Identifying OSH Interventions to protect teen workers from hazardous work in low and middle-income countries: a Scoping Review

Sámano-Ríos ML, Ijaz S, Ruotsalainen J, Verbeek J and Pérez O.

Background

In practice, often teens are not recognized as an actual working population because they are under 18 years old and work commonly without contracts at less regulated worksites. As a result, most of the interventions that have been implemented to protect them as workers have been put together in welfare contexts without consulting the extensive research base of the occupational health field.

The meaning ascribing to adolescents working is not the same in different cultures and societies. For example, in the high income societies of Europe and North America, teenagers are expected to participate in part-time work outside the home or within the family business to provide an easy transition towards adulthood. Whereas in the lower an middle-income countries (LMICs) most teenagers are accepted and often expected to be in full-time work and those who are better off in society may have their teen child doing nothing more than school work.

Social, legal and ethical implications aside, we know that teenagers or adolescents are engaged in working activities, especially in LMICs. Therefore it is imperative to know how we can best protect their mental and physical development, present well-being and future opportunities.

This scoping review attempts to: (1) map research literature of OSH interventions relevant to teen workers and gaps therein; (2) identify implications for practice; and (3) identify implications for research.

This scoping review will provide a better picture of OSH approaches considering the ongoing physical and mental maturation of teen workers as well as offering significant insight into how different actors have tried to prevent teen workers being exposed to hazardous work. Identifying what has been accomplished previously can help in sharing successful experiences and in avoiding needless duplication in research.

What is a teen worker?

First we will define teen workers taking into account biological considerations pooled with legal and social points of view. We will first look at several related concepts such as young workers, adolescent workers, child labour and child work to be better able to define teenage workers.

In biological terms, the World Health Organization defines adolescents as all the people from 10 to 19 years old (WHO 2014).

In high-income countries (HICs) and in the formal employment sector the term “young workers” is frequent. It has been used by researchers to include the law-abiding form of teen worker under 18, people under 24 or under 30 years old. It produces an overlap between adolescent workers under 18 years old and those legally recognized as adult workers.

A second overlap exists between teen workers and child work. *Child work* is defined as work carried out by people under 18 years old but in such a way that this does not affect their personal development or interfere with their schooling but instead can actually contribute to their healthy development and welfare of their

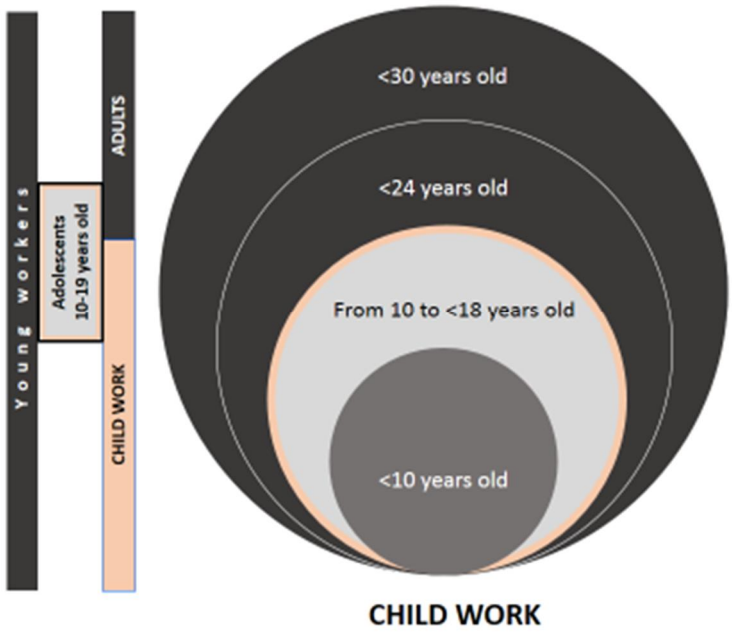

Fig. 1 Teen workers and child work. According with WHO there is an overlap between the biological definition of adolescence and the legally considered adulthood. As the same time, teen can be considered an element of children's population.

