

## Background Paper 3

### The Economic Case for Investment in Adolescent Wellbeing<sup>1</sup>

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#### Abstract

The wellbeing of today's adolescents is paramount for our future. They will shape global outcomes in the decades ahead and will be both the parents and the workers of the next generation. In many countries, existing programs fall well short of meeting the needs of this burgeoning cohort, particularly for young women. Sharply increased investments in their wellbeing are urgently needed. An emerging literature has evaluated these investments, using standard investment methods such as cost-benefit analysis and rate of return analysis. These analyses have shown that enhanced investments in adolescent wellbeing are not only matters of justice and human rights, but show high economic and social returns.

Adolescent wellbeing emerges from a dynamic and interactive process over some 8000 days from early childhood to early adulthood. This central reality has two implications. One is that the pre-adolescent experiences of cohorts matter greatly, and it is often difficult to assess interventions directed at adolescents independently of their early childhood and early school experiences. The second is that there are many synergies between different forms of interventions for adolescents, such as those in education and health. Knowledge of these synergies is emerging. For example, the mutually reinforcing benefits of coordinated investments in health and education are clear.

In spite of the many challenges to building investment cases, the initial results are powerful: studies show the ratio of benefits to costs being between 5 and 10 for many such investments, at a 3% discount rate, with ratios well above 10 in some cases. These are very high returns. The returns will be higher when the synergies between different forms of investment are fully recognised. Such results should be a strong trigger for investments in improving adolescent wellbeing, and should facilitate financing. The development of investment cases should be pushed ahead urgently, to support coordinated programs of investment in adolescent wellbeing, at both national and international levels.

#### 1. Introduction

In 2020, there were about 1.25 billion adolescents (persons aged 10–19 years) in the world, accounting for about one in seven of the global population [1]. In many countries which have had

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high fertility rates, the adolescent share of the population is larger. The wellbeing of this massive cohort, nearly half of which is in Sub-Saharan Africa and Southern Asia, is vital for the world's future and for achieving the Sustainable Development Goals.

The realisation of human potential for development requires age-specific investment for the first 8000 days of life [2]. The second half of this period, years 10–19 (adolescence) is a pivotal phase in health and growth, with adolescent nutrition, growth, learning and health risks affecting patterns of health and wellbeing across the life-course, and with implications for future population health and social and economic potential [3]. It 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 (NCDs) in later life [3].

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 which is both holistic and multi-dimensional [4].

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.

Governments, international agencies, NGOs, foundations and private donors all face many demands for investment, such as for other age groups and for other economic, social and security priorities. These will compete with the multi-dimensional investments required for adolescent wellbeing. Thus, without minimising the role of moral considerations in investment strategies or presuming that all relevant considerations can be quantified, it is important to understand the economic and social case for investments in adolescent wellbeing.

This paper provides a review of the issues involved in such an investment case and of the results that have been produced to date. It also notes the limitations of existing knowledge and some areas in which further work could add significantly to our knowledge.

## **2. Existing investment in adolescent wellbeing**

The literature contains few global estimates of the expenditure on the major programs for adolescents such as in health, education and social protection. Whether these estimates concern the provision of basic services or of interventions to improve wellbeing, little attention has been given to estimating these costs for adolescents per se.

In terms of the cost of the existing level of provision, a rare example is Zhang et al. [5], which provides a comprehensive estimate of total health expenditure on adolescents in China. For 2014, this estimate is \$13.4 billion or \$85.5 per adolescent, compared with health spending of \$382 per

person. The authors estimate that adolescents account for 2.6% of total health expenditure. Out-of-pocket expenses account for 58% of the total. Estimates of expenditure on adolescent disease categories are also provided.

Global estimates of expenditure on adolescent education programs tend to be subsets of work on financing of the SDGs [6]. However, the Brown Commission [7] provides a cost estimate for secondary education in all low and middle income countries of \$386 billion in 2015 or an average of \$292 per student [7]. These costs vary markedly with income level. Equivalent costs for primary and post-secondary students are also provided, but no estimate for adolescents is available.

