

Adolescents in a changing world: the case for urgent investment

Executive Summary

November 2023

Background

The Adolescent Well-being Investment Case has been developed by Victoria University and PMNCH with oversight by an Expert Consultative Group: "The Adolescent Well-being Expert Consultative Group comprised of 32 partner organizations working across different sectors, contributing to adolescents' well-being. The overarching Adolescent Well-being Investment case includes a global modelling toolkit for developing an adolescent well-being as well as a report that synthesizes current knowledge on the case for investing in adolescent well-being (e.g. the economic case, human rights imperative, the demographic and epidemiological transition) and revises, updates and expands previous models of investment (e.g. health, nutrition, education, road traffic injury, child marriage, etc.) as well as presents the cost of insufficient action.

The Expert Consultative Group has provided strategic oversight to this work, including recommending papers and areas for further research. The Expert Consultative group provided inputs into the development of the Summary Report. The Expert Consultative Group has met three times: May 18th 2023, September 5th 2023, and October 2nd 2023. Victoria University and PMNCH have revised the latest Summary Report based on recent feedback received from the Expert Consultative Group.

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The urgency of action on adolescent wellbeing

1. Key points

Today's adolescents (defined here as persons aged 10–19 years), face serious challenges in a rapidly shifting world. These range from rapid changes in population numbers and age distribution and the impact of climate change on mental health and wellbeing to the learning crisis and persistent inequality, violence and the neglect of human rights, especially for women.

The world urgently needs a new investment program to improve the wellbeing of adolescents. The costs of inaction are very high. Our estimate is that the costs of inaction over 2024–2035 is US\$20.5 trillion for areas and countries we studied. This amounts to 6.1% of the projected total GDP of these countries over this 12-year period, which include over 85% of the world's population.

This investment must cover all five domains of adolescent wellbeing and the linkages between them, and respond to the expressed needs of the adolescents themselves. It needs to be a global program carried out at the local level, with initiatives tailored to the realities of individual countries and involving the young people themselves.

Transformative investment in three key platforms or systems is necessary – universal health coverage, including primary care; enhanced schools that focus on learning, health, nutrition and student wellbeing; and support systems based in local communities. These platforms are not only key points for program delivery; they are essential to ensuring that all adolescents are covered and that the complex linkages involved are fully realised.

It is clear, from our review of the literature and from new modelling work undertaken for this report, that the economic and social returns to a wide range of investments to address adolescent wellbeing are high. The investments will also reduce inequalities and help to protect the human rights of adolescents, further underpinning the investment case.

The key quantitative measure reported is the benefit-cost ratio (BCR) – the ratio of the value of benefits to that of the cost of the investments necessary to achieve those benefits. For a wide range of investments analysed here, the BCRs are 10.0 or above, with much higher values in many cases. An investment in which the benefits are ten times costs is a very strong one indeed.

It is not possible to estimate such BCRs for some areas – such as connectedness, agency and interpersonal violence – because the underlying empirical work is not available. This does not deny their importance to adolescent wellbeing but rather is a challenge to researchers to strengthen our knowledge. The coverage of the BCR results here reflects the availability of studies in the literature, as revealed in our literature reviews.

Within the need for an extensive program of investment to build the universal platforms, based on BCR studies and other evidence assembled here, we identified six priority areas:

- Malnutrition: hunger and undernutrition, micronutrient deficiencies and overweight/obesity
- Mental health, both prevention and treatment
- Learning, skills and employment
- The position of women, including reductions in child marriage and in unplanned pregnancies
- The prevention of violence and injury, and
- The preparation of adolescents to cope with emerging realities.

Although a return of at least ten dollars for every dollar spent is excellent, the costs of the full suite of investments described here is high. Total costs out to 2035 are estimated to approach \$3.5 trillion, or an average of about \$300 billion per annum over the twelve years 2024–2035. This amounts to about 0.25% of average projected global GDP over the period.

With many affected countries already highly indebted, large-scale support from the international community will be necessary for these investments to be undertaken on the required scale. Nevertheless, locally tailored interventions taking account of specific needs and local knowledge and expertise about effective programs, will be crucial.

2. Emerging conditions shaping adolescent wellbeing

Many emerging features of the contemporary world are making the development process more difficult for contemporary adolescents. Here we summarise eight challenges arising from ongoing processes of global change:

- **Population trends and unplanned pregnancies.** Reflecting very different trends in birth rates, adolescent populations are continuing to rise sharply in many countries (e.g. by 60% out to 2050 in Sub-Saharan Africa) but to fall precipitously in others (e.g. by 40% out to 2050 in China, Korea and Japan combined). At both extremes, the rate of population change will have major effects on the development process for young people. In many countries, continuing population growth reflects an ongoing high rate of unplanned pregnancies, and the continued, if declining, incidence of child marriage.
- **Impact of climate change.** It is now clear that continuing climate change, manifest both in the growing frequency of dangerous weather events and in projections of future warming, is adversely affecting adolescent mental health in many countries and in physical conditions for young people in some regions. As the world warms further, these effects are likely to become more marked and of deepening concern to younger generations.
- **Learning crisis.** While rates of attendance at school have risen in almost all countries, there is now evidence that the learning achieved by adolescent populations has plateaued, at far from acceptable levels in many countries. Low levels of literacy and numeracy provide a poor base from which to address the other emerging challenges.
- **Technological change and employment.** Both economic structures and technologies are undergoing rapid change. Manual and routine jobs are being replaced by new technologies across the board; the service and care sectors are displacing the goods sectors, especially as sources of employment, while emerging artificial intelligence (AI) technologies imply a new era of change. Employment will remain a major challenge for young people, especially those without a quality education and strong skills development.
- **The double burden of disease.** For some time now the double burden of disease – a continuing burden of communicable disease combined with a rising incidence of non-communicable diseases (NCDs) – has been a reality in many countries. As the precursors of future NCDs (such as malnutrition, obesity and poor mental health) continue to rise among adolescents almost everywhere, the double burden of disease will continue to be a problem in lower-income countries.
- **Continuing malnutrition.** Malnutrition, which covers undernutrition, micronutrient deficiencies and obesity, remains a critical challenge for current and emerging adolescent cohorts. Indeed the double burden of nutrition – the simultaneous manifestation of undernutrition and overweight/obesity – affects most low- and middle- income countries. While this report focuses mainly on one response to malnutrition, the various dimensions of malnutrition remain a key challenge for adolescents around the world.
- **Persistent inequality and violence.** Pronounced inequality, both within and across countries, remains a persistent, and in some respects an increasing, reality in the world. Adolescent wellbeing is strongly related to socioeconomic status, whether within countries or between them. It is clear that adolescent wellbeing is on average lower in lower income than in higher income countries and, within a country, lower in the lower socioeconomic groups than in higher socioeconomic groups.
- **Increasing migration pressures.** The combination of rapid population growth in many countries and the growing impact of climate change in many regions is likely to increase migration flows in forthcoming decades. This applies to both cross-border and internal migration, and to both distressed or refugee flows and to voluntary migration. Where the skills of the migrants match those of the recipient country or region, both parties are likely to benefit, but this may not be the case for refugees and distressed migrants leaving an unstable situation with limited skills.

3. Domains, linkages and platforms

3.1 The five domains of adolescent wellbeing

By 'investment', we here mean a planned program of spending on interventions known to be effective in increasing the wellbeing of adolescents. In planning and developing an investment case for such investments, we must be clear about the target for such programs, in terms of the various domains of adolescent wellbeing and the linkages that exist, if any, between these domains and between the various interventions planned to impact on a given domain of wellbeing.

Recent work by the UN H6+ Technical Working Group on Adolescent Health and Wellbeing (Ross et al. 2020) has clarified the definition and five domains of adolescent wellbeing, as summarised in Table 1: good health and optimum nutrition; connectedness, positive values and contribution to society; safety and a supportive environment; learning, competence, education, skills and employability; and agency and resilience.

Each of these domains is important to wellbeing. Adolescence brings a maturation of all bodily systems and is a phase of sensitivity to the physical, nutritional and social environment. During this phase, the social dimensions of wellbeing – connectedness, a safe and supportive environment, learning and human capital, and the development of agency and resilience – become especially important. Adolescence is also a phase when risks, including tobacco and alcohol use, physical inactivity, poor diet, and overweight and obesity, increase the probability of contracting non-communicable diseases in later life. The interventions must address each of the domains of wellbeing (Azzopardi et al. 2017; Patton et al. 2016).

Table 1 The five domains and sub-domains of adolescent wellbeing

Good health and optimum nutrition	Connectedness, positive values and contribution to society	Safety and a supportive environment	Learning, competence, education, skills and employability	Agency and resilience
> Physical health and capacities	> Connectedness	> Safety	> Learning	> Agency
> Mental health and capacities	> Valued	> Material conditions	> Education	> Identity
> Optimal nutritional status and diet	> Attitudes	> Equity	> Resources, life skills and competencies	> Purpose
	> Interpersonal skills	> Equality	> Skills	> Resilience
	> Activity	> Non-discrimination	> Employability	> Fulfilment
	> Change and development	> Privacy	> Confidence	
		> Responsive		

Source: Ross et al. (2020).

These domains of wellbeing are not separate, independent aspects of adolescent wellbeing. Many factors influencing adolescent development have interactive effects with one another, with complex interplay between physical and mental health, learning, sexual maturation and the connectedness, safety and supportiveness of the community context in which the adolescent matures. Some of these aspects of health and growth during adolescence affect maternal health during pregnancy, which is a critical factor in providing a healthy start to life. These linkages, both within and across generations, are of critical importance. Given this complex mosaic of influences and interactions, we need an approach to adolescence that is both holistic and multi-dimensional.

This is especially so for young women, who are particularly disadvantaged in many settings. Many factors – such as limited education, child marriage, high and early fertility, poor access to health care and fertility control, low status within the family and the community, and endemic violence toward women – combine to undermine the wellbeing of adolescent girls in all too many countries.

The literature increasingly recognises that, if interventions are to be effective in shaping the various domains of wellbeing in ways that take account of the diverse linkages between them, they need to be situated within strong platforms or systems designed for this purpose. Three such platforms or systems are the universal health coverage system, enhanced schools designed to deliver multiple, reinforcing interventions and support systems at the community level.

3.2 The universal health coverage system

It is vital that the health system provides universally accessible health care to adolescents, and that this care is extended to emerging issues for adolescents, such as poor cardiovascular health. This is far from the case in most countries. For example, in low-income countries in 2019, the rate of disability-adjusted life years (DALYs) lost from disease per unit of population, by persons aged 15–19 years, was about 70% higher than in high-income countries (IHME 2016).

With inequality heavily shaping the access that many adolescents have to good health care, a commitment to universal health coverage (UHC) is central to the Sustainable Development Goals (SDGs), with SDG 3.8 requiring the global achievement of UHC, with financial risk protection, by 2030. This has long been a priority of the World Health Organization (WHO) and an extensive literature has outlined the need for UHC, the progress being made towards it and the pivotal role for developing primary health care within UHC.

This same literature also makes clear that, in spite of progress, adolescents in many parts of the world, and especially in lower income countries, do not have ready access to many key health services. The investment program of 95 interventions to increase the coverage of such services for adolescents, analysed in this report, would be a major step forward to UHC for adolescents.