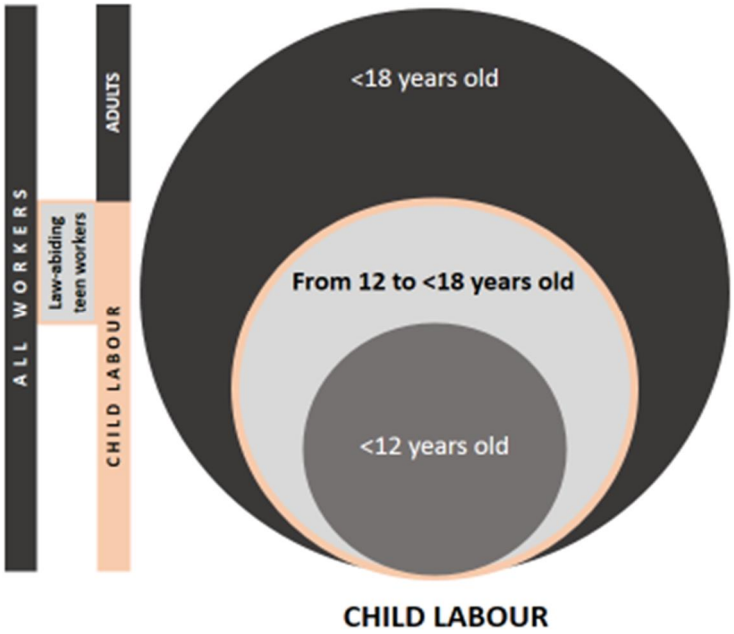

Fig. 2 Teen workers and child labour. According with ILO-Convention 138, the minimum age to work is 12 years old whereas the threshold of child labour is 18 years old. Thus, teen are consider adolescent and children at the same time in child labour framework.

families and provide them with occupational and daily life skills and experience, self-sufficiency and a boost for their self-esteem (Levison 2005). For example this can include helping one's parents around the home, assisting in a family business or earning pocket money outside school hours and during school holidays. These jobs are safe and most frequently observed in HICs but not in all industries.

There is another overlap between the law-abiding form of teen worker with the vast recognised problem of *child labour*.

According to the International Labour Organisation (ILO), *child labour* is "work that deprives children of their childhood, their potential and their dignity, and that is harmful to physical and mental development". Additionally, *hazardous work* is defined as "any activity or work by children that, by its nature or conditions, is likely to harm or jeopardise their health, safety or morals". (ILO 2012)

The criteria for both definitions depends on the person's age, generally being less than 18: twelve years is the minimum age for admission to employment and work and 18 is the threshold to be considered as an adult worker according to ILO Convention No.138. What is more, the definition further depends on the type and hours of work performed, the conditions under which it is performed and the labour laws of individual nations (ILO Convention No.138). Therefore, the definition of *child labour* varies from country to country, as well as among sectors within countries.

However one defines it exactly, *child labour* is a common finding in LMICs in all sectors, industries and activities (ILO-IPEC 2013).

Due to this variation in definitions, we will not use the term "young workers" as a synonym for any adolescent or teen worker. We will integrate biological, social and legal considerations in the Occupational Safety and Health (OSH) context: adolescent or teen workers will be used as synonyms and we define them as all people between 12 to 18 years old that face important biological and social developmental challenges whilst also having to face the occupational environment. We exclude all forms of slavery, prostitution, pornography or

production and trafficking of drugs carried out by adolescents, simply because there is no place for OSH interventions in these unacceptable illicit activities.

To trace inputs for future evidence based practice in this area, we agree with Omokhodion who, in his research about working children in Nigeria, wrote: "…*while it is desirable to abolish child labour and promote full schooling, the reality is that many families are forced by starvation to send their children to work to augment families income. In cases when for the moment, work seems to be the only option to survival, adverse outcomes in child development can be minimized if children are allowed to continue with their education and if the period of life engaged in child labour is minimized*." (Omokhodion 2006).