### **3. Methodological issues for investment cases**

Within the broad area of program evaluation, there are two main techniques with many variants: cost-effectiveness analysis and cost-benefit analysis. Cost-effectiveness analysis calculates the cost of a given intervention achieving a particular outcome, such as a reduction in disability-adjusted life years (DALYs) lost or an increase in quality adjusted years of schooling. This cost-effectiveness metric provides a way of comparing different programs to achieve a specific outcome. Interventions are often judged cost-effective if the cost per DALY gained is less than a threshold level such as \$50,000, or a lower figure for countries with low per capita incomes, although this latter method is now discouraged [8].

Cost-benefit analysis goes further, by estimating in numerical terms the value of the economic and social benefits arising from the improved outcomes. This allows the costs and the benefits to be directly compared, leading to a benefit-cost ratio (BCR) or to the calculation of a rate of return on investment. Given that costs are normally accrued, and benefits realised, over an extended period of time, both variables are normally expressed as net present values, using an appropriate discount rate. A BCR of 5, for instance, indicates that the intervention will return \$5 in benefits for every dollar invested. These methods 'will naturally resonate with those, such as finance ministers, who are challenged to determine the most productive use of government resources in both health and non-health settings' [9].

A benefit received in ten years from now is generally seen as of less value than one received today. The discount rate is the rate at which the value today of a future benefit is reduced for each additional year. Different discount rates are appropriate in different contexts. With commercial investors seeking good returns in the near term, discount rates reflecting their cost of capital are often used. For example, Infrastructure Australia uses a discount rate of 7% [10] and the Asian Development Bank uses 9% [11], and both require projects to have a BCR greater than one. For social investments such as those studied here, the appropriate discount rate is not about the opportunity cost of capital, but about how society values consumption at different times. On this basis, and after an extensive review, the UK Treasury uses a social discount rate of 3.5% [12], and most of the studies reported in this paper use a social discount rate of 3%. For a social project, a BCR of 5 or more, at a 3% discount rate, is a strong result.

Many of the attributes of adolescents that contribute to their welfare can be seen as part of their human capital. This concept has been important in the recent economic literature, and has been heavily promoted by the World Bank (e.g. [13]). Many of the studies discussed below use the concept of human capital, implicitly or explicitly. The key issue is how the link between any given increase in human capital and improved economic and social outcomes is modelled to get a quantitative measure of the benefits.

To conduct an investment case for a set of interventions, we need three types of information:

- the specification of the set of interventions themselves, and an estimate of the impact of the interventions on the target aspects of adolescent wellbeing;
- an estimate of the full cost of the interventions being studied; and
- an estimate of the value of the economic and social benefits arising from the improvement in wellbeing.

These three types of information are discussed in the next three sections: interventions and impacts (Section 4), the cost of interventions (Section 5) and the valuation of the benefits (Section 6). The three estimates allow an appropriate investment metric, such as a BCR or an internal rate of return, to be computed. We summarise the results of some existing studies in terms of BCRs in Section 7, with conclusions and final comments in Section 8.

It is important to note the limitations inherent in the requirement for such information. Many of the elements of adolescent wellbeing distinguished in [4] are difficult to quantify, and even where this is possible, few high quality empirical studies are available. In summarising below what is known about the investment case for measures to improve adolescent welfare, we are acutely aware of this limitation.

#### **4. Interventions, impact and linkages**

In this section, we mainly review interventions which have been assessed for impact and unit cost in relation to adolescents, in the context of a cost-benefit or cost-effectiveness analysis (see Table 1 with individual studies in each domain identified by roman numerals). The discussion follows the five domains distinguished in Ross et al. [4], with an additional sub-section added on synergies between interventions. Thus this study has close links to the papers in this series covering the five domains, namely Papers 4-8. Many of the interventions have impacts across several domains, and this overlap must be recognised.

The Lancet Commission on Adolescent Health and Wellbeing in 2016 carried out a series of systemic reviews on the effectiveness of interventions for adolescents – such as for sexual and reproductive health; violence, intimate partner violence (IPV) and sexual violence; the prevention of overweight/obesity; and the harmful use of drugs [3]. They found considerable evidence in the literature of the effectiveness of many initiatives, but limited data on cost-effectiveness and then mainly for high income countries. The situation has improved since their work was finalised, but the number of high quality studies for adolescents remains limited.