3.3 The enhanced school platform

The school is a pivotal institution shaping adolescent development, and one receiving extensive funding. The surge in the number of adolescents in school in most countries over the past two decades has stretched schools and their funding agencies thin, so that the quality of learning has often not kept pace. There is now evidence that schools are the best place for delivering other programs – such as for social and emotional learning, improved nutrition, deworming and the prevention of anaemia and malaria – which contribute to adolescent welfare. Rather than distracting schools from their central educative role, there are good reasons for thinking that such programs can assist schools in achieving their primary goals of student retention and high-quality educational outcomes.

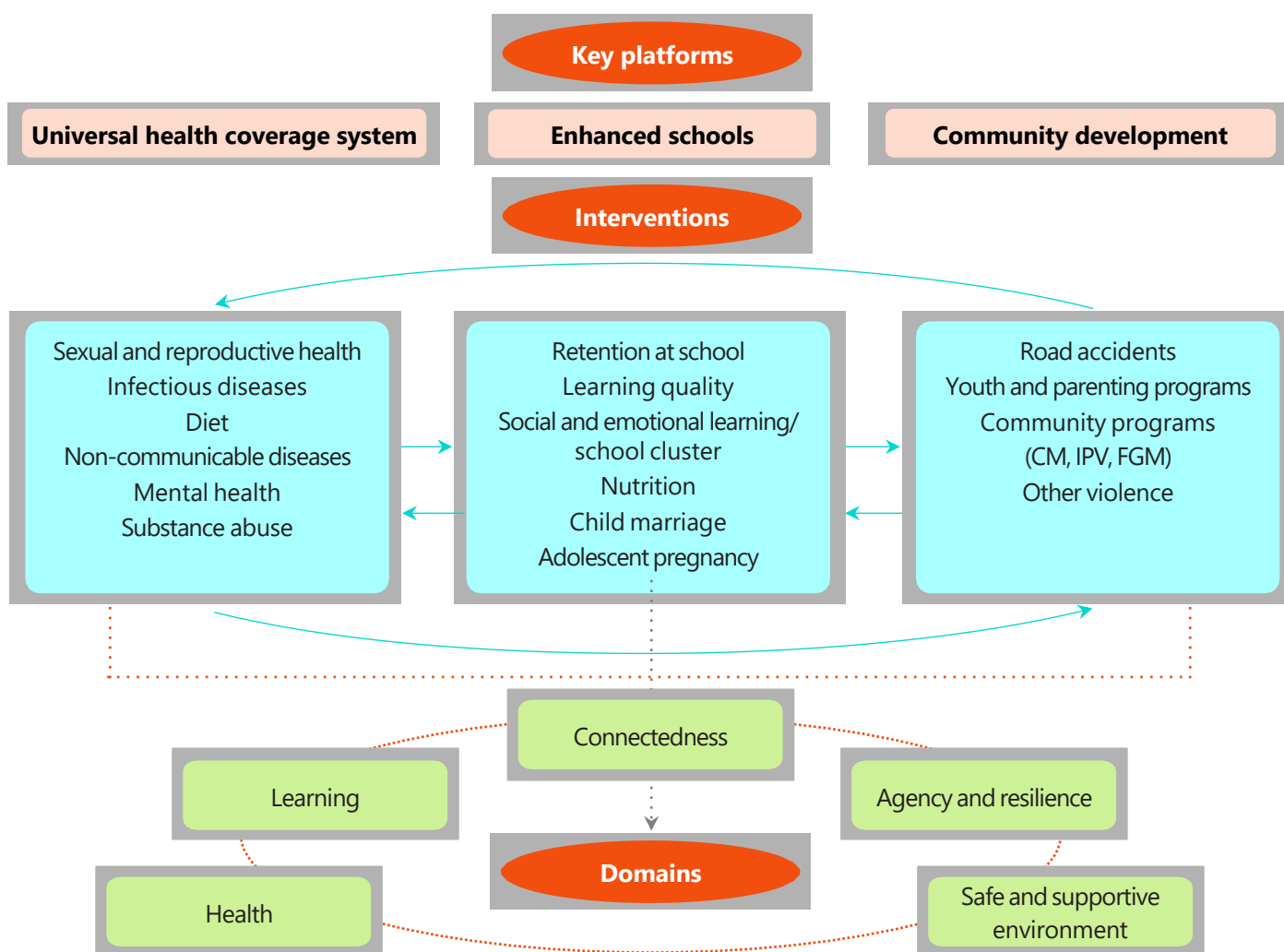
This approach, and the need for enhanced schools in this sense and for increased investment in them, was strongly endorsed by the report of the UN 2022 Transforming Education Summit (2022a). This report also stresses the depth of inequality and disadvantage inherent in current schooling arrangements: globally, 75% of children aged 0–14 years have access to only 8.6% of global public investment on education, while the 25% of children living in low-income countries have access to only 0.6% of this investment. By sharp contrast, the 25% of the world's children aged 0–14 years living in upper-middle or high-income countries have access to 91% of global investment.

In addressing the severe challenges facing adolescents, noted above, the reshaping of schools into powerful, shared platforms to deliver high quality education in conjunction with better mental and physical health and the promotion of the wellbeing of learners is a critical task (see Figure 1).

3.4 The community platform

The other vital platform is the community development network at the local level, which can be critical to effective implementation of interventions. Interventions employing these networks often focus on improved parenting and address adolescent delinquency, interpersonal violence and substance abuse amongst other problem areas. One such program is the aptly named 'Communities that Care'. Studies by Kuklinski and colleagues (2015) have illustrated the value of these programs. This is illustrated briefly in Section 6.4 below in relation to the position of women.

