alcohol dependence		
CAGE (Ewing, 1984) Screening tool used to identify alcoholics and alcoholism	Short Easy to administer Useful for primary health care settings.	Limited to certain types of alcohol misuse Limited for use only in certain populations Not recommended for use in adolescent populations Self-report
Problem Oriented Screening Instrument for Teenagers (POSIT) (Rahdert, 1991) Screening tool designed to identify substance abuse and related problems among teenagers	Easy to use Specific to the problems and concerns of adolescents	Lengthy
CRAFFT (Knight, Shrier & Bravender, 1999) Tool used to screen adolescents for high risk alcohol and other drug use disorders simultaneously	High sensitivity Validated for use in adolescents Simple to administer and score	Limited confidentiality

Third, survey research on alcohol consumption is heavily reliant on self-report. However, determining whether or not an individual accurately reports his/her alcohol consumption is a challenge and raises questions of the reliability and validity of self-reports. In spite of the criticism levelled against the use of self-reports by several researchers – most notably over or under estimation of consumption - Sobell & Sobell (1994) outline the conditions which enhance the quality of self-report data. They argue that an individual is more likely to answer accurately if they are:

- a) alcohol free when interviewed;
- b) given written assurances of confidentiality;
- c) interviewed in a setting that encourages honest reporting
- d) asked questions, which are clearly and objectively worded; and
- e) provided with memory aids (Sobell & Sobell, 1994, pg. 56)

Alcohol research among *youth* is further limited by the fact that, globally, national surveillance data among adolescent populations are limited (Donovan, 2014). Where they do exist, they draw on multiple data sources which often do not use standardised methods or designs to measure alcohol consumption. In addition, alcohol measures in adolescent populations, particularly those that measure patterns of drinking, are usually based on measures originally intended for adult populations. These measures are often modified before being used in adolescent populations. This may be inappropriate, for a range of reasons; particularly when blood alcohol content (BAC) is measured. For example, BAC in the bodies of adults differs significantly from that of adolescents and/or children, given the smaller body sizes and lower volumes of water in the bodies of young people (Donovan, 2009). In addition, asking

children and pre-adolescents to recall drinking initiation, frequency of drinking and quantity of alcohol consumed, poses difficulties. It is not uncommon for children to sip, taste or try alcohol, at least once. However, by using measures originally intended for adults, young people's experiences with alcohol may be lost or underestimated. In addition, recent research has found that young people tend to overestimate their drinking, particularly within the context of their peer group (Moreira, Oskrochi & Foxcroft, 2012). Notwithstanding these limitations measures have increasingly been successfully developed specifically for adolescent populations (Gmel, Studer, Deline, Baggio, N'Goran, et al., 2014; Thompson, Stockwell, Leadbeater, & Homel, 2014).

Measures employed and conceptualised for this PhD study

The socio-demographic measures: gender, race, school grade repetition, household SES, maternal age, maternal marital status and maternal education were drawn from the Bt20 socio-demographic data set and merged with the analytical dataset for this study.

In this PhD, one of the objectives was to calculate the prevalence of alcohol use among the Bt20 sample in terms of, lifetime alcohol use, current (past 30 day) alcohol use, and the presence/absence binge drinking episodes. The study undertook self-measurement of alcohol consumption using report measures. Because estimating the quantity and frequency of alcohol consumption was of importance in the current study, it employed a combination of Quantity Frequency (QF) and Graduated Frequency (GF). These measures were drawn from existing standardised self-report measures which have been validated in previous youth risk behaviour and intervention studies measuring frequency and quantity of alcohol consumption among adolescent populations (White & Hingson, 2014; Reddy et al., 2013; Eaton et al., 2012, Perry et al., 1996). In line with the YRBS studies (2002; 2008; 2011), binge drinking was defined as the consumption of ≥ 5 alcoholic drinks within a few hours on 1 or more days in the preceding month.

The use of self-reported GF and QF measures took account of practical considerations, i.e. resources and measures available in the larger cohort study (Bt20), and the fact that the study had a captive audience of adolescents from the larger cohort study in which this PhD was nested. The conceptualisation also took account of both over and under estimation of alcohol use by young people by: (a) ensuring ease of

administration, (b) increased privacy for respondents (via computer-based self-administered surveys), (c) providing a safe and private space, with clear instructions on questionnaire completion, and (d) eliciting information on individual drinking levels and patterns.

A second and third objective of this PhD was to identify the multiple influences on alcohol use among adolescents at early and late adolescence, the researcher conceptualised evidence-informed measures that captured these influences. As such, the researcher undertook to include measures that potentially explained the perceived *individual, family, peer, school and community* level influences on alcohol use. Alcohol refusal self-efficacy ($\alpha = .87$, test retest reliability = $.80$) and peer norms/influence were adapted from Project Northland (Perry et al., 1996) - ($\alpha = .89$, test-retest reliability coefficient = $.86$). The parental drinking measure was drawn from the existing Bt20 dataset. The community level SES variable was derived from the 2011 census data which reported average household income per annum (Statistics South Africa, 2012). (See Appendix B for a detailed description of measures included to meet the study objectives).

Data sources

The Bt20 study was the *predominant* source of data for this PhD study. Bt20 comprises singleton children and their mothers from a birth cohort study, in Soweto. It is the largest and longest running study of child and adolescent health and development in South Africa, and one of the few large-scale longitudinal studies in the sub-Saharan African region, and in the developing world. Bt20 aims to track child and adolescent health and development from birth to early adulthood along several domains - physical, social, and psychological. Initially mothers/caregivers reported on a range of physical, social, and psychological indicators of development. When the adolescents were 13 years old, they began self-reporting on their health and associated behaviours. The period between ages 10 – 20 years old was largely focused on the emergence of risk behaviours (sexual and reproductive health and metabolic disease risk). This PhD study contributes to understanding one component of risk behaviours (alcohol use) in the cohort.

In addition to drawing on historical data from the Bt20 dataset, conceptualising, selecting and developing alcohol measures for administration in year 17/18 of the study, to meet this PhD study's objectives, (see Appendix C), the researcher undertook

to examine national trends in alcohol prevalence and its association with alcohol-related harm among South African youth and its implications for policy. The researcher also drew on data from *six* sources: the two South African Youth Risk Behaviour Surveys (YRBS, 2002; 2008³), the two South Africa Demographic and Health Surveys (SADHS, 1998; 2003) and data from two phases of a sentinel surveillance system, the National Injury Mortality Surveillance System (NIMSS).

The rationale for drawing on different data sources for this PhD was twofold. First, it served as a means of comparing alcohol prevalence in the Bt20 study with national prevalence among South African youth. Second, at a time when the issues of alcohol control and regulatory measures are at the forefront of national policy debates, the thesis timeously considered implications for alcohol policy in South Africa.

Ethical approval

In addition to existing ethical clearance for the larger Bt20 study, ethical clearance for *this* PhD study was obtained in the researcher's personal capacity from the University of the Witwatersrand's Human Research Ethics Committee (Medical) clearance certificate: M150156. See Appendix D.

The ethical principles governing both Bt20 and this PhD study included voluntary participation, and assurance that refusal to participate, or withdraw from participation in the study, would not disadvantage or prejudice participants in any way. The ethical principles of informed consent and assent were maintained by obtaining written informed consent from the participants (18 years and older) and informed consent from parents/guardians of minors (under 18 years old). In addition, in the case of minors (that is those below 18 years old), assent was obtained from participants prior to the completion of the questionnaires. Confidentiality and anonymity were maintained by linking participant identities to a unique Bt20 identifier, which was known only to the data management teams, the supervisors and the researcher. Data were stored separately from the completed questionnaires and results were reported as group results to further protect any individuals.

Permission was granted by the WHO Press for the use of copyrighted graphics from the *Global Status Report on Alcohol and Health (2014)* in this thesis. See Appendix E.

³ Data from the most recent YRBS study (2013) was not released in time for inclusion as a key data source for this study

Data management

The researcher took responsibility for the overall management of the alcohol data, including data extraction, cleaning, coding, computation and analysis. Where necessary, the researcher was assisted by a research assistant and the project data manager to extract data. The Statistical Package for the Social Sciences spanning the PhD period (SPSS version 19-22) was used to analyse all the data for this PhD study. While the entire sample for the Bt20 study comprised 3273 participants, this thesis specifically focused on an analytical sample of adolescents, with maternal, and community data being included where relevant to the objectives of individual empirical papers. This resulted in an analytical sample of 1647 adolescents for whom data was available. There was no adjustment for missing data. The specific details of analysis for each paper are contained in the relevant papers (Ramsoomar & Morojele, 2012; Ramsoomar, Morojele, & Norris. 2013; Ramsoomar, Norris, Manda, & Morojele 2014). Details of the analytic techniques employed in this PhD study (with publications) are contained in relevant empirical papers.

CHAPTER THREE: EMPIRICAL PAPER

TRENDS IN ALCOHOL PREVALENCE, AGE OF INITIATION AND ASSOCIATION WITH ALCOHOL-RELATED HARM AMONG SOUTH AFRICAN YOUTH: IMPLICATIONS FOR POLICY

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INTRODUCTION

Globally, harmful alcohol use and associated risk behaviours present a formidable threat to the health of youth aged 15 - 29 years. In 2011 the World Health Organization reported that 9% of annual deaths in this age group were attributable to alcohol-related causes (World Health Organization [WHO], 2011). In South Africa (SA) harmful alcohol use is of particular concern, with implications for violence, transport-related accidents and fatalities, homicide, suicide and unintentional deaths (Matzopoulos, Cassim, & Seedat, 2003). Alcohol use among SA men – mainly binge drinking (consumption of ≥ 5 drinks on 1 or more days) – is reported to be among the highest (WHO, 2011), corroborated by findings of a 2005 - 2008 national survey demonstrating increases in current, binge and hazardous drinking (Peltzer, Davids, & Njuho (2011). Coupled with inordinate levels of alcohol-related harm, this has important implications for control and preventive policies in SA and calls into question the effectiveness of existing policies.

Current Alcohol Policy in SA

In a critical review of alcohol policy development processes in SA between 1994 and 2009, Parry succinctly described 4 policy initiatives of that period (Parry, 2010).

Restrictions on alcohol advertising and counter-advertising were first considered in 1997, yet implementation was delayed for almost 12 years due to political decision-making and effecting changes to labelling by the alcohol industry.

The regulation of retail alcohol sales was complicated, as a legacy of apartheid resulted in 70% of liquor outlets being unlicensed. The SA government was faced with bringing unlicensed outlets into the formal market and mediating among those responsible for implementing regulatory policy. The latter was complicated; each province had its own policy with varying levels of implementation, and consequently, of effectiveness.

Control of alcohol packaging. Flanagan, Schoenberg, & Lomofsky (2002), having shown the negative impact of the production and sale of cheap wine in the Western Cape winelands, recommended that bulk wine (packaged and sold in cheap non-self-supporting foil bags called *papsakke*) be brought under control. As a direct result, current law limits the capacity of alcohol containers to 5 litres and prohibits the sale of alcohol in *papsakke* (Department of Agriculture, 2007).

Increasing alcohol taxation is globally considered to be one of the most effective strategies in reducing alcohol consumption; a meta-analysis of 112 studies confirmed an inverse relationship between alcohol taxes and drinking (Anderson, Bruijn, Angus, Gordon, & Hastings, 2009). SA government and industry, with their respective vested interests, resolved that taxes would be based on a proportion of the retail price, and would increase commensurate with increasing alcohol content. There has been a consistent increase in alcohol price since 2003, to reflect excise duty increases legislated by National Treasury (South African Revenue Service [SARS], 2011); whether or not this has translated into a reduction in alcohol consumption is unclear.

Despite these efforts, alcohol-related road traffic accidents, violence, injury and mortality are a growing concern in SA. Available data indicate that 32% and 40% of deaths in youth in 2002 and 2008, respectively, were as a result of transport-related deaths, while the leading manner of death among those with a positive blood alcohol concentration (BAC) was violence (Matzopoulos, Cassim, & Seedat, 2003). Harmful alcohol use also places youth at risk for a range of risky behaviours and intentional and unintentional injury and death.

Consideration of the trends in lifetime prevalence of alcohol use (age of initiation and patterns of drinking), the association thereof with alcohol-related harm and implications for regulatory policy has not, to the knowledge of the authors, been undertaken in SA. We employed data from four national prevalence surveys and two phases of a national sentinel surveillance study with the aim of reviewing these trends among SA youth aged 13 - 19 years. In addition, we examined the association between BAC and alcohol-related harms. Findings were envisaged to inform future alcohol preventive and control policies.

METHODS

Data were extracted from 4 national cross-sectional prevalence studies (South African Demographic and Health Survey (SADHS) 1998 (Department of Health [DoH], 2003) and 2003 (Department of Health [DoH], 2007) and Youth Risk Behaviour Study (YRBS) 2002 (Reddy, Panday, Swart, Jinabhai, Amosun, James, et al., 2002) and 2008 (Reddy, James, Sewpaul, Koopman, Funani, Sifunda, et al., 2010) and two national sentinel surveillance studies (National Injury and Mortality Surveillance Study (NIMSS) 2002, (Matzopoulos, Cassim, & Seedat, 2003) and 2008

(Medical Research Council [MRC], 2010). Table 10 summarises the methods and characteristics of each study. Data on alcohol use and alcohol-related harms were extracted to Epi Info (version 7) for bivariate analyses.

TABLE 10
Summary of the Studies included in this Review

Study	Survey type	Design	Age group (years)	Sample size	Variables
SADHS 1998	National household	Cross-sectional	15 - 19	13 826	Prevalence, age of initiation, binge drinking/ risky drinking
SADHS 2003	National household	Cross-sectional	15 - 19	10 214	Prevalence, age of initiation, binge drinking/ risky drinking
YRBS 2002	National school	Cross-sectional	13 - 19	10 699	Prevalence, age of initiation, binge drinking, driving/walking under the influence of alcohol
YRBS 2008	National school	Cross-sectional	13 - 19	10 270	Prevalence, age of initiation, binge drinking, driving/walking under the influence of alcohol
NIMSS 2002	Sentinel surveillance	Surveillance/ cross-sectional	15 - 19	849 ^a	BAC, alcohol-relatedness of non-natural deaths
NIMSS 2008	Sentinel surveillance	Surveillance/ cross-sectional	15 - 19	672 ^a	BAC, alcohol-relatedness of non-natural deaths

SADHS = South African Demographic and Health Survey; YRBS = Youth Risk Behaviour Survey; NIMSS = National Injury Mortality Surveillance System; BAC = blood alcohol content.

^a Sub-sample of cases of deaths among youth aged 15 - 19 years for whom BAC levels were determined (according to forensic regulation).

RESULTS

Alcohol use Trends in SA

Lifetime alcohol use was stable but high from 1998 to 2008 (Table 11), as indicated by data from SADHS 1998 and 2003 (20% and 25%, respectively) and YRBS 2002 and 2008 (49.1% and 49.6%, respectively).

TABLE 11
Alcohol Use Trends

Study	Lifetime prevalence %	Age of initiation <13 years %	Binge /risky drinking %
SADHS 1998	20.0	N/A	N/A
Male	25.3	N/A	24.1
Female	15.0	N/A	27.3
SADHS 2003	25.0	N/A	N/A
Male	32.0	N/A	9.3
Female	17.0	N/A	36.6
YRBS 2002	49.1	12.0	23.0
Male	56.1	15.8	29.3
Female	43.5	9.0	17.9
YRBS 2008	49.6	12.1	28.5
Male	54.4	15.3	33.5
Female	45.1	8.6	23.7

SADHS = South African Demographic and Health Survey; YRBS = Youth Risk Behaviour Survey; N/A = not available.

YRBS data on age of initiation, measured broadly as age of initiation of alcohol use prior to age 13 years, indicate that 12% of youth and significantly more males than females (15.8% [13.5 - 18.0] v. 9.0% [7.4 - 10.4] in 2002 and 15.3% [13.7 - 17.2] v. 8.6% [6.8 - 10.8] in 2008) initiated alcohol use at this young age (Table 11).

Binge drinking was measured variably in each study. The terms ‘risky’ and ‘hazardous or harmful’ drinking were used in the 1998 and 2003 SADHS surveys, respectively; nevertheless they were uniformly defined as drinking ≥ 5 standard alcoholic drinks per day for males and ≥ 3 drinks per day for females. In our analysis, risky and harmful/hazardous drinking was defined as weekend drinking only, in line with episodic drinking patterns reported in studies nationally. In line with the YRBS studies, binge drinking was defined as the consumption of ≥ 5 alcoholic drinks within a few hours on 1 or more days in the preceding month.

Significant gender differences emerged from the studies reviewed. According to YRBS data, more males than females reported binge drinking (29.3% [26.7 - 31.9] v. 17.9% [15.6 - 20.3], respectively, in 2002, and 33.5% [30.8 - 36.4] v. 23.7% [21.1 - 26.6], respectively, in 2008). In contrast, more females than males reported binge drinking according to SADHS data (27.3% v. 24.1%, respectively, in 1998 and 36.3% v. 9.6%, respectively, in 2003). Overall, females showed the greatest increase in binge drinking, from 27.3% to 36.6% in the SADHS 1998 and 2003 surveys, and 17.9% to 23.7% in the YRBS 2002 and 2008 surveys, respectively.

Alcohol-related Traffic Safety

Given the association between alcohol use and traffic fatalities (Peltzer et al. (2011), we reviewed traffic risks associated with alcohol use, including driving and walking along the road under the influence of alcohol (DUI and WUI, respectively). Only the YRBS studies reported alcohol-related traffic safety.

Between 2002 and 2008 there was an overall increase in DUI and WUI among youth. The 7.8% reported prevalence of DUI among youth in 2002 increased to 25.9% in 2008 (Reddy et al., 2002; Reddy et al., 2010). Gender differences were significant, with more males than females reporting DUI (10.2% [8.7 - 11.6] v. 5.5% [3.7 - 7.2], respectively, in 2002, increasing to 29% [26.4 - 32.2] v. 18% [14.1 - 22.7], respectively, in 2008). There was a marked increase in the reported prevalence of WUI among youth, from 10.6% in 2002 to 18.1% in 2008. Significantly more males than females reported WUI (14.9% [8.7 - 11.6] v. 7.1% [3.7 - 7.3], respectively, in 2002 and 23.4% [21.7 - 25.2] v. 13% [11.5 - 14.7], respectively, in 2008).

Alcohol Relatedness of Death among Youth

The NIMSS surveys reported alcohol-related deaths among children and youth according to BAC. Between 2002 and 2008 an overall increase from 38% to 43% was reported in the alcohol-relatedness of non-natural deaths. A marked increase was observed in average BAC among those who were alcohol-positive (from 0.0569 g/mmol in 2002 to 0.14 g/mmol in 2008) (Matzopoulos, Cassim, & Seedat, 2003; MRC, 2010) Overall, stark gender differences existed with regard to alcohol-relatedness of deaths: 40% of males and 31% of females tested BAC-positive in 2002, while 80% of males and 20% of females were BAC-positive in 2008.

Alcohol Relatedness and Alleged Manner of Death

Table 12 summarises the proportion of BAC-positive cases among youth aged 15 - 19 years according to alleged manner of death between 2002 and 2008: violence/homicide-related deaths increased non-significantly from 50% to 54%; transport-related deaths increased marginally significantly from 32% to 40%; suicide cases remained stable at 17%; undetermined deaths increased non-significantly from 29% to 31%; and the most dramatic and statistically significant increase was seen in unintentional deaths from 18% to 31%.

TABLE 12
Positive BAC Cases According to Alleged Manner of Death

Alleged manner of non-natural death^a	NIMMS 2002 (N=849) %	NIMMS 2008 (N=672) %	Chi-square
Homicide/violence ^b	50	54	1.28
Suicide ^c	17	17	0.00
Transport	32	40	2.46 (<i>p</i> =.010)
Unintentional ^d	18	31	2.96 (<i>p</i> <.001)
Undetermined ^e	29	31	0.06

NIMMS = National Injury Mortality Surveillance System.

^aNIMSS definition: all deaths not or possibly not due to natural causes, and which, by law, require medico-legal investigation.

^bNIMSS definition: ‘Intentional injuries inflicted by another person (perpetrator). This definition excludes deaths due to culpable homicide since the NIMSS data are geared towards prevention initiatives, and intentional and unintentional injuries require different types of intervention’.

^cSelf-inflicted intentional injuries resulting in fatality.

^dAll other unintentional non-transport related injuries, such as burns, falls, poisoning and drowning.

^eDeaths where the medical examiner is unable to determine whether the cause of death was violence/homicide, suicide, transport, unintentional injury or natural.

BAC and Alleged Manner of Death

Table 13 summarises the results of chi-square analyses between BAC and non-natural manners of death in the 2002 and 2008 review periods. Among alcohol-positive cases, we compared the proportion of those who did or did not die for each manner of death. In 2002 there was a significant association between positive BAC and risk of violent death, with 50% of violent/homicide cases testing alcohol-positive (*p*<.001); the same held true for 2008 (*p*<.001). In 2002 unintentional deaths were significantly associated with positive BAC (*p*<.001). However, suicide cases were less likely to be alcohol-positive than non-suicide cases (*p*<.001).

TABLE 13
Chi-square Analysis of BAC and Alleged Manners of Death among Youth Aged 15 - 19 Years

Alleged manner of non-natural death	NIMMS 2002 (N=849)		NIMMS 2008 (N=672)	
	<i>n</i> (%)	Chi-square	<i>n</i> (%)	Chi-square
Homicide/violence	221 (50)	56.335 ^a	181 (54)	33.274 ^a
Suicide	17 (17)	21.512 ^a	15 (17)	27.547 ^a
Transport	58 (32)	3.649	66 (40)	1.010
Unintentional	16 (18)	16.057 ^a	17 (31)	3.492
Undetermined	12 (29)	1.444	8 (31)	1.614

NIMMS = National Injury Mortality Surveillance System.

^a *p*<.001.

DISCUSSION

We reviewed trends in lifetime use, age of initiation, binge drinking tendency and alcohol-related harm among SA youth aged 13 - 19 years between 1998 and 2008. Associations between alcohol use and related harms were examined, and findings in light of both preventive and control policies discussed.

SA is considered to be a medium consumption country in terms of *per capita* adult alcohol consumption. However, findings from national surveys show that those who do drink appear to do so at bingeing levels (≥ 5 drinks in one sitting) (Peltzer et al., 2011). Consistent with global findings, alcohol use is taking on a youthful face, as indicated by an increasing trend in lifetime prevalence of alcohol use among youth aged 13 - 19 years. The number of youth aged <13 years initiating alcohol use remained stable at 12% between 2002 and 2008; in real terms this translates to approximately 10 000 youth per review period. This is particularly important, given that early initiation of alcohol use is associated with substance use problems later in life. While overall alcohol use may have remained stable, binge drinking increased markedly, most notably, among females. These findings have serious implications for youth morbidity and mortality, indicated by the rising rates of alcohol-related traffic risks and related mortality (Matzopoulos, Cassim, & Seedat, 2003; Reddy et al., 2002; Reddy et al., 2010; MRC, 2010). The increases in non-natural deaths of BAC-positive youth in 2002 and 2008 highlight growing alcohol-related harm; it is clear that current policy efforts to minimise such harm are inadequately affected.

Global burden of disease and alcohol-attributable injury statistics indicate that alcohol-related disease burden operates in 2 dimensions via average volume of alcohol consumed, and patterns of drinking (mainly binge drinking). The former is associated with chronic health issues such as cancer or ischaemic heart disease, while the latter is associated with acute problems such as interpersonal violence and injuries (Babor, 2010). These associations are borne out in this review. Specifically, the data sources employed revealed increases in binge drinking patterns and accompanying increases in traffic-related deaths (DUI and WUI), homicides and unintentional deaths. One explanation for this is that heavy episodic drinking acts physiologically to impair motor function and psychologically to lower inhibitions, resulting in greater risk-taking behaviour. Young people, whose threshold for large amounts of alcohol may be lower given their smaller body sizes, are particularly vulnerable. Contributing to binge drinking among SA youth is the high availability and accessibility of alcohol. This

review indicated that large numbers of minors (<18 years) are drinking despite efforts to reduce alcohol availability to minors by increasing taxation and legislating liquor outlet registration.

Also revealed is that youth drinking patterns are changing, although there is no apparent change in the age of initiation or the proportion of drinkers. Plausible explanations for these trends lie in the areas of access, poor community policing, large-scale youth-specific marketing, advertising and affordable price of alcoholic beverages. Moreover, the risk for youth drinking, and binge drinking, is exacerbated by environmental stressors such as poverty, unemployment and crime, while poor communities, as consumers, producers and retailers of alcohol, are permissive of potential alcohol abuse by SA youth.

Middle- to high-income youth are equally vulnerable through youth-specific marketing strategies. SA youth are targeted by an alcohol industry determined to explore a previously untapped market. Marketing has been overt, through the promotion of alcoholic beverages at sporting events and happy hours, and subliminal, targeting youth and women with so-called 'malternatives' (American Medical Association [AMA], 2004) to alcohol such as 'alcopops' (AMA, 2004) and sweetened, fruity drinks. Popular media and adverts continue to portray alcohol use as associated with fun, success and popularity.

Together these findings have important implications for a range of policies, including the 4 strategies adopted in 1997 – 2009 (Parry, 2010), aimed at reducing alcohol-related harms. One strategy to reduce alcohol availability – and consequently consumption – via stronger community policing and enforcement of legislation that should be extended to commuters and pedestrians who display public drunkenness. Regulation of sale and access to minors would limit accessibility by reducing the number of outlets where alcohol is sold (Babor, 2010). A number of studies have demonstrated that a reduction in the number/density of alcohol outlets is associated with a reduction in alcohol-related harms, especially violence (Gruenewald & Remer, 2006). Traffic risks associated with WUI and DUI should be a call to action to prioritise drink-driving/walking countermeasures, including globally recommended unscheduled sobriety checks and stringent limits on new drivers (0.00 g/100 ml) for the first 3 years after obtaining a driver's licence (Babor, 2010).

Awareness of the role of alcohol harm to others, accruing from drunk driving, domestic violence and psychological stress to family members, has not been

adequately highlighted. As a result, the full burden of alcohol (ab)use on society is probably underestimated.

The consistent implementation of the alcohol taxation policy in SA in the last decade, while laudable, will not, singularly, result in a reduction in alcohol use and associated harm among the youth. A joint and concerted effort by policy makers, implementers, lobbyists and civil society groups is required to minimise early-onset alcohol use and binge drinking tendencies, and, thereby, alcohol-related harms.

CHAPTER FOUR: EMPIRICAL PAPER

ALCOHOL USE IN EARLY AND LATE ADOLESCENCE AMONG THE BIRTH TO TWENTY COHORT IN SOWETO, SOUTH AFRICA

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INTRODUCTION

Alcohol is a risk factor for leading causes of mortality and morbidity among young people. Globally, the harmful use of alcohol accounts for 2.5 million deaths (4% of total), and 69.4 million (4.5% of total) disability-adjusted life years (DALYs) (World Health Organization [WHO] 2002; 2011). In the 15-29 year age group, 9% of total deaths are alcohol-related annually.

Safe levels of consumption have not been established for adolescent populations. This is unsurprising, given that adolescents are physiologically and psychologically more vulnerable to the effects of alcohol. Physiologically, their smaller body sizes result in a lower threshold for the effects of alcohol. Behaviourally, the disinhibitory effect of alcohol makes adolescents vulnerable to a range of risk behaviours including sexual risk, interpersonal violence, traffic-related accidents, unintentional injuries, and death (Giancola, Josephs, Parrott, & Duke, 2010; Ramsoomar & Morojele, 2012). Given that safe levels of alcohol use have not been established in adolescent populations, any use of alcohol, particularly in early adolescence, may be a predictor of later alcohol problems (Grant & Dawson, 1998). Evidence from the South African National Youth Risk Behaviour Surveys conducted in 2002 and 2008 indicate that 49.1% of learners had drunk at least one or more drinks of alcohol in their lifetime (Reddy et al., 2002). In 2008, this increased slightly to 49.6% (Reddy et al., 2010). Of note is that in both surveys, 12% of learners reported having their first drink before 13 years of age (Reddy et al., 2002; Reddy et al., 2010). This is of particular concern given that early initiation of alcohol is associated with substance abuse problems later in life (Grant & Dawson, 1998).

Further to early initiation of alcohol use, the same surveys indicate that harmful/hazardous alcohol use (defined as ≥ 5 standard alcoholic drinks per day for males and ≥ 3 drinks per day for females) is also a significant problem for South African youth (Reddy et al., 2002; Reddy et al., 2010). Nationally, males report more binge drinking than females overall (Ramsoomar & Morojele, 2012; Reddy et al., 2002; Reddy et al., 2010). However, binge drinking among females has increased significantly (Ramsoomar & Morojele, 2012; Reddy et al., 2002; Reddy et al., 2010). This early initiation of alcohol use, coupled with the harmful/hazardous use of alcohol found among South African youth, has serious consequences for public health. Hence, identifying correlates of alcohol use particularly during early adolescence is vital for prevention and intervention programmes.

Internationally there is increased focus on adolescent alcohol use for several reasons. First, adolescence constitutes a tenuous period when young people face several developmental and social challenges which place them at risk, for example, physical violence, traffic accidents, unintentional injuries, and death (Ramsoomar & Morojele, 2012; Rehm, Mathers, Popova, Thavorncharoensap, Teerawattananon, & Patra, 2009). Second, alcohol use has been associated with other health risk behaviours such as smoking, other drug use, and sexual risk behaviours (Babor et al., 2010; Bot, Engels, Knibbe, & Meeus, 2005; Brook, Morojele, & Brook, 2006). Third, alcohol use initiated during adolescence can extend into later life and result in substance use disorders (Grant, & Dawson, 1998; Reddy et al., 2002).

Previous studies have shown that factors including the individual, family, and SES influence adolescent behaviour (Van der Vorst, Vermulst, Meeus, Dekovic, & Engels, 2009; Hutchinson, Jemmot, Jemmot, Braverman, & Fong, 2003). Specifically, the role of the mother has been examined in relation to several adolescent behaviours, including sexual risk, drug use, psychopathology, and alcohol use (Van der Vorst et al., 2009; Borawski, Evers-Landis, Lovegreen, & Trapl, 2003; Scholte, Poelen, Willemsen, Boomsma, & Engels, 2008).