Mention should also be made of the 2014 study by McDaid et al. [14] on the economic case for investing in the wellbeing of young people. This study provides a valuable review of existing knowledge on the economics of such investments for young people (aged less than 25 years) generally, across health, education and other areas. The studies reviewed are for various age categories, and the primary focus is on cost-effectiveness studies for selected high income countries. It finds that many of these investments are cost-effective in the countries considered, but does not provide cost-benefit data.

##### *4.1 Good health and optimum nutrition*

The health literature is replete with studies of the impact of one or more health interventions on relevant human outcomes, but few of these relate specifically to adolescents. The main modelling tool available for systematic analysis of effectiveness and unit costs is the UN inter-agency OneHealth tool (OHT) [15], covering most developing countries to some degree. The OHT is a modelling tool that is regularly updated and uses available epidemiological resources for the integrated assessment of the costs and effects of selected 'best-buy' health interventions. Most of the over 350 interventions modelled in the OHT are 'best buys' identified through the WHO CHOICES (CHOosing Interventions that are Cost-Effective) program [16]. The tool was initially developed with a primary focus on maternal and child health and was central to the pioneering analysis of interventions in that area [17].

The OHT model has been adapted for adolescent health interventions for 40 countries, which account for about 90% of adolescents in developing countries [18,19]. In this study, referenced in both [18] and [19], 66 interventions were modelled, in whole or part, with the OHT, including those addressing: physical health; sexual and reproductive health; maternal and newborn health; nutrition; and some non-communicable diseases that are important for adolescent health, namely depression, anxiety, alcohol dependence, and epilepsy. Separate modelling was developed for vaccinating girls against the human papillomavirus (HPV), which is not covered in OHT. In addition to the health impacts and unit costs of the interventions derived from OHT, the authors of the study estimated the system costs of the interventions and the value of the economic and social benefits arising from the improved health outcomes, enabling calculation of BCRs.

Two chapters in Volume 8 of the *Disease Control Priorities* (3<sup>rd</sup> edition) provide analyses of the economic impact of a package of health interventions, for all school-age children [20] and for adolescents [21]. In the former, Fernandes and Aurino [20] define and assess what they describe as an essential package of interventions for children aged 5–14 years, which can be effectively delivered through schools. This includes nutrition (school meals and micronutrient supplementation), deworming (drugs), malaria (parasite clearance and bednets), and HPV and tetanus vaccines. Costs and impacts are identified through a literature review for each intervention. The total cost of the package is estimated at US\$10.3 per adolescent in lower-income countries (LICs)<sup>2</sup>. The authors argue that the package as a whole is cost effective, but provide a BCR only for schools meals: a minimum of 3 for LICs and 7 for LMICs. This study covers children aged 5–9 years and 10–14 years, and highlights the need to view initiatives to improve adolescent wellbeing in terms of their earlier stage development.

In the second study, Horton and colleagues [21] review some literature on interventions to improve adolescent health in HICs and LMICs, concluding that many, but not all such interventions are cost-effective, on the basis of cost per DALY averted or other measures of cost per unit of other health outcomes. They define an essential package for adolescents, focusing on adolescent-friendly health services, school-based educational programming on health topics, and media and policy efforts to support the school-based activity. This package is different from that in [16] and not entirely delivered through schools. The cost of the package for LMICs is estimated at US\$8.90 per adolescent per year, but no investment metric is provided.

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<sup>2</sup> Where relevant, we use here the World Bank classification of countries: low income countries (LIC); lower-middle-income countries (LMIC); upper-middle income countries (UMIC) and high income countries (HIC). For the latest income criteria for these countries, and other matters, see <https://blogs.worldbank.org/opendata/new-world-bank-country-classifications-income-level-2020-2021>.

It is estimated that diseases transmitted by worms (soil-transmitted helminth and schistosomiasis) affect more than one billion people globally, mainly in LICs [22]. Ahuja and colleagues [22] reviewed the impact of these diseases, noting their epidemiological externalities and their impact on education and labour market outcomes. They argued that, while the cost of testing is relatively high (US\$1.88 per test), the cost of mass treatment programs for all at risk is low (US\$0.30 per treatment). Thus all of those at risk could be treated at low cost for high benefit, although they did not try to quantify the benefit and provide a BCR. In a historical review of mass deworming programs, Bundy et al. [23] show deworming works when targeted at school age children and adolescents, but primarily because it addresses the heavier infections in middle-grade levels.