Figure 1 Platforms, linkages and interventions in the investment case modelling



Key:

- CM Community mobilization
- IPV Intimate partner violence
- FGM Female genital mutilation

4. Costs and benefits of the interventions

4.1 The costs of inaction

The cost of inaction is the cost of failing to take action to address the challenges facing adolescents and to improve their wellbeing. There are several possible approaches to measuring the cost of inaction, but in this report we take a social opportunity cost approach.

In each of the intervention areas noted below, we construct a base case (broadly the consequences of persisting with existing policies and programs) and an intervention case (broadly a path to achieve socially achievable outcomes by 2035), and estimate the economic and social benefits of the intervention outcomes relative to those of the base case. The full report describes the process of constructing these cases for each of the areas. The costs of inaction are the economic and social costs incurred by failing to take action to implement the interventions. That is, the costs of inaction are equal to the value of the benefits achieved through the interventions and foregone by inaction.

We have applied this approach to the following areas:

- health (adolescent health services, human papillomavirus (HPV) vaccination, TB prevention and treatment and treatment of myopia)
- education and training
- child marriage, and
- road traffic injuries.

Insufficient information is available to extend this approach to other areas.

The costs of inaction are the costs of failing to implement the interventions over the period 2024–2035. They are expressed as net present values at a 3% discount rate. The period of the costs of inaction is defined by the period for which the interventions are not implemented (2024–2035), but some of the costs might be incurred outside of this period.

Our estimate is that the costs of inaction over 2024–2035, for these areas and for the countries we study, which varies for different interventions, is US\$20.5 trillion. This amounts to 6.1% of the projected total GDP of these countries over this 12-year period. That is, on average, the costs of inaction are equivalent to 6.1% of total GDP for these countries each year. If we exclude China from the estimates, the total costs of inaction for all other countries studied is US\$12.3 trillion, or 9.8% of their GDP. These estimates relate to the number of countries for which the modelling has been undertaken, as listed in the tables below and detailed in Appendix Table A1.1 in the main report. For all cases, over 85% of the global population of adolescents live in these countries.

4.2 Models, sources and methods

In terms of BCRs, we report two types of modelling results in Tables 3 to 6 below, and in the individual chapters of the main report. The first type consists of results arising from eight models developed by the authors of the current report. In many cases, these models build upon and extend earlier models developed in conjunction with colleagues, especially from UNFPA, WHO and UNICEF in previous studies. We wish to acknowledge the contributions made by these various co-authors of earlier papers and the role of agencies, and especially UNFPA, which commissioned and in part funded these studies. Table 2 provides a brief summary of the development history of these eight models, and subsequent chapters of this report provide further details.

Table 2 Origins and development paths for eight benefit-cost models used in this report

Model	Origin and development	Development work for this report
1. Adolescent health services	Built for Sheehan et al. (2017), based on prior work for Stenberg et al. (2014); reported in Sweeny et al. (2019).	Full re-estimation of OHT results, with updated cost and economic components. See Section 2.1 of the main report.
2. Human papillomavirus vaccination	While an earlier model was used for Sheehan et al. (2017), a new model is used here.	The new model was built jointly with the Daffodil Centre, University of Sydney and Sweeny, Nguyen et al. (2023). See Section 2.2 of the main report.
3. Tuberculosis prevention and treatment	Not previously included in published Victoria Institute of Strategic Economic Studies (VISES) modelling.	This new model estimates the BCR from implementing the WHO End TB Strategy in 50 countries (95.7% of adolescent TB deaths). For details, see Section 2.3 of the main report.
4. Myopia screening and treatment	Not previously included in published VISES modelling.	This new model, developed with the support of the Fred Hollows Foundation, uses, inter alia, evidence from the Lancet Global Health Commission on Global Eye Health (Burton et al. 2021). See Section 2.4 of the main report.
5. Education and training	Built for Sheehan et al. (2017), from earlier work by UNESCO and UNICEF; reported in Wils et al. (2019).	The re-developed model retains the basic structure of transition through grades. Upgrades include a new meta-analysis for effect sizes and the grouping of related interventions. See Section 6.2 of the main report.
6. Improved productivity and employment	Built for Sheehan et al. (2017); reported in Sheehan and Shi (2019).	Modest macroeconomic multiplier and innovation effects have been added, but otherwise the values from the 2019 paper have been used. See Section 6.4 and Table 6.3 of the main report.
7. Prevention of child marriage	Initial modelling reported in Sheehan et al. (2017) and Rasmussen et al. (2019), with further development in UNFPA (2022).	Model used here now includes 70 countries, with updated data inputs and effect size estimates. An optimization facility has also been developed to permit the selection of the most effective interventions. See Section 7.2.2 of the main report.
8. Road traffic injury prevention	Initially developed for Sheehan et al. (2017); see also Symons et al. (2019). Further enhanced since then with support from the FIA Foundation (Symons et al. 2022).	For this project, the model has been substantially upgraded from the latest published version. Changes include a new approach to the baseline and to rural/ urban analysis, updating of effect sizes and better infrastructure modelling. See Section 7.4 of the main report.

Two other points are worth noting about these models. First, they adopt, in several different forms, a broadly human capital approach to valuing the benefits. That is, a central aspect is potential gross domestic product (GDP) lost from death, illness or injury and/or the potential GDP gained from improved human capital, with, where relevant, the additional social value lost through death, illness or injury. These estimates are prepared using country and age-specific projections of participation rates and death rates.

Secondly, for multi-country studies, two methods are available for reporting the average ratio of benefits to costs, and hence the average BCR. The first is simply to add up the BCRs for each country and divide by the number of countries. The second is to separately sum up all the estimated benefits and then the costs for each country, and divide the total benefits by the total costs. This gives a much bigger weighting to countries generating larger estimated benefits and costs, e.g. those with larger populations such as China and India. We call the BCRs produced by the first method the unweighted average, and the second the weighted average. Both of these are reported here.