In South Africa, where adolescent drinking and early initiation of alcohol use is showing an increasing trend (Ramsoomar & Morojele, 2012), limited research exists on adolescent and maternal socio-demographic variables as correlates for alcohol use. Of the limited studies conducted, researchers argue that it may be more pragmatic to target adolescent personal attributes, and peer and parental level factors than the social environment for prevention planning Brook et al., 2006. On the contrary, social factors, such as living in communities with limited alcohol policing, easy access to alcohol, and low religiosity (Parry, Morojele, Saban, & Flisher, 2004; Tolan et al., 2005), have also been cited as targets for prevention planning.

Flisher and Chalton (1995) examined substance use among high school students in Cape Town, South Africa, and found lower rates of substance use, including alcohol use, among black⁴ females. They advocate for the importance of recognising demographic factors, such as race and gender as correlates of alcohol use in tailoring alcohol prevention programmes.

⁴ The terms 'white, black, Indian/Asian, and coloured' originate from the apartheid era. They refer to demographic markers and do not signify inherent characteristics. Their continued use in South Africa is retained to track transformation and to identify vulnerable sections of the population to be targeted for prevention and intervention programmes.

Global evidence indicates that males outnumber females with regard to frequency of alcohol use, binge drinking, and alcohol use disorders (WHO, 2011). This is consistent with evidence from the South African studies (Grant & Dawson, 1998; Reddy et al., 2002; Reddy et al., 2010).

Regarding the role of SES on adolescent alcohol use, a review of 28 studies internationally found no clear pattern of associations between SES and alcohol consumption in adolescence. Five found positive associations, that is, high SES was related to high alcohol use; five reported negative associations, that is, low SES was related to higher alcohol use. Sixteen studies found no association between SES and alcohol use (Hanson & Chen, 2007). While much evidence has indicated that adolescents with low SES have a higher inclination for alcohol use (Boden & Fergusson, 2011), other research indicates that adolescents from higher SES categories may also be at risk for substance use (including alcohol use) disorders (Humensky, 2012). However, other literature shows differences by developmental stage in the association between SES and substance use. Specifically, adolescents with low SES were more likely than adolescents with higher SES to engage in substance use, while for adults the opposite was true (Huckle, You, & Casswell, 2010).

Maternal age has largely been studied in relation to adverse pregnancy outcomes (Gill, Broussard, Devine, Green, Rasmussen, et al. 2012), particularly inadequate prenatal care, which places younger mothers at risk for poor reproductive outcomes (Fraser, Brockert & Ward, 1995) and negative neurobehavioural and cognitive functioning of their children (Huizink, & Mulder, 2006). Few studies look at the associations between maternal age at the time of child birth and health and development outcomes of their children. Available research indicates that children of young mothers were more likely to display psychological disturbances, poor school performance and engage in smoking and alcohol use (Shaw, Lawlor, & Najman, 2006). To our knowledge the effect of maternal age on adolescent alcohol outcomes has not been researched in South Africa.

Previous research has found that parental marital status is a key influencing factor in adolescent alcohol use, that is, adolescents who come from families where parents were separated or had divorced had a higher inclination for alcohol use (Melotti, Heron, Hickman, Macleod, Araya, & Lewis, 2011). Similarly, evidence regarding the influence of maternal educational status has consistently revealed that

mothers with higher educational levels are less likely to have adolescent children who use alcohol (Parry et al., 2004; Hoque & Ghuman, 2012).

All these studies provide a window into the role of socio-demographic factors in adolescent alcohol use, but they also have important limitations. Many are school based studies that do not include youths outside of the school system who may face compounding risk factors for substance use. Flisher and Chalton (1995) found that in-school youths were less likely to use substances and engage in sexual risk behaviours (the latter being girls only) than adolescents who dropped out of school. Moreover, in the South African context, many studies on adolescents capture alcohol use at only one point in time and, to the knowledge of the authors, none have examined the role of maternal socio-demographic factors in association with alcohol use.

The present study seeks to address some of these limitations by examining alcohol use in a community sample, comprising both in-school and out-of-school adolescents and the association of maternal correlates and alcohol use at two key developmental stages (early and late adolescence). Examining alcohol use at two time points enables one to demonstrate the enduring effect of maternal and child socio-demographic correlates on alcohol use behaviour. Knowledge of demographic correlates assists researchers and practitioners in identifying sub-groups of adolescents with specific maternal (e.g. low maternal age, low education, being a single mother) and child (e.g. gender, repetition of school grades) socio-demographic risk profiles.

Hypotheses

This study tested three hypotheses:

1. Lower maternal education is associated with having children with a higher inclination for alcohol use during adolescence.
2. Lower SES is associated with having children with a higher inclination for alcohol use during adolescence.
3. Children of women who are not married (single not living together) at birth have a higher inclination for alcohol use during adolescence than children whose mothers are married at birth.

METHODS

Study population

The study sample comprised of singleton children and their mothers from a birth cohort study, the Birth to Twenty (Bt20) study. This birth cohort study follows 3 273 children and their families in Soweto, Greater Johannesburg, in the Gauteng Province of South Africa. The study enrolled mothers who were 6 months pregnant with their children at the study inception. As the children were born 7 weeks after Nelson Mandela's release from prison in February 1990, they became colloquially known as 'Mandela's children' (Richter, Norris, Pettifor, Yach, & Cameron, 2007). The township of Soweto is the most populous black urban residential area in the country, with approximately 1 million people. Having originated in 1903, Soweto was the site of the 1976 uprising when school children protested against the apartheid⁵ system in South Africa. The Bt20 study aims to track child and adolescent health and development from birth to early adulthood, along several domains - physical, social, and psychological. The retention rate of the overall cohort is 70%, with the highest attrition rate occurring during the infant years, due to permanent outmigration of mothers to rural areas following the delivery of their babies (Richter et al., 2007). Black children comprised the major race group in the study sample (78.5%), followed by coloured (11.7%), white (6.7%), and Indian (3.5%) children. The mean age of the biological mothers of the index children was 25.9 years old, and the ages ranged from 13 to 48 years old. Ethical clearance for the study was obtained under the Bt20 study from the University of the Witwatersrand Committee for Research on Human Subjects, protocol no. M080320.

Alcohol use and socio-demographic assessment

Table 14 presents operational definitions of the variables measured in this study. Demographic information on the mothers and children were collected at/or within the 3 years following the birth of the child. At early adolescence (Wave 1 of the present study) risk behaviour (such as tobacco and lifetime alcohol use) data were collected using a self-administered paper-based questionnaire. At late adolescence (Wave 2 of the present study), other risk behaviours such as tobacco, sexual activity, and detailed alcohol use (frequency and patterns of drinking, alcohol use disorders, and peer/best friend drinking) data were collected using a self-complete computer-

⁵The apartheid era was characterised by a separatist regime, during which the government of the day legitimised the differentiation of people based on race difference, whites, Indians, coloured (mixed ancestry), and blacks (of African descent).

based questionnaire. The interviewer-administered questionnaires included a wide range of indicators inclusive of socio-demographic factors, community norms, household and family circumstances, education, parent-child and peer relationships, and parental monitoring (Richter et al., 2007).

Statistical analysis

The analytical study sample consists of two waves of cross-sectional data from the birth cohort study, which mark two developmental periods and are contextualised within this study as early adolescence (13 years) and late adolescence (18 years). Data

TABLE 14
Operational Definitions of Variables Used at Wave 1 (Year 13) and Wave 2 (Year 18)
of the Analytical Sample

Variable name	Variable source	Variable operationalisation	Variable coding
Child gender	Baseline Bt20 Demographic Questionnaire	Gender of child	Male =0 Female=1
School years repeated by grade 7	Wave 1 and 2 (year 13 and 18) Adolescent Questionnaire	Total number of 'repeat' school years up to grade 7	No school years repeated=0 1 school year repeated =1 2 school years repeated =2
Lifetime alcohol use	Wave 1 and 2 (year 13 and 18) Adolescent Questionnaire	Ever drunk alcohol in lifetime	No =0 Yes =1
Household SES	Baseline Bt20 Demographic Questionnaire	Asset index based on a list of eight assets in the baseline house-hold. Scores for all variables were added to obtain a value from 0 to 7, and then recoded into five SES categories	Lowest =0 (0, 1, 2 assets) Low =1 (3 assets) Medium=2 (4 assets) Higher =3 (5 assets) Highest =4 (6, 7, 8 assets)
Maternal age	Baseline Bt20 Demographic Questionnaire	Continuous data recoded into age categories that are reflective of maternal age range within the sample	13-19 years=1 20-24 years=2 25-29 years=3 30-34 years=4 35-39 years=5 40-49 years=6
Maternal education	Baseline Bt20 Demographic Questionnaire	Original six categories of maternal education included	No schooling/less than grade 5 education =1 Primary =2 Secondary =3 Post-school (i.e. diploma less than 1 year; diploma 2-3 years; 3-4 year degree; masters degree; PhD; university not specified) =4
Maternal marital status	Baseline Bt20 Demographic Questionnaire	The original variable was recoded into a binary variable based on the frequency of distribution of maternal	single or not living together =0 married (any definition) or living together;

collected from all participants on alcohol use at the early and late adolescence time points were analysed using the Statistical Package for the Social Sciences 20 (IBM SPSS Statistics; version 20; New York, USA). Univariate frequency analyses were conducted on the demographic variables including child gender, the number of schooling years repeated by grade 7, household SES, and mother's years of education, age, and marital status at or within the 3 years following the birth of the child.

Household SES was calculated based on an asset index derived from a listing of household assets (home type, home ownership, electricity in home, television, car, fridge, washing machine, phone). The use of an asset indicator as a proxy measurement for SES has been validated in developing country contexts (Hargreaves et al., 2007; Richter, Panday, Swart, & Norris, 2009; Sheppard, Norris, Pettifor, Cameron, & Griffiths, 2009). SES scores were generated through an additive index, by attributing a score of 1 to utilities/assets which people owned and a score of 0 to utilities/assets which participants did not own. The scores ranged from 0-7. Participant's responses were scored based on their asset/utility scores and ranked as ranging from 0 (lowest) to 7 (highest) SES categories. Asset scores of 0, 1, and 2 fell into the lowest SES category, 3 fell into the low SES category, 4 into medium SES category, 5 into high SES category, and 6 or 7 into the highest SES category. No participant had indicated ownership of all eight assets. Bivariate logistic regression analyses were conducted to assess the associations between SES, child and maternal socio-demographic variables, and lifetime alcohol use (measured by ever having had a drink in their lifetime) at both early and late adolescence. Finally, multivariate logistic regression analyses were conducted on the variables found to be significantly ($p < .10$) associated with alcohol use in the bivariate logistic regression analyses in order to examine the predictive value of these socio-demographic variables on alcohol use at early and late adolescence.

RESULTS

Total sample sizes for participants at early and late adolescence on whom socio-demographic and alcohol use data were collected were 1 621 and 1 735, respectively. Socio-demographic characteristics of the child participants at early and

late adolescence are presented in Table 15. Females comprised just over half the study sample at early (52%) and late (54%) adolescence. The majority of the participants at both early (74%) and late (75%) adolescence had not repeated any schooling years by grade 7. Twenty-two percent of the sample at early adolescence and 66% at late adolescence had ever used alcohol in their lifetime. Regarding household SES, 16 and 15% of the sample at early and late adolescence, respectively, fell within the lowest wealth category (poorest). A total of 13 and 14% of the sample at early and late adolescence, respectively, fell within the highest wealth category (wealthiest). The largest group (33 and 34% at early and late adolescence, respectively) fell into the medium SES category.

The characteristics of the mothers are presented in Table 16. At the time when the children were enrolled into the study, the largest proportion of mothers (53%) was between 20 and 29 years. Seventy-nine percent of mothers had secondary school education, and 62% were unmarried (single or not living together).

TABLE 15
Socio-Demographic Characteristics of the Analytical Sample at
Year 13 and Year 18

	Analytical sample			
	Early adolescence (n=1 689)		Late adolescence (n=1 735)	
	n	%	n	%
Child gender				
Male	762	48	758	46
Female	839	52	893	54
School years repeated by grade 7 ^a				
0	1116	74	1162	75
1	331	22	337	22
2	55	4	59	4
Lifetime alcohol use	373	22	1140	66
Household SES (wealth category)				
Lowest	230	16	229	15
Low	246	17	257	17
Medium	493	34	496	33
High	304	21	310	21
Highest	194	13	203	14

^aTotals do not add up to 100% due to rounding.

TABLE 16
Maternal Socio-Demographic Characteristics
at the Time of the Birth of the Bt20 Participant

Characteristic	n	%
Age		
13-19 years	278	18
20-24 years	468	29
25-29 years	386	24
30-34 years	285	18
35-39 years	143	9
40-49 years	34	2
Education		
No schooling/less than grade 5	81	6
Primary	93	6
Secondary	1169	79
Post-school	133	9
Marital status		
Not married	987	62
Married	596	38

TABLE 17
Bivariate Logistic Regression Analyses of Lifetime Alcohol Use, SES, and Child and Maternal
Socio-Demographic Characteristics

Lifetime use of alcohol	Early adolescence			Late adolescence		
	OR	95% CI	p	OR	95% CI	p
Females	1			1		
Male	1.507	1.187-1.914	0.001	1.397	1.139-1.714	0.001
No. of school years repeated by grade 7						
0	1			1		
1	2.249	0.952-5.314	0.065	1.451	0.856-2.459	0.167
2	2.518	1.039-6.100	0.041	1.443	0.824-2.528	0.199
Maternal age at birth of the child						
13-19	1			1		
20-24	3.544	1.051-11.94	0.041	1.222	0.588-2.539	0.591
25-29	3.063	0.918-10.21	0.069	0.958	0.471-1.948	0.906
30-34	3.007	0.898-10.07	0.074	1.115	0.546-2.276	0.765
35-39	2.361	0.695-8.012	0.168	1.103	0.532-2.288	0.793
40-49	2.316	0.658-8.158	0.191	1.158	0.539-2.490	0.707
Maternal education at birth of the child						
No schooling/less than grade 5	1			1		
Primary	0.237	0.105-0.537	0.001	0.308	0.103-0.921	0.035
Secondary	0.594	0.321-1.098	0.097	0.369	0.220-0.617	0.000
Post-school	0.608	0.411-0.898	0.012	0.473	0.307-0.730	0.001
Maternal marital status at birth of the child						
Not married	1			1		
Married	1.047	0.818-1.340	0.716	0.726	0.587-0.897	0.003
Household SES						
Lowest	1			1		
Low	0.601	0.384-0.940	0.026	0.793	0.432-0.975	0.037

Medium	0.553	0.354-0.863	0.009	0.853	0.455-1.008	0.055
High	0.682	0.469-0.993	0.046	0.652	0.382-0.777	0.001
Highest	0.693	0.460-1.044	0.079	1.131	0.665-1.459	0.940

Table 17 shows the results of the bivariate logistic regression analyses. In early adolescence, males were more likely than females (OR=1.507; 95% CI=1.187-1.914) to have ever drunk alcohol in their lifetime. The same is true of late adolescence (OR=1.397; 95% CI=1.139-1.714). During early adolescence, those who had repeated 2 years of school by grade 7 were significantly more likely than those who had not repeated any school years by grade 7 to have used alcohol (OR=2.518; 95% CI=1.039-6.001). There were no significant associations between the number of school years repeated by grade 7 and alcohol use at late adolescence.

Regarding maternal age, mothers between 20 and 29 years (OR=3.544; 95% CI=1.051-11.94) were significantly more likely than younger mothers (13-19 years old) to have had an adolescent child use alcohol by age 13. However, there were no significant associations between maternal age and alcohol use at late adolescence. Mothers with primary (OR=.237; 95% CI=.105-.537) and post-school education (OR=.608; 95% CI=.411-.898) were significantly less likely than mothers with no/less than grade 5 education to have had a child use alcohol in early adolescence. In late adolescence, mothers with primary (OR=.308; 95% CI=.103-.921), secondary (OR=.369; 95% CI=.220-.617), and post-school (OR=.473; 95% CI=.307-.730) education were significantly less likely than mothers with no/less than grade 5 education to have had an adolescent child use alcohol. Marital status was not significantly associated with alcohol use in early adolescence, while at late adolescence, married mothers were significantly less likely (OR=.726; 95% CI=.587-.897) than non-married mothers to have a child use alcohol.

Household SES was significantly associated with alcohol use at early and late adolescence. Specifically, at early adolescence those participants from low (OR=.601; 95% CI=.384-.940), medium (OR=.553; 95% CI=.354-.863), and high (OR=.682; 95% CI=.469-.993) SES categories were significantly less likely than those adolescents from the lowest SES households to have ever drunk alcohol in their lifetime. The same was true for late adolescence (see Table 17). Table 18 shows the results of multivariate logistic regression analyses. All variables found to be significantly ($p < .10$) associated with alcohol use in the bivariate logistic regression analyses were included in the multivariate logistic regression. Gender was predictive

of alcohol use. Males were more likely to have ever drunk alcohol in their lifetime at both early (OR=1.372; 95% CI=1.054-1.7861) and late adolescence (OR=1.387; 95% CI=1.103-1.745) than females. There were no significant associations between maternal age and alcohol use at early or late adolescence.

TABLE 18
Multivariate Regression Analyses of Lifetime Alcohol Use and Child and Maternal Socio-Demographic Characteristics

Lifetime use of alcohol	Early adolescence			Late adolescence		
	OR	95% CI	p	OR	95% CI	p
Females	1			1		
Male	1.372	1.054-1.786	0.019	1.387	1.103-1.745	0.005
No. of school years repeated by grade 7						
0	1			1		
1	2.261	0.872-5.861	0.093	1.335	0.737-2.418	0.341
2	2.489	0.872-5.861	0.067	0.489	0.737-2.418	0.341
Maternal age at birth of the child						
13-19	1			1		
20-24	3.966	0.872-18.026	0.075	1.040	0.428-2.526	0.931
25-29	3.623	0.811-16.178	0.092	0.682	0.289-1.608	0.382
30-34	3.225	0.726-14.323	0.124	0.778	0.332-1.821	0.563
35-39	2.436	0.543-10.927	0.245	0.741	0.313-1.759	0.497
40-49	2.211	0.475-10.306	0.312	0.745	0.304-1.825	0.519
Maternal education at birth of the child						
No schooling/less than grade 5	1			1		
Primary	0.312	0.127-0.768	0.011	0.381	0.106-1.368	0.139
Secondary	0.771	0.394-1.510	0.449	0.360	0.204-0.633	0.001
Post-school	0.596	0.387-0.920	0.019	0.488	0.306-0.778	0.003
Maternal marital status at birth of the child						
Not married	1			1		
Married	0.984	0.798-1.349	0.922	0.684	0.498-0.844	0.001
Household SES						
Lowest	1			1		
Low	0.681	0.417-1.112	0.125	0.837	0.535-1.309	0.435
Medium	0.596	0.366-0.970	0.037	0.897	0.579-1.389	0.627
High	0.672	0.445-1.016	0.059	0.653	0.443-0.963	0.032
Highest	0.728	0.467-1.135	0.161	1.230	0.803-1.893	0.339

Regarding maternal education, at early adolescence, children with mothers who had had at least a primary school education (i.e. completed grade 5) were significantly less likely (OR=.312; 95% CI=.127-.768) to have ever drunk alcohol, compared to children with mothers with no or less than grade 5 education. In addition, mothers who had post-school education [i.e. diploma (less than 1 year), diploma (2-3 years), 3-4 year degree, master's degree, or a PhD] were significantly less likely

(OR=.596; 95% CI=.387-.920) to have had children who had ever drunk alcohol in early adolescence than those with mothers with less than grade 5 or no education.

At late adolescence, maternal education was also predictive of adolescent alcohol use. Specifically, children with mothers who had secondary (OR=.360; 95% CI=.204-.633) and post-school (OR=.488; 95% CI=.306-.778) education were significantly less likely than children with mothers who had no schooling/less than grade 5 to have ever drunk alcohol. Significant associations emerged between maternal marital status and alcohol use in late adolescence only, with children with married mothers less likely (OR=.684; 95% CI=.498-.844) to have ever used alcohol, compared to children with non-married mothers.

Finally, household SES was predictive of lifetime alcohol use. At early adolescence, participants from the medium (OR=.596; 95% CI=.366-.970) and higher (OR=.672; 95% CI=.445-1.016) SES categories were less likely than participants from the lowest SES category to have ever drunk alcohol in their lifetime. In addition, participants from the higher SES category (OR=.672; 95% CI=.445-1.016) were marginally less likely than participants from lower SES categories to have been lifetime drinkers. For late adolescence participants from the higher SES category (OR=.653; 95% CI=.443-.963) were less likely than the participants from the lowest SES adolescents to ever have drunk alcohol in their lifetime.

DISCUSSION

This paper examined lifetime alcohol use among a birth cohort in Soweto, South Africa, in early (13 years) and late (18 years) adolescence and its association with household SES as well as child and maternal socio-demographic factors. Specifically, we examined child gender, the number of years the adolescents repeated schooling by grade 7, maternal age, education, marital status, and household SES in association with lifetime alcohol use at these two developmental stages. Consistent with national and international literature (Ramsoomar & Morojele, 2012; Reddy et al., 2002; Reddy et al., 2010), this study found gender differences in rates of alcohol use at both early and late adolescence, indicated by the higher prevalence of adolescent males who drank alcohol in their lifetime and significant associations between gender and alcohol use revealed by bivariate and multivariate analyses, respectively.

The significant association found in early adolescence between the repetition of two years of schooling by Grade 7 and lifetime alcohol can be explained by

previous research which indicates that poor educational attainment has been associated with substance use (Flisher & Chalton, 1995, Townsend, Flisher & King, 2007). Of the several theoretical perspectives which exist to explain this association, including problem prone behaviour and general deviancy theory (Battin-Pearson, Newcomb, Abbott, Hill, Catalano, et al., 2000), primary socialisation theory (Oetting, & Donnermeyer, 1998), Hirschi's social control theory could best explain this significant association in the present study. Social control theory proposes that the school, family and peer domains are the main foundations for the establishment of social norms for appropriate behaviour (Hirschi, 1969). When the bonds are broken or weakened, the likelihood of engaging in delinquent behaviour (e.g. engaging in illicit drug use or alcohol behaviour) is increased. In addition, individuals are less likely to conform to the norms of conventional societal groups, for e.g. the school (Townsend, et al., 2007). The social development model (Hawkins & Weis, 1985), which includes strong social control elements, highlights that a strong school bond plays an important role in ensuring that students engage in pro-social behaviour. While it was not within the scope of this study to test potential associations between social bonds (at the school) this theoretical perspective could potentially explain the findings of the present study, and remains a critical area for future research.

The marginally significant associations found in the multivariate analysis between the repetition of 2 years of schooling by Grade 7 and lifetime alcohol can potentially be confounded by the effect of SES and maternal education (Sheppard et al., 2009).

This study also contributes to a body of literature on the relationship between SES and alcohol use. Present findings are consistent with evidence and confirm the study hypotheses that SES is predictive of adolescent alcohol use. Both bivariate and multivariate results corroborate much existing evidence that low SES is related to higher alcohol use (Hanson & Chen, 2007; Van der Vorst et al., 2009). In particular, at early adolescence, participants from medium SES categories were less likely to have ever used alcohol in their lifetime than adolescents from the lowest SES category; while participants from higher SES categories were marginally less likely than those from lower SES categories to have ever drunk alcohol in their lifetime. However in late adolescence being from a higher SES category did significantly increase the likelihood that an adolescent had ever drunk alcohol in their lifetime. The findings for those in the higher SES categories were at a trend level. Similarly,

maternal education had predictive value in adolescent alcohol use at early and late adolescence; the higher the maternal education, the less likely adolescents were to have ever drunk alcohol in their lifetime. Potential explanations for these findings are that adolescents from lower SES categories and/or whose mother's education level is lower may be less likely than higher SES categories, with higher maternal education, to be educated about alcohol-related risks and harm (Flisher & Chalton, 1995). They may also have more access to unregulated sale of alcohol than higher SES adolescents (9) and live in areas where alcohol outlet density is higher (Chen, Gruenewald, & Remer, 2009).

The significant associations found between maternal education and alcohol use highlight the protective role of maternal education. At early adolescence, both maternal primary and post-school education were significantly associated with and predictive of alcohol use. At late adolescence, the same was true of the association between mothers with secondary and post-school education and their adolescent children's alcohol use. These findings could be explained by other research, which suggest that more educated mothers not only engage in healthier behaviour but also have more disposable income to afford more or better health protection (quality food, health care, live in safer neighbourhoods) for their children (Currie & Goodman, 2010) than mothers who may be less educated with less disposable income. Mothers with higher educational attainment may also, by virtue of their own health education, be better positioned to provide health promotion and education and model more health behaviours than mothers who are less educated (Currie & Goodman, 2010). Consequently, educating mothers to a higher level may also have benefits for preventing alcohol use by their adolescent children.

Finally, the significant associations between maternal marital status and alcohol use in late adolescence only, partially confirms the study hypothesis that adolescents of unmarried mothers have a higher inclination for alcohol use than adolescents of married mothers. The particular association between maternal marital status and alcohol use among older adolescent children may be explained by research which indicates that the lack of a biological father can have negative implications for the socialisation of children (Richter, 2005). Given that more discipline and adolescent social supervision may be required in later adolescence than in earlier adolescence, and single mothers have been found to exert less authority and provide less discipline to their children than married parents (Baumrind, 1991), the absence of

a biological father may have more profound negative effects on children's alcohol use behaviour later, rather than earlier in life.

Taken together, these findings have important implications for planning and programmes. Specifically, programmes targeting risk and protective factors for adolescent alcohol use must take account of the role of gender, SES, and maternal education in adolescent alcohol use. The findings also point to the need for mothers (with low education), boys, and children from lower SES to be targeted (albeit differentially at different stages) as intervention points for adolescent alcohol prevention initiatives. Moreover, future research is required to examine potentially relevant socio-demographic factors in tailoring adolescent alcohol prevention programmes. Finally, maternal education and SES may only partially account for the association between socio-demographic correlates and adolescent alcohol use. The absence of the biological father, coupled with the influence of other determinants (peers, community contexts), may further explain adolescent alcohol use.

There are limitations to this study notably our inability to consider the role of the father in adolescent alcohol use. Low father involvement was due, in part, to the migrant labour system in apartheid South Africa, which disrupted the structure of black families (Coovadia, Jewkes, Barron, Sanders, & McIntyre, 2009). Bearing children outside a marital arrangement was relatively normative in these contexts, resulting in children being born with very low father involvement in the Birth to Twenty cohort (Richter et al., 2007). This explains why the majority of mothers were single parents and, therefore, the primary contact for the study. Future research from the birth cohort is required to understand the presence and potential influence of a father figure on adolescent risk behaviours. Furthermore, as with any birth cohort study, loss to follow up is a limitation. Another limitation is the definition of the outcome measure (ever drunk) as a self-reported outcome measure. This is subject to socially desirable responses which potentially result in an over-/underestimation of alcohol use. The recognition of marital status in South Africa under many arrangements, including civil unions and customary unions, and cohabitation makes the standard definition of marriage used in this study a potential limitation.

Additionally, we acknowledge the potential changes that may have occurred in maternal marital status and education from study inception to the survey waves. However, future longitudinal analyses are required to examine the effect of changing maternal socio-demographic characteristics on adolescent alcohol behaviour, as the

aim of this paper was to examine the role of child and maternal socio-demographic correlates at birth in adolescent alcohol use. Finally, we recognize that lifetime use of alcohol as the only outcome measure is a limitation. Nevertheless, given that alcohol use is initiated in adolescence, this may be an important marker of future alcohol use. Future studies employing a life course approach to the development of adolescent alcohol behaviours are envisaged to examine the precision of lifetime alcohol use as a measure of later alcohol problems in this birth cohort.

CONCLUSION

This study makes a contribution to informing tailored prevention programmes for adolescent alcohol use at important stages in their developmental process. Future research is required to understand the interactions between psychosocial (social support, parenting styles, monitoring) and socio-demographic (age, SES) factors that may play a role in predicting adolescent alcohol use.

CHAPTER FIVE: EMPIRICAL PAPER

INDIVIDUAL, INTERPERSONAL AND COMMUNITY INFLUENCES IN LATE ADOLESCENT ALCOHOL USE

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INTRODUCTION

Alcohol use is a formidable public health problem facing youth, schools and communities in South Africa (SA). National data indicate that almost 50% of grade 9 learners are lifetime consumers of alcohol, 32% are current drinkers and 25% engaged in past month heavy episodic drinking (Reddy et al., 2013). Moreover, SA adolescents appear to be initiating alcohol use earlier (Reddy et al. 2013; Ramsoomar & Morojele, 2012), a risk factor for the later development of alcohol dependence (Grant & Dawson, 1998).

Epidemiological evidence cites alcohol use as a major contributor to premature mortality and morbidity among young people (15-19 years old) in SA (Matzopoulos et al., 2004). The overall alcohol-attributable burden among this group is largely accounted for by interpersonal violence/homicide (54%), transport-related deaths (40%), unintentional deaths (31%), and deaths for which there is no determined cause (31%), (Ramsoomar & Morojele, 2012).

Given its far reaching consequences, distinguishing lifetime, past month (current) alcohol use and past month binge drinking is an important first step in quantifying the prevalence and patterns of alcohol behaviours during the transition from adolescence to early adulthood. Identifying different alcohol outcomes, viz lifetime alcohol use, from current alcohol use and harmful drinking patterns has important implications for both: health promotion efforts aimed at delaying alcohol initiation, and secondary prevention efforts aimed at halting or reducing drinking. It also enables efforts to clinically intervene with problem drinkers. Understanding risk and protective factors for each adolescent outcome is critical in establishing empirically validated determinants, which could inform primary and secondary alcohol prevention efforts.

