

https://dspace.org/

Adolescent health and wellbeing in the context of impact assessment of natural resource extraction projects A scoping review

O Cambaco; J Landtwing; H Cossa; E Macete; E et al ...

ELSEVIER SCIENCE
https://hdl.handle.net/10539/40784
WOS

Downloaded from a DSpace repository. https://dspace.org/

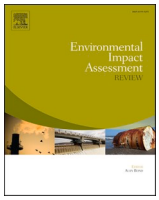
Environmental Impact Assessment Review 105 (2024) 107360



Contents lists available at ScienceDirect

Environmental Impact Assessment Review

journal homepage: www.elsevier.com/locate/eiar





Adolescent health and well-being in the context of impact assessment of natural resource extraction projects: A scoping review

Olga Cambaco [a,b,c,*], Junia Landtwing [a,b], Herminio Cossa [c], Eusébio Macete [c], Jürg Utzinger [a,b], Neusa Torres [c,d,e], Mirko S. Winkler [a,b]

[a] Swiss Tropical and Public Health Institute, Kreuzstrasse 2, CH-4123 Allschwil, Switzerland
[b] University of Basel, P.O. Box, CH-4003 Basel, Switzerland
[c] Manhiça Health Research Centre, CP 1929 Maputo, Mozambique
[d] SAMRC Developmental Pathways for Health Research Unit, University of the Witwatersrand, Johannesburg, South Africa
[e] Department of Global Health and Social Medicine, King's College London, United Kingdom

ARTICLE INFO

Keywords:
Extractive industry
Health determinants
Health outcomes
Vulnerable /marginalsed groups
Young people
Youth

ABSTRACT

Background: Natural resource extraction projects (NREPs) might impact the social, economic and health conditions of marginalised and/or vulnerable population groups, such as adolescents. While different types and forms of impact assessments (IAs) have the aspiration to place particular emphasis on potential project-related effects in vulnerable and/or marginalised groups, it remains unclear whether and to what extent health and well-being of adolescents have been considered in IA of NREPs.

Methodology: We conducted a scoping review of different sources, including peer-reviewed literature, IA reports, and existing focused IA guidelines to examine whether and how adolescent health and well-being have been addressed in IA of NREPs. We focussed on the peer-reviewed literature, IA reports and IA guidelines.

Results: Out of 5055 records identified in the peer-reviewed literature, 32 articles were included in the final analysis. Additionally, 25 IA reports from sub-Saharan African countries and six international IA guidelines were considered. We found that environmental determinants of health were the main feature addressed in peer-reviewed publications. Sexually transmitted infections, including HIV/AIDS, were frequently reported health outcomes in NREP areas that affect adolescents. However, the complex interplay between environmental exposures, social status and risk behaviour of adolescents were rarely investigated. Only a few IA reports identified adolescents as a specific vulnerable and/or marginalised group. There was a paucity of specific tools and methodologies in IA guidelines that are tailored to adolescents.

Conclusion: The development and use of specific guidance that provides a framework for IA practitioners to identify and mitigate health risks in NREP areas is an essential first step towards implementation and better inclusion of adolescents in current IA practice. This should be complemented by a broad research agenda aiming to expand the current narrow understanding of how NREPs affect the health and well-being of community subgroups, including adolescents.

1. Introduction

Over the past several decades, the number of natural resource extraction projects (NREPs) has increased in many African countries, particularly in the gas, oil and mining sectors. In turn, there is considerable dependency of NREPs for promoting social and economic development (IFC, 2018; Langton and Mazel, 2008). Investments in NREPs might leverage access to public and private services, including health care, water, sanitation and education. Indeed, the promise is that NREPs will foster public health in surrounding communities (Asante and Zwi, 2007; Mactaggart et al., 2018). However, the potential of NREPs to contribute to social and economic development conflicts with potential negative health impacts (Winkler et al., 2012; Winkler et al., 2020), increasing disparities in health status across populations (Landrigan et al., 2010), especially for poor, marginalised and/or vulnerable groups living in close proximity to NREPs in low Human Development Index

* Corresponding author at: Swiss Tropical and Public Health Institute, Kreuzstrasse 2, CH-4123 Allschwil, Switzerland.
E-mail addresses: olga.cambaco@swisstph.ch (O. Cambaco), Junia.landtwing@swisstph.ch (J. Landtwing), herminio.coassa@manhica.net (H. Cossa), eusebio.macete@manhica.net (E. Macete), juerg.utzinger@swisstph.ch (J. Utzinger), neusa.torres@manhica.net (N. Torres), mirko.winkler@swisstph.ch (M.S. Winkler).

https://doi.org/10.1016/j.eiar.2023.107360
Received 5 February 2023; Received in revised form 9 November 2023; Accepted 13 November 2023
Available online 13 December 2023
0195-9255/© 2023 Published by Elsevier Inc.

(HDI) countries (Goldenberg et al., 2008a). The World Health Organization (WHO) defines an adolescent as "any person between the ages of 10 and 19" (Azzopardi et al., 2017). This stage of life is considered a critical juncture in an individual's development as it is characterised by remarkable physical, cognitive and socio-emotional changes that have long-lasting effects on the overall health and well-being (Blakemore and Mills, 2014; Patton et al., 2016). It is during this transition period that socialisation and personality development play a vital role to adolescents' overall health and social well-being (Blakemore and Mills, 2014; Orben et al., 2020). Compared to children and adults, adolescents have different exposures and responses to pathogens, diseases and the social environment, as they are more inclined to experiment and take part in high-risk behaviours such as unsafe sex, substance abuse and violence, including self-harm (Werner et al., 2018; Steinberg, 2008). Thus, the international development community has identified the health, social development and well-being of adolescents as urgent priorities (Asha et al., 2021), which is also aligned with the overarching principle of the Sustainable Development Goals (SDGs) to "leave no one behind" (Asha et al., 2021).

In order to live up to this aspiration, the global community must increase investments in programmes, interventions and policies targeting the health and well-being of adolescents, particularly for those who are considered vulnerable and/or marginalised (WHO, 2016; WHO, 2017). Furthermore, efforts are needed to establish platforms and support systems that empower adolescents to express their voices and perspectives (Gurstein et al., 2003; Villa-Torres and Svanemyr, 2015). Hence, a multi- and intersectional transformation is required, recognising the necessity of a holistic approach that addresses adolescents' physical, mental and social well-being (Okeke et al., 2022). This holds particularly true for adolescents who are affectd by NREPs that warrant multi-sectoral action and collaboration between the public and private sectors to prevent adverse impacts on adolescents' health, while promoting health opportunities (Asante and Zwi, 2007; Ahlerup et al., 2020). The available evidence suggests that adolescents growing up in NREP-affected communities are likely to experience negative effects on living and working conditions, including fragile social contexts and high in-migration (Goldenberg et al., 2008a), risk behaviour that lead to the spread of sexually transmitted infections (STIs) (Goldenberg et al., 2008b), increased disposable income linked to transactional sex (Campbell, 2000; Parkins and Angell, 2011) and increased adolescent labour reducing school attendance (Goldenberg et al., 2010; Santos, 2018).

Impact assessment (IA) is an established systematic approach used to evaluate and analyse effects or consequences of a project, programme, plan or policy, which should mitigate potential risks to the environment and affected communities and maximize positive outcomes (Winkler et al., 2021). In most countries, IAs are mandated as part of licencing process of NREPs (Winkler et al., 2021; Winkler et al., 2013a). This commonly includes environmental impact assessment (EIA) and social impact assessment (SIA). Health is either considered within EIA or SIA or carried out as a standalone health impact assessment (HIA) (Dietler et al., 2020). A particular feature of HIA is the aim in addressing equity and social justice (Winkler et al., 2021). Moreover, SIA and HIA aspire to provide recommendations to ensure informed decision-making and promote positive health outcomes, placing particular emphasis on vulnerable and/or marginalised groups (Scott-Samuel et al., 2001).

In 2019, Leuenberger and colleagues conducted a scoping review to determine whether and to what extent the issue of health equity is addressed in IA reports and guidelines, with a focus on sub-Saharan Africa (SSA). The authors established the need for more systematic stratification of community subgroups in IA to better determine health differentials (Leuenberger et al., 2019). Consequently, it appears there is a risk that potential negative health impacts on adolescents living in highly dynamic contexts, such as NREPs, are insufficiently identified and mitigated (Cossa et al., 2022a; Leuenberger et al., 2021a). With the overaching objective of contributing to reducing potential adverse health impacts of NREPs on adolescent through subgroup-sensitive IA, we conducted a scoping literature review of different sources, including peer-reviewed literature, IA reports and existing focused IA guidelines to examine whether and how adolescent health and well-being have been addressed in IA of NREPs. This pursuit was guided by three research questions: (i) what are the specific outcomes and mechanisms through which NREPs affect adolescent health and well-being that have been described in the peer-reviewed literature? (ii) how has adolescent health and well-being been addressed in IA reports of NREPs in SSA countries? and (iii) are adolescents considered a distinct vulnerable group in EIA, SIA and HIA guidelines?"

2. Methodology

We conducted a scoping review focusing on the peer-reviewed literature, IA reports and IA guidelines (Munn et al., 2018). Our methodology was inspired by previous research conducted by Leuenberger et al. (2019) and Dietler et al. (2020). We employed the two databases these groups have established; namely (i) a systematically selected set of IA guidelines and (ii) a compilation of IA reports of mining projects located in SSA. Additionally, we conducted a systematic review on the peer-reviewed literature. The search strategies and data analysis plan for each of the data sources are outlined in Sections 2.1, 2.2 and 2.3.

The inclusion criteria of our scoping review was determined using the population, concept and context (PCC) framework, as summarised in Table 1. The study protocol was registered in the Open Science Framework (OSF) under the title "A scoping review on adolescent health in the context of natural resource extraction projects". The published methodology was made available on 14 October 2021 (OSF registration: https://archive.org/details/osf-registrations-p54xs-v1).

2.1. Peer-reviewed literature

The methodological approach developed in our scoping review was guided by a framework put forth by Arksey and O'Malley (2005) and further developed by Levac et al. (2010). In line with this framework, the following stages were included: identification of relevant studies; selection of eligible literature; extracting relevant data from the identified studies; and summarising and reporting the results.

We conducted a comprehensive search of the peer-reviewed literature using three readily available electronic databases: PubMed, Web of Science and EMBASE, with search terms refined to suit each database. The search strings were developed around the following topics: (i) NREPs; (ii) adolescents; and (iii) health. For the "adolescents" search string, the WHO definition of "adolescent" was applied (WHO, 2017), and hence, other common terms used to refer to adolescents were considered in our search (e.g., youth, teenager(s), young boy(s) and young girl(s)). Publications related to IA, HIA or NERPs were excluded if they did not explicitly mention adolescent health. Details of the search strategy are available as supplementary material (Appendix A).