Tables 5 and 6 list seven studies estimating BCRs for interventions directed at adolescents that were conducted by groups other than the Victoria Institute of Strategic Economic Studies (VISES). Further details of these studies are provided in the chapters of the main report that refer to them.

4.3 The interventions: costs and benefits

As described in Chapter 2 of this report, we model a wide range of 95 interventions directed at providing universal coverage of adolescent health services. The Appendix to this report provides a full listing of interventions analysed. The modelling is undertaken using the OneHealth Tool, together with an economic model to calculate the economic and social benefits. This chapter also provides details of modelling, undertaken with other partners and reported here, on HPV vaccination and on programs to prevent and treat tuberculosis (TB) and to screen for and treat myopia in adolescents. Table 3 shows that the BCR for a broad range of adolescent health services (on an unweighted basis and covering both economic and social benefits) is 9.5, while the BCRs for the smaller three programs are considerably higher.

Table 3 Return on investment from scale up of adolescent health services, HPV vaccination and screening and treatment of cervical cancer, and prevention and treatment of TB and screening and treatment of myopia in adolescents

Status	BCR economic	BCR economic plus social	BCR economic	BCR economic plus social
	Unweighted average	Unweighted average	Weighted average	Weighted average
Adolescent health services				
All countries modelled (40)	6.3	9.5	3.1	4.8
HPV				
All countries modelled (78)	12.7	20.2	10.8	17.8
TB				
All countries modelled (50)	37.9	53.6	39.4	54.4
Myopia in adolescents				
All countries modelled (19)		13.0		21.1

In cost terms, and probably also in terms of linkage to a range of other domains of adolescent wellbeing, the initiatives for schooling, learning and training are a dominant part of the necessary investments. The BCRs for these investments, covering both economic and social benefits are high, at 17.2 unweighted and 12.3 weighted (Table 4). In Table 4, BCRs for India and China are shown separately and they are therefore excluded from the lower-middle income and upper-middle income groups, respectively. Table 4 shows that these are genuinely transformative investments. Chapter 6 of the main report describes these results in detail.

Table 4 Return on investment (BCRs) from education and training interventions in 64 countries

	Low-income	Lower middle-income	Upper middle-income	China	India	Total
BBCR						
Unweighted average						
Total	14.6	17.6	20.7	6.6	13.8	17.2
Weighted average						
Both	11.2	13.2	11.5	6.6	13.8	12.3

Tables 5 and 6 provide a brief summary of studies from the recent literature, and from our own new modelling for this project, which provide BCRs for interventions for mental health and to protect adolescents from various types of violence and injury (such as child marriage, aggression, suicide and road traffic injuries). Again, the finding of high BCRs is confirmed.

Table 5 Summary of BCRs for mental health, parenting, health and behavioural problem prevention, school climate and school feeding interventions

Author	Location	Interventions	Benefits	BCR
Multi-program studies				
Stelmach et al. (2022)	36 countries across all income groupings	Wide ranging mental health interventions (teacher-led SEL-type, CBT (group and internet-based))	Comprehensive (mental health, education outcomes and productivity)	23.6
Verguet et al. (2020)	14 countries in Latin America, South Asia and Sub-Saharan Africa	School meals with treatment for worms and supplements to prevent anemia	Reduced STH and anemia cases; improved learning outcomes and wages	17.0 (range 7–35)
Single program studies				
Belfield et al. (2015)	USA	SEL (life skills, 4Rs, socio-emotional training)	Reduced depression, bullying and education outcomes	3.5–13.9
Nystrand et al. (2020)	Sweden	Positive parenting and parenting competence	Improved adolescent behaviours	10.6
Spoth et al. (2002)	Mid-west USA	Parenting program	Reduced substance abuse	9.6, 5.9
Kuklinski et al. (2015)	USA	Communities that Care (CTC) program	Reduced substance abuse, delinquency and violence (short term)	8.2
Kuklinski et al. (2021)	24 communities in various US states	Communities that Care – provides resources to activate communities	Reducing adolescent substance use, delinquency, and related problems (long-term)	12.9
This report (2023)	Bihar, India	School climate, connectedness,	Reduced depression and bullying, and education outcomes	21.4

Notes: 4Rs is reading, writing, respect and resolution; CBT is cognitive behavioural therapy; SEL is socio-emotional learning; STH is soil-transmitted helminths.

Table 6 Summary of BCRs for interventions to reduce violence and injuries in adolescents

Author	Location	Interventions	Benefits	BCR
This report (2023) – see Chapter 7	70 countries	Education and community programs	Reduce child marriage	11.7 (unweighted)
WSIPP (2019a)	Australia	PATHS – curriculum promoting emotional and social competencies	Reduces aggression and improves ability to resolve conflicts	19.6
Stelmach et al. (2022)	36 countries	Hospital and school- based suicide prevention program	Reduce suicide	62 (hospital) 3.5 (school)
This report (2023) – see Chapter 7	77 countries	Broad-based programs: infrastructure, alcohol, speed, helmets	Reducing road fatalities and serious injuries	15.8 (weighted)

5. Limitations of the economic and social modelling

5.1 Variations in applicability across the domains

The UN H6+ domain framework (Ross et al. 2020) outlined in Table 1 provides a comprehensive structure in which to address most aspects of adolescent wellbeing.

Some of the domains lend themselves to the type of investment case evaluations employed in this report, some less so. Domains 1 and 4 encompass health and education, which are the major focus of public, and for that matter a good deal of private, investment in adolescent wellbeing. Accordingly, the important features of the health and education systems have received significant academic and other research attention, facilitating the development of evaluation models designed to test the returns to investment in these domains such as those described in this report (Sheehan et al. 2017; Stenberg et al. 2017; Damon et al. 2019; Angrist et al. 2020; Springer and Miller-Grandvaux (2022). This is not to say that there are not gaps in the evidence base, but it is generally more comprehensive than the other domains.