Research in SA has largely focused on the role of intra and interpersonal factors (adolescent personal attributes, and peer and parental level factors) as determinants of adolescent alcohol use (Morojele & Brook, 2006; Brook et al., 2006; Flisher et al., 2003). Very few studies examine factors distal to an individual, e.g. the effects of poverty and community problems. Among these, Kalichman et al. (2006) found positive associations between poverty, substance use and the transmission of HIV risk behaviours in three South African communities, while Thomas et al. (1999) found positive associations between being a victim of violence and poverty, and substance use. More recently, Brook et al. (2011) found that environmental stressors, such as high socio-economic inequalities, poverty and violent victimisation, were directly and

indirectly associated with alcohol. Despite the importance of distal factors, our understanding of their roles as determinants of adolescent alcohol behaviours needs extension. Very few studies examine variation in community contexts and community socio-economic status (SES), in addition to individual and interpersonal risk and protective factors as determinants of adolescent alcohol use in SA. This study's unique contribution is its multi-level analysis, which enabled us to examine the direct effects of individual, and interpersonal risks (e.g. peer influence and parental drinking), and protective determinants (e.g. alcohol refusal-self-efficacy) of adolescent alcohol use; as well as variations in associations across communities.

We applied Bronfenbrenner's (1979) socio-ecological framework to understand how individual, interpersonal, school and community factors individually and collectively influence adolescent alcohol use in a birth cohort. The socio-ecological perspective recognises that behaviour is affected by, and affects, multiple levels of influence in various social settings. This approach proposes that levels of influence in each domain do not function independently to influence behaviour.

The multiplicity of influences on alcohol use

Extensive international research has established that risk factors in individual, interpersonal (peer, school, family) and community domains exert strong influences on youth alcohol decisions to abstain from or use alcohol (Ryan et al., 2010; Nash et al., 2005; Ary et al., 1999; Urberg, Luo, Pilgrim, Degirmencioglu, 2003). These include among others; gender (WHO, 2014; Van de Vorst et al., 2009) and alcohol expectations (Nash et al., 2005), academic performance (Bradley et al., 2013). Developmentally, peers exert a strong influence (Guo et al., 2002) through active offers of alcohol, modelling alcohol use behaviours, and the adoption of positive attitudes toward alcohol use (Wood, Read, Mitchell & Brand, 2004; Bahr, Hoffman & Yang, 2005). Adolescents' beliefs regarding the perceived acceptability and use of alcohol use among peers and siblings has also been found to be a strong determinant of intention to drink. (Olds et al., 2005).

Parental drinking itself is associated with adolescent alcohol use, most notably through modelling behaviours (Ennett & Bauman, 1991; Zhang et al., 1999; Yu, 2003); other research examines correlations between peer and parental factors as determinants of adolescent alcohol use (Nash et al., 2005).

Recognising that individuals have inherent strengths, skills and access to resources, research has also focused on protective factors for adolescent alcohol use (Stone et al., 2012). Protective factors are understood to be those factors that “reduce the likelihood of problem behaviour, either directly or by mediating or moderating the effect of exposure to risk factors” (Arthur et al., 2002, pg. 576). In relation to adolescent alcohol use, protective factors in different domains include, among others; self-efficacy, (Foster et al., 2014); parental monitoring and bonding, alcohol-specific communication, parental negative alcohol attitudes (Mares et al., 2011), peer attachment (Arthur et al., 2002) and religious participation (Sinha, Cnaan & Gelles, 2007).

Community influences on alcohol use

Community factors, including alcohol outlet density (Chen et al., 2010), alcohol advertising (Anderson et al., 2009) and restriction on hours of sale (Bryden et al., 2012), have been shown to be associated with adolescent alcohol use. Community poverty has been examined in relation to a variety of adolescent risk behaviours, including alcohol and other drug use (Leventhal & Brooks-Gunn, 2000; Jencks & Mayer, 1990), while living in disorganised communities has been found to be positively associated with increased adolescent alcohol and other drug use (Winstanley et al., 2008). Findings on the role of community and community SES effects on adolescent alcohol use, however, remain mixed (Karriker-Jaffe, 2011). A recent systematic review of multi-level studies on alcohol use concluded that most studies found little area level effect on adolescent alcohol use (Jackson, Denny, Ameratunga, 2014; Subramanian, Delgado, Jadue, Vega & Kawachi, 2003). Further, Brenner et al. (2011) found that, in spite of the significance of peer and parental factors on adolescent alcohol use, neighbourhood variation did not directly explain adolescent alcohol use.

Research on the role of the community environment on adolescent alcohol use has largely emerged from developed world contexts, but has not been adequately examined in developing contexts. The aim of this paper was to examine risk and protective influences at two ecological levels - individual and community level - on late adolescent alcohol use in a birth cohort in SA. We hypothesised that proximal (individual and interpersonal) factors would be directly associated with lifetime alcohol use, past month alcohol use and past month heavy episodic drinking. Further,

we expected that distal (community SES) factors would be indirectly associated with all alcohol behaviours.

METHODS

Ethics

Ethical clearance for this study was obtained from the University of the Witwatersrand Human Research Ethics Committee (clearance certificate no. M150156).

Design and sample

The study population for the original birth cohort comprises singleton children and their mothers from Birth to Twenty (Bt20), a birth cohort of 3 273 children and their mothers/caregivers in Soweto, Greater Johannesburg. Details of the birth cohort study are cited in a cohort profile paper (Richter et al., 2007).

For the purposes of this paper, only socio-demographic, alcohol-related, individual, peer, parental, school and community determinants reported by the adolescent participants (age 17/18; n = 1 647), are analysed and reported.

Procedure

Demographic information on the caregivers and index children in the sample was collected from each mother at the Bt20 study sites (Chris Hani Baragwanath Hospital, and University of the Witwatersrand Medical School) within the first three years following the birth of her child. At age 13, adolescents began reporting on socio-demographic and other questions through self-administered pen and paper questionnaires, as part of their routine participation in the Bt20 study. At age 16, they began reporting on alcohol behaviours through computer-based questionnaires.

Measures

Socio-demographic variables: included gender, household SES and the number of school years repeated by grade seven. Household SES was measured using an asset index derived from a listing of eight household assets (home type, home ownership, electricity in home, television, car, fridge, washing machine, and phone). SES categories were ranked according to their asset scores. The use of an asset indicator as

a proxy measure for SES has been validated in the larger Bt20 study (Sheppard et al., 2010).

Alcohol behaviours: this included age of alcohol initiation, lifetime alcohol use, current (past month) heavy episodic drinking, and frequency of use, quantity of use, typical drinking days (weekdays or weekends), alcohol expectations, and drinking contexts.

The measures presented reflect the individual, interpersonal, school and community factors hypothesised to impact on lifetime, current and heavy episodic drinking.

Predictor variables

Individual-related variables:

Alcohol refusal self-efficacy scale: comprised five items eliciting information on the adolescents' confidence in their abilities to refuse alcohol if offered it in particular social situations

Alcohol expectation: one question elicited information about the adolescent's expectation that he/she would be drinking in the future.

Peer-related variable:

Perceived peer influence scale comprised three items: *my friends think it's ok to drink, my friends drink, and I feel pressure from my friends to drink*. Each response ranged from agree a lot (1) to agree a little (5) on a 5-point likert scale.

Family-related variable:

Parental/caregiver drinking was measured by a single item: *Do your parents/caregivers drink?* The response choices were: both my parents/caregivers do not drink alcohol, both my parents/caregivers do drink alcohol, only my father/male caregiver drinks alcohol, only my mother/female caregiver drinks alcohol, I don't know.

School-related variable:

School problems: measured the adolescents' perceptions of specified problems at school. This variable comprised 17 items including, for example, *Does your school have a problem with poor academic standards?* and *Does your school have a problem*

with overcrowding? Other questions related to a lack of dedicated or competent teachers, bullying, smoking, alcohol, drugs, weapons, rape, and sexual relationships between teachers and learners.

Community-related variables:

Community was understood geographically within the Bt20 study to mean an area within approximately 20 minutes' walk (2 kms) from one's home in any direction (Sheppard et al., 2010). The terms community and neighbourhood were understood to be interchangeable in the cohort. Community economic status, community problem index and community social support were assessed using items from a questionnaire that emerged from formative qualitative work with the Bt20 adolescents when they were 15 years old (Sheppard et al., 2010). In this set of community-related variables, adolescents reported their perceptions of community problems, economic status, and social support

Community problems: comprised 11 items that measured participants' perceptions of problems in the community (e.g. road safety, road rage, homelessness, delinquency, repossession, unemployment, alcohol, drugs, shebeens (taverns), gangs and prostitution).

Community social support: three items measuring participant's perceived social support in the community were included (dependence on a neighbour in the event of death or illness of a family member, borrowing a cup of sugar, asking a neighbour to look after your house overnight).

Community economic status: three items pertaining to perceptions of neighbourhood wealth were included: adolescents' perceptions of neighbourhood wealth, adolescents' views about outsiders' perceptions of their neighbourhood's wealth, and adolescents' perceptions of the general condition of most houses in their neighbourhood.

Community level SES: to overcome the limitation of self-reported perceptions of community economic status, a census-derived indicator of community SES was computed. The use of annual household income as a proxy measure for SES has been validated in alcohol-related research (Patrick, Wightman, Schoeni, & Schulenberg, 2012). The community SES variable was computed based on the 2011 census data which reported average household income per annum (Statistics South Africa, 2012). First, income levels were calculated for all census suburbs in the Bt20 sample by

simple cross-tabulation of income band with Bt20 suburb. Proportions of income bands for each SES level per suburb were calculated. Based on the average R103 204 (US Dollar equivalent of R 1 = 0.086 USD), annual household income reported in the census survey, income bands were recoded from 10 census annual income categories to three for analysis, viz. 1 = low (0 - R76 400), 2 = medium (R 76 401 - R 307 600), and 3 = high (R 307 601 - R 2 457 601). These census derived income categories were linked to the individual level data of the Bt20 sample based on the self-reported suburbs of the Bt20 sample

Outcome measures

Lifetime alcohol use was measured by asking participants if they had ever drunk alcohol for any reason other than religious purposes.

Past month alcohol use (used interchangeably with the term *current alcohol use*) was measured by asking participants if they had used alcohol in the past month (30 days).

Past month heavy episodic drinking was measured by asking participants if they had had a heavy episodic drink (five or more drinks in one sitting) in the past month (30 days).

Data analysis

The Statistical Package for the Social Sciences 22 (IBM SPSS Statistics, version 22, New York, USA) was used to conduct all the analyses. All descriptive analyses were conducted using frequency analyses. As each of the alcohol outcomes was binary, we used binary logistic regression for bivariate and multivariate analyses. Alcohol refusal self-efficacy, alcohol expectations, peer influences, parental caregiver drinking, perceived school problems, perceived community problems, perceived community economic status, perceived community social support, and household SES served as individual variables, while community SES served as a community level variable.

For the multilevel binary logistic regression, we used a generalized linear mixed model (GLMM), where the effects of predictors were based on the odds ratios (95% CI). The data structure was nested in 457 suburbs, such that independence among the suburbs would not be assumed. Thus, we employed multilevel logistic regression where an adolescent was taken as a level-1 unit and a suburb as a level-2 unit. We

included alcohol refusal self-efficacy, alcohol expectations, perceived community problems, neighbourhood economic status and social support, school problems, peer influences, parental/caregiver drinking, household level SES and community SES as the main fixed effects.

RESULTS

Socio-demographic characteristics

Table 19 describes the socio-demographic profile of the sample. Females comprised 54% of the sample; 75% had not repeated any schooling years by grade seven. In terms of household SES, the sample was fairly evenly distributed amongst the three categories. The community level census-derived SES indicator indicated that 82.7% came from the lowest income category.

TABLE 19
Socio-Demographic Characteristics

Variable	n	%
Gender		
Male	769	46.0
Female	906	54.0
School years repeated by grade 7		
No school years repeated	1 495	75.0
One school year	438	22.0
Two school years repeated	68	3.4
Household SES		
Low	997	34.9
Medium	870	30.4
High	993	34.7
Community level SES		
Lowest	1 846	82.7
Medium	270	12.1
High	117	5.2

3.2 Descriptive univariate results

Of the 1 647 adolescents, 65% reported consuming alcohol by the ages of 17/18, 60% were current users, and 54% had past month heavy episodic drinking episodes. The rates of alcohol use were consistently significantly higher for males than females in terms of most drinking behaviours (Table 20).

Sixty one percent of the sample reported having a best friend who drank alcohol; 67% reported drinking alcohol with their best friend. More than half of the adolescents reported that both their parents did not drink or that they did not know (58%). Nine percent had both parents/caregivers who drank alcohol. Regarding perceptions of school problems, 41% regarded their schools as falling into the high problem category. Just over half reported living in a high economic status community (51%); 38% reported that their communities had moderate levels of problems, and 66% perceived a high level of community social support.

TABLE 20
Alcohol Behaviours by Gender

Behaviour	Male		Female		Chi-square	p-value
	n	%	n	%		
Lifetime alcohol use					10.016	.001
No	237	31	346	39		
Yes	519	69	545	61		
Age of alcohol initiation					13.623	<.001
<13 year old	146	29	102	19		
14> years old	367	72	440	81		
Current alcohol use					41.197	<.001
No	155	30	269	49		
Yes	362	70	277	51		
Past month heavy episodic drinking?					18.239	<.001
No	140	39	154	56		
Yes	218	61	120	44		
How often do you usually drink					31.714	<.001
Never	51	10	76	15		
< once a week	230	46	297	58		
Once a week	153	31	106	21		
2-3 times a week	57	11	28	5		
Every day of the week	8	2	7	1		
Past month average no. of drinks at one time					55.842	<.001
1-2 drinks	58	17	83	30		
3-4 drinks	74	21	73	27		
5-6 drinks	78	22	65	24		
7 or more drinks	141	40	54	20		
No. of drinking days in past 30 days					13.350	.020
1-2 days	212	60	183	66		
3-5 days	75	21	61	22		
6-9 days	34	10	15	5		
10-19 days	26	7	9	3		
20-29 days	5	1	7	2		
All 30 days	4	1	0	0		
No. of heavy episodic drinking days in past 30 days					28.952	<.001
0 days	66	19	95	35		
1 day	109	31	93	34		
2 days	86	25	39	14		
3-5 days	52	15	28	10		

6-9 days	20	6	11	4		
10-19 days	10	3	4	15		
20 days	5	1	2	<1		
Do you usually drink on weekdays or weekends?					7.680	.053
Never had alcohol	69	14	96	18		
Weekdays	42	8	28	5		
Weekends	355	71	375	71		
Weekdays and weekends	32	6	26	5		
How much do you drink on average during weekend?					26.734	<.001
No drinking during the weekend	95	19	133	26		
1-2 drinks	110	22	151	29		
3-4 drinks	105	21	103	20		
5 or more drinks	113	23	72	14		
Communal drinking/sharing a bottle	76	15	59	11		
How much do you drink on average during the week?					23.674	<.001
No drinking during the week	80	16	118	23		
1-2 drinks	123	25	170	33		
3-4 drinks	94	19	98	19		
5 or more drinks	112	23	75	14		
Communal drinking/sharing a bottle	85	17	58	11		
How likely is it that you will be drinking in 5 years?					27.928	<.001
Very Unlikely	114	15	112	13		
Somewhat unlikely	144	19	131	15		

3.3 Bivariate logistic regression analysis

Table 21 shows the associations between individual, interpersonal and community risk and protective factors on lifetime and current alcohol use and past month heavy episodic drinking. Adolescents with high levels of alcohol refusal self-efficacy were significantly less likely than those with low levels to have drunk alcohol in their lifetime (OR= .332; $p<.001$), in the past month alcohol (OR= .256; $p<.001$), and to have had a past month heavy episodic drinking episode (OR= .525; $p<.001$). Similarly, adolescents who had high expectations that they would be drinking five years ahead were significantly more likely than those who had low expectations, to have drunk in their lifetime (OR= 2.320; $p<.001$), in the past month (OR= 2.512; $p<.001$), and to have had a heavy drinking episode in the past month (OR=1.561; $p=.037$).

Perceived high peer influence was significantly associated with lifetime alcohol use (OR=1.637; $p<.001$) and past month alcohol use (OR= 2.023; $p<.001$).

There were no significant associations between parental/caregiver drinking and any of the alcohol use outcomes. Household SES was significantly associated with

lifetime (OR=.550; $p<.001$) and current alcohol use (OR =.698; $p=.025$). In general, adolescents from higher household SES categories were significantly less likely than those from lower SES categories to have been lifetime and current users of alcohol.

TABLE 21
Bivariate Logistic Regression of Individual, Interpersonal and Community Level Predictors on Lifetime and Current Use, and Past Month Heavy Episodic Drinking

Predictor variable	Lifetime alcohol use			Current alcohol use			Past month heavy episodic drinking		
	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value
Low alcohol refusal self-efficacy (REF)	1			1			1		
High alcohol refusal self-efficacy	.332	.265-.416	<.001	.256	.196-0.334	<.001	.525	.377-.731	<.001
Low alcohol expectation (REF)	1			1			1		
Unsure	.969	.755-1.245	.807	.763	.553-1.052	.098	.974	.626-1.517	.908
High Alcohol expectation	2.320	1.735-3.101	<.001	2.512	1.774-3.557	<.001	1.561	1.027-2.371	.037
Low peer influence (REF)	1			1			1		
High peer influence	1.637	1.329-2.018	<.001	2.023	1.557-2.627	<.001	1.252	.882-1.778	.209
No parental/caregiver drinking/don't know (REF)	1			1			1		
Both my parents/caregivers drink	.703	.454-1.089	.115	.705	.425-1.170	.177	.577	.307-1.085	.088
Only my father/male caregiver drinks	1.192	.674-2.108	.545	1.870	.948-3.687	.071	.561	.266-1.180	.128
Only my mother/female caregiver drinks	.802	.503-1.280	.355	.876	.509-1.509	.634	.586	.299-1.149	.120
Low household SES (REF)	1			1			1		
Medium household SES	.670	.513-0.874	.003	.906	.662-1.242	.541	1.101	.748-1.622	.625
High household SES	.550	.423-0.715	<.001	.698	.510-0.956	.025	1.232	.823-1.846	.311
Low school problems (REF)	1			1			1		
Moderate school problems	1.374	.991-1.907	.057	.550	.366-0.827	.004	.672	.398-1.133	.136
High school problems	1.312	.930-1.852	.122	.839	.543-1.297	.428	.827	.488-1.403	.482
Low community problems (REF)	1			1			1		
Moderate community problems	1.003	.767-1.312	.982	.857	.615-1.194	.362	.763	.504-1.158	.204
Highest community problems	1.120	.868-1.446	.384	.776	.569-1.058	.109	.618	.417-0.915	.016
Low community economic status (REF)	1			1			1		
Middle community economic status	.662	.511-.858	.002	1.004	.720-1.398	.983	.662	.511-0.858	.706
High community economic status	1.049	.812-1.356	.713	.950	.706-1.278	.735	1.049	.812-1.356	.959
Low community social support (REF)	1			1			1		
High community social support	1.171	.946-1.449	.148	.851	.659-1.009	.216	.970	.700-1.345	.855
Low community level SES (REF)	1			1			1		
Medium income level	.517	.283-0.948	.033	.507	.260-0.987	.046	.832	.420-1.650	.599
High income level	.553	.282-1.086	.086	.358	.169-0.761	.008	.690	.297-1.600	.387

Perceptions of school problems as moderate were marginally significantly associated with lifetime alcohol use (OR=1.397; $p=.057$) and significantly associated with current alcohol use (OR=.550; $p=.004$) (Table 21).

Adolescents who perceived their communities to be of medium economic status, as opposed to low economic status were significantly less likely to be lifetime consumers of alcohol (OR=.662; $p<.002$). No significant associations were found between adolescents' perceptions of community economic status and current or past month heavy episodic drinking.

Community social support was not associated with any of the alcohol outcomes.

Community SES level was significantly associated with current drinking. Specifically, adolescents who came from high SES communities were less likely than those from the low SES communities to have been past users of alcohol (OR=.358; $p=.008$) (Table 21).

3.4 Standard and multi-level modelling logistic regression

For each of the outcomes, we took all bivariate associations, as presented in Table 21, into respective multivariate logistic regression models. In the multivariate logistic regression, we fitted the standard logistic model and multilevel logistic model to account for unobserved effects of suburbs. The results are presented in Tables 22 and 23, respectively. Across the 457 suburbs, the mean number of subjects within each suburb was five, with a range of 1-7; and half of the suburbs comprised two or more subjects.

3.5 Standard multivariate logistic regression

Table 22 shows the associations between individual, interpersonal and community factors on lifetime alcohol use, current alcohol use and past month heavy episodic drinking in a standard multivariate logistic regression model (without controlling for clustering at community level).

TABLE 22
Multivariate logistic regression of individual, interpersonal and community level predictors on lifetime ad current use and past month heavy episodic drinking

	Lifetime alcohol use			Current alcohol use			Past month heavy episodic drinking		
	OR	95% CI	<i>p</i> -value	OR	95% CI	<i>p</i> -value	OR	95% CI	<i>p</i> -value
Low alcohol refusal self-efficacy (REF)	1			1			1		
High alcohol refusal self-efficacy	.409	.280-0.596	<.001	.379	.244-0.589	<.001	.551	.319-.952	.033
Low alcohol expectation (REF)	1			1			1		
Unsure	1.140	.771-1.686	.510	.809	.477-1.371	.431	1.14	.554-2.346	.722
High alcohol expectation	2.4160	1.482-3.937	<.001	1.911	1.063-3.433	.030	1.221	.602-2.473	.580
Low peer influence (REF)	1			1			1		
High peer influence	1.215	.851-1.735	.285	1.486	.942-2.346	.089	.932	.507-1.713	.821
No parental/caregiver drinking/don't know (REF)	1			1			1		
Both my parents/caregivers drink	.643	.313-1.321	.229	.849	.382-1.883	.686	.394	.149-1.041	.060
Only my father/male caregiver drinks	.707	.273-1.829	.474	1.871	.600-5.837	.280	.503	.151-1.676	.263
Only my mother/female caregiver drinks	.774	.359-1.668	.513	.924	.392-2.177	.856	.447	.158-1.264	.129
Low household SES (REF)	1			1			1		
Medium household SES	.767	.503-1.168	.216	.727	.430-1.227	.232	.838	.448-1.568	.581
High household SES	.652	.429-.990	.045	.536	.317-.907	.020	1.628	.834-3.177	.153
Low school problems (REF)	1			1			1		
Moderate school problems	1.061	.684-1.645	.791	.458	.261-0.803	.006	.800	.404-1.583	.521
High school problems	1.096	.711-1.689	.677	.652	.373-1.141	.134	.806	.421-1.541	.514
Low community problems (REF)	1			1			1		
Moderate community problems	1.339	.829-2.164	.233	1.319	.700-2.484	.392	.719	.341-1.517	.387
Highest community problems	1.681	1.109-2.547	.014	1.026	.609-1.729	.924	.691	.371-1.290	.246
Low community economic status (REF)	1			1			1		
Medium community economic status	.863	.551-1.353	.522	1.000	.552-1.808	.999	.979	.476-2.016	.955
High community economic status	1.049	.695-1.583	.820	1.031	.616-1.726	.908	.823	.441-1.536	.540
Low community social support (REF)	1			1			1		
High community social support	1.245	.881-1.758	.214	.652	.424-1.003	.052	.890	.527-1.502	.662
Low community SES (REF)	1			1			1		
Medium community SES	.645	.256-1.628	.354	.893	.298-2.672	.839	.903	.305-2.676	.854
High community SES	.785	.275-2.244	.652	.472	.138-1.620	.233	.559	.150-2.079	.385

Alcohol refusal self-efficacy was significantly associated with lifetime (OR= .409; $p < .001$), current (OR= .379; $p < .001$) and past month heavy episodic drinking (OR= .551; $p = .033$). Adolescents' high expectations that they will be drinking five years ahead was significantly associated with lifetime (OR= 2.416; $p < .001$) and current drinking, (OR= 1.911; $p = .030$). Household level SES was significantly associated with current drinking (OR= .536; $p = .020$). Specifically, adolescents from households with higher SES levels were significantly less likely than those from households with lower SES levels to have been current drinkers at 18 years old.

There were no significant associations between adolescents' perceptions of school problems and lifetime or past month heavy episodic drinking. However, adolescents who perceived their schools as having a moderate level of problems were significantly less likely than their counterparts who perceived their schools to have lower level of problems to have been current drinkers (OR=.458; $p = .006$). Adolescents who perceived their communities as having high levels of problems were significantly more likely than those from communities with low problems to have been lifetime consumers of alcohol (OR= 1.681; $p = .014$).

Multi-level modelling logistic regression

Outcome 1: Lifetime alcohol use

A full model was used, which considered all the predictors to be fixed effects on lifetime alcohol use. Two of the predictors (alcohol refusal self-efficacy ($p < .001$) and alcohol expectations ($p = .001$) were significantly associated with lifetime alcohol use. Participants who reported low levels of alcohol refusal self-efficacy were significantly more likely than those with high alcohol refusal self-efficacy to have been lifetime drinkers of alcohol; while those who reported that they were unsure whether or not that they would be drinking alcohol in the next five years were significantly more likely than those who felt they were very unlikely to be drinking in five years, to have drunk alcohol in their lifetime. This is consistent with findings from the standard model. Also consistent with the standard model were significant associations between household SES ($p = .021$) and perceived community problems ($p = .012$), and lifetime alcohol use at 17/18 years old.

Outcome 2: Past month alcohol use

Employing the same predictors in a full model, alcohol refusal self-efficacy ($p < .001$) and alcohol expectations ($p = .040$) were significantly associated with past month alcohol use. This is consistent with findings from the standard model. Adolescents with higher self-efficacy were less likely to have been past month drinkers of alcohol compared to those with low self-efficacy to refuse alcohol. Those who were unsure about the likelihood that they would be drinking five years from now were more likely to be past month drinkers of alcohol compared to those who were felt they were very unlikely to be drinking in five years. Also consistent with the standard model were significant associations between household SES ($p = .025$) and perceived school problems ($p = .006$), and past month alcohol use at 17/18 years old.

Outcome 3: Past month heavy episodic drinking

In the full model, only alcohol refusal self-efficacy was significantly associated ($p = .010$) with past month heavy episodic drinking. Specifically, adolescents with high alcohol refusal self-efficacy were significantly less likely than those in the low alcohol refusal self-efficacy category to have had a heavy episodic drinking episode in the past month. As with the other outcomes, these findings from the multilevel analysis were consistent with the standard model.

TABLE 23

Multi-level logistic regression of individual, interpersonal and community level predictors on lifetime, current use and past month heavy episodic drinking

	Lifetime alcohol use			Current alcohol use			Past month heavy episodic drinking		
	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value
High alcohol refusal self-efficacy	0 ^a			0 ^a			0 ^a		
Low Alcohol refusal self-efficacy	2.444	1.652-3.614	<.001	2.397	1.512-3.799	<.001	2.279	1.218-4.263	.010
High alcohol expectation	0 ^a			0 ^a			0 ^a		
Very unlikely alcohol expectation	1.096	.731-1.645	.656	.890	.516-1.536	.675	1.075	.478-2.414	.861
Unsure alcohol expectation	2.424	1.460-4.024	.001	1.892	1.030-3.473	.040	.976	.439-2.187	.953
High Peer influence	0 ^a			0 ^a			0 ^a		
Low Peer influence	.837	.578-1.213	.347	.707	.440-1.134	.150	1.149	.585-2.255	.686
Only my mother/female caregiver drinks	0 ^a			0 ^a			0 ^a		
Both my parents/caregivers do not drink	.811	.381-1.722	.584	.890	.377-2.103	.790	.375	.120-1.175	.092
Both my parents/caregivers drink	.745	.279-1.990	.556	1.827	.546-6.114	.327	.560	.137-2.289	.418
Only my father/male caregiver drinks	.890	.399-1.983	.775	.943	.375-2.370	.900	.469	.139-1.578	.220
High Household SES	0 ^a			0 ^a			0 ^a		
Low SES	.734	.473-1.139	.167	.681	.394-1.176	.168	.842	.410-1.731	.639
Medium SES	.598	.387-1.925	.021	.533	.308-0.923	.025	1.519	.718-3.214	.273
High School Problems	0 ^a			0 ^a			0 ^a		
Low problems	1.159	.732-1.837	.529	.436	.241-0.788	.006	.721	.334-1.556	.403
Moderate problems	1.099	.386-1.670	.680	.624	.345-1.128	.118	.803	.386-1.670	.556
High Community Problems	0 ^a			0 ^a			0 ^a		
Low problems	1.356	.829-0.223	.228	1.025	.626-2.319	.576	.747	.326-1.713	.490
Moderate problems	1.739	1.127-2.683	.012	.970	.561-1.677	.913	.670	.331-1.356	.264
High Community economic status	0 ^a			0 ^a			0 ^a		
Low status	.896	.562-1.430	.645	.930	.503-1.720	.816	.952	.420-2.159	.906
Medium status	1.084	.706-1.664	.713	.993	.581-1.698	.979	.751	.367-1.537	.432
High Community Social support	0 ^a			0 ^a			0 ^a		
Low social support	1.464	.801-2.676	.395	1.511	.963-2.370	.073	1.464	.801-2.676	.215
High Community SES	0 ^a			0 ^a			0 ^a		
Low SES	.554	.185-1.654	.289	.968	.296-3.160	.957	.710	.172-2.932	.635
Medium SES	.694	.203-2.367	.559	.502	.133-1.894	.308	.405	.076-2.165	.289

0^a the co-efficient is set to zero because it is redundant

DISCUSSION

In this birth cohort study of urban adolescents, we found a higher prevalence of lifetime, current drinking and past month heavy episodic drinking among adolescent males when compared to data from the South African literature (Peltzer et al., 2011; Reddy et al., 2013). The prevalence of drinking in our study is a concern, both in terms of long and short term health and social consequences for adolescents (Lim et al., 2013; Rehm et al., 2009).

We also found that risk and protective factors in the individual and interpersonal domains of the socio-ecological framework are directly associated with lifetime, current and heavy episodic drinking in the cohort. This is consistent both with our study hypothesis, and with previous research on the correlates of adolescent alcohol use (Kliewer & Murrelle, 2007; Hawkins & Catalano, 1992).