Hits from the database searches were included if they stemmed from the peer-reviewed literature, the full-text was readily accessible with the rights of the University of Basel (Basel, Switzerland) and published either in English, French, Portuguese or Spanish. During the initial search phase, sources of grey literature, conference proceeding, books,

Table 1
Population, concept and context (PCC) framework.

Population, concept and context (PCC) framework (Tricco et al., 2018)	
Population	Female and male adolescents between the age of 10 and 19 years (according to the WHO definition (WHO, 2017)) in NREP areas.
Concept	Aspects related to mental health, sexual and reproductive health, maternal health, nutritional conditions, communicable and non-communicable diseases, injuries, health prevention and interventions.
Context	Communities hosting industrial and large-scale NREPs and/or artisanal and small-scale mining (ASSM).

books chapter, study protocols and editorials were excluded from our search. All relevant peer-reviewed papers published from inception of each database to 31 August 2022 were included.

The selection process included two stages of screening, performed independently by two reviewers (OC and JL), using EndNote version X9.2 for data management (Thomson Reuters Corp; New York, NY, USA) and Rayyan software (Harrison et al., 2020). In a first step, 20% of the studies were independently reviewed and discussed by the two reviewers. This stage included the screening of titles and abstracts to identify potentially eligible studies retrieved from the database search. Any discordant decision was resolved by consensus or with the help of a third reviewer (MSW). Once the title and abstract screening was completed, a full-text review of all included articles was performed to assess eligibility of the studies. The selection procedure, including reasons for exclusion, is illustrated in the "Preferred Reporting Items for Systematic Reviews and Meta-analyses Extension for scoping reviews" (PRISMA-ScR) flow chart in Fig. 1. Subsequently, data were extracted from each study and recorded in an Excel file (Microsoft Corp., v16.0; Redmond, WA, USA). The following data were extracted from the included peer-reviewed literature: year of publication, country, aim, study population, type of natural resources extracted and health determinants and outcomes studied. Data were thematically analysed by categorizing and organizing the data based on the review's objective. The development of the themes involved a systematic process, following three main steps: (1) coding of the articles to record the components; (2) the development of descriptive themes (e.g., health concerns and determinants); and (3) the creation of analytical themes (e.g., socio-economic status, vulnerability or proximity to NREPs) (Thomas and Harden, 2008). These analytical themes were developed by addressing the research objective using existing descriptive themes. This allowed us to identify gaps, trends and focal areas within the examined literature (Levac et al., 2010). The coding process was iterative.

2.2. IA reports

IA reports assess the impacts that the development initiatives will have by identifying and managing potential environmental, social and public health impacts of NREPs, mitigating the risk while concurrently promoting health opportunities (Winkler et al., 2021). IA reports from SSA countries hosting large-scale NREPs that assessed impacts on the community health and well-being were obtained from a recently published scoping review by Dietler et al. (2020). In total, 44 IA reports obtained from different sources were eligible for full-text screening. The description of the search methodology and details of the screening process are described in the referenced paper (Dietler et al., 2020). For our study, IA reports were excluded if they did not include any information about adolescent health and well-being in any of the following report sections: (i) baseline; (ii) IA; (iii) mitigation measures; and (iv) monitoring plan. For the full-text screening, we applied Adobe Reader's search function to search the prefixes "ado" and "hea" to assess for information related to "adolescent health". If more than one IA report was available for the same project (e.g., one environmental health impact assessment (EHIA) and SIA, the new information related to adolescent health mentioned in the different types of reports was combined. The following variables were extracted (into an Excel spreadsheet) from all screened reports that met our inclusion criteria: country, year of publication, type of IA report, resource extracted, population groups at risk and health determinants and outcomes addressed.

2.3. IA guidelines

For our scoping review, we built on the set of international and national EIA, SIA and HIA guidelines that were identified by Leuenberger et al. (2019) for a scoping review pertaining to "HIA and health equity in sub-Saharan Africa". With the objective to not miss recently published guidelines in our review, we applied the same search strategy as pursued by Leuenberger et al. (2019) from January 2019 to 31 August 2022. The screening of the IA guidelines followed the same strategy as applied in the IA reports. We carried out a full-text examination of each of the commonly followed IA steps: (i) screening; (ii) scoping; (iii) IA; (iv) reporting; and (v) implementation and monitoring (Winkler et al., 2021). Since the guiding research question for the review of the guidelines was whether adolescents are considered a distinct vulnerable group in EIA, SIA and HIA guidelines, guidance documents that did not provide specific information on adolescent health and well-being in any section were excluded from this analysis. Information extracted from the guidelines was organised in an Excel spreadsheet, applying the following main categories: (i) country and year of publication; (ii) health outcomes addressed; and (iii) health determinants addressed.

3. Results

3.1. Adolescent health and NREPs in the peer-reviewed literature

We identified a total of 5.055 records from either PubMed, Web of Science and EMBASE. After removing 1.464 duplicates, a total of 3591 studies were deemed eligible for screening of titles and abstracts. Of these, 32 studies met our inclusion criteria for data extraction and analysis (Fig. 1).

3.1.1. Characteristics of peer-reviewed literature

The characteristics of the included peer-reviewed papers are summarised in Fig. 2. The geographic distribution of the 32 peer-reviewed articles is presented in Panel A. According to the World Bank classification, most of the studies were conducted in upper-middle-income countries ($n = 14$) and high-income countries ($n = 14$), whereas three were conducted in low-income countries. Only one study performed a multi-country analysis comparing 136 settings. Eligible studies were published between 1996 and 2022, with the majority ($n = 16$) published between 2018 and 2022 (Panel B). In the years 1998–2003, 2005, 2006 and 2009 no study was published on the topic.

Qualitative ($n = 12$) and quantitative studies ($n = 12$) were performed equally in most studies extracted from the peer-reviewed literature. Of those, qualitative studies explored perceived effects of NREPs in adolescents' health, while quantitative research focused on health outcomes associated with the risk for adolescents residing in NREP communities.

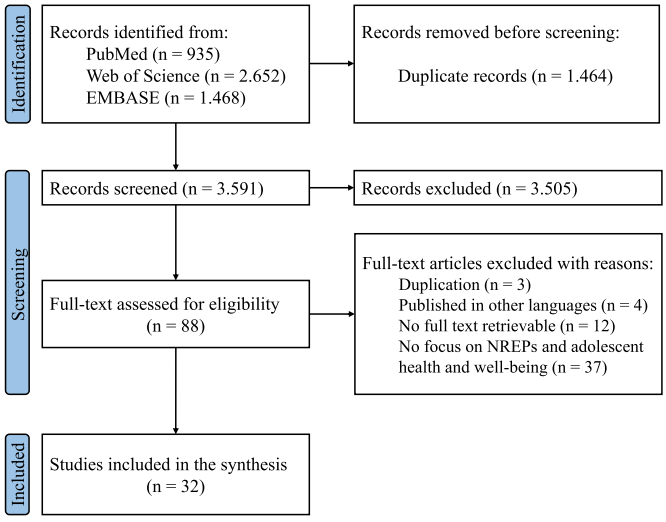


Fig. 1. PRISMA flow chart showing the number of articles identified in PubMed, Web of Science and EMBASE. Abbreviation: NREPs, natural resource extraction projects.

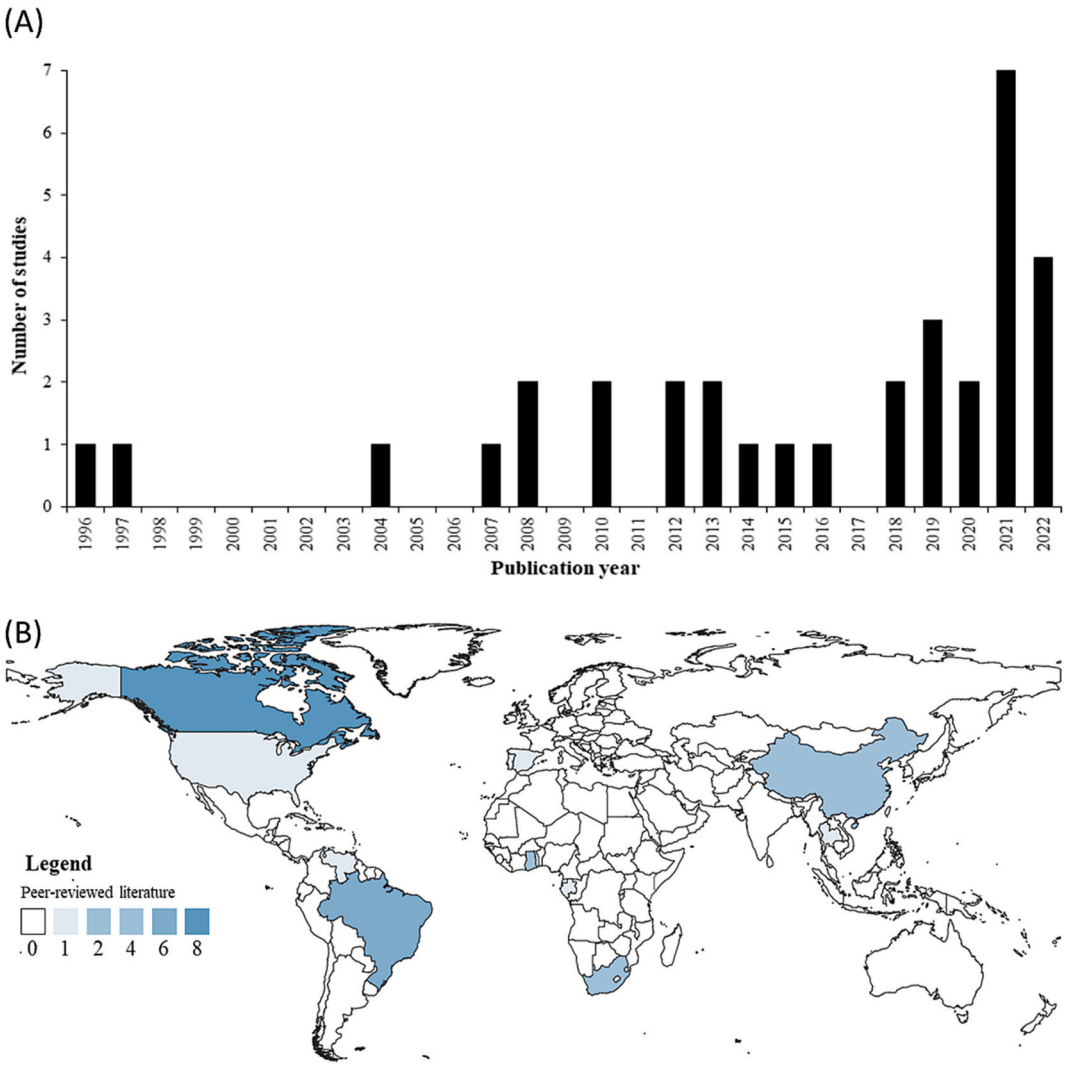


Fig. 2. Temporal (Panel A) and geographic (Panel B) distribution of the eligible studies pertaining to adolescents' health in NREPs, identified from the peer-reviewed literature ($n = 32$).