Domain 3, Safety and supportive environment contains elements that have been studied in some detail and these studies support the development of models for investment returns analysis. Here we have developed, or relied on, studies that provide evidence of the high returns to investment in protective interventions to lessen the risk of violence or injury in specific areas. These are child marriage, female genital mutilation (FGM) and road traffic injuries (Rasmussen et al. 2019; Katz et al. 2021; Symons et al. 2019). We are conscious, however, of the many other equally important areas of adolescent safety for which quantitative studies are not available. One that is receiving increasing attention is intimate partner violence, but at this stage the information is not yet available to support this form of investment case (Ferrari et al. 2022). Considerations of inequality and human rights remain, of course, powerful reasons for investment in such areas.

Outside these specific domains, the broader issue of interpersonal violence among adolescent males, including in war and terrorist activity, is one of the more prominent causes of male adolescent death and injury, but interventions to prevent this is missing from investment case analysis (Wodon et al. 2021).

Two other domains – Domain 2. Connectedness, positive values and contribution to society and 5. Agency and resilience – are conceptually very important for adolescent wellbeing. Those individuals that have high levels of these attributes are more likely to thrive and be able to survive the emotional and physical challenges of adolescence. The fact that data limitations restrict the application of the style of investment evaluation adopted in this report should not be taken as in any way casting doubt on the importance of these domains to adolescent wellbeing.

The case study in Chapter 3 developed based on the results of the SEHER study in Bihar (Shinde et al. 2018), which links school connectedness to mental health and education impacts, is a rare attempt to demonstrate that interventions to improve connectedness (in this to school and schoolmates) can have measurable outcomes that result in a benefit-cost analysis with a significant BCR of 21.4.

5.2 Multi-country models and local implementation

The multi-country models used here inevitably employ estimated data on key parameters, drawn from existing studies that cover many countries in most cases. Thus, the models have limited ability to tailor the intervention parameters to the situation of a specific country, or indeed to model those interventions that will be most effective in that specific country.

Each country should invest in the set of interventions likely to be most effective in the country's specific conditions, with cost and impact parameters shaped as far as possible by local conditions and knowledge. One modelling approach that may assist with this selection process is that of optimisation across interventions, to determine a suite of interventions that will achieve a given level of the target outcome (e.g. reduction in child marriage) most effectively. Some results with this approach are discussed in Chapter 7 of the main report. For a given country, selection of the optimum suite of measures to achieve a given end is necessary, and, inter alia, should give a higher BCR than that from the standard model.

5.3 Uncertainty in BCR estimates

The BCR results reported in Tables 3–6 emerge from complex analyses in which many decisions need to be taken on modelling methodologies, parameter values and other factors. In many cases, these decisions must be taken on the basis of the best information available, although that information is often quite limited. For technical reasons, it has not been possible to provide meaningful formal estimates of uncertainty levels. It should be recognised that the uncertainty ranges around the point estimates provided are likely to be substantial, but also that the point estimate BCR results are high.

6. Key investment priorities

6.1 Malnutrition

Malnutrition, which covers undernutrition, overweight and obesity, remains a critical challenge for current and emerging adolescent cohorts. Indeed the double burden of nutrition (DBN) – the simultaneous manifestation of undernutrition and overweight/obesity – affects most low- and middle-income countries (Popkin et al. 2020). DBN has increased most in many low- and middle-income countries between 1990 and 2010, with Indonesia having seen the biggest increase among larger countries. But many other Asian and sub-Saharan countries have also seen big increases in DBN.

Sustained action to address these issues has been widely discussed in the literature, and some modelling has been done. The impact of malnutrition comes through three channels:

- inadequate intake of micronutrients (such as various vitamins, iron, iodine, zinc and folic acid), which can predispose adolescents to various adverse effects, such as cognitive defects, maternal haemorrhage, birth defects and diseases
- hunger and macronutrient or protein-energy undernutrition, giving rise to stunting, underweight and thinness, and
- overweight and obesity, giving rise *inter alia* to poor cardiovascular health and an increased risk of cardiovascular disease in later life.

The key interventions to address undernutrition in adolescents are micronutrient supplements of various types, and the expansion of school feeding programs, integrated with programs to provide micronutrient-fortified foods. There is increasing empirical evidence on such school feeding programs (e.g. Verguet et al. 2020), suggesting that they provide high returns. Important elements in the malnutrition crisis are the shift to commercialised, global systems of food production and distribution, which often generate less healthy, energy-dense foods at the lowest price and contribute to rising prevalence of overweight and obesity. Especially for families that are time or income poor, this makes it difficult to access healthy food.

The key messages of the important 2023 multi-agency review led by UNESCO, summarised in Table 7, highlight the importance of both school health and nutrition programs as part of a broad enhanced schools program.

Table 7 School health and nutrition programs: Summary of the key messages of the multi-agency report *Ready to Learn and Thrive* (UNESCO 2023)

1. The health, nutrition and wellbeing of learners are key determinants of education outcomes.
2. Almost every country in the world implements school health and nutrition programs.
3. Such programs are cost-effective and feasible in all settings, and deliver significant gains.
4. School health and nutrition programs promote inclusion and equity in education and health.
5. More attention must be paid to the school environment, critical to health and learning.
6. More comprehensive and sustained school health/nutrition programs are required.