Despite this, we found mixed results in support of the socio-ecological approach. The lack of significant associations between peer influence, perceived community economic status, community social support and community level SES in the multivariate models suggests that individual factors, more proximal to the individual, were better predictors of lifetime alcohol use at 17/18 years old.

Similar findings emerged for past month alcohol use: in addition to individual factors, perceptions of school problems were significantly associated with current drinking. Specifically, adolescents who perceived their schools as having a moderate level of problems were less likely to have been current drinkers.

The latter findings could be explained by previous research which found that adolescence is a period marked by experimentation with alcohol (WHO, 2011)

It is plausible that temporality is at play, where young people may have engaged in experimentation with alcohol in their lifetime prior to the measurement of their perceptions of school problems. Therefore longitudinal analyses are required to examine whether lifetime alcohol use preceded the influence of perceived school problems. Furthermore, previous research indicates that the school environment can promote positive behaviours through prevention programmes, and via school connectedness (Aspy, Vesely, Oman, Tolma, Rodine, et al., 2012). It is plausible that schools functioned to protect adolescents from current drinking and that other factors such as personal skills (self-efficacy) were more salient predictors of current and past month binge drinking. Future research is required to examine adolescent pathways to current drinking.

Bivariate analyses indicated that alcohol refusal-self-efficacy and community problems were the only two factors that were significantly associated with having had a past month heavy episodic drinking episode. However, the significance of perceived community problems was not retained in the multivariate analysis, indicating that, in this cohort, an adolescent's belief in his or her ability to refuse alcohol in different social situations was the only predictor of past month heavy episodic drinking at 17/18 years old.

Multilevel modelling found no evidence to support a direct effect of variation in adolescent's community or community level SES on any of the alcohol behaviours.

The consistent significant associations between alcohol refusal self-efficacy and alcohol expectations, as well as the associations between perceived school and community problems, with lifetime and past month alcohol use, suggests that factors in the adolescent's micro-system more strongly account for the alcohol behaviours at 17/18 years than factors in the macro-system (Bronfenbrenner, 1979). The lack of association between community level variation and SES are consistent with a previous research (Jackson et al., 2014; Subramanian et al. 2003; Brenner et al., 2011).

One plausible explanation for this lack of association may lie in Brenner et al.'s (2011) arguments that census-derived indicators of community disadvantage may be insufficient to explain the most salient community influences for adolescents. They argue that census derived measures may be more influential for adults than for adolescents. Previous research has found that more concrete social factors such as crime, gang presence and community alcohol and other drug use, may be more salient influences on adolescent alcohol use than measures of disadvantage (Diez Roux, 2001). Furthermore, in a study on anti-social behaviour, Seidman et al. (1998) found that despite neighbourhoods being poor, the presence of social cohesion protected their adolescents from antisocial behaviour. In contrast, poor neighbourhoods with low social cohesion placed adolescents at risk for anti-social behaviour. While this study did not permit an examination of these social factors in relation to adolescent alcohol use, it is a noteworthy study for future research.

The findings from the present study suggests that proximal influences, e.g. home or school, may account more significantly for their alcohol behaviours. Although we did not find significant associations for parents and peers in the

multilevel model, we did find significant associations between individual perceptions of school and community problems, and alcohol behaviours.

The absence of parental effect may be due, in part, to the fact that parenting and parental drinking data measured at the parental level were limited in this cohort. Future research, employing data at the parent level, is required to empirically test direct and mediational associations between distal and proximal influences on adolescent alcohol use in this cohort.

The derivation of community level SES from the census survey may have masked other social processes such as social capital, social cohesion (Bryden, 2013) and social isolation, and violence and crime, which individually or collectively influence adolescent alcohol use (Boyce et al., 2008; Echeverria et al., 2008). This is especially relevant in the South African context, and specifically in Soweto, where, 20 years post-apartheid, people continue to be geographically clustered by ethnic groups, and face harsh socio-economic inequalities and violence (Pradeilles et al., 2014). However, we were unable to examine these social processes in the community solely on a census-based derivation of SES. This requires further investigation. Moreover, the measurement of “community” level factors at the individual levels (through individual perceptions of community problems, community economic status and community social support) captures only between-individual variation in alcohol behaviours, as opposed to group-level variation.

Notably consistent positive associations between alcohol refusal self-efficacy and adolescent alcohol behaviours in this study supports previous research which found alcohol refusal self-efficacy to be a protective factor pertaining to current and future increases in heavy drinking (Schulenberg & Maggs, 2002, Nash et al., 2005). As such, prevention and treatment strategies that enhance alcohol refusal self-efficacy must be leveraged to mitigate the risks associated with adolescent alcohol use.

Limitations and strengths

This cross-sectional analysis did not allow us to establish causality between the risk and protective predictors and any of the outcome variables. We relied on self-reporting of alcohol use from adolescents, which may have been subject to social desirability. In order to counter this limitation, the study used self-administered computer based questionnaires. In addition, ethical controls ensured confidentiality, and a safe and private space in which to complete the questionnaires, together with the

added advantage of the trust built with a birth cohort in a long running study. These efforts helped to enhance the quality of the data by mitigating some social-desirability bias associated with self-report. The study was also unable to consider parenting behaviours (e.g. parental monitoring and parental support, parent-child communication) or parental drinking (at the parent level), limiting our understanding of possible parenting behaviours and mediational effects thereof on alcohol behaviours in the cohort. Neither was it able to capture social processes at community level by using solely census-based indicators of community variation and community SES.

Notwithstanding these limitations, the findings have important implications for prevention programmes; the study is an extension of previous research on the epidemiology of alcohol use in SA (Reddy et al., 2013, Peltzer et al., 2011). It was able to examine adolescent alcohol use at a key developmental stage (transition from late adolescence to early adulthood). This is uncommon in SA, where most alcohol studies are school-based (Reddy et al.; 2002; 2010; 2013) or household surveys (Department of Health, 2003; 2007). Neither of these designs can fully capture the transitions from adolescence into adulthood in a developmental life course approach. The empirical validation of risk and protective factors can be used as potential points of intervention for adolescent alcohol use prevention programmes. Finally, with its specific focus on adolescent alcohol use, this study can potentially contribute to a body of research in the larger Bt20 cohort on adolescent risk and protective factors. As previous research indicates, health risk behaviours tend to cluster in adolescence (Newbury-Birch, Gilvarry, McArdle, Venkateswaran, Stewart, et al., 2008). As the Bt20 cohort tracks adolescent risk behaviours, including smoking and sexual risk behaviours, this study can contribute to cohort analyses of the clustering of risk, in terms of initiation of risk behaviours, progress, and risk and protective factors associated with risk taking behaviours in late adolescence. Such cohort analyses can inform broader risk reductions interventions for the cohort.

Implications and future research

Examining lifetime alcohol use, current use and past month binge drinking is useful for establishing trajectories of drinking among a stable birth cohort. It also presents a unique opportunity to understand the prevalence, and early initiation of

adolescent alcohol use, which could be a potentially useful marker of lifetime risk of alcohol use. In addition, identifying risk and protective factors that determine initiation, and drinking prevalence and patterns of drinking among adolescents has important implications for both health promotion efforts aimed at delaying alcohol initiation, and secondary prevention efforts aimed at halting or reducing drinking. Clinically, it is significant for early identification of drinking patterns which can aid in early diagnosis and treatment (Flory et al., 2004). Specifically, examining socio-demographic and other determinants of lifetime alcohol use can aid researchers and practitioners to establish socio-demographic and other risk profiles for early initiators. Similarly, understanding prevalence and risk and protective factors of current alcohol use can aid prevention scientists in secondary prevention efforts aimed at reducing drinking. Finally, the lack of effect of community level variation on adolescent alcohol use necessitates future cohort studies that prospectively consider multilevel designs to analyse community effects on adolescent alcohol use in the cohort.

CHAPTER SIX: DISCUSSION

This chapter presents a synthesis of the empirical findings emanating from this PhD research. In the first part of the chapter, consolidated research findings are presented, followed by a discussion of the identified hypotheses in the thesis. Three main emergent themes are identified and discussed. The theoretical contribution of the PhD is considered and reflections are made on reframing the conceptual framework employed in this study. The strengths and limitations of the thesis are presented, followed by a discussion of the significance of the findings in the South African context, as well as the broader low and middle income country (LMIC) contexts. The chapter also presents implications for alcohol policies in South Africa, closing with future research directions, and a conclusion.

This is one of very few studies investigating the role of multiple factors and their interrelations on adolescent alcohol use in the South African context. Findings from this work can be used to inform multi-faceted and comprehensive alcohol prevention/reduction interventions within the Bt20 cohort. Following suggested approaches for future research, and evaluation of those findings, this study's implications may be applicable to other alcohol prevention and/or reduction studies in South Africa. Methodologically, it also the first study to test a multi-level model of the correlates of alcohol use and misuse within this birth cohort.

The thesis elucidated relevant policy issues at a time when alcohol policy discussions are at the forefront of the national government's agenda. One of the empirical papers was featured as a cluster of papers in a special issue for the South African Medical Journal on alcohol use in South Africa. In addition, a dissemination output of the study appeared in the Public Health Association of South Africa's (PHASA) most recent newsletter as one of the featured articles (see Appendix A). This has contributed to further raising the profile and evidence-base of alcohol use as a major public health problem facing South African youth.

Consolidated research findings

This study aimed to examine three research questions related to adolescent alcohol use nationally and, more specifically, within a birth cohort of urban adolescents in Soweto, Johannesburg, South Africa. The study objectives were addressed through a series of empirical studies, presented in Chapters three, four and

five of the thesis. A summary of the overall study objectives, their position in the thesis, and their associated empirical research findings, are presented in Table 24.

TABLE 24
Summary of Thesis Findings

Objective	Chapter no.	Thesis finding
To describe trends in alcohol use among South African youth following rapid policy development (1998-2008), and its associations with alcohol-related harm. To discuss implications for alcohol policies in SA.	3	<ul style="list-style-type: none"> • Lifetime alcohol use among adolescents remained stable but high in South Africa over the period 1998-2008, with age of initiation before 13 years old stable at 12% in the same period. • Significant gender differences exist, with more males than females consuming alcohol consistently. • Binge drinking increased significantly among females from 1998 to 2003 • Alcohol-attributable violent/homicide cases increased from 50% in 2002 to 54% in 2008. • Unintentional alcohol attributable deaths increased significantly from 18% in 2002 to 31% in 2008.
To calculate the prevalence of alcohol use among the birth cohort during pre-adolescence (11/12 years) and late adolescence (18 years). To examine individual factors and maternal socio-demographic factors associated with alcohol use at these developmental periods	4	<ul style="list-style-type: none"> • Lifetime alcohol use increased from 22% at early adolescence (11/12 yrs.) to 66% at late adolescence (17/18 yrs.) among the Bt20 cohort. • Gender (being male), low maternal education, and low household SES were significantly associated with lifetime alcohol use at both early and late adolescence, while marital status (single parenting) was significantly positively associated with alcohol use at late adolescence.
To test a multi-level model of individual, family, peer, school and community level factors that are associated with adolescent lifetime, current and past month binge drinking at 18 years old.	5	<ul style="list-style-type: none"> • In multi-level regression, alcohol refusal self-efficacy, alcohol expectations and perceived community problems were significantly associated lifetime alcohol use • Alcohol refusal self-efficacy, alcohol expectations, and school problems were significantly associated with past month alcohol use. • Alcohol refusal self-efficacy was significantly associated past month binge drinking. • There was no association between variation in community level SES and any of the alcohol behaviours.

The overall findings revealed a higher prevalence of lifetime, past month drinking and past month binge drinking among Bt20 adolescents when compared to data from the South African literature (Reddy et al., 2013). The findings support a consistent gendered pattern (predominance of male drinking) in terms of adolescent alcohol use, in keeping with national and international studies (WHO, 2014; Reddy et al., 2013; Eaton et al., 2012). It should be noted, however, when studies are compared across national and international contexts, ages of the study populations differ. For example, while the SADHS studies (Department of Health, 2003; 2007) examine youth alcohol use among 15-19 year olds, the South African YRBS studies focus on 13-19 year olds, and the US YRBS studies examine alcohol use behaviours among 10-24 year olds. The variations in prevalence reported in studies may be therefore be a function of the varying definitions of “youth”, as well as differing sample sizes and methodologies employed.

As previously found, alcohol use is associated with harms, including unintentional injuries, homicide, and mortality (Matzopolus et al., 2008). The emergence of increases in alcohol-attributable morbidity and mortality demonstrated in Chapter three of this thesis attests to this, and has important implications for the development of harm reduction policies (which will be elaborated on in the latter part of this chapter).

The transition from early to late adolescence, is accompanied by increases in alcohol consumption. Chapter four reported an increase in alcohol consumption from 22% to 66%. These increases are differentially influenced by socio-demographic characteristics of both the adolescent and his/ her mother/primary caregiver. In terms of socio-demographic correlates, male adolescents were more likely than females to be lifetime drinkers at both early and late adolescence. Adolescents whose mothers were of low educational status had a higher inclination for alcohol use than those whose mothers were educated to a higher level. Being an adolescent of a single mother, as well as being from a low SES household were also risk factors for alcohol use. These empirically validated individual and maternal socio-demographic factors signal potential intervention points for adolescent alcohol prevention in this birth cohort.

As young people reached late adolescence, they reported more current binge drinking. Chapters three, four and five demonstrated this nationally, as well as within the Bt20 cohort.

Binge drinking has important implications for long-term progression into drinking, as well as acute alcohol-related harms, highlighted in both the literature review and the empirical findings of this thesis. Binge drinking is implicated as a major risk factor for a range of alcohol-related harms in South Africa, which include traffic-related accidents and deaths, interpersonal violence, foetal alcohol syndrome, crime, sexual risk and the resultant burden of all these harms on the economy (Matzopoulos et al., 2008; Seedat et al., 2009; May, Gossage, Marais, Hendricks, Snell, Tabachnick, et al., 2007; Swart, Seedat & Nel, 2015; Morojele et al., 2006; Matzopolous et al., 2014). In light of South Africa's status as one of the countries with the riskiest drinking patterns in the world, addressing binge drinking early in the life course is essential to prevent both its direct effects on individual health and well-being, and its associated harms.

Chapter five largely focused on the determinants of adolescent alcohol behaviours in this cohort. The hypothesis was that alcohol behaviours are influenced by intrapersonal, interpersonal, school and community factors, contextualised within a socio-ecological framework. This was partially supported by the findings that intrapersonal, interpersonal, perceived community problems, and school problems were, indeed, significantly associated with lifetime and current drinking respectively, while only self-efficacy was associated with binge drinking. These findings support a body of research validating the role of multiple intra- and interpersonal determinants of adolescent alcohol use (Arthur et al., 2002; Hawkins et al., 1995). Also consistent with previous research (Jackson et al., 2014; Subramanian et al. 2003), was the lack of significant associations between differences in SES at the community level and any of the alcohol outcomes.

Notably consistent negative associations between alcohol refusal self-efficacy and adolescent lifetime, current and past month binge drinking, demonstrated in Chapter five, support previous research which found that alcohol refusal self-efficacy is a significant protective factor for current and future adolescent drinking (Schulenberg & Maggs, 2002; Nash et al., 2005). As such, alcohol refusal self-efficacy is a noteworthy protective factor that must be leveraged for intervention and prevention efforts aimed at adolescent alcohol prevention.

Main emergent themes

Three broad themes emerged from the synthesised findings of the thesis. The first relates to an *approach* to studying the role of risk and protective factors for adolescent alcohol use nationally and, specifically, within the Bt20 cohort. The discussion of this theme offers an alternative framing of risk and protection for adolescent alcohol use. The second theme, empirical in nature, relates to the high rates of adolescent binge drinking nationally and in the Bt20 cohort. The third theme, also empirical in nature, relates to the significance of alcohol refusal self-efficacy as a protective factor for adolescent alcohol use.

Risk and protection

The consideration of both risk and protective factors, in efforts to reduce and contain adolescent alcohol use, has been the mainstay of this thesis. In addition, the thesis advances that, in order for risk and protective factors to be meaningfully applied to comprehensive prevention and/or harm reduction interventions, these factors must be considered within the context of a socio-ecological framework (Bronfenbrenner, 1979).

Within the Bt20 cohort, several risk and protective factors exist which potentially impact adolescent alcohol use. While the scope of this study did not permit examination of all these factors, those that were examined (gender, socio-economic status, alcohol expectations, alcohol refusal self-efficacy, academic achievement, maternal socio-demographics, school factors, peer influence, neighbourhood and community level factors) indicate the importance of examining multiple factors in understanding adolescent alcohol use. These factors emerged as potential points of intervention for both comprehensive primary and secondary prevention of adolescent alcohol use in the cohort.

Approaches used in the literature, as well as within the empirical papers in this thesis, offer a more risk-focused understanding of adolescent alcohol use. Consequently, and unsurprisingly, interventionists design programmes and invest time, effort and resources based on these empirically validated risk factors. For example, in this thesis, risk factors identified as determinants for adolescent alcohol use and misuse could be summarised as: being male, having low alcohol refusal self-efficacy, being a child of a single mother with low educational status, having negative

peer influence, and having a low household SES. Consequently, the inclination is to make recommendations only for mitigating these risks for the birth cohort.

Recent efforts at revitalising the approach to public health problems have been articulated through scholars calling for an asset-based approach to health (Morgan & Ziglio, 2010). Such an approach calls for a shift from the historical deficit approaches to health to be balanced with inherent strengths and assets that exists within the context of communities, families and schools (Brooks, Magnusson, Spencer, & Morgan, 2012).

Consequently, an alternative framing of the role of risk and protective factors in understanding and intervening in adolescent alcohol use is suggested. While recognising the merits of well-established demographic and other risk factors in explaining alcohol use, similarly focusing on protective factors lends itself to a positive approach to adolescent alcohol prevention. Assets are defined as “collective resources which individuals and their communities have at their disposal, that serve to protect against negative health outcomes and promote health status” (McLean, 2011, pg. 2). Adopting an asset-based approach to health requires reframing the way we view, think about, and practice public health. It recognises that individuals, and the contexts in which they live, work and play, are not void of skills, capacity and resources to improve their health.

Foot and Hopkins (2010) suggest practical steps to identifying and operationalising an asset-based approach to health as follows:

- Recognising the skills, capacity and knowledge of local people;
- Understanding health aspirations and interests of local people;
- Understanding that people exist within the context of supportive social networks;
- Viewing local community and community-based organisations as partners in attaining health and well-being; and
- Identifying existing physical and economic resources that promote health and well-being.

In the context of alcohol research, applying an asset-based approach ranges from the choice of determinants of adolescent alcohol use to be measured, to leveraging the skills, capacity and knowledge of individuals to exert control over their own drinking behaviours. For example, the surveys within this thesis that offered the potential to identify risk factors can similarly identify assets and protective factors,

such as high alcohol refusal self-efficacy, positive peer influences, meaningful alcohol-specific parent-child communication, resilience and social capital. These protective factors can be leveraged by researchers and/or interventionists to ameliorate the effects of risk exposures present in various socio-ecological domains. This proposition strongly resonates with health promotion approaches to adolescent health behaviours (Whiting, Kendall, & Wills, 2012).

The concept of positive deviance is one example used here to illustrate an asset-based approach to adolescent alcohol use. Positive deviance refers to a person or group of persons who display better outcomes than their peers in the presence of the same risks (Marsh, Schroeder, Dearden, Sternin, & Sternin 2004). Seemingly paradoxical, a positive deviant is an individual who deviates from the normal (undesirable) behaviour in a positive way. Previous work conducted in LMICs documents the success of positive deviance approaches in promoting safer behaviours, such as malnutrition alleviation, (Sternin, Sternin, & Marsh, 1996) and exclusive breastfeeding (Dearden, Quan, Do, et al., 2002; Ahrari, Kuttub, Khamis, Farahat, Darmstadt, et al., 2002). To date, the positive deviance approach has not been implemented to promote safe alcohol behaviours in the South Africa context.

In the present study a positive deviant is an adolescent who does not binge drink in a context where binge drinking may be normative in his/her peer environment. By identifying positive deviants in the Bt20 cohort, who in spite of experiencing the same risks as their peers, do not engage in binge drinking, practitioners could leverage the assets of these positive deviants. These positive deviants can model and inspire positive behaviours. Furthermore, identifying the skills, capacity and knowledge that the positive deviants apply, and confirming that they have access to the same resources as their peers, positive deviants can be used to model socially acceptable, achievable and desirable behaviours to their peers. Methodologically, this would involve identifying people who adopt positive behaviours, interviewing them to understand what enables the behaviour/s, and training them to encourage and model safer alcohol behaviours to their peers.

Adopting positive deviance programmes requires the use of mixed research methods for an optimal impact. For example, identifying segments of the populations that deviate from the (undesirable) behaviour requires qualitative techniques (such as ethnography or observation), while matching these positive deviants to each population segment may be better suited to the use of quantitative techniques.

An example of the application of an asset based positive deviance approach is illustrated in the proposed case study below (Box 3).

BOX 3
Example of a Positive Deviance Approach to Adolescent Alcohol Use

Positive deviants: Identify 40 adolescents from the Bt20 cohort who have not binge drunk by age 18.

Interview and/or observe: Conduct focus group discussions, in-depth interviews and/or observations with these 40 participants to gain insight into the attitudes, skills, and knowledge that enabled them to carry out the positive behaviour. Examine the resources they tapped into in their interpersonal and community contexts that enabled the positive behaviours.

Analyse: Analyse the outcome of these interviews/focus groups to ascertain that these behaviours are locally acceptable, accessible to the larger community, and can be carried out within the available resources in the community.

Design: Design interventions and activities that encourage the uptake of these new behaviours, using available resources.

Monitor and evaluate: Monitor the implementation of the programme and evaluate the outcome.

“WE ARE MORE HEAVILY
INVESTED IN THE THEORIES OF
FAILURE THAN WE ARE IN THE
THEORIES OF SUCCESS.”

APA address, 1998



Advantages of a Positive Approach

The benefits of adopting an asset-based approach in a birth cohort is that a stable cohort will enable age-sex matching of the participants who display the positive behaviours with those that display the negative behaviours from the same community. Rogers and Shoemaker (1971) posit that, for effective communication to occur between peers, the giver and the receiver of such communication should be 'homophilous', that is, they must be similar in certain attributes, such as age, opinions, morals, education and socio-economic status. Applying a positive deviance approach in a birth cohort maximises the chances of identifying homophilous groups.

Furthermore, a stable and long-running cohort study that has enlisted the trust of researchers, combined with commitment from the cohort members themselves, has the potential to produce asset-based programmes with long term benefits. Should such an approach be successful on a small scale, it unlocks opportunities for its application to a range of other social problems, and in broader contexts.

An additional advantage of adopting a new approach and testing its efficacy within the current context is that it offers potential for the design of locally relevant, culturally appropriate and community-owned programmes for adolescents in the cohort. Methodologically, the trials within cohort studies (TWICS) approach lends itself to testing the aforementioned interventions. TWICS is a pragmatic trial design that is informed by the innovative cohort multiple randomised controlled trial (Relton, Torgerson, O'Cathain & Nicholl, 2010). It enables the testing of new interventions within an existing observational cohort, such as the Bt20 cohort. Following the principles of the cohort multiple randomised controlled trial, adopting a TWICS design will enable identification of eligible participants, random selection of participants and comparison with patients not randomly selected to test new interventions and their outcomes. The benefit of the TWICS approach for testing the proposed interventions is that Bt20 is a long-running cohort that has existing infrastructural and research capacity to test interventions and their outcomes at regular intervals. TWICS provides a viable opportunity to test asset-based prevention approaches to adolescent and early adulthood alcohol consumption. Previous research has found that, when public health practitioners adopt a positive approach to health, they serve to increase personal and collective efficacy to address their own health needs, as well as their capacity to mobilise support from external sources (Foot & Hopkins, 2010).

High rates of adolescent binge drinking

Chapters three and five demonstrate the high rates of adolescent binge drinking nationally data and in this birth cohort. The prevalence of binge drinking in this birth cohort remains a concerning issue, particularly as it supersedes national figures among adolescents. Apart from the long term consequences of heavy drinking on health, binge drinking has deleterious effects for social spheres (school, interpersonal relationships, sexual risk behaviours, and traffic-related and unintentional injuries) which, if left unchecked, can result in catastrophic consequences for both the binge drinker and those around him/her.

The prevalence of binge drinking and its associated harms among adolescents requires decisive and improved public health action in the areas of:

- Decreased accessibility, by reducing the number of alcohol outlets in close proximity to schools, universities and residential areas;
- Introduction of laws prohibiting the sale of large quantities of alcohol (including “fishbowls”⁶ and “jam jars”⁷); and
- A total ban on alcohol advertising and media portrayals linked to excessive drinking.

As many of these efforts require political commitment from all spheres of government (health, social development, law enforcement, trade and industry), these issues will be discussed in detail in the section on the policy relevance of this PhD thesis.

Another issue that reinforces binge drinking is the relatively new body of literature that indicates that the portrayal of alcohol use in the media is linked to binge drinking (Hanewinkel, Tanski, & Sargent, 2007; Hanewinkel & Sargent, 2009; Stoolmiller, Wills, McClure, Tanski, Worth, et al., 2012; Hanewinkel, Sargent, Poelen, Scholte, Florek, et al., 2012). It is evident that on-screen portrayals (movies, music videos, and soap operas) of alcohol are associated with alcohol use, initiation and binge drinking. Specific findings indicate that being exposed to alcohol use via movies in the US, in the absence of parental knowledge about drinking, was associated with binge drinking (Hanewinkel, 2007). In addition, having controlled for

⁶ A fish bowl is a cocktail of alcohol which is served in a fish bowl-shaped container, designed to hold large quantities of alcohol.

⁷ A jam jar is an alcoholic drink which is served in a jam-jar shaped container.

co-variates, Hanewinkel et al. (2012) found an association between exposure to alcohol in movies and both binge drinking and heavy drinking. Similarly, Stoolmiller et al. (2012) found that increased exposure to movies exposing alcohol led to drinking initiation and binge drinking.

While the literature on the association between advertising and alcohol use is well established (Anderson et al., 2009; Swahn, Ali, Palmier, Tumwesigye, Sikazwe, et al., 2011; Jones & Magee, 2011; Parry et al., 2012) (see also Appendix A), these findings underscore the need to not merely focus on alcohol advertising (though this is laudable in the South African context), but to extend our focus to media portrayals of alcohol use that are associated with harmful drinking. This should not preclude social media which are becoming ubiquitous in the lives of adolescents, and are fertile ground for marketing and promotion of alcohol (Winpenny, Marteau, & Nolte, 2014).

Alcohol Refusal Self-Efficacy

The offer of alcohol in multiple social situations is a formidable pressure facing many adolescents. Alcohol refusal self-efficacy has emerged as a consistent protective factor associated with adolescent alcohol use behaviours, as demonstrated by empirical findings presented in Chapter Five. Unlike non-modifiable factors, such as gender, age or a genetic predisposition to alcoholism, alcohol refusal self-efficacy is a promising and modifiable factor that can be leveraged to reduce alcohol use and misuse equally. This is discussed in more detail below.

Significance of alcohol refusal self-efficacy as a protective factor

Alcohol refusal self-efficacy is applicable to different social situations, e.g. believing that one can refuse alcohol if offered it by a stranger versus believing that one can refuse alcohol if offered it by a family member or close friend. In this study, alcohol refusal self-efficacy was measured in interpersonal relationships (peers, siblings, boy/girlfriends) and was consistently found to be a protective factor for all alcohol behaviours. This is consistent with previous research which demonstrated the importance of self-efficacy to alcohol behaviours (Laflin et al., 1994; Marcoux & Shope, 1997; Cicognani, Elvira; Zani, & Bruna, 2011; Foster, Yeun, & Neighbours, 2014); and increasingly, self-efficacy has been incorporated into interventions for alcohol use (Witkiewitz & Donovan, 2011; Weichold & Brambosch; 2012; Komro, Perry, Williams, Stigler, Farbaksh, et al., 2001) Alcohol refusal self-efficacy is also compatible with a range of other individual level determinants, e.g. intentions to

drink, decisional balance, gender, and alcohol attitudes in explaining alcohol use (Young, Connor, Ricciardelli, & Saunders, 2006; Foster, Young, Bryan, Steers, Yeung, et al., 2010; Jang, Rimal, & Cho, 2013). As such, it is usually part of broader and combined behavioural interventions to reduce alcohol use.

In a Cochrane review conducted on school-based prevention for illicit drug use, researchers found that interventions that are skills-based (e.g. self-efficacy) are better than affective ones (Faggiano, Vigna-Taglianti, Versino, Zambon, Borraccino, et al., 2005). This gives impetus to the idea of conducting broader skills-based interventions with specific focus on increasing alcohol refusal self-efficacy skills among the Bt20 cohort. The versatility of alcohol refusal self-efficacy is that it can be adapted to social situations specific to South African drinking contexts, for example, where community drinking (beer halls, street gatherings, taverns) is commonplace, self-efficacy may be applied to understand an individual's resistance to alcohol in such settings.

Within a socio-ecological framework, alcohol refusal self-efficacy can be studied in interaction with individual and interpersonal determinants (such as peer and parental interactions) of adolescent alcohol use (Jang, Cho, & Yoo, 2011; McCleary & Leickly, 2012). Understanding the role of self-efficacy as both a predictor and mediator of adolescent alcohol use is critical for future work. Most promising is the fact that alcohol refusal self-efficacy is a modifiable factor that is applicable across the drinking continuum from prevention to treatment. This means that interventions should focus on increasing alcohol refusal self-efficacy to delay the onset of alcohol use, retard its progress, and assess self-efficacy to change behaviour once in treatment (Kadden & Mitt, 2011).

Theoretical relevance

Based on the thesis findings, as well as a discussion of the emergent themes, the conceptual framework proposed at the outset of this thesis has been re-examined. The next section considers the manner in which undertaking this thesis has led to a validation of the conceptual framework, and reflects on potential reframing of the model that can extend our understanding of adolescent alcohol use.

Bronfenbrenner's socio-ecological model

The research presented in this thesis is conceptualised within the context of a socio-ecological model (Bronfenbrenner, 1979). Bronfenbrenner posits that, in order to fully understand behaviour, one must recognise that it (behaviour) is affected by, and affects, multiple levels of influence. In the main, applying this model to examining and understanding adolescent alcohol use has proved useful. This is largely because the influential factors that have been internationally and nationally validated as correlates of adolescent alcohol use can be categorised into different levels of a socio-ecological model.