Finally, an urgent reason to allocate efforts and resources to OSH interventions instead of taking the highly theoretical approach to try to eradicate *child labour* are orphan children of whom the governments in LMICs can not take care and for whom work is the only way to survive.

Description of the condition

Global estimates and trends over the years 2000-2012 made by ILO show that there were 78 million of children at work between the ages of 5 to 17 years old in the Asia-Pacific region. This region was followed by Sub-Saharan Africa with 59 million, 12.5 million in Latin America and the Caribbean and 9.2 million of children at work in the Middle East and North Africa. Between 2000 and 2012, especially among the group of 5-14 years-old, child labour decreased from 186 million to 120 million children worldwide and the numbers of boys and girls exposed to hazardous work decreased even more, from 111 to 38 million. However changes among older children, from 15 to 17 year-old, were less impressive. There were still 47.5 million of these adolescent workers in 2012 (ILO 2013).

Teenagers are at an increased risk of injuries at work compered to older workers (Salminen 2004, Santana 2012). Non-fatal occupational injury rates are higher among young workers (16–24 years of age) when compared to other age groups but fatality rates are lower. This means that even though their probability to die is lower they run a higher risk of being disabled for any or all future work (Salminen 2004, Santana 2012).

Higher work-related risks in teens and the challenge to develop safe working environments for them

Children and adolescents are more vulnerable than are older coworkers because of social and biological reasons (see appendix 1).

Common social characteristics of adolescent work in LMICs are that it provides little or no training, that it lacks or it has low payment, that there is insufficient supervision, low job security, a lack of labour rights, that it is performed at non-traditional worksites (houses, streets) and that the employment usually is in industries or activities with high OSH risks (agriculture, construction, mining).

Bioecological framework explains how physiological changes during pubertal development such as neurohormonal shifts produce physical and cognitive instability that have implications for work (Sudhinaraset 2010). We present some examples:

PUBERTAL DEVELOPMENT	BIOLOGICAL BASIS	TYPE OF CHANGES	DESCRIPTION OF CHANGES	CONTRIBUTION TO WORK VULNERABILITY	IMPLICATIONS TO DEVELOP OSH INTERVENTIONS
Physical	Physiologic neurohormonal shifts	Circadian rhythms	Shift to more nocturnal wakefulness	Not enough hours of sleep, produces less alertness during daytime.	Setting a threshold of daily work hours (fewer hours)
		Physical growth	Rapid linear growth	Joint instability: ligaments and bone growth plates susceptibility. Clumsiness.	Adapting tools and working surfaces. Designing less physically demanding work and lower loads.
Cognitive (Up to third decade of life)		Neuromaturation	Mainly, in pre-frontal cortex associated with emotional response and reactivity. Development of abstract reasoning.	Proclivity for thrill-seeking and high-intensity feelings: greater frustration, less tolerance, increased reactivity, rebelliousness and impulsivity. Lack or minor understanding and awareness of risks. High risk behaviours. Lack of adult decision-making skills.	OSH training and educational programs should consider teens' neuromaturation. Designing less complex work task.

Table 1. Biological development during adolescence and their implications in the OSH field.

Therefore, the characteristics inherent to the kinds of work teenagers engage in combination with the mental and physical maturation processes they experience (see Table 1 above) together create work conditions with high health and safety risks for teen workers.

Loss of health in adolescence may set in motion a cycle of negative impacts on the developmental process, not only in the biological sense but also in terms of socialisation and participation in working life in the future.