**Table 1 Summary of selected investment case studies, by most relevant adolescent wellbeing dimension, domains 1–4**

Domain	Interventions	Impact effectiveness	Costs	Measurement of benefits	Investment metric
<b>1. Good health and optimum nutrition</b>					
(i)	Package of 66 interventions for 40 countries, covering adolescent physical, mental and sexual health, nutrition, selected NCDs and HPV [18,19].	Based on OHT, with new analysis for depression and anxiety [see 25] and HPV.	Unit costs: OHT, author estimates. System costs: based on methods in [17]	Primarily based on lost productivity from death and disability averted [18]	BCRs for interventions modelled with OHT>10, for HPV 17; higher in LICs
(ii)	Essential package for school age health [20], including nutrition, deworming, malaria, vision, oral health, tetanus and HPV vaccines.	Derived from the literature for individual elements, for available LICs and LMICs	Based on literature estimates, mainly delivery costs	For each case, wellbeing gains lead to higher productivity and GDP	BCRs only for school meals: a minimum of 3 for LICs and 7 for LMICS
(iii)	Essential package for adolescent health [21]	Reviews evidence from HICs and LMICs to define essential package	Assembled from existing studies		
(iv)	Interventions for depression and anxiety, for 36 countries, all ages [25]	Based on OHT, and additional analysis	Unit costs based on OHT; system costs estimated	Employment/productivity, health benefits assessed	BCRs of 5.3 for depression and 4.0 for anxiety
(v)	Drug treatment to address diseases caused by worms [22], all ages				BCRs for mass treatment likely to be very high
<b>2. Connectedness, positive values and contributions to society</b>					
(i)	Study of six social and emotional learning (SEL) programs [26,27]	Literature review of impact on target outcomes	Estimates based on ingredients method	Shadow prices, based on willingness to pay	BCR: 11 for six programs [21]; 13.9 for Swedish case [22]
(ii)	Positive Youth Development (PYD) programs, engaging youth to reach full potential [28]	Meta-analysis of 94 evaluations, 35 rigorous	No estimates	Many programs show strong proximate benefits	None of the evaluations (94) had CE analysis
(iii)	Mental health interventions for trauma-affected youth [29]	Meta-analysis of 62 studies of programs in schools	No estimates	Only proximate benefits, e.g. lower PTSD, assessed	High impact on PTSD (Cohen's d of 0.94), no BCR
<b>3. Safety and a supportive environment</b>					
(i)	Intimate partner violence, (IPV) [18]	Model using data on the health burden of IPV from (GBD)	Range from \$10-\$70 per participant	Measured effectiveness range from 10% to 80%	BCRs of >1 require costs at <\$30 and effectiveness >30%
(ii)	Programs to reduce effects of child marriage on health, education, work for girls 15–19 [18,30]	For 65 countries impact of direct and school programs on CM.	Drawn from literature on existing programs	Better school and work outcome, lower mortality	BCR: 5.7 65 countries, 6.9 LICs; strong country variation
(iii)	Road injuries [18,32]				See Table 3
<b>4. Learning, competence, education, skills and employability</b>					
(i)	Package of measures directed at quantity and quality of schooling and access to work [15,34,35]				See Table 3
(ii)	Education from a health perspective [32]				Health-inclusive BCRs of 10 (LICs), 3.8 (LMICS) and 1.5 (UMICs)
(iii)	Impact of schooling on maternal mortality, financial risk and equity [28]	Uses extended cost effectiveness analysis for Niger and India	Costs: based on UNESCO cost of schooling data		Distribution of outcomes by quintile

Watkins et al. [24] identified six interventions to reduce the future incidence of NCDs in adolescents, two each in the areas of reducing tobacco use, alcohol consumption and obesity, for 70 representative countries covering all income groups and 86% of the global population. They use the potential impact fraction method to estimate that these interventions would reduce future deaths in the relevant cohorts by 10%. With the economic value of the mortality averted valued by a human capital approach, they estimate that on average the measures return a benefit of about \$5 for every \$1 invested, using a 3% discount rate. This return varies sharply across countries and interventions.