A benefit of this has been the practical consideration of clustering factors into manageable categories as levers for designing potential interventions. For example, being able to categorise alcohol attitudes, beliefs, refusal self-efficacy, gender, and age into individual level factors enables one to distinguish modifiable factors from non-modifiable factors. This has important implications for designing interventions that seek to modify factors to effect positive behaviour change. However, a socio-ecological model's value and applicability goes beyond practical considerations to theoretical strengths. The model is compatible with a range of theories (the Theory of Reasoned Action, The Health Belief Model, the Socio-Cognitive Theory, the Theory of Gender and Power, Community Theory, and the Diffusion of Innovations) across ecological levels that could potentially predict and change alcohol behaviour (Sallis et al., 2008).

In addition, ecological models recognise that influencing individual factors (e.g. education, awareness and even skills-building) in the presence of an unsupportive peer or community level environment, can result in weak programmes. Despite the principles of a socio-ecological model being well-established, its application in the South African and African contexts has been limited. As such, being able to apply a socio-ecological model and conduct multi-level modelling of adolescent alcohol use is an important theoretical contribution to the field.

Another advantage presented by a socio-ecological model is the more sophisticated methods of statistical analysis such as multi-level modelling, it is suitable to. These analytic methods make it possible to examine how variability in exposure variables (adolescents' community, neighbourhood, and school, social and cultural environments) are associated with their drinking behaviours.

Contextual relevance

The next section discusses the contextual relevance of this PhD thesis for South Africa and for LMICs broadly.

South Africa

The empirical findings from this PhD make a valuable contribution to understanding adolescent alcohol use, first among adolescents in South Africa and second among adolescents living in a large urban catchment area in South Africa.

The thesis findings support the justifiable identification of alcohol use, in national and international literature, as a major public health problem facing adolescents in South Africa. The problem necessitates the design, implementation and evaluation of multi-faceted and comprehensive interventions that address the interrelated determinants of alcohol use among adolescents. To the knowledge of the researcher, this is one of very few studies in South Africa to examine multiple influences on adolescent alcohol use at different ecological levels. This multifaceted approach presents an opportunity to reframe our thinking about what influences adolescent alcohol use. As discussed, a socio-ecological model facilitates reframing the way interventionists think about, plan and implement their interventions. This reframing also challenges interventionists to employ a range of research methods, select potentially different sub groups (e.g. positive deviants), and design interventions, based on a balance of risk and protective factors, that can bring about desired behaviour. It points to alternative ways of thinking about and designing interventions that are likely to bring about positive change - interventions that are locally-owned, managed and implemented.

An additional advantage of reframing interventions is that they are likely to be culturally and socially acceptable, more cost-effective and sustainable because they are already embedded in the society where at-risk populations reside (Marsh and Schroeder, 2002). A challenge that remains for South African researchers, practitioners and policy makers is how to leverage the attitudes, behaviours and skills of adolescents who do not drink, or do not drink harmfully, to produce positive change in those adolescents that do.

Low-Middle Income Countries (LMICs)

The specific empirical findings that emerged from this thesis can, in part, be applicable to LMICs facing alcohol use as a prevalent public health problem. As discussed, the application of a socio-ecological model (Bronfenbrenner, 1979) has widespread implications for the design and implementation of comprehensive programmes. The proposition of an asset-based approach in this thesis can extend to other contexts in Africa, resulting in locally relevant programmes, for high drinking countries such as, Namibia, Nigeria, and Uganda (WHO, 2014),

While adolescent alcohol use and patterns of drinking have been studied in other African contexts (Swahn et al., 2011; Chikere & Mayowa, 2011; Fuhr, Fleischmann, Riley, Kann, & Poznyak, 2013), there remains a paucity of research on multi-level influences.

The findings of this thesis thus point to potential conceptual and methodological issues that may be usefully applied in other African contexts. It also alludes to novel and reframed ways of thinking about alcohol and other health behaviours that could be taken up by countries in low to middle income settings to bring about positive change.

Implications for policy

Policy environments can help or hinder the adoption and continuation of healthy behaviours. The consolidated empirical findings that emerged from this thesis necessitate a discussion of their implications for alcohol policy. South Africa has made significant advances in alcohol policy development in the past two decades. Despite, this, the absence of a standardised national policy in South Africa, in the face of harmful and costly effects of alcohol use, calls to attention the need to adopt a standardised national policy. Such a policy could benefit from the evidence of international best practices (pricing, decreasing alcohol availability and banning alcohol advertising) (Anderson et al., 2009; Babor et al. 2010), and incorporate best practices that may have emerged from provincially (state) based policies in the country. These include zero tolerance for drink-driving in Kwa-Zulu Natal, as well as the Western Cape's training of liquor traders and bringing shebeens into the regulated market (Parry, 2010).

A further proposition offered by this thesis is the need to distinguish between policies that address alcohol use versus those that address its misuse. Stated differently, policies can be differentiated into those that control and regulate alcohol

use, and those that minimise alcohol-related harms. The high rates of alcohol-attributable morbidity and mortality, as well as the health and social risks associated with its use, indicate that current regulatory policies are inadequate in ensuring a reduction in alcohol-related harm. A strong evidence base of alcohol-related harm would go a long way towards advocating for youth-specific policies that mitigate the harmful effects of alcohol. A useful first step in developing harm reduction policies is the development of a strong evidence base that links alcohol use to harm among different groups (age-specific, gender-specific, and ‘special’ populations). This would form the basis for quantifying alcohol-attributable morbidity, mortality and social harms, which could be used as leverage for advocating for prevention programmes and policies aimed at reducing alcohol-related harm among adolescents in South Africa.

A further differentiation in alcohol policy development relates to age relevant policies, i.e. policies targeted at adult populations versus those that are youth-focused. Given the high rate of youth binge drinking rates (see Chapters three and five), the fact that youth are disproportionately affected by alcohol-related injuries and fatalities in South Africa (see Chapter three), and the exorbitant direct and indirect costs of harmful alcohol use (Matzopolous et al., 2014), age- targeted policies are essential to reduce harmful alcohol use and its associated risks. Therefore, in addition to developing a standardised national policy, it is necessary to develop and effectively implement youth-specific policies to reduce alcohol availability to adolescents, increase prices, impose a total ban on alcohol advertising, reduce accessibility, and restrict sale to minors (Anderson et al., 2009; Babor et al., 2010). Modifications to existing policies and the introduction of strategies are suggested below.

Minimum alcohol purchasing and drinking laws

Despite the existence of minimum alcohol purchasing and drinking laws in South Africa (18 years old), the high rates of underage drinking, nationally and in this birth cohort, suggest that the laws are being grossly contravened. This calls into question their effective implementation. The following strategies are suggested:

- Stricter enforcement of existing minimum alcohol purchasing, selling and drinking age laws [age enforcement checks at point of sale, age checks of workers at outlets, adults purchasing alcohol for minors (Paschall, Grube, Black, & Ringwalt, 2007), and age enforcement checks at point of sale (Babor et al., 2010)]

- Stronger monitoring of existing laws for minimum purchasing, selling and drinking age (e.g. through identification checks, routine checks on public drinking, spot checks of sellers and purchasers at outlets)

Control of alcohol packaging

The current law that prohibits the sale of alcohol in non-self-sustaining containers and which limits the capacity of alcohol containers to five litres (Department of Agriculture, 2007) requires review. While seemingly adhering to the sale of alcohol in self-sustaining packages, the alcohol industry appears to be subverting the law related to the capacity of alcohol containers, mainly through the bulk sale of alcohol (e.g. cases of beer and twin packs of bottles of spirits). Another capacity issue is related to the sale of large amounts of alcohol (“fishbowls” and “jam jars”) which are available in many South African drinking spaces. To counter this, policies must take account of how restricting the sale of bulk alcohol will be operationalised. The following strategies are suggested:

- Restrict bulk sale of alcohol to the equivalent of five litres per consumer.
- Ban the sale of “fishbowls”, “jam jars” and other containers that promote communal and binge drinking.

Pricing

Consistent increases in alcohol pricing is the most effective strategy to reduce alcohol consumption (Anderson et al., 2009). Youth are particularly sensitive to increases in alcohol prices. Chaloupka and colleagues (2002) found that when beer prices increased, the frequency of drinking and heavy drinking among adolescents decreased. Two industry efforts appear to be countering the effectiveness of price increases in South Africa. In the first instance, the self-regulated alcohol industry regularly discounts the sale of alcohol, a strategy that promotes sales. Second, product “bundling”, which offers two or more products for sale as one combined product, subverts price increases (Chiambaretto & Dumez, 2012). Alcohol product bundling, a packaging “special” that consists of food packages (meat, chocolates) and an alcoholic drink/s, are widespread in South Africa. The alcohol industry in South Africa has taken bundling a step further by targeting specific symbols of national pride, including

“braai⁸ packs”. Braai packs consist of meat that is conveniently packaged and promoted for the purposes of braaing. Braai packs are combined with alcoholic drinks (mainly beer) to promote the sale of alcohol. While liquor codes in other countries (e.g. Pennsylvania - Pennsylvania Liquor Control Board), (Seim & Waldfogel, 2010), have specified guidelines around bundling of food with alcohol, such guidelines are absent in the South Africa Liquor Act (Department of Trade and Industry, 2004). To this end, implementing regulations related to alcohol in the same manner in which regulations exist for foodstuffs for infants and young children, e.g. formula milk (Department of Health, 2013), is needed. In effect, this means imposing a total ban on the free distribution of alcohol, low cost sale of alcohol, and the handing out of free alcohol samples. Box 4 refers to proposed policy relevant strategies to reduce alcohol availability to minors, regulate access and reduce binge drinking and monitor implementation of existing laws.

BOX 4
Proposed Policy-Relevant Strategies

<p>Minimum age drinking and purchasing laws:</p> <ul style="list-style-type: none"> • Conduct regular unannounced checks on sale of alcohol, by and to minors • Suspend liquor licenses of outlets contravening the minimum age law • Train servers to identify minors, check identification and restrict entry of minors to alcohol outlets (Babor et al., 2010) <hr/> <p>Control of alcohol packaging</p> <ul style="list-style-type: none"> • Restrict bulk sale of alcohol • Ban sale of individual servings of alcohol in containers larger than 250 ml <hr/> <p>Pricing</p> <ul style="list-style-type: none"> • Consistently increase alcohol taxes • Regulate sale of discounted alcohol • Ban bundling of food with alcohol

It is evident from the prevalence of early alcohol debut and underage drinking demonstrated in Chapters three, four and five, that underage SA youth are accessing alcohol. While this study did not examine where, and how alcohol is being accessed by youth, one can speculate that the proliferation of informal liquor outlets might account in part for their access. Twenty years post-democracy, South Africa is still faced with the heavy burden of informal and/or unlicensed liquor outlets, resulting in a high density of outlets and the existence of such near restricted areas (schools,

⁸ A braai is a uniquely South African Afrikaans word, short for braaivleis, which means to grill or barbecue meat.

churches and residential areas). To effectively reduce accessibility and availability of alcohol, efforts to bring the number of unlicensed outlets into the regulated market must be prioritised (Parry, 2010). A promising sign of political will and commitment to reduce alcohol-use and its related harm in South Africa has been the establishment of the Inter-Ministerial Committee on Substance Abuse, under the leadership of the Minister of Social Development (National Department of Social Development, 2011). One challenge for such a committee remains the *effective implementation* of policies that seek to restrict the access and availability of alcohol in a largely unregulated market.

To this end, the following strategies are suggested:

- While recognising that regulated alcohol trade contributes to the gross domestic product (GDP) of South Africa, a tiered approach of introducing an annual quota that brings unregulated markets into regulation, is a promising strategy. This must be incorporated into the South African government's medium term strategic framework, and accounted for by the Minister of Social Development. In effect this should mean that if quotas for bringing unregulated markets into regulation are not met, no **new** licences should be issued.
- Effective implementation of current policies and laws related to the illegal sale of, and access to, alcohol requires a concerted effort by key players within multiple departments (health, safety and security, correctional services, education). It also requires additional resources, including those required for the strict monitoring of alcohol outlet density.

Limitations

This study had some notable limitations. First, it relied on data that were self-reported and which are subject to social desirability. As discussed in Chapter two, determining the reliability and validity of data that are self-reported remains a challenge. The administration of self-administered computer based questionnaires attempted to overcome this limitation. In addition, ethical controls ensured confidentiality, and a safe and private space in which to complete the questionnaires,

together with the added advantage of the trust built with a birth cohort in a long running study. These efforts helped to enhance the quality of the data by mitigating some social-desirability bias associated with self-report.

Research adopting a socio-ecological approach is, by its very nature, more demanding than research at single level. A challenge of applying ecological models lies in the fact that there should be appropriate and objective units of analysis at each of the identified levels in order to meaningfully interpret what interactions occur, what the specific hypothesised relationships are, and what these relationships mean. The lack of data at different levels of the ecological framework restricted analysis to individual perceptions of what occurs at different ecological levels (peer, school, parental, community). Employing a prospective multilevel study design might yield different results from those obtained by a predominantly individual level study design, as in this study.

To overcome this limitation, in part, this thesis employed objective measures of community SES from the South African census survey to examine community SES on adolescent alcohol use. However, future research must take into account the prospective employment of multi-level designs to examine contextual differences in addition to individual level differences in this cohort.

Limited prospective research exists on the patterns of alcohol among South African youth. The Bt20 study, being a longitudinal birth cohort study, offered the potential for alcohol use and misuse to be studied over a period of time and at key development stages in the life course of adolescents. However, given that earlier alcohol use data (at 13-16 years) were recorded in far less depth and detail than the year 18 year old data, meaningful longitudinal analyses could not be conducted. Nonetheless, the available data did provide an opportunity for adolescent alcohol use to be studied cross-sectionally at two key development points in the life course, namely, pre-adolescence and late adolescence/early adulthood. Furthermore, the alcohol measures that were introduced expressly as part of this PhD highlighted the importance of recording detailed alcohol use information so that future empirical research undertaken in the birth cohort will benefit from longitudinal analyses.

This study also collected limited information on parental level influences on alcohol use. Future prospective research in the cohort should consider parent-child communication, parental monitoring and parent-child bonding as correlates of

adolescent alcohol use. This will enable an examination of both the direct and mediational effects of parenting on alcohol behaviours in the cohort.

Strengths

Despite the noted limitations, this PhD thesis has several strengths. First, the study employed data from South Africa's largest and longest running study of child and adolescent health and development. Bt20 is one of the few large-scale longitudinal studies in the sub-Saharan African region and the developing world. Its captive audience of urban adolescents provides solid platform for examining the etiology of alcohol (and other risk behaviours), understanding the determinants of such risk behaviours and informing intervention based work. Second, it undertook the first analyses of Bt20 data on alcohol use in the cohort. It provides a strong basis for future work that can investigate more complex longitudinal analyses, for example co-risking behaviours at key developmental points in the life-course of the cohort and, potentially, in relation to other life events. Third, it signals the need for substantive analyses on the role of the family in determining adolescent alcohol use. In particular, this study elucidated the need for substantive analysis of parenting behaviours and parental drinking as determinants of alcohol use.

Finally, unlike household- and school-based behaviour surveys, this study was able to capture alcohol use among adolescents as they progressed from school to out of school, when determinants of their risk behaviours might change.

Future research directions

Undertaking this PhD elucidated many research questions which could not be answered within the scope of this study. Notwithstanding the potential for further, more complex longitudinal analyses, the recommendations for future research apply differentially to the Bt20 cohort and South African adolescents.

The lack of objective data at higher levels of the socio-ecological model (e.g. parental, community and policy measures) meant this study was unable to measure the potential interrelations of factors within multiple ecological domains to explain adolescent alcohol use in the Bt20 cohort. It also did not permit an exploration of whether individual, interpersonal and community influences were bi-directional or not. However, these remain critical areas for future research.

Following well-established research which indicates that preventing disease and disability among populations is best initiated early in the life course if one expects to see returns on health investments (Sawyer et al., 2012), this study was able to signal early detection of youth at risk for alcohol use that could potentially predict alcohol early initiation and/or problem drinking. The consistent early initiation of alcohol use highlighted in Chapter three suggests that prevention efforts should begin much earlier in an effort to reach children before they begin drinking.

A useful first step to reducing volume and patterns of (heavy/episodic) drinking in the Bt20 cohort would be to identify the sub-groups of early initiators, late starters and high risk drinkers. Identifying trajectories from early to mid-adolescence can function as a means of both initiating prevention earlier in the developmental life course, and intervening with problem drinkers before they enter young adulthood when alcohol use patterns become more entrenched. In keeping with an asset-based approach, it is plausible that identifying the asset profiles (individual, interpersonal and environmental) may be a useful route to explore in bringing about small but steady positive changes in this group. In addition, tailoring programmes to suit the risk and asset profiles of this sub-group of drinkers could provide a good return on the investment of resources.

The issue of drinking environments in a country with unique geo-political issues necessitates further research on the role of both legal and illegal alcohol outlet densities in adolescent alcohol use and alcohol-related harm. Specialised research methods, including GIS and spatial analysis, provide a fast developing system of applying socio-ecological frameworks to health problems. Studies employing these and other methods (e.g. ethnographic, content analysis) would advance our understanding of how drinking environments and their locations impact alcohol use and its related harms.

Additionally, based on previous evidence that risk behaviours tend to cluster in adolescence (Newbury-Birch et al., 2012; Connell, Gilreath, & Hansen, 2009), the Bt20 study examines adolescent development along a range of risk behaviours (including smoking and sexual risk). Although not within the scope of this PhD, findings from this study can add to a cohort analysis of risk behaviour clustering in early and later adolescence. This can be achieved by systematically comparing the prevalence rates of risk behaviours in the cohort. This will lend itself to an examination of co-risks taking behaviours in adolescence, a comparison of when risk

behaviours first emerge in the life course, how they progress, and what determines these risks. Those analyses could inform the design of broader risk reduction and asset-based interventions which can comprehensively address multiple risk-taking behaviours and associated risk and protective determinants (Kipping, Campbell, MacArthur, Gunnell, & Hickman, 2012).

The intervals of the Bt20 data collection waves resulted in this study simultaneously examining alcohol use among 17 year old adolescents (for whom alcohol use was illegal) and 18 year old adolescents (for whom alcohol use is legal). As such, it was not possible to differentiate models for those for whom alcohol was illegal versus those for whom alcohol was legal. Future prospective research is required to examine the effect of in school participants who were of legal drinking age versus those in school who were not of legal age. Finally, alcohol use poses a significant threat to the health and social well-being of adolescents. The direct associations between alcohol use and unintentional injuries and mortality, demonstrated by findings presented in Chapter three, attest to this. The indirect costs suffered by families, peers and communities in the face of alcohol-attributable morbidity and mortality raise the need for further examination of the issue of alcohol's (physical, social, and psychological) harm to others in the South Africa context. Such evidence-based work can leverage further support from national government, researchers and practitioners to address alcohol behaviours among adolescents. Furthermore, it has the potential to buy in support from, and amplify the voices of, the very communities affected by the scourge of alcohol problems.

Conclusion

South Africa is faced with a formidable threat to individual and public health, should the current drinking situation persist. The fact that young people are at the heart of this threat is worrying. While knowing how much, where and what they drink, are essential indicators for prevention and harm reduction, knowing why they drink and how influences converge to impact their drinking, is equally important. Comprehensively addressing adolescent alcohol use and misuse requires high-level political commitment and prevention/ harm reduction interventions that are evidence-based. In addition, authoritative and consistent implementation of alcohol laws will

ensure that the adoption of positive health behaviours is supported. Finally, continuing research, lobbying and advocacy will ensure that alcohol remains on the agenda of public health practitioners, politicians and communities alike. A multi-faceted approach that addresses the determinants of adolescent drinking and non-drinking from individual and interpersonal, through to social and political levels, is required to comprehensively deal with adolescent alcohol use. Advancing our understanding of this “why question” has only just begun.

REFERENCES

- Agartz, I., Momenan, R., Rawlings, R. R., Kerich, M. J., & Hommer, D. W. (1999). Hippocampal volume in patients with alcohol dependence. *Archives of General Psychiatry*, 56(4), 356-363.
- Ahrari M., Kuttab A., Khamis S., Farahat A.A., Darmstadt G.L., Marsh D.R., et al. (2002). Socioeconomic and behavioural factors associated with successful pregnancy outcomes in upper Egypt: A positive deviance inquiry. *Food Nutrition Bulletin*, 23, 83-8.
- American Medical Association. (2004). *Girlie drinks... women's diseases*. Chicago, IL: AMA. Retrieved May, 2012, from http://www.alcoholpolicymd.com/pdf/girlie_drinks_survey%20.pdf
- American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders, (DSM-IV) (5th ed.)*. Arlington, Virginia, USA: American Psychiatric Publishing.
- Anderson, P., & Baumberg, B. (2006). Alcohol in Europe. *London: Institute of Alcohol Studies*, 2, 73-75
- Anderson, P., Bruijn, A.D., Angus, K., Gordon, R., & Hastings, G. (2009). Impact of alcohol advertising and media exposure on adolescent alcohol use: A systematic review of longitudinal studies. *Alcohol and Alcoholism*, 44(3), 229-243.
- Andrews, G., & Peters, L. (1998). The psychometric properties of the composite international diagnostic interview. *Social Psychiatry and Psychiatric Epidemiology*, 33(2), 80-88.
- Arthur, M. W., Hawkins, J. D., Pollard, J. A., Catalano, R. F., & Baglioni, A. J. J. (2002). Measuring risk and protective factors for use, delinquency, and other adolescent problem behaviours the communities that care youth survey. *Evaluation Review*, 26(6), 575-601.
- Ary, D. V., Duncan, T. E., Biglan, A., Metzler, C. W., Noell, J. W., & Smolkowski, K. (1999). Development of adolescent problem behaviour. *Journal of Abnormal Child Psychology*, 27(2), 141-150.
- Aspy, C. B., Vesely, S. K., Oman, R. F., Tolma, E., Rodine, S., Marshall, L., & Fluhr, J. (2012). School-Related Assets and Youth Risk Behaviors: Alcohol Consumption and Sexual Activity. *Journal of School Health*, 82(1), 3-10.
- Babor, T. F., Campbell, R., Room, R., & Saunders, J. (1994). *Lexicon of Alcohol and Drug Terms*. Geneva: Switzerland: WHO Press.

- Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., & Monteiro, M. G. (2001). *The alcohol use disorders identification test. Guidelines for use in primary care 2.*
- Babor, T. F., Stephens, R. S., & Marlatt, G. A. (1987). Verbal report methods in clinical research on alcoholism: Response bias and its minimization. *Journal of Studies on Alcohol and Drugs*, 48(05), 410.
- Babor, T., Caetano, R., Casswell, S., Edwards, G., Giesbrecht, N., Graham, K., & Rossow, I. (2003). Alcohol: no ordinary commodity—a consumer’s guide to public policy. *Alcohol: no ordinary commodity-a consumer's guide to Public Policy.*
- Bahr, S. J., Hoffman, J. P., & Yang, X. (2005). Parental and peer influences on the risk of adolescent drug use. *The Journal of Primary Prevention*, 26, 529-551.
- Baker, T. K., Johnson, M. B., Voas, R. B., & Lange, J. E. (2000). To reduce youthful binge drinking: Call an election in Mexico. *Journal of Safety Research*, 31(2), 61-69.
- Bakke, Ø., & Endal, D. (2010). Vested interests in addiction research and policy alcohol policies out of context: Drinks industry supplanting government role in alcohol policies in sub-Saharan Africa. *Addiction*, 105(1), 22-28.
- Battin-Pearson, S., Newcomb, M. D., Abbott, R. D., Hill, K. G., Catalano, R. F., & Hawkins, J. D. (2000). Predictors of early high school dropout: A test of five theories. *Journal of Educational Psychology*, 92(3), 568.
- Baumrind, D. (1991). Parenting styles and adolescent development. *The encyclopedia of adolescence*, 2, 746-58.
- Bloomfield, K., Hope, A., & Kraus, L. (2013). Alcohol survey measures for Europe: A literature review. *Drugs: Education, Prevention and Policy*, 20(5), 348-360.
- Boden, J. M., & Fergusson, D. M. (2011). The short and long term consequences of adolescent alcohol use. *Young People and Alcohol: Impact, Policy, Prevention and Treatment. Chichester: Wiley-Blackwell*, 32-46.
- Bogensneider, K., Wu, M. Y., Raffaelli, M., & Tsay, J. C. (1998). Parent influences on adolescent peer orientation and substance use: The interface of parenting practices and values. *Child Development*, 69(6), 1672-1688.

- Borawski, E. A., Ievers-Landis, C., Lovegreen, L. D., & Trapl, E. S. (2003). Parental monitoring, negotiated unsupervised time, and parental trust: the role of perceived parenting practices in adolescent health risk behaviours. *Journal of Adolescent Health, 33*, 60-70.
- Borsari, B., & Carey, K. B. (2001). Peer influences on college drinking: A review of the research. *Journal of Substance Abuse, 13*(4), 391-424.
- Bot, S. M., Engels, R. C., Knibbe, R. A., & Meeus, W. H. (2005). Friend's drinking behaviour and adolescent alcohol consumption: The moderating role of friendship characteristics. *Addictive Behaviours, 30*(5), 929-947.
- Bouchery, E. E., Harwood, H. J., Sacks, J. J., Simon, C. J., & Brewer, R. D. (2011). Economic costs of excessive alcohol consumption in the US, 2006. *American Journal of Preventive Medicine, 41*(5), 516-524.
- Boyce, W. F., Davies, D., Gallupe, O., & Shelley, D. (2008). Adolescent risk taking, neighbourhood social capital, and health. *Journal of Adolescent Health, 43*(3), 246-252.
- Bradley, B. J., & Greene, A. C. (2013). Do health and education agencies in the United States share responsibility for academic achievement and health? A review of 25 years of evidence about the relationship of adolescents' academic achievement and health behaviours. *Journal of Adolescent Health, 52*(5), 523-532.
- Brady, M. (2000). Alcohol policy issues for indigenous people in the United States, Canada, Australia and New Zealand. *Contemporary Drug Problems, 27*(3), 433-509.
- Brenner, A. B., Bauermeister, J. A., & Zimmerman, M. A. (2011). Neighbourhood variation in adolescent alcohol use: Examination of socioecological and social disorganization theories. *Journal of Studies on Alcohol and Drugs, 72*(4), 651.
- Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist, 32*(7), 513.
- Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Cambridge, MA: Harvard University Press: Brook, D. W., Rubenstone, E., Zhang, C., Morojele, N. K., & Brook, J. S. (2011). Environmental stressors, low well-being, smoking, and alcohol use among South African adolescents. *Social Science & Medicine, 72*(9), 1447-1453.