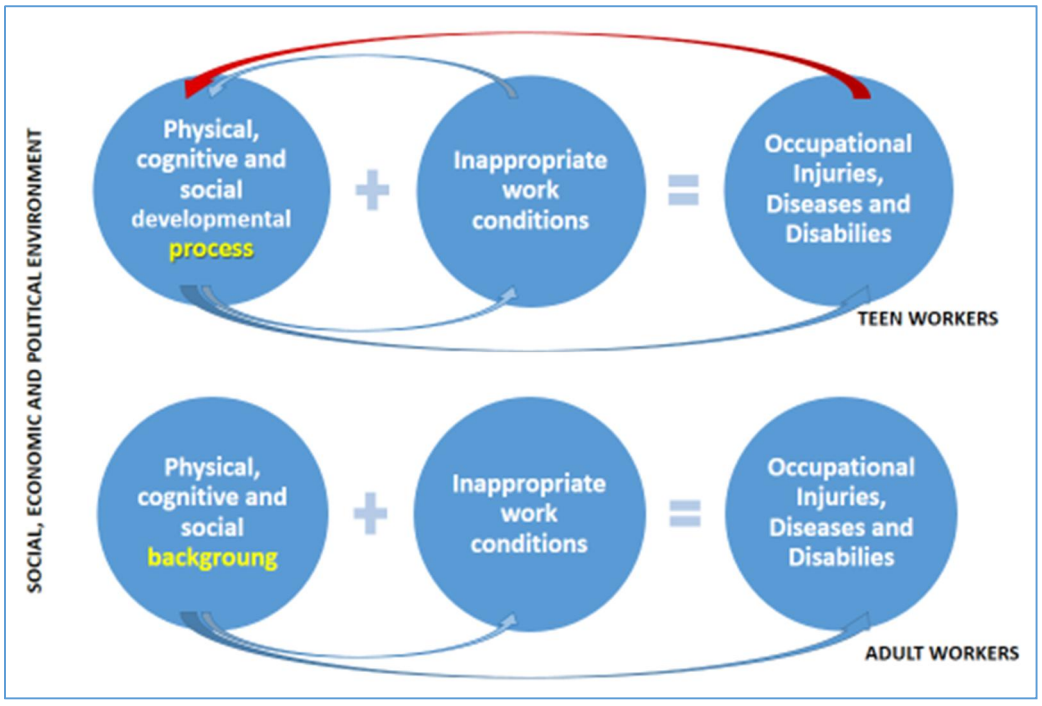

Fig.3 Developmental chances contribute to produce inappropriate work conditions and thus, occupational injuries, diseases and disabilities; inappropriate work conditions as well as alterations in health can impact on normal teens' development.

Not everyone agrees that working is harmful for adolescents. A systematic review found that less capacity in normal young persons due to their ongoing development does not pose an additional risks for work-related injuries (Breslin 2005). This finding suggest that: 1) safety and health issues in young workers are not different from those in elder workers; 2) working conditions are the main determinants of safety and health at work. Thus, Breslin et al.'s findings suggest that teenagers sustain injuries at work despite but not because of the disadvantages brought on by physical, mental or developmental immaturity.

The debate surrounding teenage workers' particular vulnerability continues because it has mainly been supported with epidemiological data. Multidisciplinary research can probably discover whether adolescents at work need special protection or if the classical approaches as in use for adult workers suffice (Levison 2005).

OSH Interventions

To understand the type of interventions involved we adopt and adapt a previous classification model of primary preventive occupational health interventions (Verbeek 2013). Interventions can thus be brought under three broad categories: environmental or taking away risk factors in the environment, behavioral or trying to modify behavior that is adverse to health or clinical as usually administered by health care professionals such as in the case of vaccinations.