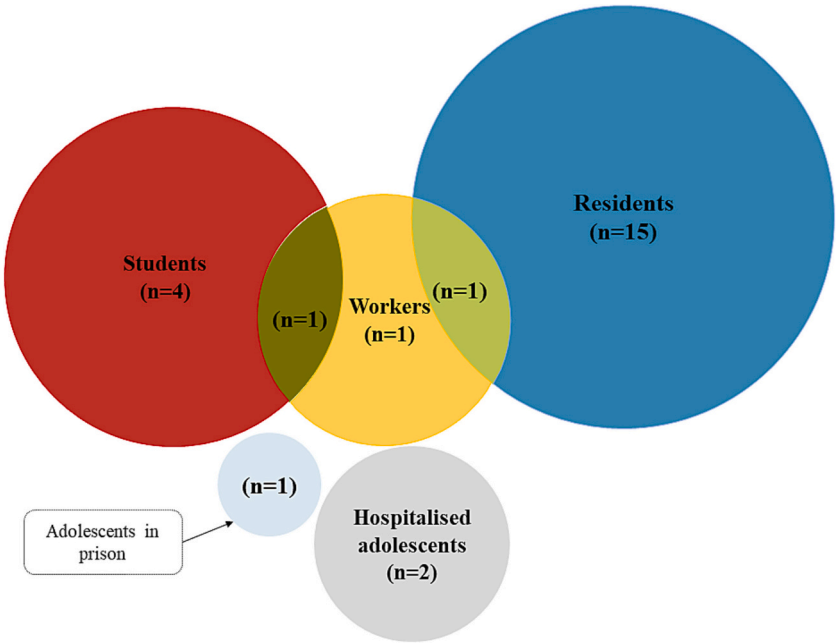


Fig. 3. Number of peer-reviewed papers included in this scoping review, stratified by adolescent population groups.

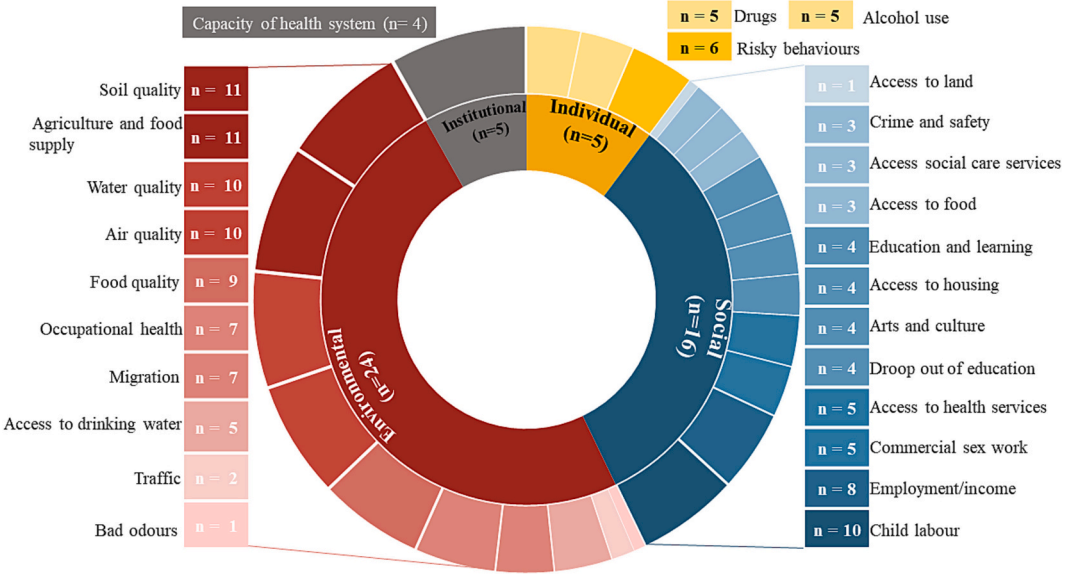


Fig. 4. Categories of health determinants studied in the peer-reviewed literature. The numbers (n) represent the frequency each determinant was mentioned.

In terms of the scale of the extractive industry projects, most studies were conducted in the context of large-scale mining (n = 22). Other studies focused on artisanal and small-scale mining (ASSM). With regard to the extracted commodities, studies in gold mining settings were most frequent (n = 11), followed by studies done in the oil and gas sector (n = 7).

Regarding sex, most studies targeted both adolescent girls and boys (n = 23). None of the studies solely focused on female adolescents in affected communities. A considerable number of peer-reviewed papers did not clarify the sex of participants included (n = 8). Additionally, less than one-fifth of the studies focused only on the adolescents' age group, as defined by WHO (n = 6). Additionally, in more than half of the peer-reviewed papers, adolescents residing in NREP areas were included in the study population (n = 22) (Fig. 3).

3.1.2. *Health determinants and outcomes studied*

As shown in Fig. 4, environmental determinants of health were studied most frequently at the nexus of NREPs and adolescent health, followed by social determinants of health. With regards to specific determinants of health, soil quality (n = 11), agriculture and food supply, (n = 11), water quality (n = 10), food quality (n = 19), child labour (n = 10) and employment (n = 8) were studied most often.

Overall, 16 health outcomes were addressed in the included peer-reviewed papers. STIs were the most frequently studied health outcomes (n = 5), followed by neurological/behavioural disorders (n = 4), anaemia (n = 3) asthma (n = 3), and cancer (n = 3) (Fig. 5).

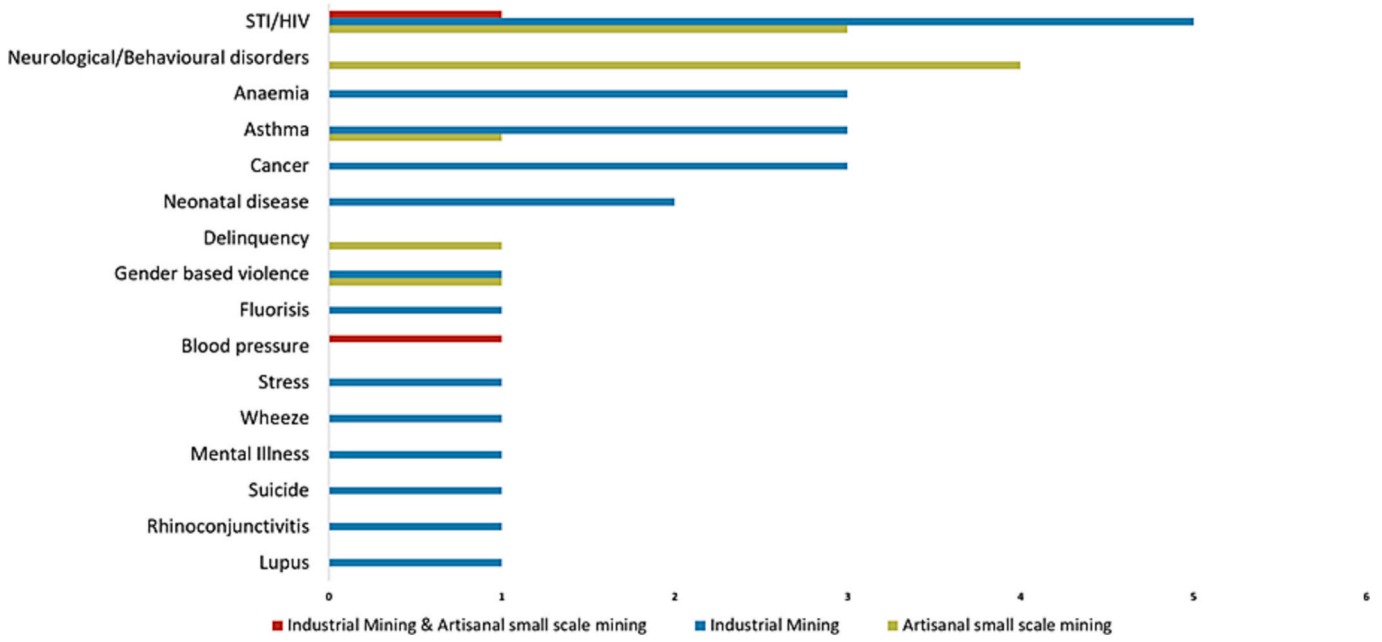


Fig. 5. Categories of health outcomes studied in the peer-reviewed literature. Abbreviation: Human immunodeficiency virus, HIV; Sexually-transmitted infection, STI.

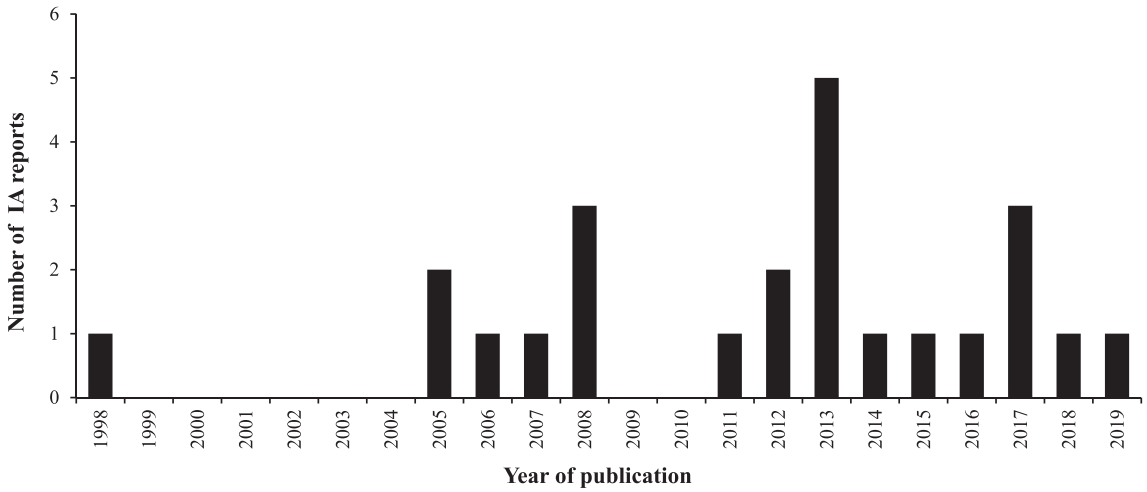


Fig. 6. Publication year and number of impact assessment (IA) reports included.

3.2. Adolescent health in IA reports

3.2.1. Characteristics of the included IA reports

Of the initial sample of 44 IA reports, 19 were excluded in the full text analysis, as they did not meet the inclusion criteria. A total of 25 IA reports addressing adolescents' health and well-being were included for data extraction and analysis. The temporal pattern of the 25 IA reports is shown in Fig. 6.