- Brook, J. S., Morojele, N. K., Pahl, K., & Brook, D. W. (2006). Predictors of drug use among South African adolescents. *Journal of Adolescent Health, 38*(1), 26-34.
- Brooks, F. M., Magnusson, J., Spencer, N., & Morgan, A. (2012). Adolescent multiple risk behaviour: an asset approach to the role of family, school and community. *Journal of Public Health, 34*(suppl 1), i48-i56.
- Bryden, A., Roberts, B., McKee, M., & Petticrew, M. (2012). A systematic review of the influence on alcohol use of community level availability and marketing of alcohol. *Health & Place, 18*(2), 349-357.
- Budlender, D. (2009). National and provincial government spending and revenue related to alcohol abuse. *Johannesburg: Soul City*.
- Bushman, B. J. (1997). Effects of alcohol on human aggression: Validity of proposed mechanisms. In: M. Galanter, (Ed). *Recent Developments in Alcoholism, 13*, 227-244.
- Campbell, C. A., Hahn, R. A., Elder, R., Brewer, R., Chattopadhyay, S., Fielding, J. et al. (2009). The effectiveness of limiting alcohol outlet density as a means of reducing excessive alcohol consumption and alcohol-related harms. *American Journal of Preventive Medicine, 37*(6), 556-569.
- Centers for Disease Control and Prevention. (2009). ***Global school-based student health survey***. Retrieved April 2010, 2009, from <http://www.cdc.gov/gshs>
- Chaloupka, F. J., Grossman, M., & Saffer, H. (2002). The effects of price on alcohol consumption and alcohol-related problems. *Alcohol Research and Health, 26*(1), 22-34.
- Chen, M. J., Grube, J. W., & Gruenewald, P. J. (2010). Community alcohol outlet density and underage drinking. *Addiction, 105*(2), 270-278.
- Chen, M., Gruenewald, P. J., & Remer, L. G. (2009). Does alcohol outlet density affect youth access to alcohol? *Journal of Adolescent Health, 44*(6), 582-589.
- Chiambaretto P. & Dumez H. (2012). The role of bundling in marketing strategy of companies: A Synthesis, *Research and Applications in Marketing, 27*(2), 91-106.
- Chikere, E. I., & Mayowa, M. O. (2011). Prevalence and perceived health effect of alcohol use among male undergraduate students in Owerri, South-East Nigeria: A descriptive cross-sectional study. *BMC Public health, 11*(1), 118.
- Christiansen, K. M., Qureshi, F., Schaible, A., Park, S., & Gittelsohn, J. (2013). Environmental factors that impact the eating behaviours of low-income

- African American adolescents in Baltimore City. *Journal of Nutrition Education and Behaviour*, 45(6), 652-660.
- Cicognani, E., & Zani, B. (2011). Alcohol use among Italian university students: the role of sensation seeking, peer group norms and self-efficacy. *Journal of Alcohol and Drug Education*, 55(2), 17-36.
- Cloninger, C. R., Bohman, M., Sigvardsson, S., & von Knorring, A. L. (1985). Psychopathology in adopted-out children of alcoholics the Stockholm adoption study. In *Recent developments in alcoholism* (pp. 37-51). Springer US.
- Community Agency for Social Enquiry (CASE) 2006. World Health Survey 2003: Report of South Africa. Geneva: World Health Organisation.
- Connell, C. M., Gilreath, T. D., & Hansen, N. B. (2009). A multi-process latent class analysis of the co-occurrence of substance use and sexual risk behaviour among adolescents. *Journal of Studies on Alcohol and Drugs*, 70(6), 943.
- Connor, J. P., George, S. M., Gullo, M. J., Kelly, A. B., & Young, R. M. (2011). A prospective study of alcohol expectancies and self-efficacy as predictors of young adolescent alcohol misuse. *Alcohol and Alcoholism*, 46(2), 161-169.
- Coovadia, H., Jewkes, R., Barron, P., Sanders, D., & McIntyre, D. (2009). The health and health system of South Africa: historical roots of current public health challenges. *The Lancet*, 374, 817-834.
- Corrao, G., Bagnardi, V., Zambon, A., & La Vecchia, C. (2004). A meta-analysis of alcohol consumption and the risk of 15 diseases. *Preventive Medicine*, 38(5), 613-619.
- Cupp, P.K., Zimmerman, R.S., Bhana, A., Feist-Price, S., Dekhtyar, O., Karnell, A. & Ramsoomar, L. (2008). Combining and adapting American school-based alcohol and HIV prevention programmes in South Africa: The HAPS project. *Vulnerable Children and Youth Studies*, 3(2):134–42.
- Currie, J., & Goodman, J. (2010). Parental SES and child health. In P. Peterson, E. Baker, & B. McGaw (Eds.), *International Encyclopaedia of Education* (3rd ed.) (pp. 253-259). Amsterdam: Elsevier.
- Davis, A., Quimby, A., Odero, W., Gururaj, G., & Hijar, M. (2003). Improving road safety by reducing impaired driving in developing countries: A scoping study. *Project Report*, 724(03).
- De Boni, R., do Nascimento Silva, P. L., Bastos, F. I., Pechansky, F., & de Vasconcellos, M. T. L. (2012). Reaching the hard-to-reach: A probability

- sampling method for assessing prevalence of driving under the influence after drinking in alcohol outlets. *PLoS One*, 7(4), e34104.
- Dearden, K. A., Quan, L. N., Do, M., Marsh, D. R., Pachón, H., Schroeder, D. G., & Lang, T. T. (2002). Work outside the home is the primary barrier to exclusive breastfeeding in rural Viet Nam: insights from mothers who exclusively breastfed and worked. *Food & Nutrition Bulletin*, 23(Supplement 2), 99-106.
- Department of Agriculture. (2007). *Amendment to Liquor Products Act 60 of 1989*. Pretoria: Department of Agriculture.
- Department of Health, (2012). Regulations Relating to Foodstuffs for Infants and Young Children. R 991/6. Retrieved December 2014 from <http://www.info.gov.za/view/DownloadFileAction?id=180046>
- Department of Health, Medical Research Council, OrcMacro. (2007). *South Africa Demographic and Health Survey 2003*. Pretoria: DoH.
- Department of Health, Medical Research Council. (2003). *South Africa Demographic and Health Survey 1998*. Pretoria: DoH.
- Department of Trade and Industry (2004). The national liquor act 59 of 2003. Cape Town: South Africa
- DeWitt, D. J., Adlaf, E. M., Offord, D. R., & Ogborne, A. C. (2000). Age at first alcohol use: A risk factor for the development of alcohol disorders. *American Journal of Psychiatry*, 157(5), 665-665
- Diclemente, J. R., Salazar, F. L., Crosby, A. R., & Rosenthal, L. S. (2005). Prevention and control of sexually transmitted infections among adolescents: The importance of a social ecological perspective-a commentary. *Public Health*, 19(9), 825-836.
- Dishion, T. J., Capaldi, D. M., & Yoerger, K. (1999). Middle childhood antecedents to progressions in male adolescent substance use: An ecological analysis of risk and protection. *Journal of Adolescent Research*, 14(2), 175-205.
- Diez Roux, A. V. (2001). Investigating neighbourhood and area effects on health. *American Journal of Public Health*, 91(11), 1783-1789.
- Donovan, J. E. (2004). Adolescent alcohol initiation: A review of psychosocial risk factors, *Journal of Adolescent Health*, 35(6), 529e-7.
- Donovan, J. E. (2009). Estimated blood alcohol concentrations for child and adolescent drinking and their implications for screening instruments. *Paediatrics*, 123(6), e975-e981.

- Donovan, J. E. (2014). The burden of alcohol use: Focus on children and preadolescents. *Alcohol Research: Current Reviews*, 35(2), 186.
- Dryfoos, J. G. (1991). Adolescent at risk: A summation of a work in the field: Programs and polices: Special issue: Adolescents at risk. *Journal of Adolescent Health*, 12, 630.
- Eaton, D. K., Kann, L., Kinchen, S., Shanklin, S., Flint, K. H., Hawkins, J. & Wechsler, H. (2012). Youth Risk Behaviour Surveillance--United States, 2011. Morbidity and Mortality Weekly Report. Surveillance Summaries. Volume 61, Number 4. *Centers for Disease Control and Prevention*.
- Eaton, L. & Flisher, A.J. (2001). Why do you people engage in unsafe sex? *South African Journal of Psychiatry*, 7, 55-57.
- Echeverría, S., Diez-Roux, A. V., Shea, S., Borrell, L. N., & Jackson, S. (2008). Associations of neighbourhood problems and neighbourhood social cohesion with mental health and health behaviours: The multi-ethnic study of atherosclerosis. *Health & Place*, 14(4), 853-865.
- Ennett, S. T., & Bauman, K. E. (1991). Mediators in the relationship between parental and peer characteristics and beer drinking by early Adolescents¹. *Journal of Applied Social Psychology*, 21(20), 1699-1711.
- Ennett, S. T., Foshee, V. A., Bauman, K. E., Hussong, A., Cai, L., Reyes, H. L. M., & DuRant, R. (2008). The social ecology of adolescent alcohol misuse. *Child Development*, 79(6), 1777-1791.
- Ewing, J. A. (1984). Detecting alcoholism: The CAGE questionnaire. *JAMA: Journal of the American Medical Association*, 252(14), 1905-1907.
- Faggiano, F., Vigna-Taglianti, F. D., Versino, E., Zambon, A., Borraccino, A., & Lemma, P. (2005). School-based prevention for illicit drugs' use. *Cochrane Database Systematic Reviews*, 2.
- Fergus, S., Zimmerman, M. A., & Caldwell, C. H. (2007). Growth trajectories of sexual risk behaviour in adolescence and young adulthood. *American Journal of Public Health*, 97(6), 1096-1101.
- Flanagan, V., Schoenberg, C., & Lomofsky, D. (2002). *Final Report: Study to Examine the Impact of the Production and Sale of Cheap Wine in South Africa*. Pretoria: National Agricultural Marketing Council.

- Flisher, A. J., & Chalton, D. O. (1995). High school drop-outs in working class South African community: Selected characteristics and risk taking behaviour. *Journal of Adolescence, 18*, 105-121.
- Flisher, A. J., Parry, C. D., Evans, J., Muller, M., & Lombard, C. (2003). Substance use by adolescents in Cape Town: Prevalence and correlates. *Journal of Adolescent Health, 32*(1), 58-65.
- Flory, K., Lynam, D., Milich, R., Leukefeld, C., & Clayton, R. (2004). Early adolescent through young adult alcohol and marijuana use trajectories: Early predictors, young adult outcomes, and predictive utility. *Development and Psychopathology, 16*(1), 193-213.
- Foot, J., & Hopkins, T. (2010). *A glass half-full: How an asset approach can improve community health and well-being*. Great Britain Improvement and Development Agency.
- Foster, D. W., Yeung, N., & Neighbors, C. (2014). I think I can't: Drink refusal self-efficacy as a mediator of the relationship between self-reported drinking identity and alcohol use. *Addictive Behaviours, 39*(2), 461-468.
- Foster, D. W., Young, C. M., Bryan, J., Steers, M. L. N., Yeung, N. C., & Prokhorov, A. V. (2014). Interactions among drinking identity, gender and decisional balance in predicting alcohol use and problems among college students. *Drug and Alcohol Dependence, 143*, 198-205.
- Foxcroft, D.R. & Tsertsvadze, A. (2011). Universal school-based prevention programs for alcohol misuse in young people. *Cochrane Database Systematic Review*. Art. No.: CD009113.
- Fraser, M. W. (1997). *Risk and resilience in childhood: An ecological perspective*. National Association of Social Work Press: Washington DC.
- Fraser, A. M., Brockert, J. E., & Ward, R. H. (1995). Association of young maternal age with adverse reproductive outcomes. *New England Journal of Medicine, 332*(17), 1113-1118.
- Fuhr, D. C., & Gmel, G. (2011). What is alcohol per capita consumption of adults telling us about drinking and smoking among adolescents? A population-based study across 68 countries. *Alcohol and Alcoholism, 46*(1), 88-92.
- Fuhr, D. C., Fleischmann, A., Riley, L., Kann, L., & Poznyak, V. (2013). Alcohol and other psychoactive substances in Africa and the Americas: Results from the

- WHO Global school-based student health survey. *Journal of Substance Use*, 19(3), 274-282.
- Galvez, M. P., Pearl, M., & Yen, I. H. (2010). Childhood obesity and the built environment: A review of the literature from 2008-2009. *Current Opinion in Paediatrics*, 22(2), 202.
- Gelmanova, I. Y., Keshavjee, S., Golubchikova, V. T., Berezina, V. I., Strelis, A. K., Yanova, G. V. & Murray, M. (2007). Barriers to successful tuberculosis treatment in Tomsk, Russian Federation: Non-adherence, default and the acquisition of multidrug resistance. *Bulletin of the World Health Organization*, 85(9), 703-711.
- Ghuman, S., Meyer-Weitz, A., & Knight, S. (2012). Prevalence patterns and predictors of alcohol use and abuse among secondary school students in Southern KwaZulu-Natal, South Africa: Demographic factors and the influence of parents and peers. *South African Family Practice*, 54(2), 535-544.
- Giancola, P. R., Josephs, R. A., Parrott, D. J., & Duke, A. A. (2010). Alcohol myopia revisited: Clarifying aggression and other acts of disinhibition through a distorted lens. *Perspectives on Psychological Science*, 5, 265-578.
- Giles-Corti, B., Broomhall, M. H., Knuiaman, M., Collins, C., Douglas, K., Ng, K., & Donovan, R. J. (2005). Increasing walking: How important is distance to, attractiveness, and size of public open space? *American Journal of Preventive Medicine*, 28(2), 169-176.
- Gill, S. K., Broussard, C., Devine, O., Green, R. F., Rasmussen, S. A., & Reefhuis, J. (2012). Association between maternal age and birth defects of unknown etiology—United States, 1997–2007. *Birth Defects Research Part A: Clinical and Molecular Teratology*, 94(12), 1010-1018.
- Gmel, G., & Rehm, J. (2004). Measuring alcohol consumption. *Contemporary Drug Problems*, 31, 467.
- Gmel, G., Studer, J., Deline, S., Baggio, S., N'Goran, A., Mohler-Kuo, M., et al. (2014). More is not always better-comparison of three instruments measuring volume of drinking in a sample of young men and their association with consequences. *Journal of Studies on Alcohol and Drugs*, 75(5), 880-888.
- Gordhan, P. (2013). Budget speech. Republic of South Africa, Pretoria: Government Printers.

- Grant, B. F. (1998). Age at smoking onset and its association with alcohol consumption and DSM-IV alcohol abuse and dependence: Results from the national longitudinal alcohol epidemiologic survey. *Journal of Substance Abuse, 10*, 59-73.
- Grant, B.F., & Dawson, D.A. (1998). Age at onset of alcohol use and its association with DSM–IV alcohol abuse and dependence: Results from the national longitudinal alcohol epidemiologic survey. *Journal of Substance Abuse, 9*, 103.
- Gray, D., Saggars, S., Sputore, B., & Bourbon, D. (2000). What works? A review of evaluated alcohol misuse interventions among aboriginal Australians. *Addiction, 95*(1), 11-22.
- Gruenewald, P. J. & Remer, L. (2006). Changes in outlet densities affect violence rates. *Alcoholism: Clinical and Experimental Research, 30*(7), 1184-1193.
- Gruenewald, P. J. (2011). Regulating availability: How access to alcohol affects drinking and problems in youth and adults. *Alcohol Research and Health, 34*(2), 248.
- Guo, J., Chung, I. J., Hill, K. G., Hawkins, J. D., Catalano, R. F., & Abbott, R. D. (2002). Developmental relationships between adolescent substance use and risky sexual behaviour in young adulthood. *Journal of Adolescent Health, 31*(4), 354-362.
- Hanewinkel, R., & Sargent, J. D. (2009). Longitudinal study of exposure to entertainment media and alcohol use among German adolescents. *Paediatrics, 123*(3), 989-995.
- Hanewinkel, R., Sargent, J. D., Poelen, E. A., Scholte, R., Florek, E., Sweeting, H., et al. (2012). Alcohol consumption in movies and adolescent binge drinking in 6 European countries. *Pediatrics, 129*(4), 709-720.
- Hanewinkel, R., Tanski, S. E., & Sargent, J. D. (2007). Exposure to alcohol use in motion pictures and teen drinking in Germany. *International Journal of Epidemiology, 36*(5), 1068-1077.
- Hanson, M., & Chen, E. (2007). Socio-economic status and health behaviours in adolescence: A review of the literature. *Journal of Behavioural Medicine, 30*, 263-285.
- Hargreaves, J. R., Morison, L. A., Gear, J. S. S., Kim, J. C., Makhubele, M. B., Porter, J. D., et al. (2007). Assessing household wealth in health studies in developing

- countries: A comparison of participatory wealth ranking and survey techniques from rural South Africa. *Emerging Themes in Epidemiology*, 4, 1-9.
- Hawkins, J. D., Arthur, M. W., & Catalano, R. F. (1995). Preventing substance abuse. *Crime & Justice*, 19, 343.
- Hawkins, J. D., Catalano, R. F., & Miller, J. Y. (1992). Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. *Psychological Bulletin*, 112, 64–105.
- Hawkins, J. D., & Weis, J. G. (1985). The social development model: An integrated approach to delinquency prevention. *Journal of Primary Prevention*, 6(2), 73-97.
- Hayatbakhsh, M. R., Najman, J. M., Bor, W., Clavarino, A., & Alati, R. (2011). School performance and alcohol use problems in early adulthood: A longitudinal study. *Alcohol*, 45(7), 701-709.
- Henry, K. L., Knight, K. E., & Thornberry, T. P. (2012). School disengagement as a predictor of dropout, delinquency, and problem substance use during adolescence and early adulthood. *Journal of Youth and Adolescence*, 41(2), 156-166.
- Herrman, H., Stewart, D. E., Diaz-Granados, N., Berger, E. L., Jackson, B., & Yuen, T. (2011). What is resilience? *Canadian Journal of Psychiatry*, 56(5), 258-265.
- Hibell, B., Guttormsson, U., Ahlstrom, S., Balakireva, O., Bjarnason, T., Kokkevi, A. E., et al. (2012). *The 2011 ESPAD report- Substance use among students in 36 European countries*. Stockholm: Swedish Council for Information on Alcohol and Other Drugs (CAN).
- Hingson, R. W., Edwards, E. M., Heeren, T., & Rosenbloom, D. (2009). Age of drinking onset and injuries, motor vehicle crashes, and physical fights after drinking and when not drinking. *Alcoholism: Clinical and Experimental Research*, 33(5), 783-790.
- Hirschi, T. (2002). *Causes of delinquency*. Berkeley, California: University of California Press.
- Hollander, J., & Haber, L. (1992). Ecological transition: Using Bronfenbrenner's model to study sexual identity change. *Health Care for Women International*, 13(2), 121-129.

- Hong, J. S., Huang, H., Sabri, B., & Kim, J. S. (2011a). Substance abuse among Asian American youth: An ecological review of the literature. *Children and Youth Services Review, 33*(5), 669-677.
- Hong, J. S., Lee, N. Y., Grogan-Kaylor, A., & Huang, H. (2011b). Alcohol and tobacco use among South Korean adolescents: An ecological review of the literature. *Children and Youth Services Review, 33*(7), 1120-1126.
- Hoque, M., & Ghuman, S. (2012). Do parents still matter regarding adolescents' alcohol drinking? Experience from South Africa. *International Journal of Environmental Research and Public Health, 9*, 110-122.
- Huckle, T., You, R. Q., & Casswell, S. (2010). Socio-economic status predicts drinking patterns but not alcohol-related consequences independently. *Addiction, 105*, 1192-1202.
- Huis in 't Veld, D., Skaal, L., Peltzer, K., Colebunders, R., Ndimande, J.V., Pengpid, S. (2012). The efficacy of a brief intervention to reduce alcohol misuse in patients with HIV in South Africa: Study protocol for a randomized controlled trial. *Trials, 13*, 190-196.
- Huizink, A. C., & Mulder, E. J. (2006). Maternal smoking, drinking or cannabis use during pregnancy and neurobehavioral and cognitive functioning in human offspring. *Neuroscience & Biobehavioral Reviews, 30*(1), 24-41.
- Humensky, J. F. (2012). Are adolescents with high socioeconomic status more likely to engage in alcohol and illicit drug use in early adulthood? *Substance Abuse Treatment, Prevention, and Policy, 5*, 19-28.
- Hutchinson, M. K., Jemmot, J. B., Jemmot, L. S., Braverman, P., & Fong G. T. (2003). The role of mother-daughter sexual risk communication in reducing sexual risk behaviours among urban adolescent females: A prospective study. *Journal of Adolescent Health, 33*, 98-107.
- Jackson, N., Denny, S., & Ameratunga, S. (2014). Social and socio-demographic community effects on adolescent alcohol use: A systematic review of multi-level studies. *Social Science & Medicine, 115*, 10-20.
- Jang, S. A., Cho, N., & Yoo, J. (2011). Understanding the antecedents of Korean high school students' drinking refusal self-efficacy: Parental influence, peer influence, and behaviour. *Global Journal of Health Science, 4*(1), 10-21.

- Jang, S. A., Rimal, R. N., & Cho, N. (2013). Normative influences and alcohol consumption: The role of drinking refusal self-efficacy. *Health Communication, 28*(5), 443-451.
- Jencks, C., & Mayer, S. E. (1990). *The social consequences of growing up in a poor Community*. National Academy Press: Washington, DC.
- Jewkes, R. K., Dunkle, K., Nduna, M., & Shai, N. (2010). Intimate partner violence, relationship power inequity, and incidence of HIV infection in young women in South Africa: a cohort study. *The Lancet, 376*(9734), 41-48.
- Jewkes, R., Levin, J., & Penn-Kekana. (2002). Risk factors for domestic violence: Finding from a South African cross-sectional study. *Social Science and Medicine, 55*, 1603-1617.
- Johnston, L. D., O'Malley, P. M., Miech, R. A., Bachman, J. G., & Schulenberg, J. E. (2015). *Monitoring the future national survey results on drug use: 1975-2014: Overview, key findings on adolescent drug use*. Ann Arbor: Institute for Social Research, The University of Michigan.
- Jones, B. T., Corbin, W., & Fromme, K. (2001). A review of expectancy theory and alcohol consumption. *Addiction, 96*(1), 57-72.
- Jones, S. C., & Magee, C. A. (2011). Exposure to alcohol advertising and alcohol consumption among Australian adolescents. *Alcohol and Alcoholism, 46*(5), 630-637.
- Kadden, R. M., & Litt, M. D. (2011). The role of self-efficacy in the treatment of substance use disorders. *Addictive Behaviours, 36*(12), 1120-1126.
- Kalichman, S. C., Simbayi, L. C., Kagee, A., Toefy, Y., Jooste, S., Cain, D., & Cherry, C. (2006). Associations of poverty, substance use, and HIV transmission risk behaviours in three South African communities. *Social Science & Medicine, 62*(7), 1641-1649.
- Karnell, A.P., Cupp, P.K., Zimmerman, R.S., Feist-Price, S. & Bennie, T. (2006). Efficacy of an American alcohol and HIV prevention curriculum adapted for use in South Africa: Results of a pilot study in five township schools. *AIDS Education and Prevention, 18*(4), 295-310.
- Karriker-Jaffe, K. J. (2011). Areas of disadvantage: A systematic review of effects of area-level socioeconomic status on substance use outcomes. *Drug and Alcohol Review, 30*(1), 84-95.

- Keller, M., McCormick, H., & Efron, V. (1982). *A dictionary of words about alcohol*. Brunswick, NJ: Rutgers Center of Alcohol Studies.
- Kelly, A. B., Toumbourou, J. W., O'Flaherty, M., Patton, G. C., Homel, R., Connor, J. P., & Williams, J. (2011). Family relationship quality and early alcohol use: Evidence for gender-specific risk processes. *Journal of Studies on Alcohol and Drugs*, 72(3), 399.
- Keyes, K. M., Schulenberg, J. E., O'Malley, P. M., Johnston, L. D., Bachman, J. G., Li, G., & Hasin, D. (2012). Birth cohort effects on adolescent alcohol use: The influence of social norms from 1976 to 2007. *Archives of General Psychiatry*, 69(12), 1304-1313.
- Kipping, R. R., Campbell, R. M., MacArthur, G. J., Gunnell, D. J., & Hickman, M. (2012). Multiple risk behaviour in adolescence. *Journal of Public Health (Oxford, England)*, 34 Suppl 1, i1-2.
- Kliewer, W., & Murrelle, L. (2007). Risk and protective factors for adolescent substance use: Findings from a study in selected central American countries. *Journal of Adolescent Health*, 40, 448-455.
- Knight, J. R., Shrier, L. A., Bravender, T. D., Farrell, M., Vander Bilt, J., & Shaffer, H. J. (1999). A new brief screen for adolescent substance abuse. *Archives of Paediatrics & Adolescent Medicine*, 153(6), 591-596.
- Komro, K. A., & Toomey, T. L. (2002). Strategies to prevent underage drinking. *Alcohol Research and Health*, 26(1), 5-14.
- Komro, K. A., Perry, C. L., Williams, C. L., Stigler, M. H., Farbaksh, K., & Veblen-Mortenson, S. (2001). How did project northland reduce alcohol use among young adolescents? Analysis of mediating variables. *Health Education Research*, 16(1), 59-70.
- Kumpfer, K. L., Alvarado, R., & Whiteside, H. O. (2003). Family-based interventions for substance use and misuse prevention. *Substance use & Misuse*, 38(11-13), 1759-1787.
- La Hausse, P. (1988). *Brewers beerhalls and boycotts: A history of liquor in South Africa*. Johannesburg: Ravan Press.
- Laflin, M. T., Moore-Hirsch, S., Weis, D. L., & Hayes, B. E. (1994). Use of the theory of reasoned action to predict drug and alcohol use. *Substance Use & Misuse*, 29(7), 927-940.

- Laslett, A. M., Callinan, S., & Pennay, A. (2013). The increasing significance of alcohol's harm to others research. *Drugs and Alcohol Today*, 13(3), 163-172.
- Laslett, A. M., Catalano, P., Chikritzhs, Y., Dale, C., Doran, C., Ferris, J., et al. (2010). The range and magnitude of alcohol's harm to others. Fitzroy, Victoria: AER Foundation Melbourne.
- Latkin, C., & Knowlton, A. (2005). Micro-social structural approaches to HIV prevention: A social ecological perspective. *AIDS Care*, 17(S1), 102-113.
- Lazarus, R. S. & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer Publishing.
- Leigh, B. C. (1989). In search of the seven dwarves: Issues of measurement and meaning in alcohol expectancy research. *Psychological Bulletin*, 105(3), 361.
- Lesufi, P. (2015). We must say bye to booze. *The Star Newspaper*, January 6 2015.
- Leung, R. K., Toumbourou, J. W., & Hemphill, S. A. (2014). The effect of peer influence and selection processes on adolescent alcohol use: A systematic review of longitudinal studies. *Health Psychology Review*, 8(4), 426-457.
- Leventhal, T., & Brooks-Gunn, J. (2000). The neighborhoods they live in: The effects of neighborhood residence on child and adolescent outcomes. *Psychological Bulletin*, 126, 309–337.
- Levy, D., & Sheflin, N. (1983). New evidence on controlling alcohol use through price. *Journal of Studies on Alcohol*, 44, 929-937.
- Lewin, K., & Cartwright, D. (1951). *Field Theory in Social Science*. New York: Harper.
- Lim, S. S., Vos, T., Flaxman, A. D., Danaei, G., Shibuya, K., Adair-Rohani, H., et al. (2013). A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: A systematic analysis for the global burden of disease study 2010. *The Lancet*, 380(9859), 2224-2260.
- Luthar, S.S. & Zigler, E. (1991). Vulnerability and competence: A review of research on resilience in childhood. *American Journal of Orthopsychiatry*, 61, 6-22.
- Manton, E., MacLean, S., Laslett, A. M., & Room, R. (2014). Alcohol's harm to others: Using qualitative research to complement survey findings. *The International Journal of Alcohol and Drug Research*, 3(2), 143-148.

- Marcoux, B. C., & Shope, J. T. (1997). Application of the theory of planned behaviour to adolescent use and misuse of alcohol. *Health Education Research, 12*(3), 323-331.
- Mares, S. H., van der Vorst, H., Engels, R. C., & Lichtwarck-Aschoff, A. (2011). Parental alcohol use, alcohol-related problems, and alcohol-specific attitudes, alcohol-specific communication, and adolescent excessive alcohol use and alcohol-related problems: An indirect path model. *Addictive Behaviours, 36*(3), 209-216.
- Marsden, J., Boys, A., Farrell, M., Stillwell, G., Hutchings, K., Hillebrand, J., & Griffiths, P. (2005). Personal and social correlates of alcohol consumption among mid-adolescents. *British Journal of Developmental Psychology, 23*(3), 427-450.
- Marsh, D. R., & Schroeder, D. G. (2002). The positive deviance approach to improve health outcomes: Experience and evidence from the field—Preface. *The Positive Deviance Approach to Improve Health Outcomes: Experience and Evidence from the Field, 23*(4), 3. 02). The positive deviance approach to improve health outcomes: Experience and evidence from the field—Preface. *The Positive Deviance Approach to Improve Health Outcomes: Experience and Evidence from the Field, 23*(4), 3.
- Marsh, D. R., Schroeder, D. G., Dearden, K. A., Sternin, J., & Sternin, M. (2004). The power of positive deviance. *BMJ: British Medical Journal, 329*(7475), 1177.
- Mason, M., Cheung, I., & Walker, L. (2004). Substance use, social networks, and the geography of urban adolescents. *Substance use & Misuse, 39*(10-12), 1751-1777.
- Matzopoulos, R. G., Truen, S., Bowman, B., & Corrigall, J. (2014). The cost of harmful alcohol use in South Africa. *SAMJ: South African Medical Journal, 104*(2), 127-132.
- Matzopoulos, R., Myers, J. E., Butchart, A., Corrigall, J., Peden, M., & Naledi, T. (2008). Reducing the burden of injury: An intersectoral preventive approach is needed. *SAMJ: South African Medical Journal, 98*(9), 703-705.
- Matzopoulos, R., Norman, R. & Bradshaw, D. (2004). The burden of injury in South Africa: Fatal injury trends and international comparisons. In S. Suffla, A. Van Niekerk & N. Duncan (Eds). *Crime, violence and injury prevention in South*

- Africa: Developments and challenge (pp.9-21). Tygerberg: MRC-UNISA Crime, Violence and Injury Lead Programme.
- Matzopoulos, R., Cassim, M., & Seedat, M. (2003). A profile of fatal injuries in South Africa 2002: Fourth annual report of the National Injury Mortality Surveillance System. Tygerberg: MRC-UNISA Crime, Violence and Injury Lead Programme.
- May, P. A., Gossage, J. P., Marais, A. S., Hendricks, L. S., Snell, C. L., Tabachnick, et al. (2008). Maternal risk factors for foetal alcohol syndrome and partial foetal alcohol syndrome in South Africa: A third study. *Alcoholism: Clinical and Experimental Research*, 32(5), 738-753.
- McCleary, A. M., Leickly, E., Dillworth, T., Pace, T., Desai, S., Lawrence, N., & Larimer, M. E. (2012). Drinking refusal self-efficacy as a mediator between parental monitoring and alcohol-related negative consequences in emerging adults. *Alcoholism-Clinical and Experimental research*, 36, 50.
- McLean, J. (2011). Asset based approaches for health improvement: Redressing the balance. UK: Glasgow Centre for Population Health.
- McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Education & Behaviour*, 15, 351.
- Melotti, R., Heron, J., Hickman, M., Macleod, J., Araya, R., & Lewis, G. (2011). Adolescent alcohol and tobacco use and early socioeconomic position: The birth cohort. *Pediatrics*, 127, 948-955.
- Messler, E. C., Lee, A. A., Quevillon, R. P., & Simons, R. M. (2015). Parents do matter, but why? examining two mediators of the association between parental approval and negative consequences of alcohol use. *Journal of Substance Use*, (preprint), 1-6.
- Moos, R. H. (1979). Social ecological perspectives on health. *Health Psychology: A Handbook*, 523-547.
- Moreira, M. T., Oskrochi, R., & Foxcroft, D. R. (2012). Personalised normative feedback for preventing alcohol misuse in university students: Solomon three-group randomised controlled trial. *PloS one*, 7(9), e44120.
- Morgan, A., & Ziglio, E. (2010). Revitalising the public health evidence base: An asset model. *Health assets in a global context* (pp. 3-16) Springer.