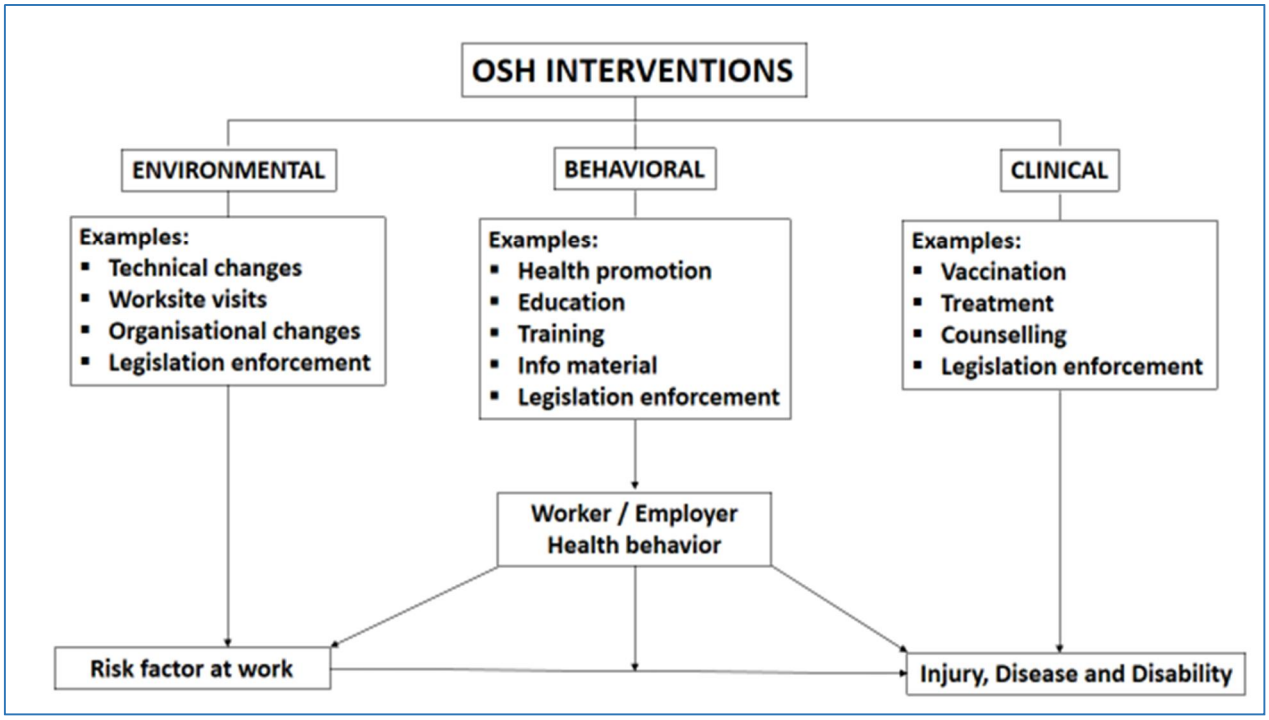

Fig. 4. Adapted from: Model of primary preventive occupational health interventions (Verbeek and Ivanov 2013)

Why it is important to do this review

Teen workers and the Occupational Safety and Health (OSH) field

Since the subjects are under 18 year-old and the setting is social as opposed to workers in ordinary workplaces, the safety and health policies and the resulting interventions for working children often fall outside the occupational context such as in social or child welfare. In these cases, policies and interventions are implemented without using the extensive research base of the occupational health field (Bambra 2005, Oliver 2006).

At the same time OSH professionals do not address teen workers as they are not visible at regular workplaces. Often teen workers are not even recognized as a working population (ILO-IPEC 2011). As a result, there is an inconsistent implementation of policies and interventions.

Additionally, OSH research often focuses on exposures meaning descriptive studies about the conditions and agents that must be equally or even more hazardous for children and teenagers if they have been found dangerous to adult workers.

Consequently the paucity of intervention studies and good evidence on the effectiveness of interventions directed especially at teen workers is notorious (Forastieri 1999).

As the number of adolescents participating in child labour continues to decline slowly, it may well be possible to reduce the numbers even further and faster. To achieve this it is imperative to find out how adolescent workers' health and safety can be ensured.