The eligible IA reports can be classified into two main groups: (i) reports not originally addressing health (e.g., EIA and SIA); and (ii) reports with the inclusion of health (e.g., HIA and ESHIA). The majority of reports belong to the first group ($n = 18$). In terms of geographic distribution of the included countries of SSA, Ghana ($n = 5$), Mozambique ($n = 3$) and Burkina Faso ($n = 3$) were featured most often with information on adolescent health in NREP communities. Similarly to the identified peer-reviewed literature, most of the reports were conducted in gold mining areas ($n = 12$).

3.2.2. Consideration of adolescents in IA reports

IA reports explicitly indicated the population groups considered vulnerable and/or marginalised in communities affected by resource extraction projects. Among the different groups considered as being vulnerable and/or marginalised in the reports, vulnerabilities were related to sex, age, income, health status and socially disadvantaging circumstances.

As shown in Fig. 7, three different categories for population groups considered the issues of vulnerability and/or marginalisation in NREP areas. Most reports included stratified population groups being women or mothers mostly considered as a vulnerable and/or marginalised group ($n = 18$), followed by infants/children ($n = 13$). However, only three IA reports specifically described the impacts on adolescents and defined subcategories as particularly vulnerable and/or marginalised, including teenage mothers ($n = 2$) and unemployed youth ($n = 1$).

3.2.3. Health determinants and outcomes addressed in IA reports

The strong influence of social determinants on the health and well-being of adolescents was mentioned in most of the IA reports ($n =$

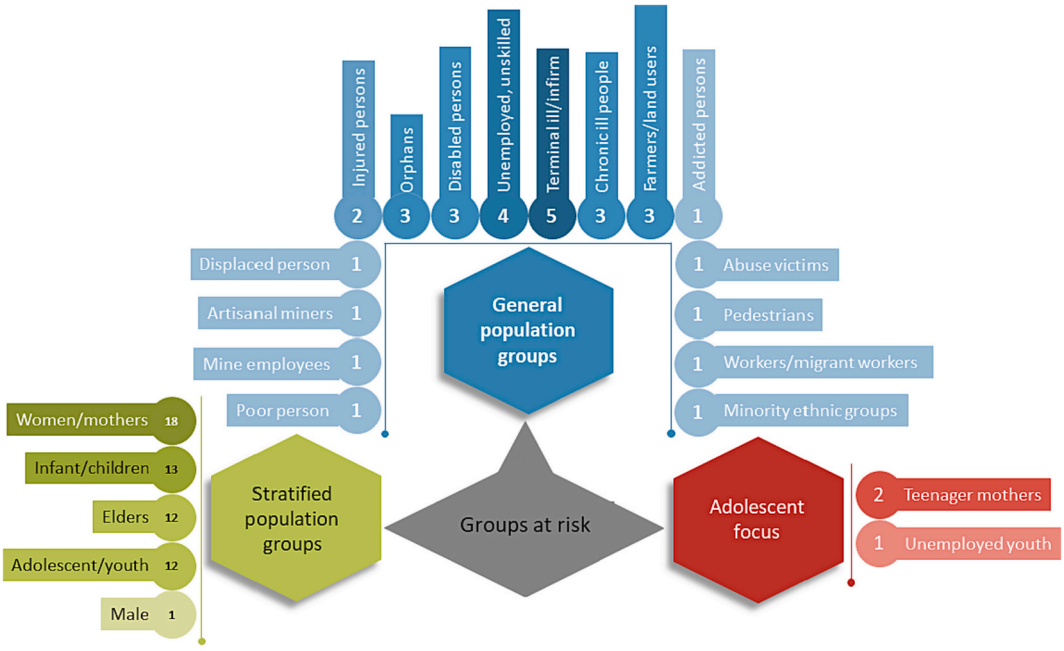


Fig. 7. Community subgroups considered at risk in the impact assessment (IA) reports.

21). Of those, employment and income ($n = 21$), access to education and learning ($n = 13$), access to health services ($n = 9$), access to social care ($n = 8$), commercial sex work ($n = 8$) and child labour ($n = 7$) were the most frequently reported. Hence, institutional determinants (e.g., capacity of health systems) ($n = 2$) and capacity of education facilities ($n = 1$) were by far the most frequently examined determinants in adolescent health.

In total, seven health outcomes were reported to affect adolescents living and working in NREP areas. Among them, the most frequent were STIs, including HIV/AIDS ($n = 15$), followed by adolescent pregnancy (n = 13) and gender-based sexual violence ($n = 6$). The majority of health determinants and health outcomes were assessed in the reports not originally addressing health in their design.

3.3. Adolescent health in IA guidelines

3.3.1. Characteristics of the included IA guidelines

In total, 14 international and national guidelines pertaining to IA for large infrastructure projects in SSA were subjected to full-text screening (one EIA, one ESIA, eight HIA, two SIA and two EHIA). However, eight of these guidelines were excluded after full-text analysis, as they did not meet one or several inclusion criteria. The six eligible guidelines (three HIA, one EIA, one SIA and one ESIA) that referred to adolescent health and well-being, were all published by international organisations: International Association for Impact Assessment, Asian Development Bank, United Nations Environment Programme, Inter-American Development Bank and the French Institute for Sustainable Development (Abaza et al., 2004; Quigley et al., 2006; Kvam, 2018; Zhongming et al., 2018). No national guidelines covering adolescent health and well-being were found. The guidelines were published between 2010 and 2021.

Of the included guidelines, only one provided in-depth information about adolescent health and well-being in NREP areas ($n = 1$). Half of the eligible guidelines mentioned issues that affect adolescents in NREP areas such as gender-based violence, mental health problems, cancer and typhus ($n = 3$). Of those, two guidelines specified the sex of adolescents at risk when examining health outcomes ($n = 2$).

The importance of social determinants in adolescent health pertained to the following aspects: employment/income ($n = 4$), child labour ($n = 2$) and access to health services ($n = 2$). Only one guideline addressed institutional determinants of health, which focused on the capacity of the healthcare system. In general, specific attention was drawn to health inequalities due to changes in determinants of health in NREP areas. Nevertheless, information was lacking on approaches to reduce and address health inequities within individuals and groups.

3.3.2. Focus on vulnerable and/or marginalised groups in IA guidelines

All guidelines mentioned social groups that are at particular risk in mining areas ($n = 6$). In half of them, adolescents were identified as a vulnerable and/or marginalised population in NREP areas (n = 3). None of the guidelines offered a systematic methodology or specific tool to assess the health effects in the adolescent population group, listed particular regulations or other means to address health issues in this group when conducting IA. In addition, information about the inclusion of adolescents in decision-making and participation during an IA process and corresponding recommendations were lacking.

4. Discussion

To our knowledge, this is the first scoping review that provides evidence on adolescents' health and well-being in the context of IA in NREPs. Overall, 32 peer-reviewed publications, 25 IA reports from SSA countries and six international IA guidelines met our inclusion criteria, and hence, were subjected to detailed analysis. It is interesting to reflect on the determinants and outcomes associated with adolescent health in current IA literature and practice, which might serve as a starting point to identify gaps in the current evidence-base. Here, we put key findings in the context of existing IA literature for identifying how IA practice could be adjusted to better address adolescents' vulnerability to NREPs health impacts, while acknowledging the challenges they face growing up in fast-changing contexts.

4.1. Investigating adolescent' health and well-being in NREPs in the peer-reviewed literature

Our scoping review revealed only a small number of peer-reviewed papers that focused on adolescent health and well-being in the context of NREPs. Interestingly, most of these studies were conducted in high HDI countries. This finding corroborates with previous studies indicating that the health of adolescents living and working in NREP areas needs more attention and should urgently be prioritized (Goldenberg et al., 2008a; Goldenberg et al., 2008c; Goldenberg et al., 2010; Mbonane et al., 2021). This holds particularly true for adolescents growing up in a low HDI countries, where there is evidence of adverse health risks that are exacerbated by poverty, in addition to environmental, societal, cultural heritage, health and community safety concerns (Emmanuel et al., 2018; Goldenberg et al., 2008a; Leuenberger et al., 2021a; Leuenberger et al., 2021b; Mwakesi et al., 2020;).

Most studies identified in our review were conducted in gold mining areas. Our findings are in line with a recent review investigating health studies in ASSM areas, which found that approximately 80% of studies were performed in gold mining contexts. Additionally, the study concluded that, rarely, studies pertaining to health effects in ASSM attempted to include the most vulnerable and/or marginalised groups (Cossa et al., 2022b). With regards to adolescents, the emphasis on gold mining can be explained, at least partially, by the informal nature of the artisanal gold mining sector, which renders it an attractive livelihood opportunity for children and adolescents (Banchirigah, 2008; Cossa et al., 2022b). However, only two studies from Brazil evaluated adolescent perceptions of mercury contamination (Câmara Vde et al., 1997; Novais and Câmara, 2009). When considering the range of potential health effects of mercury exposure in adolescents, future research on occupational hazards should assess health-related exposure and health effects from ASSM activities in vulnerable and/or marginalised groups (Allan-Blitz et al., 2022; Steckling et al., 2017). This aligns with ongoing initiatives such as "The Minamata Convention", which has already recognised community health as "priority for action", with particular attention on vulnerable and/or marginalised risk groups, including adolescents (WHO, 2021).

Our findings revealed that overall, the peer-reviewed literature did not address the most socially disadvantaged groups, taking into consideration intersectional factors such as pregnant adolescents, migrant adolescents, adolescents out of school, adolescents lacking mental capacity or others with severe health conditions. Hence, health research largely misses the most vulnerable and/or marginalised people who are at highest risk of experiencing negative health impacts and have limited ability to cope with NREP impacts (Leuenberger et al., 2021a). One potential explanation for the lack of research focussing on these vulnerable and/or marginalised groups might be ethical issues and regulations on conducting studies with minors and power dynamics that may marginalise these groups (Levine, 2008). Another possible explanation might be related to the research-driven agenda and infrastructure to support research including vulnerable and/or marginalised groups, who lack power and influence in these communities, which may require additional resources (e.g., skilled personnel), and hence, resulting in higher costs (Shepherd, 2020).

Given that globally, 64 million girls and 88 million boys, including adolescents, are involved in child labour in NREP areas (World Bank, 2020), increasing investments in sectors and systems that improve environmental and social determinants of health to reduce adolescent vulnerabilities to NREP health risks needs to be prioritized (Currie et al., 2012). In addition, it is essential to conduct new research exploring the health and social impacts experienced by this age group in NREP

communities (Leuenberger et al., 2021a; Leuenberger et al., 2022). For doing so, it is crucial to involve all relevant stakeholders, such as ethical boards, national and local health authorities, non-governmental organisations active in NREP settings, native populations, local leaders and potential participants in all steps of the research process (Cossa et al., 2021). Given the increasing impact of NREPs on community outcomes, particularly for the most vulnerable and/or marginalised living in low HDI countries, there is a need for novel tools and approaches tailored to the needs of adolescents (Leuenberger et al., 2021a; Leuenberger et al., 2022). Equally important is responding to urgent calls from international agencies to establish platforms and support systems that empower adolescents to express their voices and perspectives, and to increase investments in the health and well-being of adolescents (Sheehan et al., 2017).