- Morojele, N.K., Brook, J.S. & Kachieng'A, M.A. (2006). Perceptions of sexual risk behaviours and substance abuse among adolescents in South Africa: A qualitative investigation. *AIDS Care*, 18 (3), 215-219.
- Morojele, N. K., & Brook, J. S. (2006). Substance use and multiple victimisation among adolescents in South Africa. *Addictive Behaviours*, 31(7), 1163-1176.
- Morojele, N. K., Kekwaletswe, C. T., & Nkosi, S. (2014). Associations between alcohol use, other psychosocial factors, structural factors and antiretroviral therapy (ART) adherence among South African ART recipients. *AIDS and Behavior*, 18(3), 519-524.
- Morojele, N. K., Muller, M., Reddy, P., Lombard, C. J., Flisher, A. J., & Ziervogel, C. F. (2002). Measurement of risk and protective factors for drug use and anti-social behaviour among high school students in South Africa. *Journal of Drug Education*, 32(1), 25-39.
- Morojele, N.K. Flisher, A.J. & Parry C.D.H, (2005). Urbanization, youth and substance use in South Africa. In I. S. Obot & S. Saxena (Eds.), *Substance Use among Young People in Urban Environments* (pp. 191-202). Geneva: World Health Organization.
- Morojele, N.K.; Brook, J.S. & Kachieng'A, M.A. (2006). Perceptions of sexual risk behaviours and substance abuse among adolescents in South Africa: A qualitative investigation. *AIDS Care*, 18 (3), 215-219.
- Mrazek, P. J., & Haggerty, R. J. (1994). *Reducing risks for mental disorders: Frontiers for preventive intervention research* National Academies Press.
- Medical Research Council, Crime, Violence and Injury Lead Programme. (2010). *A Profile of Fatal Injuries in South Africa: Tenth Annual Report 2008 of the National Injury Mortality Surveillance System*. Pretoria: MRC.
- Mukamal, K. J., Jensen, M. K., Grønbaek, M., Stampfer, M. J., Manson, J. E., Pischon, T., & Rimm, E. B. (2005). Drinking frequency, mediating biomarkers, and risk of myocardial infarction in women and men. *Circulation*, 112(10), 1406-1413.
- Myers, B., Van Heerden, M. S., Grimsrud, A., Myer, L., Williams, D. R., & Stein, D. J. (2011). Prevalence and correlates of atypical patterns of drug use progression: Findings from the South African stress and health study. *African Journal of Psychiatry*, 14(1).

- Nash, S. G., McQueen, A., & Bray, J. H. (2005). Pathways to adolescent alcohol use: Family environment, peer influence, and parental expectations. *Journal of Adolescent Health, 37*(1), 19-28.
- National Road Traffic Act 93 (1996) Retrieved 23 February 2015, from http://www.gautengonline.gov.za/Publications%20and%20Reports/National_Road_Traffic_Act_1996.pdf
- National Department of Social Development, (2011). Ethekewini resolution on second biennial substance abuse summit, 25 March 2011. Pretoria: Department of Social Development. Retrieved July 10, 2014, from http://www.dsd.gov.za/index.php?option=com_content&task=view&id=307&Itemid=106
- Newbury-Birch D., Gilvarry E., McArdle P., Venkateswaran R., Stewart S., Walker J. et al. (2008). Impact of alcohol consumption on young people: A review of reviews. Newcastle University: Institute of Health and Society.
- Oetting, E. R., & Donnermeyer, J. F. (1998). Primary socialization theory: The etiology of drug use and deviance. I. *Substance use & Misuse, 33*(4), 995-1026.
- Olds, R. S., Thombs, D. L., & Tomasek, J. R. (2005). Relations between normative beliefs and initiation intentions toward cigarette, alcohol and marijuana. *Journal of Adolescent Health, 37*(1), 75.
- Onya, H., Tessera, A., Myers, B., & Flisher, A. (2012). Adolescent alcohol use in rural South African high schools. *African Journal of Psychiatry, 15*(5), 352-357.
- Overbeek, G., Bot, S. M., Meeus, W. H., Sentse, M., Knibbe, R. A., & Engels, R. (2011). Where it's at! the role of best friends and peer group members in young adults' alcohol use. *Journal of Research on Adolescence, 21*(3), 631-638.
- Parry, C. D. (2005). A review of policy-relevant strategies and interventions to address the burden of alcohol on individuals and society in South Africa: Original article. *South African Psychiatry Review, 8*(1), 20-24.
- Parry, C. D. (2010). Alcohol policy in South Africa: A review of policy development processes between 1994 and 2009. *Addiction, 105*(8), 1340-1345.
- Parry, C. D. (2013). Testing the national alcohol policy score card (NAPSC) to assess progress in implementing a comprehensive policy response to reduce the

- harmful use of alcohol in South Africa. *The International Journal of Alcohol and Drug Research*, 3(3), 202-209.
- Parry, C. D. H., Morojele, N. K., Saban, A., & Flisher, A. J. (2004). Brief report: Social and neighbourhood correlates of adolescent drunkenness: A pilot study in Cape Town, South Africa. *Journal of Adolescence*, 27, 369-374.
- Parry, C. D., Myers, B., & Thiede, M. (2003). The case for an increased tax on alcohol in South Africa. *South African Journal of Economics*, 71(2), 265-281.
- Parry, C. D., Plüddemann, A., Steyn, K., Bradshaw, D., Norman, R., & Laubscher, R. (2005). Alcohol use in South Africa: Findings from the first demographic and health survey (1998). *Journal of Studies on Alcohol*, 66(1), 91-97.
- Parry, C., Burnhams, N. H., & London, L. (2012). A total ban on alcohol advertising: Presenting the public health case. *SAMJ: South African Medical Journal*, 102(7), 602-604.
- Parry, C., Patra, J., & Rehm, J. (2011). Alcohol consumption and non-communicable diseases: Epidemiology and policy implications. *Addiction* 106(10), 1718–1724.
- Paschall, M. J., Grube, J. W., Black, C., & Ringwalt, C. L. (2007). Is commercial alcohol availability related to adolescent alcohol sources and alcohol use? Findings from a multi-level study. *Journal of Adolescent Health*, 41(2), 168-174.
- Parry, C., Rehm, J., Poznyak, V., & Room, R. (2009). Alcohol and infectious diseases: An overlooked causal linkage? *Addiction*, 104(3), 331-332.
- Paschall, M. J., Grube, J. W., Thomas, S., Cannon, C., & Treffers, R. (2012). Relationships between local enforcement, alcohol availability, drinking norms, and adolescent alcohol use in 50 California cities. *Journal of Studies on Alcohol and Drugs*, 73(4), 657.
- Patrick, M. E., Wightman, P., Schoeni, R. F., & Schulenberg, J. E. (2012). Socioeconomic status and substance use among young adults: A comparison across constructs and drugs. *Journal of Studies on Alcohol and Drugs*, 73(5), 772.
- Patton, G. C., Coffey, C., Lynskey, M. T., Reid, S., Hemphill, S., Carlin, J. B., & Hall, W. (2006). Trajectories of adolescent alcohol and cannabis use into young adulthood. *Addiction*, 102, 607.

- Peltzer, K., Malaka, D.W. & Phaswana, N. (2002). Socio-demographic factors, religiosity, academic performance, and substance use among first-year university students in South Africa. *Psychological Reports, 91*, 105-113.
- Peltzer, K., & Ramlagan, S. (2009). Alcohol use trends in South Africa. *Journal of Social Science, 18*(1), 1-12.
- Peltzer, K., Davids, A., & Njuho, P. (2011). Alcohol use and problem drinking in South Africa: Findings from a national population-based survey. *African Journal of Psychiatry, 14*(1), 30-37.
- Peterson, K. (2004/5). Biomarkers for alcohol use and abuse-a summary. *Alcohol Research and Health, 28*(1), 30.
- Ponicki, W. R., Gruenewald, P. J., & Remer, L. G. (2013). Spatial panel analyses of alcohol outlets and motor vehicle crashes in California: 1999–2008. *Accident Analysis & Prevention, 55*, 135-143.
- Pradeilles, R., Rousham, E. K., Norris, S. A., & Griffiths, P. L. (2014). Urban South African adolescents' perceptions of their neighbourhood socio-economic environments: The birth to twenty plus cohort study. *Children Youth and Environments, 24*(3), 173-200.
- Prescott, C. A., Aggen, S. H., & Kendler, K. S. (1999). Sex differences in the sources of genetic liability to alcohol abuse and dependence in a Population-Based sample of US twins. *Alcoholism: Clinical and Experimental Research, 23*(7), 1136-1144.
- Protogerou, C. (2012). Substance use and abuse in South Africa, perspectives from brain-behaviour and other disciplines, in .G. Ellis, D. Stein, E. Meintjies & K. Thomas, *Chapter: 15* (Eds.). UCT Press: Cape Town.
- Rahdert, E. R. (1991). The adolescent Assessment/Referral system manual.
- Ramsoomar, L., & Morojele, N. K. (2012). Trends in alcohol prevalence, age of initiation and association with alcohol-related harm among South African youth: Implications for policy. *SAMJ: South African Medical Journal, 102*, 609-612.
- Ramsoomar, L., Morojele, N. K., & Norris, S. A. (2013). Alcohol use in early and late adolescence among the birth to twenty cohort in Soweto, South Africa. *Global Health Action, 6* (supplement 1), 57-66.

- Reddy S.P., James S, Sewpaul R, Sifunda S, Ellahebokus A, Kambaran NS, Ouardien RG. *Umthente Uhlaba Usamila – The 3RD South African National Youth Risk Behaviour Survey 2011*. Cape Town: South African Medical Research Council, 2013. Retrieved July 1, 2014, from <http://www.hsrc.ac.za/press>.
- Reddy, S. P., James, S., Sewpaul, R., Koopman, F., Funani, N. I., Sifunda, S., et al. (2010). *Umthente Uhlaba Usamila – The 2nd South African Youth Risk Behaviour Survey 2008*. Pretoria: DoH. Retrieved, November 15, 2012, from http://www.mrc.ac.za/healthpromotion/yrbs_2008_final_report.pdf
- Reddy, S. P., Panday, S., Swart, D., Jinabhai, C. C., Amosun, S. L., James, S., et al. (2002). *Umthente uhlaba usamila – the 1st South African youth risk behaviour survey 2002*. Pretoria: DoH. Retrieved, May 20, 2012, from <http://www.mrc.ac.za/healthpromotion/YRBSpart1.pdf>
- Rehm, J., Borges, G., Gmel, G., Graham, K., Grant, B., Parry, C. & Room, R. (2013). The comparative risk assessment for alcohol as part of the global burden of disease 2010 study: What changed from the last study? *The International Journal of Alcohol and Drug Research*, 2(1), 1-5.
- Rehm, J., Mathers, C., Popova, S., Thavorncharoensap, M., Teerawattananon, Y., & Patra, J. (2009). Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. *The Lancet*, (373), 2223-2233.
- Rehm, J., Room, R., Monteiro, M. G., Gmel, G., Graham, K., Rehm, N., et al. (2004). Comparative quantification of health risks: Global, and regional burden of disease due to selected major risk factors. Geneva, Switzerland: World Health Organization; 2004. Alcohol use; pp. 959–1109.
- Rehm, J., Samokhvalov, A.V. & Shield, K. (2013). Global burden of alcoholic liver diseases. *Journal of Hepatology*, 59, (1), 160–168.
- Reimuller, A., Hussong, A., & Ennett, S. T. (2011). The influence of alcohol-specific communication on adolescent alcohol use and alcohol-related consequences. *Prevention Science*, 12(4), 389-400.
- Relton, C., Torgerson, D., O'Cathain, A., & Nicholl, J. (2010). Rethinking pragmatic randomised controlled trials: Introducing the "cohort multiple randomised controlled trial" design. *BMJ (Clinical Research Ed.)*, 340, c1066

- Resnicow, K., Cross, D., & Wynder, E. (1993). The know your body program: A review of evaluation studies. *Bulletin of the New York Academy of Medicine*, 70(3), 188-207.
- Richter, L. M. (2005). The importance of fathering for children. In L.M. Richter, & R. Morell (Eds.), *Baba: men and fathers in South Africa* (pp. 53-72). Cape Town: Human Science Research Council Press.
- Richter, L. M., Panday, S., Swart, T., & Norris, S. A. (2009). Adolescents in the city: Material and social living conditions in Johannesburg, Soweto, South Africa. *Urban Forum*, 20, 319-334.
- Richter, L., Norris, S., Pettifor, J., Yach, D., & Cameron, N. (2007). Cohort profile: Mandela's children: The 1990 birth to twenty study in South Africa. *International Journal of Epidemiology*, 36(3), 504-511.
- Rocha-Silva, L. (1989). *Drinking practices, drinking-related attitudes and public impressions of services for alcohol and other drug problems in South Africa*. Pretoria: Human Sciences Research Council.
- Roerecke, M., & Rehm, J. Irregular heavy drinking occasions and risk of ischaemic heart disease: A systematic review and meta-analysis. *American Journal of Epidemiology*, 171, 633-44.
- Rogers, E. M., & Shoemaker, F. F. (1971). *Communication of innovations: A cross-cultural approach* (2nd ed. of *Diffusion of innovations*). New York: Free Press.
- Room, R., Ferris, J., Laslett, A. M., Livingston, M., Mugavin, J., & Wilkinson, C. (2010). The drinker's effect on the social environment: A conceptual framework for studying alcohol's harm to others. *International Journal of Environmental Research and Public Health*, 7(4), 1855-1871.
- Rutter, M. (1985). Resilience in the face of adversity. *British Journal of Psychiatry*, 147(1), 598-611.
- Rutter, M., & Garmezy, N. (1983). Developmental psychopathology. In E. M. Hetherington (Eds.), *Mussen's handbook of child psychology: Vol. 4. Socialization, Personality, and Social Development*, 4th ed, 75-911.
- Ryan, S. M., Jorm, A. F., & Lubman, D. I. (2010). Parenting factors associated with reduced adolescent alcohol use: a systematic review of longitudinal studies. *Australian and New Zealand Journal of Psychiatry*, 44(9), 774-783.

- Sallis, J. F., Owen, N., & Fisher, E. B. (2008). Ecological models of health behaviour. In K. Glanz, B.K. Rimer, K. Viswanath (Eds.) *Health behaviour and health education: Theory, Research, and Practice*, 4, 465-486.
- Saloojee, Y. (2000) Tobacco control, Chapter 22. South African Health Review. Health Systems Trust, Durban, pp. 429–440.
- Samokhvalov, A. V., Irving, H. M., & Rehm, J. (2010a). Alcohol as a risk factor for atrial fibrillation: A systematic review and meta-analysis. *European Journal of Cardiovascular Prevention and Rehabilitation*, 17, 706-712.
- Samokhvalov AV, Irving HM, Rehm J. (2010b). Alcohol consumption as a risk factor for pneumonia: A systematic review and meta-analysis. *Epidemiology of Infection*, 138, 1789–95.
- Sawyer, S. M., Afifi, R. A., Bearinger, L. H., Blakemore, S. J., Dick, B., Ezeh, A. C., & Patton, G. C. (2012). Adolescence: A foundation for future health. *The Lancet*, 379(9826), 1630-1640.
- Scarborough, P., Bhatnagar, P., Wickramasinghe, K. K., Allender, S., Foster, C., & Rayner, M. (2011). The economic burden of ill health due to diet, physical inactivity, smoking, alcohol and obesity in the UK: An update to 2006–07 NHS costs, *Journal of Public Health*, 33(4), 527-535.
- Scheier, L. M., Botvin, G. J., Diaz, T., & Griffin, K. W. (1999). Social skills, competence, and drug refusal efficacy as predictors of adolescent alcohol use. *Journal of Drug Education*, 29(3), 251-278.
- Schneider, M., Norman, R., Parry, C., Bradshaw, D., Plüddemann, A., & Collaboration, S. A. C. R. A. (2007). Estimating the burden of disease attributable to alcohol use in South Africa in 2000. *South African Medical Journal*, 97(8), 664-672.
- Scholte, R. H. J., Poelen, E. A. P., Willemsen, G., Boomsma, D. I., & Engels, R. C. M. E. (2008). Relative risks of adolescent and young adult alcohol use: The role of drinking fathers, mothers, siblings, and friends. *Addictive Behaviours*, 33, 1-14.
- Schulenberg, J. E., & Maggs, J. L. (2002). A developmental perspective on alcohol use and heavy drinking during adolescence and the transition to young adulthood. *Journal of Studies on Alcohol and Drugs*, (14), 54.

- Seedat, M., Van Niekerk, A., Jewkes, R., Suffla, S., & Ratele, K. (2009). Violence and injuries in South Africa: Prioritising an agenda for prevention. *The Lancet*, 374(9694), 1011-1022.
- Seggie, J. (2012). Alcohol and South Africa's youth. *SAMJ: South African Medical Journal*, 102(7)
- Seidman, E., Yoshikawa, H., Roberts, A., Chesir-Teran, D., Allen, L., Friedman, J. L., & Aber, J. L. (1998). Structural and experiential neighbourhood contexts, developmental stage, and antisocial behaviour among urban adolescents in poverty. *Development and Psychopathology*, 10(02), 259-281.
- Seim, K., & Waldfogel, J. (2010). Public monopoly and economic efficiency: Evidence from the Pennsylvania Liquor Control Board's entry decisions (No. w16258). National Bureau of Economic Research.
- Shaw, M., Lawlor, D. A., & Najman, J. M. (2006). Teenage children of teenage mothers: Psychological, behavioural and health outcomes from an Australian prospective longitudinal study. *Social Science & Medicine*, 62(10), 2526-2539.
- Sheppard, Z. A., Norris, S. A., Pettifor, J. M., Cameron, N., & Griffiths, P. L. (2009). Approaches for assessing the role of household socioeconomic status on child anthropometric measures in urban South Africa. *American Journal of Human Biology*, 21(1), 48-54.
- Shield, K., Parry, C., & Rehm, J. (2014). Chronic diseases and conditions related to alcohol use. *Alcohol Research : Current Reviews*, 35(2), 155–171.
- Shisana O., Peltzer K., Zungu-Dirwayi M., Louw, J. (2006). HSRC study on alcohol and drug use and HIV prevalence, South Africa 2005. Presented at the MRC/ CDC South Africa Workshop: Addressing the link between drugs and HIV in vulnerable populations, Medical Research Council: Cape Town.
- Shisana O., Rehle T., Simbayi, L.C., Parker, W., Zuma, K., Bhana, A, Connolly C, et al. (2005) South African National HIV Prevalence, HIV Incidence, Behaviour and Communication Survey, 2005. Cape Town: HSRC Press.
- Shuper, P. A., Neuman, M., Kanteres, F., Baliunas, D., Joharchi, N., & Rehm, J. (2010). Causal considerations on alcohol and HIV/AIDS--a systematic review. *Alcohol and Alcoholism (Oxford, Oxfordshire)*, 45(2), 159-166
- Sinha, J.W., Cnaan, R.A. & Gelles, R.J. (2007). Adolescent risk behaviours and religion: Findings from a national study. *Journal of Adolescence*, 30(2): 231-49.

- Skinner, H. A. (1984). Assessing alcohol use by patients in treatment. In R.G. Smart, H.D. Campbell, F.B. Glaser, Y. Israel, H. Kalant, R.E. Popham, W. Schmidt & E.M. Sellers, (Eds) *Research Advances in Alcohol and Drug Problems*, Vol. 8 (pp. 183-207). Springer US.
- Smith, E.A., Palen, L.A., Caldwell, L.L., Flisher, A.J., Graham, J.W., Mathews, C., Wegner, L. & Vergnani, T. (2008). Substance use and sexual risk prevention in Cape Town, South Africa: An evaluation of the healthwise program. *Prevention Science*, 9(4):311–21.
- Sneed, C. D., Morisky, D. E., Rotheram-Borus, M. J., Ebin, V. J., & Malotte, C. K. (2001). Patterns of adolescent alcohol, cigarette, and marijuana use over a 6-month period. *Addictive Behaviours*, 26(3), 415.
- Sobell, L. C., & Sobell, M. B. (1995). Alcohol consumption measures. *Assessing alcohol problems: A guide for clinicians and researchers*, 4, 55-76.
- South African Revenue Service. (2011). *Tax Proposals: Budget 2011*. Pretoria: SARS.
- Spence, C. J., & Lee, E. R. (2003). Toward a comprehensive model of physical activity. *Psychology of Sport and Exercise*. 4 (1), 7-24.
- Statistics South Africa. Census 2011 Statistical Release. 2012. Retrieved 17 January 2015, from: <http://www.statssa.gov.za>.
- Sternin, M., Sternin, J., & Marsh, D. L. (1996). Rapid sustained childhood malnutrition alleviation through a positive-deviance approach in rural Vietnam: Preliminary findings. Retrieved 30 August, 2015, from <http://www.popline.org/node/268211>.
- Stockwell, T., & Chikritzhs, T. (2009). Do relaxed trading hours for bars and clubs mean more relaxed drinking quest: A review of international research on the impacts of changes to permitted hours of drinking. *Crime Prevention & Community Safety*, 11(3), 153-170.
- Stokols, D. (1992). Establishing and maintaining healthy environments: Toward a social ecology of health promotion. *American Psychologist*, 47, 6-22.
- Stone, A. L., Becker, L. G., Huber, A. M., & Catalano, R. F. (2012). Review of risk and protective factors of substance use and problem use in emerging adulthood. *Addictive Behaviours*, 37(7), 747-775.
- Stoolmiller, M., Wills, T. A., McClure, A. C., Tanski, S. E., Worth, K. A., Gerrard, M., & Sargent, J. D. (2012). Comparing media and family predictors of

- alcohol use: A cohort study of US adolescents. *BMJ: British Medical Journal open*, 2(1), e000543.
- Subramanian, S. V., Delgado, I., Jadue, L., Vega, J., & Kawachi, I. (2003). Income inequality and health: Multilevel analysis of Chilean communities. *Journal of Epidemiology and Community Health*, 57(11), 844-848.
- Sutherland, I. & Sheppard, J.P. (2001). Social dimensions of adolescent substance use. *Addiction*, (96), 445-458.
- Swahn, M. H., Ali, B., Palmier, J. B., Sikazwe, G., & Mayeya, J. (2011). Alcohol marketing, drunkenness, and problem drinking among Zambian youth: Findings from the 2004 Global School-Based Student Health Survey. *Journal of Environmental and Public Health*, 2011, 1-8.
- Swart, L. A., Seedat, M., & Nel, J. (2015). Alcohol consumption in adolescent homicide victims in the city of Johannesburg, South Africa. *Addiction*, 110,595–601.
- The World Bank. World development indicators. Retrieved from 25 July 2014, from, <http://data.worldbank.org/country/south-africa>
- Thomas, R., Seager, J. R., Viljoen, E., Potgieter, F., Rossouw, A., Tokota, B., McGranahan, G., & Kjellen, M. (1999). *Household Environment and Health in Port Elizabeth, South Africa*. Stockholm, Sweden: Stockholm Environment Institute.
- Thompson, K., Stockwell, T., Leadbeater, B., & Homel, J. (2014). Association among different measures of alcohol use across adolescence and emerging adulthood. *Addiction*, 109(6), 894-903.
- Tildesley, E. A., & Andrews, J. A. (2008). The development of children's intentions to use alcohol: Direct and indirect effects of parent alcohol use and parenting behaviours. *Psychology of Addictive Behaviours*, 22(3), 326.
- Tolan, P., Schoeny, M., Slavick, J., Boonmongkon, P., Czemy, V., Eisenstein, E., et al. (2005). Substance use among adolescents in urban areas: a brief survey in nine countries. In I. S. Obot & S. Saxena (Eds.), *Substance use among young people in urban environments* (pp. 191-202). Geneva: World Health Organization.
- Townsend, N., & Foster, C. (2013). Developing and applying a socio-ecological model to the promotion of healthy eating in the school. *Public Health Nutrition*, 16(6), 1101-1108.

- Trucco, E. M., Colder, C. R., Wieczorek, W. F., Lengua, L. J., & Hawk Jr, L. W. (2014). Early adolescent alcohol use in context: How neighbourhoods, parents, and peers impact youth. *Development and Psychopathology*, *26*(02), 425-436.
- Truen, S., Ramkolowan, Y., Corrigan, J., & Matzopoulos, R. (2011). Baseline study of the liquor industry including the impact of the national liquor act 59 of 2003. *Pretoria: Department of Trade and Industry*.
- Turner, B. J., & McLellan, A. T. (2009). Methodological challenges and limitations of research on alcohol consumption and effect on common clinical conditions: Evidence from six systematic reviews. *Journal of General Internal Medicine*, *24*(10), 1156-1160.
- United States Institute of Medicine. Office of the Assistant Secretary for Health, & Surgeon General. (1979). *Healthy people: The Surgeon General's report on health promotion and disease prevention* (No. 79). US Dept. of Health, Education, and Welfare, Public Health Service, Office of the Assistant Secretary for Health and Surgeon General: for sale by the Supt. of Docs., US Govt. Print. Off.
- Urberg, K. A., Luo, Q., Pilgrim, C., & Degirmencioglu, S. M. (2003). A two-stage model of peer influence in adolescent substance use: Individual and relationship-specific differences in susceptibility to influence. *Addictive Behaviours*, *28*(7), 1243-1256.
- Van Der Vorst, H., Vermulst, A. A., Meeus, W. H., Deković, M., & Engels, R. C. (2009). Identification and prediction of drinking trajectories in early and mid-adolescence. *Journal of Clinical Child & Adolescent Psychology*, *38*(3), 329-341.
- Vingilis, E., McLeod, A. I., Stoduto, G., Seeley, J., & Mann, R. E. (2007). Impact of extended drinking hours in Ontario on motor-vehicle collision and non-motor-vehicle collision injuries. *Journal of Studies on Alcohol and Drugs*, *68*(6), 905.
- Wang, M. T., & Fredricks, J. A. (2014). The reciprocal links between school engagement, youth problem behaviours, and school dropout during adolescence. *Child Development*, *85*(2), 722-737.
- Waters, S. K., Cross, D. S., & Runions, K. (2009). Social and ecological structures supporting adolescent connectedness to school: A theoretical model. *Journal of School Health*. *79*, (11), 515-524.

- Wechsberg, W.M., Luseno, W.K., Karg, R.S., Siobhan Young, S., Rodman, N., Myers, B. & Parry, C.D.H. (2008). Alcohol, cannabis, and methamphetamine use and other risk behaviours among black and coloured South African women: A small randomized trial in the Western Cape. *International Journal of Drug Policy*, 19(2):130–39.
- Weichold, K., Brambosch, A., & Silbereisen, R. K. (2012). Do girls profit more? Gender-specific effectiveness of a life skills program against alcohol consumption in early adolescence. *The Journal of Early Adolescence*, 32(2), 200-225.
- White, A., & Hingson, R. (2014). The burden of alcohol use: Excessive alcohol consumption and related consequences among college students. *Alcohol Research: Current Reviews*, 35(2), 201.
- Whiting, L., Kendall, S., & Wills, W. (2012). An asset-based approach: An alternative health promotion strategy? *Community Practitioner*, 85(1), 25-28.
- Windle, M., Mun, M., & Windle, R. (2004). Adolescent to young adult heavy drinking trajectories and their prospective predictors. *Journal of Studies on Alcohol*, 66, 313.
- Winpenny, E. M., Marteau, T. M., & Nolte, E. (2014). Exposure of children and adolescents to alcohol marketing on social media websites. *Alcohol and Alcoholism*, 49(2), 154-159.
- Winstanley, E. L., Steinwachs, D. M., Ensminger, M. E., Latkin, C. A., Stitzer, M. L., & Olsen, Y. (2008). The association of self-reported community disorganization and social capital with adolescent alcohol and drug use, dependence, and access to treatment. *Drug and Alcohol Dependence*, 92, 173-182.
- Witkiewitz, K., Donovan, D. M., & Hartzler, B. (2012). Drink refusal training as part of a combined behavioural intervention: Effectiveness and mechanisms of change. *Journal of Consulting and Clinical Psychology*, 80(3), 440.
- Wood, M. D., Read, J. P., Mitchell, R. E., & Brand, N. H. (2004). Do parents still matter? Parent and peer influences on alcohol involvement among recent high school graduates. *Psychology of Addictive Behaviours*, 18(1), 19.
- World Health Organization. (1986). Young people's health-a challenge for society: Report of a WHO study group on young people and" health for all by the year 2000, Technical Report Services, Geneva.

- World Health Organization. (2014). *Global status report on alcohol and health-2014*
World Health Organization.
- World Health Organization. (1992). *The ICD-10 classification of mental and behavioural disorders: Clinical descriptions and diagnostic guidelines*
Geneva: World Health Organization. World Health Organization, & World Health Organization. (2001). *The second decade: Improving adolescent health and development*. Geneva: World Health Organization. World Health Organization. (2002). *Alcohol in developing countries: A public health approach*. Geneva: World Health Organization.
- Young, R. M., Connor, J. P., Ricciardelli, L. A., & Saunders, J. B. (2006). The role of alcohol expectancy and drinking refusal self-efficacy beliefs in university student drinking. *Alcohol and Alcoholism, 41*(1), 70-75.
- Yu, J. (2003). The association between parental alcohol-related behaviours and children's drinking. *Drug and Alcohol Dependence, 69*(3), 253-262.
- Yu, M., Stiffman, A. R., & Freedenthal, S. (2005). Factors affecting American Indian adolescent tobacco use. *Addictive Behaviours, 30*(5), 889-904.
- Zhang, L., Welte, J. W., & Wieczorek, W. F. (1999). The influence of parental drinking and closeness on adolescent drinking. *Journal of Studies on Alcohol and Drugs, 60*(2), 245.
- Ziervogel, C.F., Ahmed, N., Flisher, A.J. & Robertson, B.A. (1997-1998). Alcohol misuse in South African male adolescents: A qualitative investigation. *International Quarterly of Community Health Education, 17* (1): 25-41.
- Zonfrillo, M.R., & Osterhoudt, K.C. (2014). NekNominate: A deadly, social media-based drinking dare. *Clinical Paediatrics (Phila), 53* (12), 1215.

APPENDICES

Appendix A: Dissemination: PHASA Newsletter, February 2015

The Ban on Alcohol Advertising in South Africa

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South Africa faces a formidable threat to public health attributable to alcohol use and misuse. Current epidemiological evidence from burden of disease studies indicate that the use of alcohol is associated with a range of adverse chronic health and economic consequences (1,2). Heavy and episodic alcohol use result in acute negative physical and social outcomes including: accidents, unintentional injuries and deaths, interpersonal violence and sexual risk (3,4). The economic costs associated with harmful alcohol use in South Africa have been estimated at between R245 933 - 280 687 billion. This is approximately 12% of the country's gross domestic product (5). This estimation takes into account both tangible (treatment and rehabilitation, crime prevention, road accidents) and intangible (premature morbidity and mortality resulting in loss of productivity and income) costs. What it is unable to calculate are the social and emotional costs to those around the drinker (children, spouses, co-workers), which no doubt are significant in itself.