6.2 Mental health: prevention and treatment

Mental disorders represent 13% of the global adolescent burden of disease as measured by DALYs lost (IHME 2019). Expressed as a DALY rate (DALYs lost per 100,000), the estimate for global mental disorders is 1,384, which is almost twice as high as the DALY rate of the next highest cause. The disease burden of mental disorders as measured by the DALY rate is higher for females at 1,440, than males at 1,331 (IHME 2019). This does not include the effects of substance use disorders (DALY rate 107) and suicide/self-harm (DALY rate 285).

There are wide disparities in the burden of mental disorders between countries. Some possible reasons include income per capita and political instability/terrorism, which are significantly correlated with the level of mental disorders. Inequality and the level of youth unemployment also potentially play a role (Viner et al. 2012). For adolescents in many countries, these structural determinants of mental health may have a very large impact on mental health outcomes. However, in formulating preventive interventions to address adolescent issues, it is the determinants much closer to home that are the focus of preventive intervention programs.

Connectedness to school is a powerful protective factor against mental health risks such as bullying, and mental disorders, such as depression and anxiety (Patton 2000; Bond et al. 2004; Shinde et al. 2018). School-based social and emotional learning programs conducted by teachers or other trained staff are effective interventions to reduce depression and anxiety (Durlak et al. 2011; Taylor et al. 2017; Corcoran et al. 2018), and have been included in recent WHO Guidelines on mental health promotive and preventive interventions for adolescents (WHO 2020).

Increasingly, social and emotional skills are being recognised as important for child development and involve the ability to respond appropriately to social interactions, providing support for their universal delivery. In evaluating social and emotional learning (SEL) programs, attempts are being made to capture mental health benefits, such as reductions in delinquency, conduct disorder, depression and anxiety; education benefits due to improved academic performance and enrolment retention; and direct earnings benefits through higher self-esteem and enhanced 'soft skills' (Belfield et al. 2015).

Mental health problems are one of the largest contributors to the health burden for adolescents. For a detailed analysis on quantitative assessment of programs for the prevention and treatment of adolescent mental health see Chapter 4 (note also Table 5 above). However, the actual implementation of known successful intervention programs with demonstrably high benefit-cost ratios is limited in all countries, spanning the range from low- to high-income. The barriers to the adoption of universal programs through schools, for instance, needs further consideration.

6.3 Learning, skills and employment

This is a critical area, given that the issue of learning quality has become so central to the global debate, together with the importance of the two-way link between schooling and mental health, bullying, nutrition and school climate (Gray et al. 2022). Many of these matters have been investigated both within studies reported in the literature and empirical models. The redevelopment for this project of our large, multi-country education model outlined in Wils et al. (2019) has been completed, as has the revision of the employment model (Sheehan and Shi 2019).

The interventions analysed through these models are listed in Chapter 6 of the main report. They focus in particular on increasing secondary school retention and improving the quality of schooling. One of their short-term impacts is on reducing the pressure of supply on youth labour markets by raising secondary school completion rates. In the longer term, they improve the productivity of cohorts post-school and improve their ability to secure formal rather than informal jobs. The improved human capital of the workforce also enhances the innovation capacity of the economy as a whole. The BCRs derived from the analysis of these interventions are summarised in Table 4 above. Interventions related to mental health and child marriage are also considered through these models.

6.4 Interventions to improve the position of women

The disadvantage experienced by adolescent girls ranges from implicit discrimination to violent injury and premature mortality. Intervention programs to address this disadvantage include developing and affirming human and civil rights, working in communities to change cultural and social norms and implementing practical programs in health and education.

The disadvantage faced by girls has everlasting consequences. More than 200 million women and girls have undergone female genital mutilation (FGM), which in turn costs health systems US\$1.4 billion per year to treat the complications from FGM (WHO 2023a). Twelve million girls are married each year before the age of 18 (UNICEF 2023a). According to UNESCO estimates, 129 million girls are out of school, including 32 million of primary school age, and 97 million of secondary school age. Katz et al. (2021) estimate that employing high-coverage targets for 31 countries by 2030, requiring an investment of US\$3.3 billion, would avert more than 24 million cases of FGM at a relatively modest cost of \$134 per girl, although not all would be adolescents. Unplanned pregnancies also often come at a high cost to individual women and to society as a whole. A cost-benefit study conducted by the Burnett Institute for the UNFPA (UNFPA 2022) estimated the returns to a program of interventions to end unmet need for family planning and the prevention of maternal deaths to have a BCR of 8.4. It was not, however, limited to adolescents. Of the total estimated benefits of \$660 billion, for the period 2022–2050, teenage pregnancies averted accounted for \$106 billion or 16% of the total.

In developing an investment case for adolescent wellbeing, we have assembled existing evidence on the success of intervention programs across many of these dimensions and developed some of our own. These interventions address many, but not all, of the fundamental issues that confront adolescents. There are three important platforms available for the delivery of most of these interventions, as discussed above. These are:

- enhanced, school-based intervention programs incorporating more than basic teaching and learning
- adolescent health services provided by accessible clinics and hospitals, and
- broad-based community platforms conducted by civil society and government agencies.

Enhanced schools can contribute greatly to improving the position of young women. Accessibility to schools is a major problem for girls in low-income countries. Schools need to be within walking distance and once there, they need to be girl-friendly. At the most basic level, this may be by the provision of girls-only latrines. These interventions typically have high effectiveness.

Programs to reduce child marriage are effective in increasing girl enrolments and enabling more girls to complete secondary school. Intervention programs generally address three aspects of deterring early marriage:

- economic and other incentives to remain in school
- empowerment through specific group education programs which include, life skills, financial literacy, sexual and reproductive health (SRH) and negotiating strategies, and
- community mobilisation programs to change social and cultural norms to obtain community support for delayed marriage (Malhotra and Elanakib 2021; Girls not Brides 2023).