The only multi-country cost-benefit analysis of interventions for depression and anxiety, to our knowledge, is that by Chisholm and colleagues [25]. This analysis covers the 36 largest countries in the world, both developed and developing, but has no age disaggregation. It is covered here because these results might be indicative for adolescents, for whom it is known that these issues are particularly serious. The study referred to above [18] also included mental health for adolescents in its broader analysis.

The study by Chisholm et al. [25] extended the mental health module of OHT to model the impact of basic psychosocial treatment for mild cases, and either basic or more intensive psychosocial treatment plus anti-depressant drugs for moderate to severe cases. Economic benefits modelled covered higher employment and productivity (reduced absenteeism and presenteeism), and the intrinsic value of improved health was modelled following [17]. Although it is recognised that many benefits are not covered, the BCRs obtained are 5.3 for depression and 4.0 for anxiety, at a 3% discount rate.

#### *4.2 Connectedness, positive values and contributions to society*

Paper 5 in this series demonstrates powerfully that connectedness with family, peers and the community plays a critical role in adolescent wellbeing, and that programs to build connectedness and positive values are much more effective than those directed at reducing problem behaviour. While many positive programs are being trialled and there is considerable evidence of their success, there are few cases in which the data are available for benefit-cost analysis. Here we review three programs for which data are available.

It has long been argued that social and emotional skills, or non-cognitive skills, play a central role not only in school but also in employment and life within the community after leaving school. This has led to a number of programs to enhance social and emotional learning (SEL). These programs focus on the process of acquiring the attitudes, competencies, knowledge and skills essential for learning, being effective and having a sense of belonging and wellbeing [26,27] (see also Paper 7 in this series).

Belfield and colleagues [26] reviewed the evidence (mainly from the USA with some from Europe) on six SEL programs, one of which was a Swedish program, while Klapp and colleagues [27] reported in more detail on the Swedish program. For the six programs, the analysis found that the average BCR over these programs was 11, while that for the Swedish program was 13.9.

Catalano et al. [28] undertook a meta-analysis of positive youth development programs in LMIC countries, covering 94 program evaluations, of which 35 were assessed as being rigorous. These programs aim to: build skills, assets, and competencies; foster youth agency; build healthy relationships; strengthen the environment; and transform systems to prepare youth for successful adulthood. In other words, to address many elements critical to adolescent wellbeing. They found that 60% of the programs which had been rigorously evaluated demonstrated positive effects on

behaviour and/or other development outcomes, and may be promising for increasing gender equality. However, none of evaluations included a cost-effectiveness or a cost-benefit analysis.

In a more specific vein, Fondren and colleagues [29] assessed trauma-informed and trauma-responsive interventions among trauma-affected youth through a meta-analysis of 62 studies. These interventions were provided to children and adolescents from elementary school to middle school in response to war/political violence and natural disasters. Many of these interventions were associated with significant decreases in PTSD symptoms and psychopathology (i.e. depression and somatic symptoms), and increases in a metric assessing children's feelings of 'hope' with medium to large effect sizes.

Most of the interventions included cognitive behavioural therapy (CBT), supplemented by various other psychosocial support programs. The outcomes were generally large and significant, with the effect size on PTSD having a Cohen's d score (mean difference divided by pooled standard deviation) of 0.94. A Cohen d score in excess of 0.8 is often considered a large effect. While showing the potential effectiveness of psychosocial support program for those experiencing serious trauma, this paper did not measure costs or attempt a cost-benefit analysis.

#### *4.3 Safety and a supportive environment*

The many important aspects of safety and a supportive environment are discussed in Paper 6 in this series. Here we report on three areas on which detailed cost-benefit analysis has been attempted.

As part of the analysis reported in [18], a cost-benefit analysis of intimate partner violence (IPV) interventions was undertaken. The model developed drew on new country-specific data regarding intimate partner violence, by age, from the Global Burden of Disease. This source provided the estimated burden of mental health, HIV/AIDS, and injuries from intimate partner violence for girls aged 15–19 years. The IPV model used these estimates to predict the economic and social value of DALYs saved by the interventions (group training programs and community mobilisation programs).