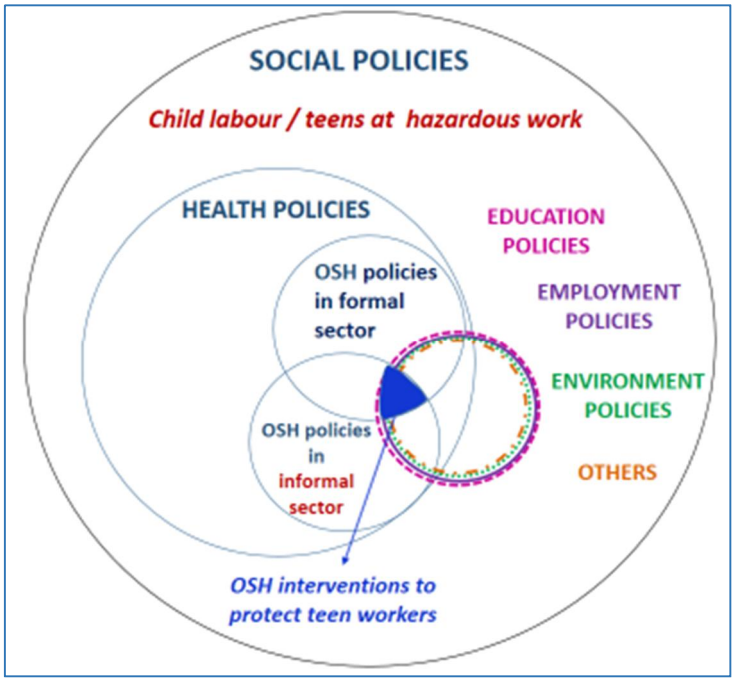

Fig.5 Interventions undertaken against hazardous exposures in teen workers. A social problem with a traditional multi-social-policy approaches.

Objectives

- ✓ To map primary preventive OSH interventions and their effects on the health and safety of teen workers, especially useful for those at work in LMICs.

Methods

Criteria for considering studies for this review

- ✓ Studies published between 1990 and the present day.
  1989 - Enactment of the rights of the child about freedom from exploitation and right of education.
  1999 – Convention No.182 of the ILO about "the worst forms of child labour"
  These international instruments could have underpinned OSH interventions around the world and justify the date limitation.
- ✓ No language nor publication status limitations

Types of studies

Any empirical study that describes or otherwise evaluates an active purposeful change in hazardous work-related exposures aimed at protecting health and ensuring safety in teenage workers.

Types of participants

- Teen workers between 12 to 18 years old as the main population of interest in the study or as a subgroup with its own report of outcomes.
- Workplaces where there are adolescent workers.

Types of interventions

- Any OSH interventions to avoid or reduce teen workers' harmful work-related exposures.

We define an OSH intervention as an action implemented specifically to modify clinical employment concerns, work environment, behavioural attitudes of adolescent workers or another intermediate population to improve the OSH conditions of teen workers.

Teen workers are our target population who have to benefit from the intervention, but it can be mediated by another population, for instance parents, families, employers, teachers, other community members, whole community, healthcare providers, etc.

Types of outcome measures

We will include all studies that give a quantitative or qualitative description of the program.

This can relate to the feasibility such as participation rates or participant satisfaction or to the implementation such as hazardous exposures or to health and safety outcomes such as symptoms and injuries.

Search methods for identification of studies

We will build a sensitive systematic search strategy to obtain all available studies of OSH interventions including the following elements:

1) Key words for teen workers, considering all possible variations.
2) Key words for occupational exposure and occupational accidents, injuries, diseases and disabilities.
3) Sensitive terms to look for interventions in OSH field (Verbeek 2006).

Designing and conducting the search will be an iterative process.

Electronic searches

We will look for intervention studies published in the following databases:

- Medline
- EMBASE
- Cochrane OSH review group
- NIOSHTIC 2
- Cochrane Library
- CINAHL
- Systematic Reviews in OSH, Institute of Work &Health-Canada.
- BAUA literature
- Science Direct

Searching other resources

We will ask for advice from experts and stakeholders and by hand searching through included studies; information found will be a resource to identify additional material. It will be carried out by at least two reviewers.

Data collection and analysis

Selection of studies

Two reviewers will screen the obtained titles and abstracts independently for eligibility. After reading full-text articles of the studies identified as potentially eligible based on title and abstract, we will include all studies that satisfy our inclusion criteria. Discrepancies will be discussed by both reviewers trying to fulfill a consensus, if it was not possible, a third reviewer will decide.

Data extraction and management

Also, two reviewers will conduct data extraction independently using a standardized form.