Much of the focus of interventions for female adolescents delivered through a health platform is on SRH. Firstly, adolescent girls are entitled to professional advice and information about SRH. Secondly, it is essential that interventions to provide adolescent girls with the capacity to make informed choices about pregnancy and avoid unintended teenage pregnancies is readily accessible. Thirdly, it is important that quality antenatal and postnatal care, and safe delivery attended by skilled personnel are available. Fourthly, screening and treatment for sexually transmitted diseases should be available and programs should be implemented to eliminate harmful gender-based practices, such as FGM (UNFPA 2022).

As already mentioned, a number of the intervention programs for female adolescents have a community component directed towards persuading influential community leaders to support changed attitudes to longstanding practices. Both child marriage and female genital mutilation programs have benefited from the mobilisation of changed community attitudes to early marriage and FGM.

The outcome of a recent systematic review and assessment by Malhotra and Elnakib (2021) of 20 years of evaluations of the effectiveness of interventions to reduce child marriage emphasised the importance of education interventions, such as conditional cash or in-kind transfers for schooling support, in enhancing the girl's own human capital and employment opportunities. Other interventions that have been successful have included, conditional asset transfers for delayed marriage, life skills training (including gender rights), and, to a lesser extent, community mobilisation. Interventions that have had little success include unconditional cash transfers. These have been directed largely at addressing poverty, a factor in child marriage.

The Girls not Brides (2023) evidence review confirmed how effective cash transfers can be in keeping girls at school (Mathers 2021). The review also pointed out the need to ensure that the supply side of girls' education can be as important as the demand side – often girls are unable to stay at school due to poor availability and quality of schools, particularly at secondary levels (Malhotra and Elnakib 2021). Cohen et al. (2023) argue that educational interventions are not enough to reduce child marriage, but need to be bundled with interventions to change social norms.

Favourable job markets can have a positive impact on keeping girls in school (Rose 2021), as well as vocational training in areas including tailoring, hairdressing, catering or carpentry, with a view to improving adolescent girls' financial independence (Freccero and Taylor 2021).

A structured review of the evidence from Sub-Saharan Africa concluded that context and intervention design and delivery were important to the success of child marriage intervention programs (Feyissa et al. 2023).

There is much remaining to be achieved to improve the position of young women. Our analysis suggests that interventions addressing health and education issues that have the most reliable evidence base are likely to be highly effective and cost-effective, however the scarcity of empirical data on costs and benefits has, so far, hampered the possibility of calculating formal cost-benefit ratios.

6.5 The prevention of violence and injury

Adolescents (and young people more generally) face heavy burdens of violence and injury. These include child marriage, intimate partner and other interpersonal violence, transport injuries, suicide and other self-harm, and violence related to war and terrorism. These diverse elements of violence and injury have a major impact on adolescent wellbeing, and addressing them must be a key priority.

Globally, it has been estimated that over half of children – 1 billion, ages 2–17 years – experienced emotional, physical or sexual violence in 2015 (Hillis et al. 2016). There are many different types of violence perpetrated on adolescents, and these include homicide, maltreatment, bullying and intimate partner violence (IPV). In humanitarian situations in particular, adolescents are subject to increased forms of violence that include recruitment into conflict, increased trafficking of girls and increased rates of child marriage. The impacts of violence can be long lasting and intergenerational. A range of countries have estimated that violence against children has economic costs of up to 5% of GDP (UNICEF 2022), and the global cost of violence against children is estimated at 8% of GDP (Pereznieto et al. 2014).

Violence prevention approaches related to the enforcement of laws that have high benefit-cost ratios included laws banning firearms and those against serving alcohol to the intoxicated. Strategies that address harmful gender norms are usually undertaken through community mobilisation programs. Ferrari et al. (2022) provide costs for implementing programs for secondary school girls aimed at changing norms, some which are effective in terms of DALYs averted. One such initiative, although not exclusively for adolescents, is the Cardiff Violence Prevention Programme (CVPP), a violent crime and injury data sharing partnership, with intervention costs limited to IT system and related costs. It generated a BCR of 82 based on the sizeable reduction in injuries and justice system costs (Florence et al. 2014).

The response and support services are usually provided in health care facilities. Educational interventions have the most marked effect on preventing violence. Schools offer an important platform for delivering preventive interventions and have positive impacts on improving educational outcomes resulting in reductions in child marriages, reductions in sexual and intimate partner violence, reductions in bullying behavior, and empowering adolescents to protect themselves from violence.

6.6 Engaging adolescents in coping with emerging realities

There is now a powerful body of evidence that the emerging reality of climate change is having a major impact on adolescent wellbeing. Some are affected directly, in terms of actual or anticipated effects on living conditions and/or relocation. Many others share a sense of foreboding about the state of the world that they will inherit (see e.g. van Nieuwenhuizen et al. 2021; Hickman et al. 2021). This is true also of other ongoing trends, such as the increasing number of zoonotic diseases – diseases in animals than can affect humans – and the ongoing likelihood for further pandemics.

Consistent with the themes of connectedness, agency and resilience, some studies have shown that engaging young people in the response to climate change is an effective way for them to cope with the change. Systematic programs to engage adolescents in addressing such global and national challenges are likely to be an important part of the policy response. Making effective use of the ongoing digital transformation will be a central element of such programs.

7. Conclusion

Large-scale and immediate investment to increase the capabilities and wellbeing of adolescents is now of critical importance. This investment will empower young people to meet these challenges, and to thrive in the decades ahead. If such investment is not forthcoming, the costs of inaction will be very high. However, we show in this report that the returns to these investments – the returns to action – are also high, both in terms of benefit-cost ratios and in terms of delivering human rights and of reducing inequalities around the world. The time for action is now!

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