HIA might offer an entry point for adolescents to play a role as actors of their own development through public participation, empowering and allowing their representative participation in addressing their key concerns, a voice that is consistently missing from the research. Therefore, the methods and approaches to ensure marginalised and/or vulnerable individuals and groups, including adolescents' participation in HIA, should be theory-informed and well described (den Broeder et al., 2017; Glucker et al., 2013).

4.2. Consideration of adolescent health in IA of NREPs

In this scoping review, fewer than one fifth of the peer-reviewed papers that met our inclusion criteria specifically considered adolescents. In contrast, health-related studies were primarily oriented towards children and adults, while the critical adolescent years were largely neglected. Many studies have shown that adolescents face unique social contexts and confront unique challenges compared to children and adults (Al CCe, 2012). For example, a study in America investigating how rapid community growth affects adolescents and adults differentially found that adolescents affected by large-scale projects have significantly higher negative attitudes towards growth and lower levels of satisfaction compared to adults (Freudenburg, 1984). Given NREPs increasing impacts on community outcomes (Mactaggart et al., 2018), particularly for the most vulnerable and/or marginalised groups in low HDI countries (Farnham et al., 2020), novel tools and approaches tailored to the needs of adolescents are warranted (Leuenberger et al., 2022). Equally important is to empower adolescents with tools that allow them to express their voices and perspectives in extractive industry contexts (Brondi et al., 2012; Glucker et al., 2013).

While past research has mainly focussed on children and adults affected by NREPs, there is uncertainty around short- to long-term health impacts on adolescents living in close proximity to NREPs (Cossa et al., 2022a; Dietler et al., 2021). This is particularly salient in low HDI countries, where studies point to a dearth of demographic, socio-economic and epidemiological data on adolescents (Azzopardi et al., 2017). Our study supports evidence from previous observations, showing limited literature and available data on adolescent health, their indicators and definition (Sawyer et al., 2012). Most of the evidence derives from aggregated data at the country level with insufficient stratification by age group (Azzopardi et al., 2017). Those are major limitations for assessing adolescent-specific impacts of NREPs (Leuenberger et al., 2019). This makes it difficult to use the data to inform health programmes, design policies and interventions to mitigate potential adverse effects of NREPs on the health, well-being and equity of adolescents (Guthold et al., 2019). Hence, the collection of high-quality data (primary and secondary data) on different population groups in the IA process represents an opportunity to identify and address local health impacts on the adolescent population fraction (Winkler et al., 2013b). This could be supported by establishing a consistent and standardised tool for measuring adolescents' health profile in NREP areas and investigate immediate and long-term impacts.

4.3. Gap identified in the searched health outcomes

While several health outcomes in communities surrounding mining areas are studied (Cossa et al., 2022b; Leuenberger et al., 2021a; Lyatuu et al., 2021), in IA reports, STIs, including HIV/AIDS, was the most prevalent health outcome in adolescents in NREP areas. When considering that adolescents and young people represent a growing share of people living with HIV/AIDS worldwide (UNICEF, 2020), these findings are not surprising. In addition, HIV is estimated to be the sixth and eighth leading cause of death among people aged 10–14 and 15–19 years, respectively, with the overwhelming majority in SSA countries (Chandan and Legins, 2020). This is also reflected in resource extraction communities, which have experienced high rates of STI, including HIV/AIDS (Auvert et al., 2001; Goldenberg et al., 2008c; Goldenberg et al., 2008d). In a recent study analysing the impact of NREPs on HIV transmission risks in local communities near 39 mine openings across 16 countries in SSA, the findings indicated that HIV infection risks substantially increase (20%) upon mine mining (Dietler et al., 2022). This reinforces the concern that mining areas can become potential hotspots for HIV transmission among adolescents (Osei-Yeboah et al., 2019).

The current literature suggests that adolescent girls are the most vulnerable to STIs, including HIV and bear most of sexual and reproductive problems (Okeke et al., 2022). Some explanations might point to risky sexual behaviours (Auvert et al., 2001; Dietler et al., 2022) and low level of readily disposable income, leading adolescent girls to face challenges in negotiating safe sex (Goldenberg et al., 2008c). However, despite the political efforts from international agencies and organisations for urgent action and more investments in HIV preventon and control worldwide to target the most disadvantaged in remote settings (Shiffman, 2006), little improvement in HIV transmission in NREPs of adolescents has been recorded in SSA countries (Murewanhema et al., 2022). In accordance with the SDGs, which underpin the health and well-being of adolescents, there is a need to disentangle the direct and indirect pathways in which NREPs affect sexual health of adolescent girls and boys as this can lead the way towards reducing gender-related inequities (WHO, 2017). This requires multi-sectoral and intersectoral transformation, which recognizes inequality patterns while also being specific to gender and age considerations (Leuenberger et al., 2021b).

It is surprising that other health outcomes such as mental health, injuries and nutritional conditions were rarely studied in adolescents in NREPs areas. Considering that mental health disorders and injuries are the leading causes of death and disability among adolescents worldwide, there remains a dearth of evidence examining the topics in adolescents living and working in NREP areas (Patton et al., 2016; WHO; WHO, 2016). As an example, data on prevalence of mental health conditions are extremely scarce across low- and middle-HDI countries, even though most adolescents live in such settings (Azzopardi et al., 2017). One potential explanation could be the influence of the global public health agenda, where other health conditions are considered more relevant and are, consequently, given higher priority in the research domain concerning adolescent health and well-being (Ong et al., 2009). This knowledge gap is further exacerbated because only a few brief instruments for measuring adolescent mental illness are validated, making population-level measurement of adolescent health especially difficult to carry out (Carvajal et al., 2022). In addition, the gap between the broad range of available tools, scant research, policy support/interest and their lack of prioritization highlights how decision-makers continue to overlook adolescents in NREP communities (Asha et al., 2021).

4.4. Relevant determinants of adolescent health and well-being addressed in IA reports

Our scoping review revealed that in the examined IA reports, environmental aspects remain the focus of most peer-reviewed publications, despite the important consideration of social aspects for the health and well-being of adolescents. This finding is consistent with a previous

review evaluating IA reports in SSA that observed a heavy focus on environmental health determinants in health studies in mining areas (Dietler et al., 2020). In contrast to earlier findings, a study observed that in NREP areas the health and well-being of adolescents are determined by social, economic, cultural and individual factors beyond environmental changes (Leuenberger et al., 2019). Thus, changes in the conditions of the communities where NREPs operate were observed to affect the nature of existing health determinants and health outcomes (Carney and Gushulak, 2016; Mactaggart et al., 2018). However, despite its importance, understanding of the mechanisms by which NREPs work, their determinants of health and their association with specific health outcomes remain poorly addressed in the literature. This holds true for adolescents who live in dynamic contexts such as NREP communities and facing unprecedented challenges, including complex burden of disease encompassing diseases of multidimensional poverty and inequalities (Leuenberger et al., 2021b). While these findings have interesting implications for other situations and contexts of rapid community growth, it would be premature to accept them as definite or final. It is early to ascertain whether negative adolescent experiences will be transitory or long-lasting.

Our findings suggest that a deeper understanding of the specific determinants and outcomes of adolescent health and well-being, and the mechanisms through which NREPs affect them, can better inform IA studies to develop targeted interventions and formulation of policies (Viner et al., 2012). Given the NREPs evidence showing increased impacts on adolescent sexual and reproductive health outcomes, particularly among the most vulnerable and/or marginalised populations living in lower HDI countries (Campbell, 2000; Osei-Yeboah et al., 2019), it is crucial that greater attention is being paid to adolescent health and to prioritize key issues (Asha et al., 2021). Considering the fact that different types and form of IA, in particular HIA, pursue this aim (Winkler et al., 2021), more participative and innovative research that take into account the differences in social context are needed to better understand the aspects shaping the health profile of adolescents in impacted communities, considering their stage of development, contextual differences, geographic diversity and gender balance across different settings (Leuenberger et al., 2019; Leuenberger et al., 2022; Sadare et al., 2020). By studing the local effects of NREPs on adolescent health and well-being, this can provide insights into other mechanisms that may be relevant at the local level in the IA process.

4.5. How to promote better consideration of adolescents in IA practice

Recently, many mining companies have taken concrete steps to mitigate the effects of their past actions through the development of comprehensive IA studies and approaches for dealing with the potential adverse effects of mining (Harris et al., 2015; Winkler et al., 2013a). However, to date only a few studies are available that specifically focus on adolescent health and well-being in the context of NREPs (Leuenberger et al., 2019; Pereira et al., 2017).

Although health equity has always been considered to be a core aspect in IA guidelines (WHO, 1999), the implementation and use of the recommended actions to reduce and address existing inequities and the potential for unequal distribution of health risk among the most vulnerable and/or marginalised groups, such as adolescents, are not rigorously adopted at every stage of the IA process (Leuenberger et al., 2019). Hence, adolescents' health and well-being in the context of NREPs may not only be a blind spot in IA guidance documents, but also in IA reports of NREPs (Bawole, 2013). As an example, recent HIA guidelines did not provide any examples of adolescents as vulnerable and/or marginalised groups in the context of large-scale development projects (IPIECA, 2016; Pyper et al., 2021). Hence, this missed opportunity hinders the inclusion and engagement of vulnerable and/or marginalised groups, including children, pregnant women, indigenous peoples, handicapped/disabled people and adolescents themselves, in having their voices heard and represented in the IA process (Winkler et al., 2021). Additionally, it is not well understood whether decision-makers and health practitioners pay attention to adolescent health and well-being to develop and implement health impact mitigation strategies in NREP areas (McCallum et al., 2015). This points at an important potential shortcoming in current IA and mitigation practice, particularly in relation to upholding the guiding principle of "equity and equality" within IA practices (Wise et al., 2009).

HIA is increasingly recognised as a powerful methodology for mitigating potential negative health impacts, including equity, health and social well-being of communities, particularly the most vulnerable and/or marginalised (IPIECA, IOGP, 2016). Given its focus, HIA offers opportunities for adolescents to be part of the decision-making processes and become central and relevant to policies and most importantly "to ensure the health and well-being for all at all ages". It can also inform decision makers, HIA practitioners, programme implementers and other stakeholders interested in adolescent health about the pressing needs of this group and enable them to develop and implement targeted interventions (Glucker et al., 2013). In turn, this can guide future research and practice. Additionally, with its comprehensive approach to engaging stakeholders, the consideration of adolescents in the IA process offers an opportunity to promote not only the health and well-being of this marginalised and/or vulnerable group, but also allows adolescent voices to be heard and to actively influence health decisions on issues that are meaningful to them, serving as catalysts for driving positive change (den Broeder et al., 2017; Leuenberger et al., 2022). Furthermore, this could promote multisectoral collaboration among relevant actors (e.g., health, education, transport, social services and environmental protection) in different contexts, which is crucial for protecting and promoting adolescent health and well-being in the context of NREPs (Negev et al., 2013).