We will extract the following details:

1) First author
2) Publication year
3) Conflict of interests
4) Funder (who supported the published research or intervention or both)
5) Stakeholder (who developed/applied the intervention to improve teen workers OSH)
6) Country
7) Geographic location (rural or urban area)
8) Sector/Industry/Labour activity
9) Population who receive the intervention (teen workers or intermediate population)
10) Gender ratio
11) Special vulnerable population
12) Work status (self-employed, employed in informal sector, or employed in formal sector)
13) School attendance
14) Brief description of the intervention
15) Special considerations of research in adolescent workers (risk factors, exposure thresholds, puberal development implications to undertake de intervention)
16) Description of outcome(s)
17) Study design

Data analysis

Results

(1) A map of the OSH interventions for teen workers categorized according to:

a) Type of interventions
b) Type of outcomes
c) Design of studies
d) Type of population who received the intervention
e) Stakeholders involved

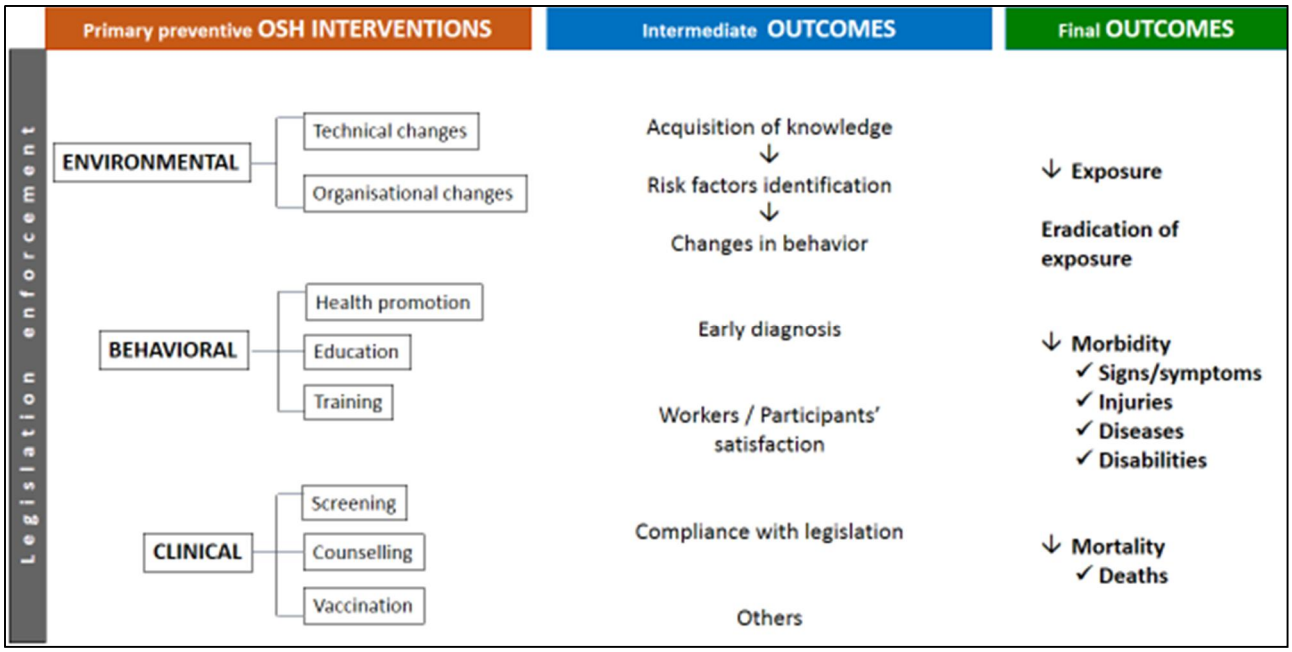

Table 2. Our general framework to trace the map.

(2) A list of what could be of value from the identified OSH interventions to undertake them in LMICs. We will apply the following set of criteria to determine the feasibility of OSH interventions for teen workers in LMICs, this list is not exhaustive and it will be complemented during the review process.