Given its substantial burden on public health, international and local actors have articulated evidence-informed recommendations to adopt preventive programmes and policies to reduce harmful drinking and its associated risks (6). Evidence-based strategies to reduce alcohol use and misuse include; drink-driving prevention and counter measures, pricing and taxation regulations, regulating availability of alcohol, modifying the drinking contexts, as well as education and awareness programmes (7). The mainstay of the public health argument has been that all preventive efforts must be seen as complementary approaches to addressing alcohol use and misuse.

Progress in establishing a ban on alcohol advertising

Although the ban on alcohol advertising has been on the government's agenda for more than five years, the past two years has seen increased public dialogue between the South African government, academic, civil society organisations and the alcohol and advertising industries on a proposed ban on alcohol advertising in South Africa.

Arguments in support of the ban have been voiced by public health researchers and practitioners in response to the substantial evidence for alcohol related harms. The rationale behind a ban on alcohol advertising is substantiated by credible and consistent evidence in international literature showing that; exposure to alcohol (particularly to adolescents) through media and other communication channels is associated with increased probability that adolescents will initiate alcohol use and continue to drink more after initiation (8). Other research has shown that exposure to alcohol through advertising promotes underage drinking (9,10). This is particularly concerning given that early initiation of alcohol use has been associated with increased likelihood of developing alcohol dependence and substance use problems later in life (11). Furthermore, previous research refutes the alcohol and advertising industry arguments that advertising of alcohol only impacts the choice of brand (8,12).

In a recent South African Medical Journal (SAMJ) issue Parry, and colleagues (2012) (13) amply capture the public health case for a ban on alcohol advertising. They argue that

previous experience with Tobacco control legislation and the strong evidence base indicates that advertising affects not just brand choice, but also increased likelihood of engaging in alcohol behaviours. This makes a ban on alcohol advertising - preferably supplemented by other policy efforts - an effective strategy in reducing alcohol related harms. The evidence base in support of the ban on alcohol advertising as an effective public health approach is based on credible research findings. Studies show that banning advertising of alcohol goods, banning all sport and arts sponsorships, and the prohibition of alcoholic beverage promotion will reduce exposure to alcohol, thereby reducing the likelihood of early alcohol use and its related harms (14). Therefore researchers and other public health advocates are candid in their views that rapid and decisive action must be taken to adopt a total ban on alcohol advertising.

The public health argument has been met with vociferous opposition from the alcohol industry (including the Industry at the helm of the Association for Responsible Alcohol Use-ARA) and other detractors, who cite that a ban on alcohol advertising would have “a devastating effect on the economy” (15). These effects they say, would be manifested through the loss of almost 12 000 jobs, mainly in the advertising industry. In addition, the alcohol industry claim that a ban would result in increased illicit trade of alcohol, which could also negatively impact the economy. What can only be seen as a weak justification by the alcohol industry (which is self-regulated) are arguments that, given the high proportion of alcohol abstainers in South Africa, the onus to drink in a safe and responsible manner rests with the individual drinker. They go on to assert that education and awareness can help to mitigate the risks of harmful alcohol use.

Taking a wide lens approach to the issue, public health has (and should) be concerned with understanding how multiple factors interact to produce an adverse effect on health. Alcohol use and misuse are associated with a range of determinants and consequences operating within multiple domains in which the drinker exists. Consequently exposure to alcohol advertising is viewed as an important contributory factor accounting for alcohol use and misuse. Given the evidence that exposure through advertising has consistently been shown to increase the likelihood to drink and continue drinking, it follows that decisive action must be taken to bring advertising under control through public health policies and regulations.

The somewhat short-sighted and individually focused approach, proposed by the industry, fails to recognise that a ban on alcohol advertising is one (albeit an important) component of a more comprehensive and multi-faceted suite of policies and health promotion interventions to mitigate the adverse effects of alcohol use on public health. South Africa currently ranks among the highest alcohol per capita consumers in the world, is the lead drinking country in Sub-Saharan Africa, and rates as one of the riskiest drinking nations globally, in terms of patterns of drinking (mainly heavy episodic drinking) (16). This evidence combined with alcohol attributable harms, refutes the industry’s defence that personal responsibility (supported by education and awareness) will singularly result in a reduction in alcohol related harms.

Appointment of an Interministerial Committee

The South African government signalled their political will and commitment to a reduction in alcohol related harms by appointing an Interministerial Committee (IMC) in 2010, under the direction of the Minister of Social Development. This committee was tasked to develop and implement strategies and interventions to reduce the harm associated with alcohol use. The

most recent global status report on alcohol use cites the establishment of the IMC as a significant country level effort and show of political leadership to reduce alcohol related harms (16). In 2013 cabinet approved the “The Control of Marketing of Alcoholic Beverages Bill”, another signal of the IMC’s commitment to seeing a ban on alcohol advertising brought to fruition.

Given the vested interests of the government (which profits significantly from the alcohol industry’s contribution to South Africa’s GDP) and the alcohol industry, it is unsurprising that not all government ministries share the public health argument for a ban on alcohol advertising. Ongoing dialogue on this issue has seen a fair amount of opposition from ministries, such as the Department of Trade and Industry and National Treasury, as well as the South African Chamber of Commerce and Industry. These stakeholders understandably stand to lose and/or have to confront the consequences of, the loss of fiscal power in the event of a ban. Nonetheless, the IMC projects a unified front in their support of the public health approach to the ban. When the Department of Social Development Minister, Mnr Bathabile Dlamini announced cabinet’s approval of the draft Bill banning alcohol advertising, she affirmed that the approval was couched within a strong scientific evidence-base. In addition she cited that the tangible cost of alcohol use doubled that of which is brought in by excise tax and valued added tax combined (17). This clearly showed government’s sway in favour of the public health approach. Furthermore, the fact that relevant ministries (including those that are potentially opposed to the ban) have been appointed to jointly address a reduction in alcohol related harms is encouraging. It reflects a commitment to consultation, inclusivity and collaboration on alcohol laws and public health policy development in South Africa.

Notwithstanding the intrinsic worth of inter-ministerial collaboration, policy development is by its very nature, a messy and fraught process. This was clearly demonstrated over two decades ago when the ban on tobacco advertising was called for. Industry opposition, delays in parliamentary debates, deferments in political decision making, claims of job losses, and claims of attacks on personal freedom characterised that advertising ban (18). In spite of this fractious policy development process, a strong evidence base, political will and leadership and advocacy efforts, saw the Tobacco Products Control Act being adopted in 1993, implemented in 1995 and amended in 2007. The latter amendments indicate that despite a long delay in initial adoption of the tobacco control policy, tobacco control has remained at the forefront of public health discussions.

The draft bill on a ban on alcohol advertising is subject to mandatory public comment, and regulatory impact assessments (RIA). The Department of Health completed an RIA previously. However, a request for an independent RIA quietly slipped through in November 2013, resulting in a further delay to proposals to ban alcohol advertising. Questions remain as to whether these delays are simply the result of a natural process of public health policy development or if government is buckling under the weight of industry and opposing ministries to the ban. As we proceed slowly, but steadily toward the adoption of an advertising ban on alcohol products we can only hope that commercial interests do not dwarf the interests of public health.

References:

1. Rehm J, Mathers C, Popova S, Thavorncharoensap M, Teerawattananon Y, Patra J. Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. *The Lancet*. 2009;(373): 2223-2233.
2. Lim SS et al. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*. 2012;380: 2224-60.
3. Ramsoomar L, Morojele NK. Trends in alcohol prevalence, age of initiation and association with alcohol-related harm among South African Youth: Implications for Policy. *South African Medical Journal*. 2012;102(7):609-612.
4. Morojele NK, et al. Alcohol use and sexual behaviour among risky drinkers and bar and shebeen patrons in Gauteng province, South Africa 2006. *Social Science and Medicine*. 2006;62(1):217–227.
5. Matzopoulos R, Truen S, Bowman B, Corrigan J. The cost of harmful alcohol use in South Africa. *South African Medical Journal*. 2014;104(2):127-132.
6. World Health Organisation. Global status report on alcohol and health. Geneva, Switzerland: WHO;2011.
7. Babor TF, et al. *ALCOHOL: No ordinary commodity, research and public policy (2nd Ed.)*. New York: Oxford University Press; 2010.
8. Anderson P, Bruijn AD, Angus K, Gordon R, Hastings G. Impact of alcohol advertising and media exposure on adolescent alcohol use: A systematic review of longitudinal studies. *Alcohol and Alcoholism*. 2009;44(3):229-243.
9. Austin EW, Chen MJ, Grube JW. How does alcohol advertising influence underage drinking? The role of desirability, identification and skepticism. *Journal of Adolescent Health Care*. 2006;38(4):376-384.
10. Ellickson PL, Collins RL, Hambarsoomians K, et al. Does alcohol advertising promote adolescent drinking? Results from a longitudinal assessment. *Addiction*. 2005;100:235–46.
11. Grant BF, Dawson DA. Age at onset of alcohol use and its association with DSM-IV alcohol abuse and dependence: results from the National Longitudinal Alcohol Epidemiologic Survey. *Journal of substance abuse*. 1997;9:103-110.
12. Snyder LB, Milici FF, Slater M, Sun H, Strizhakova Y. Effects of alcohol advertising exposure on drinking among youth. *Archives of Paediatric and Adolescent Medicine*, 2006;160(1):18-24.
13. Parry C, Harker-Burnhams N, London L. A total ban on alcohol advertising: Presenting the public health case. *South African Medical Journal*. 2012;102(7):602-604.
14. Parry C, Myers B, London L. Delays in South Africa’s plan to ban alcohol advertising. *Lancet*. 2014;383(9933):1972.
15. Phakathi B. Ban on alcohol advertising would have devastating effect on economy. *Business Day Live*, 29 October, 2013. [<http://www.bdlive.co.za/business/2013/10/29/ban-on-alcohol-advertising-would-have-devastating-effect-on-economy>] Accessed 26 January 2015.
16. World Health Organization. Global status report on alcohol and health 2014. Geneva: WHO; 2014.
17. Mail and Guardian. Cabinet approves draft Bill banning alcohol ads, M&G, 29 September, 2013. [<http://mg.co.za/article/2013-09-20-cabinet-approves-draft-bill-banning-alcohol-ads/>] Accessed 26 January 2015.
18. Saloojee H. Tobacco Control, Chapter 22. *South African Health Review*. Durban: Health Systems Trust; 2000.

Appendix B: Quantitative measures conceptualised (drawn on) in the PhD study

Variable name (no. of items)	Variable operationalisation	Variable coding/recoding	Psychometric properties
Child gender (1)	Gender of child	0= Male 1= Female	n/a
Child Race (1)	Ethnicity of Child	1=White 2=Black 3=Coloured 4=Indian	n/a
School years repeated by grade 7 (1)	Total number of "repeat" school years up to Grade 7	0= No school years repeated 1 = 1 school year repeated 2 = 2 school years repeated	n/a
Lifetime alcohol use (1)	Ever drunk alcohol in lifetime	0= No 1= Yes	n/a
How old were you when you drank alcohol for the first time (1)	Age of alcohol initiation	0= I have never drunk alcohol in my lifetime 1= Less than 12 years old 2= 12 years old 3= 13 years old 4= 14 years old 5= 15 years 6= 16 years old 7= 17 years old Recoded 1=13< years old 2=14+ years old	n/a
Had alcohol in the past month (1)	Past month alcohol use	0= No 1= Yes	n/a
Last month average many drinks at one time (1)	Last month average no of drinks	1= 1-5 drinks 2= 6-12 drinks 3= 13-20 drinks 4= 21-24 drinks 5= 25 -30 drinks	n/a
How many days drink alcohol past 30 days? (1)	Past month no. of days drunk alcohol	1= 1 or 2 days 2= 3 to 5 days 3= 6 to 9 days 4= 10 to 19 days 5= 20 to 29 days 6= All 30 days	n/a

Last month did you binge drink? (1)	Past month binge drink?	0= No 1= Yes	n/a
Past 30 days how you got alcohol you drank? (1)	Past month access alcohol	0= I did not drink alcohol during the past 30 days 1= I bought it in a store such as a liquor store, supermarket 2= I bought it at a restaurant, bar or club 3= I bought it at a public event such as a concert or sporting event 4= I gave someone else money to buy it for me 5= Someone gave it to me 6= I took it from a store or family member 7= I got it some other way	n/a
In the past 30 days did you drink alcohol on SCHOOL property? (1)	Drank alcohol on school property	0= 0 days 1= 1 or 2 days 2= 3 to 5 days 3= 6 to 9 days 4= 10 to 19 days 5= 20 to 29 days 6= All 30 days	n/a
Thinking about the last time you had alcohol on school property, who drank with you?	Who drank with you on SCHOOL property? (1)	0= I did not have alcohol on school property 1= I was with friends 2= I was with other, whom I did not know 3= I was alone	n/a
How often do you usually drink alcohol? (1)	How often do you usually drink	0= I have never used alcohol 1= less than once a week 2= Once a week 3= 2-3 times a week 4= Every day of the week	n/a
Do you usually drink alcohol on weekdays or weekends? (1)	Usually drink on weekdays or weekends?	0= I have never had alcohol 1= Weekdays 2= Weekends	n/a

		3= Weekdays and weekend
How much alcohol do you drink on average during the week? (1)	How much drinking during the week?	0= No drinking during the week 1= 1-2 drinks per day 2= 3-4 drinks per day 3= 5 or more drinks per day 4= Communal drinking/sharing bottle
How much alcohol do you drink on average during the weekend? (1)	How much drinking during the weekend?	0= No drinking during the week 1= 1-2 drinks per day 2= 3-4 drinks per day 3= 5 or more drinks per day 4= Communal drinking/sharing bottle
AUDIT (7)	Adapted AUDIT	0= Never
Past year have you found that you were not able to stop drinking once started	Summed and Scored	1= Less than monthly
Past year have you failed do what normally expect because of drinking		2= Monthly
Past year have needed drink morning to get going after drinking		3= Weekly
Past year have guilt remorse after drinking		4= Daily or almost daily
Past year been unable remember night before because drinking		
Have you or someone else ever been injured as a result drinking?		
Has a relative or friend, doctor or other health worker been concerned about your drinking or suggested you cut down?		
Have you ever had treatment for alcohol? (1)	Treatment for alcohol use	0= No 1= Yes
How likely are you to start drinking alcohol in the next 12 months? (1)	Alcohol expectations in next 12 months	5= Very likely 4= Somewhat likely 3= Not likely or unlikely

		2= Somewhat unlikely 1= Very unlikely	
How likely are you to start drinking alcohol in the next 5 years? (1)	Alcohol expectations in next 5 years	5= Very likely 4= Somewhat likely 3= Not likely or unlikely 2= Somewhat unlikely 1= Very unlikely	
Peer Pressure (3)	Perceived Peer influence	1= Agree a lot	$\alpha=.62$
Friends think it's OK to drink Friends Drink	Scale Summed and scored	2= Agree a little 3= Don't agree or disagree	
Pressure from friends use		4= Disagree a little 5= Disagree a lot	
My best friend drinks alcohol? (1)	Best friend drinks	0 = No 1= Yes	
Have you ever drunk alcohol with your best friend? (1)	Drunk alcohol with best friend	0 = No 1= Yes	
Do your parents/caregivers drink alcohol? (1)	0= Both my parents/caregivers do not drink alcohol 1= Both my parents/caregivers do drink alcohol 2= Only my father/male caregiver drinks alcohol 3= Only my mother/female caregiver drinks alcohol 4= I don't know	0= Both my parents/caregivers do not drink alcohol 1= Both my parents/caregivers do drink alcohol 3= I don't know	
Alcohol Refusal Self-efficacy (5)	Alcohol Refusal Self-efficacy (scale)		$\alpha=.852$
How sure are you that you could say "no" if you were given alcohol in these situations? (tick one): alcohol at a friend's house by an older brother/sister by other older person given alcohol at a bash by a boyfriend/girlfriend	0= Definitely say yes 1= Probably say yes 2= Maybe 3= Probably say no 4= Definitely say no Summed and scored	0= Definitely say no 1= Probably say no 2= Maybe 3= Probably say yes 4= Definitely say yes	
Household SES (8)	Asset index based on a list of 8 assets in the baseline household.	0= Lowest (0, 1, 2 assets)	

	Scores for all variables were added to obtain a value from 0-7, and then recoded into 5 SES categories.	1= Low (3 assets) 2= Medium (4 assets) 3= Higher (5 assets) 4= Highest (6,7,8 assets)	
Maternal Age (1)	Maternal age at birth of the child Continuous data recoded into age categories that are reflective of maternal age range within the sample.	1= 13-19 years 2= 20-24 years 3= 25-29 years 4= 30-34 years 5= 35-39 years 6= 40-49 years	
Maternal Education (1)	Maternal educational status Original 6 categories of maternal education included	1= No schooling/less than grade 5 education 2= Primary 3= Secondary 4= Post-School (i.e. Diploma less than one year; Diploma 2-3 years; 3-4 year degree; Masters degree; PhD; University not specified)	
Maternal Marital status (1)	Mother's marital status The original variable was recoded into a binary variable based on the frequency of distribution of maternal marital status in the sample	1=married (any definition) or living together; 0=single or not living together	
School Problems Scale (17)	Computation of a scale based on 17 items related to e.g. poor academic standards, lack of resources, overcrowding, lack of dedicated teachers, lack of competent teachers, bullying, smoking,	1= Lower	$\alpha=.85$

	alcohol, drugs, weapons, rape, sexual relationships between teachers and learners	2= Medium 3= Higher	
Neighbourhood SES Scale (3)	Computation of scale based on 3 items related to adolescents' perceptions of neighborhood wealth, outsiders' perceptions of their neighbourhood's wealth and adolescents' perceptions about the general condition of most houses in their neighborhood.	0= Lower 1= Medium 2= Higher	$\alpha=.62$
Neighbourhood Problems Scale (11)	Computation of a scale based on 11 items relating to e.g. road safety, road rage, homelessness, delinquency, repossession, unemployment, alcohol, drugs, shebeens (taverns), gangs and prostitution	1= Lower 2= Medium 3= Higher	$\alpha=.78$
Neighbourhood Social Support Scale (3)	Computation of a scale related to dependence on a neighbour in the event of death or illness of a family member, borrowing a cup of sugar, asking your neighbour to look after your house overnight	0= Lower 1= Higher	$\alpha=.67$

Appendix C: Study Questionnaires

*University of the Witwatersrand
Department of Paediatrics and Child Health*



BIRTH TO TWENTY BARA SITE: 13TH YEAR

ADOLESCENT QUESTIONNAIRE

THIS IS A CONFIDENTIAL QUESTIONNAIRE

Please carefully read through the following sets of questions and answer as truthfully as possible.

If you need any assistance with the understanding of the procedure or questions, please do not hesitate to contact a research assistant.

Your responses will be confidential, and your name will not appear anywhere on the questionnaire.

Once you have completed the questionnaire, please place it in the unmarked envelope and deposit it in the questionnaire box.

1. How old, in years, were you the first time you tasted alcohol?

2. Have you ever had an alcoholic drink? {A drink is defined as one can/bottle of beer
one glass of wine, one tot of liquor, or one mixed drink}

No 0 Yes 1

If YES, ←

How old, in years, were you the first time you drank alcohol?

3. With whom have you drunk alcohol?
parents/guardians

No 0 Yes 1

brothers or sisters

No 0 Yes 1

friends

No 0 Yes 1

neighbours

No 0 Yes 1

alone

No Yes 1

4. Do you drink alcohol now?

No 0 Yes 1 Sometimes 2



YEAR 18

THIS IS A CONFIDENTIAL QUESTIONNAIRE

Please carefully read through the following sets of questions and answer as truthfully as possible.

If you need any assistance with the understanding of the procedure or questions, please do not hesitate to contact a research assistant.

Your responses will be confidential, and your name will not appear anywhere on the questionnaire.

Once you have completed the questionnaire, please place it in the unmarked envelope and deposit it in the questionnaire box.

Question 1

Have you ever drunk alcohol for any reason other than religious purposes?

YES	NO
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Question 2

How old were you when you had alcohol for the first time?

I have never had alcohol	
Less than 12 years old	
12 years old	
13 years old	
14 years old	
15 years old	
16 years old	
17 years old or older	

Question 3

In the last **month (30 days)** have you had alcohol?

YES	NO
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Question 4

In the last **month (30 days)** on average how many drinks did you have at one time?

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Question 5

On how many days did you drink alcohol in the past 30 days?

1 or 2 days	
3 to 5 days	
6 to 9 days	
10 to 19 days	
20 to 29 days	
All 30 days	

Question 6

In the last **month (30 days)** have you had a drinking binge (5 or more drinks in one sitting/occasion?)

YES	NO
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Question 7

During the past 30 days, on how many days did you binge drink (i.e. have 5 or more drinks of alcohol on one or more occasions, within a couple of hours)?

0 days	0
1 day	1
2 days	2
3 to 5 days	3
6 to 9 days	4
10 to 19 days	5
20 or more days	6

Question 8

During the past 30 days, how did you usually get the alcohol you drank?

I did not drink alcohol during the past 30 days	0
I bought it in a store such as a liquor store, supermarket	1
I bought it at a restaurant, bar or club	2
I bought it at a public event such as a concert or sporting event	3
I gave someone else money to buy it for me	4
Someone gave it to me	5
I took it from a store or family member	6
I got it some other way	7

Question 9

For the following questions, please indicate how much you agree or disagree with the statements below

Most of my friends think it's OK to drink alcohol?

1. Agree a lot
2. Agree a little
3. Don't agree or disagree
4. Disagree a little
5. Disagree a lot

Question 10

Most of my friends drink alcohol?

1. Agree a lot
2. Agree a little
3. Don't agree or disagree
4. Disagree a little
5. Disagree a lot

Question 11

I feel pressure from my friends to use alcohol?

1. Agree a lot
 2. Agree a little
 3. Don't agree or disagree
 4. Disagree a little
 5. Disagree a lot
- Reverse code

Question 12

My best friend drinks alcohol?

YES	NO
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Question 13

Have you ever drunk alcohol with your best friend?

YES	NO
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Question 14

Do your parents/caregivers drink alcohol?

Both my parents/caregivers do not drink alcohol	0
Both my parents/caregivers do drink alcohol	1
Only my father/male caregiver drinks alcohol	2
Only my mother/female caregiver drinks alcohol	3
I don't know	4

Question 15

During the last 30 days, on how many days did you have at least one drink of alcohol ON SCHOOL PROPERTY?

0 days	
1 or 2 days	
3 to 5 days	
6 to 9 days	
10 to 19 days	
20 to 29 days	
All 30 days	

Question 16

Thinking about the last time you had alcohol on SCHOOL PROPERTY, who were you with (Tick one)?

I did not have alcohol on school property	
I was with friends	
I was with other, whom I did not know	
I was alone	

Question 17

How sure are you that you could say “no” if you were given alcohol in these situations? (Tick one)

	Definitely say no	Probably say no	Maybe say no	Probably say yes	Definitely say yes
If I were given alcohol at a friend's house					
If I were given alcohol by an older brother/sister					
If I were given alcohol by other older person					
If I were given alcohol at a bash					
If I were given by a boyfriend/girlfriend					

Question 18

How often do you usually drink alcohol?

Every day of the week	1
2-3 times a week	2
Once a week	3
Less than once a week	4
I have never used alcohol	0

Question 19

Do you usually drink alcohol on weekdays or weekends?

I have never had alcohol	0
Weekdays	1
Weekends	2
Weekdays and weekend	3

Question 20

How much alcohol do you drink on average during the week?

No drinking during the week	0
1-2 drinks per day	1
3-4 drinks per day	2
5 or more drinks per day	3
Communal drinking/sharing bottle	4

Question 21

How much alcohol do you drink on average during the weekend?

No drinks during weekend	0
1-2 drinks per day	2
3-4 drinks per day	3
5 or more drinks per day	4
Communal drinking/sharing bottle	5

Question 22

During the past year, how often have you found that you were not able to stop drinking once you had started?

Never	0
Less than monthly	1
Monthly	2
Weekly	3
Daily or almost daily	4

Question 23

During the past year, how often have you failed to do what you would normally expect to do because of drinking?

Never	0
Less than monthly	1
Monthly	2
Weekly	3
Daily or almost daily	4

Question 24

During the past year, how often have you needed a drink in the morning to get yourself going after a heavy drinking session?

Never	0
Less than monthly	1
Monthly	2
Weekly	3
Daily or almost daily	4

Question 25

During the past year, how often have you had a feeling of guilt or remorse after drinking?

Never	0
Less than monthly	1
Monthly	2
Weekly	3
Daily or almost daily	4

Question 26

During the past year, have you been unable to remember what happened the night before because you had been drinking?

Never	0
Less than monthly	1
Monthly	2
Weekly	3
Daily or almost daily	4

Question 27

Have you or someone else been injured as a result of your drinking?

No	0
Yes, but not in the last year	1
Yes, during the past year	2

Question 28

Has a relative or friend, doctor or other health worker been concerned about your drinking or suggested you cut down?

No	0
Yes, but not in the last year	1
Yes, during the past year	2

Question 29

Have you ever had treatment for alcohol abuse?

YES	NO
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Questions 30

How likely is it that you will be drinking alcohol in 5 years from now?

Very likely	5	
Somewhat likely	4	
Not likely or unlikely	3	
Somewhat unlikely	2	
Very unlikely	1	



**BIRTH TO TWENTY: 18TH YEAR YOUNG ADULT
COMMUNITY SES QUESTIONNAIRE**

DATE : Day Month Year

BTT ID NUMBER :

BONE STUDY ID NUMBER :

Introduction

We learnt some interesting things from the families visiting the Medical School Site recently about the places where they lived. We asked about the places where they lived because we thought it was important for understanding health and well-being. We would now like to find out more about the places where you live as you become young adults. It is hoped the study will help the government to design environmental, social, and health policies that reduce the risk of poor health and improve the wellbeing of those living in cities, adding to Birth to Twenty's vision to produce research that makes a difference.

The following questions refer to the **neighbourhood** where you live which we consider to be the **area where you could potentially walk to in about 20 minutes from your house, that is, approximately 2km in any direction from your house.**

If you live in more than one house because for example you stay with your mother/father/partner, as they do not live in the same house, please answer the questions based on the neighbourhood where you spend **most** of your time. There are no right or wrong answers to the questions we are asking you as we are only interested in your **perceptions** of the neighbourhood where you live. The questions are split into four main sections: section A addresses economic aspects of your neighbourhood, section B deals with social aspects of your neighbourhood, section C asks about your school/college/university if you are still studying, and finally section D asks about your employment status and place of work if you are employed.

Section A: Economic aspects of your neighbourhood

The first few questions ask about the level of wealth in your neighbourhood. Remember we are interested in the area where you could potentially walk to in about 20 minutes from your house, that is, approximately 2km from your house.

1. How do you describe your neighbourhood in terms of wealth?

Response	Code	Please tick one box only
Very poor	1	
Poor	2	
Average	3	
Wealthy	4	
Very wealthy	5	

2. Do you think people living **outside** of your neighbourhood see **your** neighbourhood as being:

Response	Code	Please tick one box only
Very poor	1	
Poor	2	
Average	3	
Wealthy	4	
Very wealthy	5	

3. Which of the following statements do you think is **true** about your neighbourhood?

Response	Code	Please tick one box only
There is a big mix of living standards	1	
There is some mix of living standards	2	
Most households have the same living standards	3	
All households have the same living standards	4	

The next few questions are about the main type of housing in your neighbourhood. Remember we do not want to know about **your** house but the houses that are **most common** in your **neighbourhood**.

4. How would you describe the general condition of **most** houses in your neighbourhood?

Response	Code	Please tick one box only
Very bad condition	1	
Bad condition	2	
Average condition	3	
Good condition	4	
Very good condition	5	

5. In general, do you think your neighbourhood has a problem with any of the following? (*please tick one box for each problem*)

Problem	Yes [0]	No [1]
a) Traffic congestion		
b) Road safety		
c) Road rage		
d) Sewerage		
e) Illegal dumping		
f) Pollution		
g) Overcrowding		
h) People born outside South Africa		
i) Minority attacks e.g. sexual orientation, ethnicity		
j) Delinquency e.g. people hanging around causing trouble		
k) Homelessness		
l) Repossession (houses being taken away)		
m) Unemployment/retrenchment		
n) Prostitution		
o) Alcohol abuse		
p) Drugs		
q) Gangsters		
r) Shebeens		

6. If you were away from home overnight, could you or your caregiver ask one of your neighbours to look after your house?

Response	Code	Please tick one box only
No	0	
Yes	1	

7. **IF YOU ARE STILL STUDYING**, in your opinion, does your school/college/university have problems with any of the following? (*please tick one box for each problem*)

Problem	Yes [0]	No [1]	N/A [98] (not studying)
a) Poor academic standards			
b) Lack of resources			
c) Lack of discipline			
d) Overcrowding			
e) Lack of dedicated teachers			
f) Teachers who cannot teach well			
g) Bullying/teasing			
h) Bunking off			
i) Smoking			
j) Learners under the influence of alcohol during teaching hours			
k) Teachers under the influence of alcohol during teaching hours			
l) Drugs			
m) Weapons			
n) Violence			
o) Teenage pregnancy			
p) Rape			
q) Sexual relationships between learners and teachers			

Research Assistant: _____ *Date:* _____

Co-checked by: _____ *Date:* _____

Quality checked by: _____ *Date:* _____

Appendix D: Ethics Clearance Certificate



R14/49 Ms Leane Ramsoomar

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M150156

NAME: Ms Leane Ramsoomar
(Principal Investigator)

DEPARTMENT: Public Health
Bt20 Research Office Site at Chris Hani Baragwanath
Academic Hospital

PROJECT TITLE: Risk and Protection: Alcohol Use Among Urban
Youth Within the Birth to Twenty Cohort (Initially M081115)

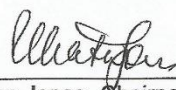
DATE CONSIDERED: Adhoc

DECISION: Approved unconditionally

CONDITIONS:

SUPERVISOR: Prof Shane Norris and Prof Neo K Morojele

APPROVED BY:



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

DATE OF APPROVAL: 11/02/2015

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

Date

11/02/2015

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To: Leane Ramsoomar
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