4.6. Strengths and limitations

The strength of our scoping review is that it includes different data sources on adolescent health in the context of NREPs. Given the broad range of sources for our review (e.g., peer-reviewed literature, IA reports and IA guidelines), our study is an important contribution to the literature in providing new insights into adolescents' health and well-being in the context of NREPs, specifically key health determinants and health outcomes reported and gaps identified in current IA practices.

Although we aimed to be systematic throughout the process, certain limitations need to be acknowledged. First, a potential bias could have been introduced by our search strategy as specific restrictions, such as language, publication type and status, were applied. Consequently, some relevant publications may have been omitted. In addition, we acknowledge that studies and reports published in the grey literature could have complemented our bibliography. On the other hand, the focus on peer-reviewed literature ensured methodological rigour and quality of the studies included. Second, we applied stringent exclusion criteria for reports and guidelines, which is common when conducting scoping literature reviews (Tricco et al., 2018). While the stringent application of inclusion and exclusion criteria was essential for capturing topics exclusively related to adolescent health in NREPs, this approach may have omitted relevant information on adolescent health and potential gaps in IA reports and guidelines. Additionally, we applied similar search strategy and included IA reports and IA guidelines built within the same databases used by Leuenberger et al. (2019) and Dietler et al. (2020), which could potentially introduce bias in terms of topic, sampling, time frame and publication type. Third, our search strategy aimed at identifying relevant studies using search terms in English, which might have excluded studies published in other languages. Fourth, mining companies have been accused of lack of transparency, only reports obtained from a previous review were included in our analysis (Dietler et al., 2020). Hence, the temporal and geographical distribution of available reports may not fully represent current IA practice. Fifth, due to the inconsistency in terminology referring to

adolescents, we considered the terms “children”, “youth”, “teenager”, “young boy(s)”, “young girl(s)” and “young adult(s)” to refer to adolescents. That said, we could not ensure that the included adolescent groups exactly matched the age group defined by WHO (Asha et al., 2021). In addition, adolescent health outcomes were not classified by the type/areas as papers did not provide information on diagnostic criteria or manuals used to classify health disorders or conditions. Hence, some misclassification might have affected the results and interpretation.

Finally, as this is the first attempt at providing an overview of whether and how adolescents' health and well-being be impacted by NREPs, the aspects described here may not represent the extent of health issues affecting adolescents. The observed disconnection between the focus on environmental determinants and their association with specific health outcomes affecting adolescents was not further investigated, as it was beyond the scope of our review. Indeed, more research is needed to adequately compare and assess the actual status of IA implementation and inclusion of adolescent health in different countries at different levels of development.

5. Conclusion

Beyond environmental factors, social factors exert the main potential influence on the health and well-being of adolescents living in close proximity to NREPs. It follows that such factors are fundamental to understand key determinants and health outcomes affecting adolescents living and working in NREP areas. At present, it remains unclear how these determinants link to poor health outcomes among adolescents living and working in NREP areas. With its comprehensive approach to promote equity and addressing health inequalities among the most vulnerable and/or marginalised, HIA offers an opportunity to improve health and well-being of adolescents in NREP-affected communities, and at the same time promoting sustainable development (Winkler et al., 2020). The articulation of specific guidance for identifying and mitigating health risks to adolescents in NREPs are implemented and operating would be an essential first step towards better inclusion of adolescents in IA practice. New research should prioritize: (i) adolescent-inclusive approaches that allow their voices to be heard; (ii) the most disadvantaged groups at risk of poor health and with low visibility to inform adoption planning, strategies and policies; (iii) investigate the main mechanisms by which NREPs directly and indirectly affect adolescent health and well-being across the stages of a mine’s life cycle; and (iv) how different types and forms of IA have been used to address adverse health impacts and inequalities among adolescents in NREP areas.

Funding

This work was supported by the Swiss Programme for Research on Global Issues for Development (r4d programme), which is a joint funding initiative by the Swiss Agency for Development and Cooperation (SDC) and the Swiss National Science Foundation (SNSF) [grant number 169461].

CRediT authorship contribution statement

Olga Cambaco: Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing, Visualization. **Junia Landtwing:** Methodology, Writing – review & editing, Visualization. **Herminio Cossa:** Visualization. **Eusébio Macete:** Writing – review & editing. **Jürg Utzinger:** Writing – review & editing, Visualization. **Neusa Torres:** Methodology, Writing – review & editing. **Mirko S. Winkler:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Visualization, Supervision, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no conflict of interest.

Data availability

Data will be made available on request.

Acknowledgements

The authors acknowledge Dr. Dominik Dietler and Dr. Andrea Leuenberger for the support in creating the IA guidelines and IA reports databases, Giovanni Casagrande for the assistance with the search strategy and peer-reviewed publications, Curdin Brugger for his inputs with the figures and Dr. Karin Gross and Prof. Khátia Munguambe for sharing insights into a social perspective related to the topic.

We are grateful to the Faculty of Health Science University of Pretoria for providing training in “Evidence synthesis research” for female scientists in SSA. We thank Prof. Tivani Mashamba-Thompson and her team for providing specific training and assistance.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.eiar.2023.107360.

References

Abaza, H., Bisset, R., Sadler, B., 2004. Environmental Impact Assessment and Strategic Environmental Assessment: Towards an Integrated Approach: UNEP/Earthprint.

Ahlerup, P., Baskaran, T., Bigsten, A., 2020. Gold mining and education: a long-run resource curse in Africa? J. Dev. Stud. 56 (9), 1745–1762. https://doi.org/10.1080/00220388.2019.1696959.

Al CCe, 2012. Social Determinants of Health and Well-Being among Young People. Health Behaviour in School-Aged Children (HBSC) Study: International Report from the 2009/2010 Survey. WHO Regional Office for Europe, Copenhagen.

Allan-Blitz, L.T., Goldfine, C., Erickson, T.B., 2022. Environmental and health risks posed to children by artisanal gold mining: a systematic review. SAGE Open Med. 10 https://doi.org/10.1177/20503121221076934, 20503121221076934. Epub 2022/02/18. PubMed PMID: 35173966; PubMed Central PMCID: PMCPMC8841918.

Arksey, H., O’Malley, L., 2005. Scoping studies: towards a methodological framework. Int. J. Soc. Res. Methodol. 8 (1), 19–32. https://doi.org/10.1080/1364557032000119616.

Asante, A.D., Zwi, A.B., 2007. Public-private partnerships and global health equity: prospects and challlenges. Indian J Med Ethics. https://doi.org/10.20529/ijme.2007.070. Epub 2008/07/17. PubMed PMID: 18630239.

Asha, G., Tanya, J., Rajani, V., Troy, J., Kumanan, R., Shehla, Abbas Z., 2021. Adolescent health in the sustainable development goal era: are we aligned for multisectoral action? BMJ Glob. Health 6 (3), e004448. https://doi.org/10.1136/bmjgh-2020-004448.

Auvert, B., Ballard, R., Campbell, C., Caraël, M., Carton, M., Fehler, G., et al., 2001. HIV infection among youth in a south African mining town is associated with herpes simplex virus-2 seropositivity and sexual behaviour. Aids 15 (7), 885–898. Epub 2001/06/16. https://doi.org/10.1097/00002030-200105040-00009. PubMed PMID: 11399961.

Azzopardi, P., Kennedy, E., Patton, G., 2017. Data and Indicators to Measure Adolescent Health, Social Development and Well-Being Inoccenti Research Brief. Florence.

Banchirigah, S.M., 2008. Challenges with eradicating illegal mining in Ghana: a perspective from the grassroots. Res. Policy 33 (1), 29–38. https://doi.org/10.1016/j.resourpol.2007.11.001.

Bank W, 2020. 2020 State of the Artisanal and Small Scale Mining Sector. Washington, D. C.

Bawole, J.N., 2013. Public hearing or ‘hearing public’? An evaluation of the participation of local stakeholders in environmental impact assessment of Ghana’s Jubilee oil fields. Environ. Manag. 52 (2), 385–397. https://doi.org/10.1007/s00267-013-0086-9.

Blakemore, S.J., Mills, K.L., 2014. Is adolescence a sensitive period for sociocultural processing? Annu. Rev. Psychol. 65, 187–207. Epub 2013/09/11. https://doi.org/10.1146/annurev-psych-010213-115202. PubMed PMID: 24016274.

Brondi, S., Sarrica, M., Nencini, A., 2012. Youth participation in environmental issues: a study with Italian adolescents. Hum. Aff. 22 (3), 390–404. https://doi.org/10.2478/s13374-012-0032-1.

Câmara Vde, M., Filhote, M.I., Lima, M.I., Alheira, F.V., Martins, M.S., Dantas, T.O., et al., 1997. Strategies for preventing adolescent mercury exposure in Brazilian gold mining areas. Toxicol. Ind. Health 13 (2–3), 285–297. Epub 1997/03/01. https://doi.org/10.1177/074823379701300214. PubMed PMID: 9200795.

Campbell, C., 2000. Selling sex in the time of AIDS: the psycho-social context of condom use by sex workers on a Southern African mine. Soc. Sci. Med. 50 (4), 479–494. Epub 2000/01/21. https://doi.org/10.1016/s0277-9536(99)00317-2. PubMed PMID: 10641801.

Carney, G., Gushulak, D., 2016. A review of research on health outcomes for workers, home and host communities of population mobility associated with extractive industries. J. Immigr. Minor. Health. https://doi.org/10.1007/s10903-015-0328-4. Epub 2016/02/24. PubMed PMID: 26902231.

Carvajal, L., Ahs, J.W., Requejo, J.H., Kieling, C., Lundin, A., Kumar, M., et al., 2022. Measurement of mental health among adolescents at the population level: a multicountry protocol for adaptation and validation of mental health measures. J. Adolesc. Health. https://doi.org/10.1016/j.jadohealth.2021.11.035.

Chandan, U., Legins, Ken, 2020. Promoting Equity for Children Living in a World with HIV and AIDS. United Nations Children's Fun, New York.

Cossa, H., Scheidegger, R., Leuenberger, A., Ammann, P., Munguambe, K., Utzinger, J., et al., 2021. Health studies in the context of artisanal and small-scale mining: a scoping review. Int. J. Environ. Res. Public Health 18 (4). https://doi.org/10.3390/ijerph18041555. Epub 2021/02/11. PubMed PMID: 33562086; PubMed Central PMCID: PMCPMC7914471.

Cossa, H., Dietler, D., Macete, E., Munguambe, K., Winkler, M.S., Fink, G., 2022a. Assessing the effects of mining projects on child health in sub-Saharan Africa: a multi-country analysis. Glob. Health 18 (1), 7. Epub 2022/02/02. https://doi.org/10.1186/s12992-022-00797-6. PubMed PMID: 35101058; PubMed Central PMCID: PMCPMC8802519.