- ✓ Intervention has to be cheap
- ✓ It does not require work of experts (OSH professionals)
- ✓ It does not require extensive health infrastructure/facilities
- ✓ It has to be independent from legislation enforcement

(3) A list of what is of value from the body of OSH research literature for future systematic reviews (PICO implications for research)

(4) A list of gaps in OSH primary research. Identifying what has been accomplished previously, allowing for consolidations and avoiding duplication.

Analysis of results according to:

- Availability of OSH intervention research for teen workers in medical scientific databases. Is it easy to find it? Challenges to overcome during the search.

- The special case of teen workers: can developmental considerations make a difference?

  - To assess exposures and to implement interventions

	RISK FACTORS	EXPOSURE LEVELS	INTERVENTIONS
	Are work-related risk factors the same for teenagers and adults?	Is level of exposure defined differently for teenagers than for adults?	Should primary preventive OSH interventions be developed/undertaken differently?
Some examples:	High wage, decision autonomy and status are protective psychosocial factors for adult employees but they are linked with misbehavior in adolescent workers (Staff 2003).	The noise exposure threshold for adult workers is 80dB, is there a different one for adolescents? Why?	Size of personal protective equipment could be too big for adolescents. Training programs could be in need of adaptation: (a) cognitive processes like abstraction are not completely achieve in teens' mind; (b) Schooling level.
Developmental considerations	Cognitive immaturity and social vulnerability	Physic/physiological immaturity	Physical immaturity Cognitive immaturity Social vulnerability

- Which stakeholders have been involved in OSH interventions for adolescent workers and how.

  Stakeholder(s) involved

  - employers
  - parents
  - teachers
  - community leaders
  - civil society organisations
  - academic organisations
  - unions
  - private industrial sectors
  - government agencies
  - others

  How they are involved in the intervention

  - designing-planning
  - undertaking-applying it in real fieldworks
  - sponsoring

- Judgment of study designs.
  Is the study design good enough to answer PICO questions in future researches?

Strong evidence	Weak evidence
✓ Randomised Control Trials (RCT) ✓ Cluster randomised trial ✓ Control Before & After study (CBA) also called non-randomised controlled trial or non-randomised trial or cohort study ✓ Interrupted Time Series Studies (ITS) ✓ Repeated measures study	× Uncontrolled before-after studies × Cross sectional studies
To evaluate harmful effects of the intervention: ✓RCT, cohort, case control studies	It is difficult, if not impossible, to attribute causation from such studies.

Contributions of authors

Martha Sámano-Ríos is involved in coordinating the project team, conceptualising and writing the review, designing the search strategy, developing the process of study selection as well as data extraction and in the interpretation of results.

Sharea Ijaz is involved in conceptualising the review, giving critical comments on all the drafts and will cast the deciding vote in cases of disagreement about study selection and data extraction and in the interpretation of results.

Jani Ruotsalainen is involved in conceptualising the review, giving critical comments on all the drafts, editing, in translation into English and in the interpretation of results.

Jos Verbeek is involved in conceptualising the review, giving critical comments on all the drafts, editing, in translation into English and in the interpretation of results.

Omar Pérez is involved in the processes of study selection and data extraction and in the interpretation of results.

Declarations of interest

The authors involved in this review do not have any conflicts of interest to declare in conjunction with this study.

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Sources of support

Internal sources

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External sources

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National Council for Science and Technology (CONACYT), México.

Appendices

Appendix 1. "Children are not little adults".

- Children have thinner skin, so toxics are more easily absorbed.
- Children breathe faster and more deeply, so can inhale more airborne pathogens and dusts.
- Children dehydrate more easily due to their larger skin surface and because of their faster breathing.
- Children absorb and retain heavy metals (lead, mercury) in the brain more easily.
- Children's endocrine system (which plays a key role in growth and development) can be disrupted by chemicals.
- Children's enzyme systems are still developing so are less able to detoxify hazardous substances.
- Children use more energy when growing and so are at higher risk from metabolized toxins.
- Children require more sleep for proper development.
- Children's less-developed thermoregulatory systems make them more sensitive to heat and cold.

From: ILO-IPEC 2011-Children in hazardous work: what we know, what we need to do. Geneva 2011. p.p13.