Cossa, H., Dietler, D., Macete, E., Munguambe, K., Winkler, M.S., Fink, G., 2022b. Assessing the effects of mining projects on child health in sub-Saharan Africa: a multi-country analysis. Glob. Health 18 (1), 7. https://doi.org/10.1186/s12992-022-00797-6.

Currie, C., et al., 2012. Social Determinants of Health and Well-Being among Young People. Health Behaviour in School-Aged Children (HBSC) Study: International Report from the 2009/2010 Survey. WHO Regional Office for Europe, Copenhagen.

den Broeder, L., Uiters, E., ten Have, W., Wagemakers, A., Schuit, A.J., 2017. Community participation in health impact assessment. A scoping review of the literature. Environ. Impact Assess. Rev. 66, 33–42. https://doi.org/10.1016/j.eiar.2017.06.004.

Dietler, D., Lewinski, R., Azevedo, S., Engebretsen, R., Brugger, F., Utzinger, J., et al., 2020. Inclusion of health in impact assessment: a review of current practice in sub-Saharan Africa. Int. J. Environ. Res. Public Health 17 (11). https://doi.org/10.3390/ijerph17114155. Epub 2020/06/14. PubMed PMID: 32532108; PubMed Central PMCID: PMCPMC7312242.

Dietler, D., Loss, G., Farnham, A., de Hoogh, K., Fink, G., Utzinger, J., et al., 2021. Housing conditions and respiratory health in children in mining communities: an analysis of data from 27 countries in sub-Saharan Africa. Environ. Impact Assess. Rev. 89, 106591 https://doi.org/10.1016/j.eiar.2021.106591.

Dietler, D., Farnham, A., Lyatuu, I., Fink, G., Winkler, M.S., 2022. Industrial mining and HIV risk: evidence from 39 mine openings across 16 countries in sub-Saharan Africa. Aids 36 (11), 1573–1581. Epub 2022/06/23. https://doi.org/10.1097/qad.0000000000003294. PubMed PMID: 35730379; PubMed Central PMCID: PMCPMC9451919.

Emmanuel, A.Y., Jerry, C.S., Dzigbodi, D.A., 2018. Review of environmental and health impacts of mining in Ghana. J Health Pollut. 8 (17), 43–52. https://doi.org/10.5696/2156-9614-8.17.43 (PubMed PMID: 30524848).

Farnham, A., Cossa, H., Dietler, D., Engebretsen, R., Leuenberger, A., Lyatuu, I., et al., 2020. Investigating Health Impacts of Natural Resource Extraction Projects in Burkina Faso, Ghana, Mozambique, and Tanzania: Protocol for a Mixed Methods Study. JMIR Res. Protoc. 9 (4), e17138. Epub 2020/04/09. https://doi.org/10.2196/17138. PubMed PMID: 32266876; PubMed Central PMCID: PMCPMC7177430.

Freudenburg, W., 1984. Boomtown's youth: the differential impacts of rapid community growth on adolescents and adults. Am. Sociol. Rev. 49, 697.

Glucker, A.N., Driessen, P.P.J., Kolhoff, A., Runhaar, H.A.C., 2013. Public participation in environmental impact assessment: why, who and how? Environ. Impact Assess. Rev. 43, 104–111. https://doi.org/10.1016/j.eiar.2013.06.003.

Goldenberg, S., Shoveller, J., Ostry, A., Koehoorn, M., 2008a. Youth sexual behaviour in a boomtown: implications for the control of sexually transmitted infections. Sex. Transm. Infect. https://doi.org/10.1136/sti.2007.027219. Epub 2007/12/22. PubMed PMID: 18096646.

Goldenberg, S.M., Shoveller, J.A., Ostry, A.C., Koehoorn, M., 2008b. Sexually transmitted infection (STI) testing among young oil and gas workers: the need for innovative, place-based approaches to STI control. Can. J. Public Health 99 (4), 350–354. Epub 2008/09/05. https://doi.org/10.1007/bf03403770. PubMed PMID: 18767285; PubMed Central PMCID: PMCPMC6975581.

Goldenberg, S.S.J., Ostry, A., Koehoorn, M., 2008c. Youth sexual behaviour in a boomtown: implications for the control of sexually transmitted infections. Sex. Transm. Infect. 84 (3), 220–223 (PubMed PMID: rayyan-730621119).

Goldenberg, S.S.J., Koehoorn, M., Ostry, A., 2008d. Barriers to STI testing among youth in a Canadian oil and gas community. Health Place 14 (4), 718–729 (PubMed PMID: rayyan-730624097).

Goldenberg, M., Shoveller, A., Koehoorn, M., Ostry, S., 2010. And they call this progress? Consequences for young people of living and working in resource-extraction communities. Crit. Public Health. https://doi.org/10.1080/09581590902846102.

Gurstein, P., Lovato, C., Ross, S., 2003. Youth participation in planning: strategies for social action. Can. J. Urban Res. 12 (2), 249–274.

Guthold, R., Moller, A.B., Azzopardi, P., Ba, M.G., Fagan, L., Baltag, V., et al., 2019. The global action for measurement of adolescent health (GAMA) initiative-rethinking adolescent metrics. J. Adolesc. Health 64 (6), 697–699. Epub 2019/05/28. https://doi.org/10.1016/j.jadohealth.2019.03.008. PubMed PMID: 31122505; PubMed Central PMCID: PMCPMC6531407.

Harris, P., Viliani, F., Spickett, J., 2015. Assessing health impacts within environmental impact assessments: an opportunity for public health globally which must not remain missed. Int. J. Environ. Res. Public Health 12 (1), 1044–1049. https://doi.org/10.3390/ijerph120101044 (PubMed PMID: 25608592).

Harrison, H., Griffin, S.J., Kuhn, I., Usher-Smith, J.A., 2020. Software tools to support title and abstract screening for systematic reviews in healthcare: an evaluation. BMC Med. Res. Methodol. https://doi.org/10.1186/s12874-020-0897-3. Epub 2020/01/15. PubMed PMID: 31931747; PubMed Central PMCID: PMCPMC6958795.

IFC, 2018. Mapping the Oil and Gas Industry to the Sustainable Development Goals: An Atlas. IPIECA, IFC, UNDP, London (Washington DC and New York).

IPIECA, 2016. Health Impact Assessment: A Guide for the Oil and Gas Industry London the Global Oil and Gas Industry Association for Environmental and Social Issues, and International Association of oil & Gas Producers. London and Brussels.

IPIECA, IOGP, 2016. Health Impact Assessment: A Guide for the Oil and Gas Industry. International Association of Oil & Gas Producers London.

Kvam, R., 2018. Social Impact Assessment: Integrating Social Issues in Development Projects. Inter-American Development Bank.

Landrigan, P.J., Rauh, V.A., Galvez, M.P., 2010. Environmental justice and the health of children. Mt Sinai J. Med. 77 (2), 178–187. Epub 2010/03/24. https://doi.org/10.1002/msj.20173. PubMed PMID: 20309928; PubMed Central PMCID: PMCPMC6042867.

Langton, M., Mazel, O., 2008. Poverty in the midst of plenty: aboriginal people, the 'resource curse' and Australia's mining boom. J. Energy Nat. Resour. Law. https://doi.org/10.1080/02646811.2008.11435177.

Leuenberger, A., Farnham, A., Azevedo, S., Cossa, H., Dietler, D., Nimako, B., et al., 2019. Health impact assessment and health equity in sub-Saharan Africa: a scoping review. Environ. Impact Assess. https://doi.org/10.1016/j.eiar.2019.106288.

Leuenberger, A., Winkler, M.S., Cambaco, O., Cossa, H., Kihwele, F., Lyatuu, I., et al., 2021a. Health impacts of industrial mining on surrounding communities: local perspectives from three sub-Saharan African countries. PLoS One 16 (6), e0252433. Epub 2021/06/05. https://doi.org/10.1371/journal.pone.0252433. PubMed PMID: 34086737; PubMed Central PMCID: PMCPMC8177516.

Leuenberger, A., Cambaco, O., Zabré, H.R., Lyatuu, I., Utzinger, J., Munguambe, K., et al., 2021b. "It is like we are living in a different world": health inequity in communities surrounding industrial mining sites in Burkina Faso, Mozambique, and Tanzania. Int. J. Environ. Res. Public Health 18 (21). https://doi.org/10.3390/ijerph182111015. Epub 2021/11/14. PubMed PMID: 34769535; PubMed Central PMCID: PMCPMC8582703.

Leuenberger, A., Winkler, M.S., Lyatuu, I., Cossa, H., Zabré, H.R., Dietler, D., et al., 2022. Incorporating community perspectives in health impact assessment: a toolbox. Environ. Impact Assess. Rev. 95, 106788 https://doi.org/10.1016/j.eiar.2022.106788.

Levac, D., Colquhoun, H., O'Brien, K.K., 2010. Scoping studies: advancing the methodology. Implement. Sci. 5 (1), 69. https://doi.org/10.1186/1748-5908-5-69.

Levine, R.J., 2008. Research involving adolescents as subjects: ethical considerations. Ann. N. Y. Acad. Sci. 1135, 280–286. Epub 2008/06/25. https://doi.org/10.1196/annals.1429.039. PubMed PMID: 18574234.

Lyatuu, I., Winkler, M.S., Loss, G., Farnham, A., Dietler, D., Fink, G., 2021. Estimating the mortality burden of large scale mining projects—evidence from a prospective mortality surveillance study in Tanzania. PLOS Glob. Public Health 1 (10), e0000008. https://doi.org/10.1371/journal.pgph.0000008.

Mactaggart, F., McDermott, L., Tynan, A., Whittaker, M., 2018. Exploring the broader health and well-being outcomes of mining communities in low- and middle-income countries: a systematic review. Glob. Public Health. https://doi.org/10.1080/17441692.2016.1240821. Epub 2016/10/18.

Mbonane, T.P.M.A., Swart, A., Naicker, N., 2021. Lead poisoning among male juveniles due to illegal mining: a case series from South Africa. Int. J. Environ. Res. Public Health 18 (13), 6. PubMed PMID: rayyan-730622529.

McCallum, L.C., Ollson, C.A., Stefanovic, I.L., 2015. Advancing the practice of health impact assessment in Canada: obstacles and opportunities. Environ. Impact Assess. Rev. 55, 98–109. https://doi.org/10.1016/j.eiar.2015.07.007.

Munn, Z., Peters, M.D.J., Stern, C., Tufanaru, C., McArthur, A., Aromataris, E., 2018. Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. BMC Med. Res. Methodol. 18 (1), 143. https://doi.org/10.1186/s12874-018-0611-x.

Murewanhema, G., Musuka, G., Moyo, P., Moyo, E., Dzinamarira, T., 2022. HIV and adolescent girls and young women in sub-Saharan Africa: a call for expedited action to reduce new infections. IJID Reg. 5, 30–32. Epub 2022/09/24. https://doi.org/10.1016/j.ijregi.2022.08.009. PubMed PMID: 36147901; PubMed Central PMCID: PMCPMC9485902.

Mwakesi, I., Wahome, R., Ichang'i D., 2020. Mining impacts on society: a case study of Taita Taveta County, Kenya. J. Environ. Prot. 11, 986–997. https://doi.org/10.4236/jep.2020.1111062.

Negev, M., Davidovitch, N., Garb, Y., Tal, A., 2013. Stakeholder participation in health impact assessment: a multicultural approach. Environ. Impact Assess. Rev. 43, 112–120. https://doi.org/10.1016/j.eiar.2013.06.002.

Novais, G., Câmara, Vde M., 2009. Perception of mercury contamination by Brazilian adolescents in a gold mining community: an ethnographic approach. Cien. Saude Colet. 14 (6), 2015–2026. Epub 2010/01/14. https://doi.org/10.1590/s1413-81232009000600009. PubMed PMID: 20069170.

Okeke, C.C., Mbachu, C.O., Agu, I.C., Ezenwaka, U., Arize, I., Agu, C., et al., 2022. Stakeholders' perceptions of adolescents' sexual and reproductive health needs in Southeast Nigeria: a qualitative study. BMJ Open 12 (6), e051389. Epub 2022/06/

09. https://doi.org/10.1136/bmjopen-2021-051389. PubMed PMID: 35676003; PubMed Central PMCID: PMCPMC9185505.
Ong, A., Kindhauser, M., Smith, I., Chan, M., 2009. 1713 Global health agenda for the twenty-first century. In: Detels, R., Beaglehole, R., Lansang, M.A., Gulliford, M. (Eds.), Oxford Textbook of Public Health. Oxford University Press.
Orben, A., Tomova, L., Blakemore, S.J., 2020. The effects of social deprivation on adolescent development and mental health. Lancet Child Adolesc. Health 4 (8), 634–640. Epub 2020/06/17. https://doi.org/10.1016/s2352-4642(20)30186-3. PubMed PMID: 32540024; PubMed Central PMCID: PMCPMC7292584.
Organization WH, 2017. Progressing the Sustainable Development Goals through Health in all Policies [Accessed 2021 April 10]. Available from: http://www.who.int/social_determinants/publications/Hiap-case-studies-2017/en/.
Osei-Yeboah, R., Adedze, M., Bannor, R., Opoku, E., Akweongo, P., 2019. HIV prevalence variations in mining communities in Ghana. J. HIV/AIDS Soc. Serv. 18, 1–17. https://doi.org/10.1080/15381501.2019.1599748.
Parkins, J.R., Angell, A.C., 2011. Linking social structure, fragmentation, and substance abuse in a resource-based community. Community Work Fam. 14 (1), 39–55. https://doi.org/10.1080/13668803.2010.506030.
Patton, G.C., Sawyer, S.M., Santelli, J.S., Ross, D.A., Afifi, R., Allen, N.B., et al., 2016. Our future: a lancet commission on adolescent health and wellbeing. Lancet 10036. Epub 2016/05/14. https://doi.org/10.1016/s0140-6736(16)00579-1 (PubMed PMID: 27174304; PubMed Central PMCID: PMCPMC5832967).
Pereira, C.A.R., Périssé, A.R.S., Knoblauch, A.M., Utzinger, J., Hacon, SdS, 2017. Health impact assessment in Latin American countries: current practice and prospects. Environ. Impact Assess. Rev. 175–185. https://doi.org/10.1016/jeiar201609005.
Pyper, R., Cave, B., Purdy, J., McAvoy, H., 2021. Health Impact Assessment Guidance: Executive Summary. Standalone Health Impact Assessment and Health in Environmental Assessment. Institute of Public Health.
Quigley, R., den Broeder, L., Furu, P., Bond, A., Cave, B., Bos, R., 2006. Health Impact Assessment International Best Practice Principles: Special Publication Series No 5.
Sadare, O., Williams, M., Simon, L., 2020. Implementation of the health equity impact assessment (HEIA) tool in a local public health setting: challenges, facilitators, and impacts. Can. J. Public Health 111 (2), 212–219. Epub 2019/11/23. 10.17269/s41997-019-00269-2. PubMed PMID: 31755052; PubMed Central PMCID: PMCPMC7109223.
Santos, R.J., 2018. Blessing and curse. The gold boom and local development in Colombia. World Dev. 106, 337–355. https://doi.org/10.1016/j.worlddev.2018.02.016.
Sawyer, S.M., Afifi, R.A., Bearinger, L.H., Blakemore, S.-J., Dick, B., Ezeh, A.C., et al., 2012. Adolescence: a foundation for future health. Lancet 379 (9826), 1630–1640. https://doi.org/10.1016/s0140-6736(12)60072-5.
Scott-Samuel, A., Birley, M., Ardern, K., 2001. The Merseyside guidelines for health impact assessment. In: International Health Impact Assessment Consortium.
Sheehan, P., Sweeny, K., Rasmussen, B., Wils, A., Friedman, H.S., Mahon, J., et al., 2017. Building the foundations for sustainable development: a case for global investment in the capabilities of adolescents. Lancet 390 (10104), 1792–1806. Epub 2017/04/24. https://doi.org/10.1016/s0140-6736(17)30872-3. PubMed PMID: 28433259.
Shepherd, V., 2020. An under-represented and underserved population in trials: methodological, structural, and systemic barriers to the inclusion of adults lacking capacity to consent. Trials 21 (1), 445. https://doi.org/10.1186/s13063-020-04406-y.
Shiffman, J., 2006. HIV/AIDS and the rest of the global health agenda. Bull. World Health Organ. 84 (12), 923. Epub 2007/01/24. https://doi.org/10.2471/blt.06.036681. PubMed PMID: 17242823; PubMed Central PMCID: PMCPMC2627575.
Steckling, N., Tobollik, M., Plass, D., Hornberg, C., Ericson, B., Fuller, R., et al., 2017. Global burden of disease of mercury used in artisanal small-scale gold mining. Ann. Glob. Health 83 (2), 234–247. Epub 2017/06/18. https://doi.org/10.1016/j.aogh.2016.12.005. PubMed PMID: 28619398.
Steinberg, L., 2008. A social neuroscience perspective on adolescent risk-taking. Dev. Rev. 28 (1), 78–106. Epub 2008/05/30. https://doi.org/10.1016/j.dr.2007.08.002. PubMed PMID: 18509515; PubMed Central PMCID: PMCPMC2396566.
Thomas, J., Harden, A., 2008. Methods for the thematic synthesis of qualitative research in systematic reviews. BMC Med. Res. Methodol. 8, 45. Epub 2008/07/12. https://doi.org/10.1186/1471-2288-8-45. PubMed PMID: 18616818; PubMed Central PMCID: PMCPMC2478656.
Tricco, A.C., Lillie, E., Zarin, W., O'Brien, K.K., Colquhoun, H., Levac, D., et al., 2018. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. Ann. Intern. Med. 169 (7), 467–473. Epub 2018/09/05. https://doi.org/10.7326/m18-0850. PubMed PMID: 30178033.
UNICEF, 2020. HIV and AIDS in Adolescents: Turning the Tide against AIDS will Require more Concentrated Focus on Adolescents and Young People.
Villa-Torres, L., Svanemyr, J., 2015. Ensuring youth's right to participation and promotion of youth leadership in the development of sexual and reproductive health policies and programs. J. Adolesc. Health 56 (1 Suppl), S51–S57. Epub 2014/12/23. https://doi.org/10.1016/j.jadohealth.2014.07.022. PubMed PMID: 25528979.
Viner, R.M., Ozer, E.M., Denny, S., Marmot, M., Resnick, M., Fatusi, A., et al., 2012. Adolescence and the social determinants of health. Lancet 379 (9826), 1641–1652. Epub 2012/04/28. https://doi.org/10.1016/s0140-6736(12)60149-4. PubMed PMID: 22538179.
Werner, A.K., Watt, K., Cameron, C., Vink, S., Page, A., Jagals, P., 2018. Examination of child and adolescent hospital admission rates in Queensland, Australia, 1995–2011: a comparison of coal seam gas, coal mining, and rural areas. Matern. Child Health J. 22. Epub 2018/03/04. https://doi.org/10.1007/s10995-018-2511-4. PubMed PMID: 29500783; PubMed Central PMCID: PMCPMC6096510.
WHO, 1999. Gothenburg Consensus Paper: Health Impact Assessment, Main Concepts and Suggested Approach. Brussels.
WHO, 2016. Orientation Programme on Adolescent Health for Health-Care Providers. World Health Organization, Geneva.
WHO, 2017. Global Accelerated Action for the Health of Adolescents (AA-HA!):Guidance to Support Country Implementation. World Health Organization, Geneva.
Winkler, M., Krieger, G., Divall, M., Singer, B., Utzinger, J., 2012. Health impact assessment of industrial development projects: a spatio-temporal visualization. Geospat. Health. https://doi.org/10.4081/gh.2012.148. Epub 2012/05/29. PubMed PMID: 22639132.
Winkler, M., Krieger, G., Divall, M., Cissé, G., Wielga, M., Singer, B., et al., 2013a. Untapped potential of health impact assessment. Bull. World Health Organ. https://doi.org/10.2471/blt.12.112318. Epub 2013/04/20. PubMed PMID: 23599554; PubMed Central PMCID: PMCPMC3629454.
Winkler, M.S., Krieger, G.R., Divall, M.J., Cissé, G., Wielga, M., Singer, B.H., et al., 2013b. Untapped potential of health impact assessment. Bull. World Health Organ. 91 (4), 298–305. Epub 2013/01/31. https://doi.org/10.2471/BLT.12.112318. PubMed PMID: 23599554.
Winkler, M.S., Adongo, P.B., Binka, F., Brugger, F., Diagbouga, S., Macete, E., et al., 2020. Health impact assessment for promoting sustainable development: the HIA4SD project. Impact Assess. Proj. Apprais. https://doi.org/10.1080/14615517.2019.1694783.
Winkler, M.S, Viliani, F., Knoblouch, A., Cave, B., Divall, M., Ramesh, G., et al., 2021. Health Impact Assessment International Best Practice Principles. International Association for Impact Assessment, USA.
Wise, M., Harris, P., Harris-Roxas, B., Harris, E., 2009. The role of health impact assessment in promoting population health and health equity. Health Promot. J. Austr. 20 (3), 172–179. PubMed PMID: WOS:000272688200004.
WHO, 2015. The Global Strategy for Women's, Children's and Adolescents' Health (2016–2030) (Accessed April 15, 2021)]. Available from: http://globalstrategy.everywomaneverychild.org/pdf/EWEC_globalstrategyreport_200915_FINAL_WEB.pdf.
World Health, 2021. Review of Minamata Convention Initial Assessment Reports: Key Findings for Health. World Health Organization, Geneva, p. 2021.
Zhongming, Z., Linong, L., Xiaona, Y., Wangqiang, Z., Wei, L., 2018. Health Impact Assessment: A Good Practice Sourcebook.