The literature review showed a wide range of intervention costs (from \$22.6 to \$73.2 per participant) and program effectiveness rates in terms of reducing sexual assault (from 38% to 83%) for these programs. With such a wide range in the key input data, no definite results could be obtained. Based on the assumptions used in the model, intervention programmes would require an effectiveness of at least 30% and costs of no more than \$30 per participant to show a BCR of more than one, at a 3% discount rate.

Child marriage has well-documented impacts on the wellbeing and future prospects of young girls and two related studies [18,30] have undertaken a benefit-cost analysis of relevant interventions. The interventions studied work on two fronts: school-based measures to improve retention of girls at school and specific interventions to reduce early marriage. The latter involve community-based education programs to help change cultural norms, and a group training program on life skills to empower girls to resist early marriage. The costs of the interventions were derived from the education model in [18] and those for the specific early marriage interventions came from the literature on these programs.

The benefits modelled were the employment and productivity gains derived from longer schooling and those derived from reduced mortality and lower fertility. The BCR estimated in [18] was 5.7 for all 65 countries and 6.9 for the LICs. A subsequent and more detailed adaptation of this methodology [30] found a BCR of 7.4. Since the results were published, a systematic review of

evidence over 20 years has found that interventions focusing on improving girl's human capital and opportunities through schooling and skills training were most successful in reducing child marriage [31].

Road accidents are a major cause of death and injury worldwide, and especially in developing countries. Adolescents, especially those aged 15–19 years, are over-represented in these accidents, which also tend to fall heavily on males. The broad paper [18] reports on a benefit-cost analysis of a range of interventions to reduce this toll: behavioural measures (helmet use, speed compliance, alcohol testing, seat belt use, and graduated licensing); and motor vehicle safety and infrastructure expenditure (see also [32] for a more detailed analysis of the same approach).

The authors developed a model following Chisholm and Naci [33], based on data about deaths and disability arising from road accidents by age, sex, and vehicle type (bicycles, motorcycles, cars, other vehicles, and pedestrians) for 75 LMICs from the GBD 2013 study. Intervention costs and impacts were derived through literature reviews, with the targeted outcomes reduced deaths and serious injuries for male and female adolescents. The resulting BCRs are 5.9 for all countries and 6.6 for the LICs in the sample.

#### *4.4 Learning, competence, education, skills and employability*

There is a vast literature in education on the need for interventions to achieve better outcomes in these areas (see also Paper 7 in this series), but few studies extend to cost-benefit analysis covering a full suite of costs and benefits. The International Commission on Financing Global Education Opportunity (the Brown Commission [7]) provided a summary report of the returns to investment in increased schooling in low and middle income countries. They reported that for every additional dollar invested in additional years of school, there was a BCR of 10 for LICs, 4 for LMICs and 2 for UMICs. These results were based on a report prepared for the Commission by Jamison and Schäferhoff [34]. In calculating the benefits of education, this report augments the standard private earnings return with estimated benefits arising from the reduction in adult and under-five mortality arising from increased schooling.

In the academic literature, a study by Pradhan and colleagues [35] extends this approach to examine the impact of better education on adult mortality, under-five mortality and the fertility rate. They then undertake a cost-benefit analysis of an additional year of schooling taking account of this impact. The additional year of schooling is applied to national data on populations 25 years and over, but in almost all cases would have occurred during adolescence. In their cross-country regressions (covering 80 countries), they find that mean years of schooling (both sexes combined) are significant at the 1% level for all three variables. The costs of an additional year of schooling are derived from international sources, but do not include the cost of the interventions necessary to achieve the higher retention rate nor the incidental costs borne by families.

The value of the mortality benefits is estimated by applying the value of a statistical life methods developed in [36], and these are added to the standard private returns to schooling estimates. The central results are that the social rate of return to an additional year of schooling (the implied annual return on the investment after measuring all the benefits) is 16.3%, 9.3% and 4.7% for LICs, LMICs and UMICs respectively. For the same groupings the BCRs are 9.9, 3.7 and 1.5 respectively, at a discount rate of 3%.

The project reported in [18], [37] and [38] constructed two new models to examine the economic and social returns to improved quantity and quality of schooling in 72 LMICs. One was a model of educational progression based on earlier UNESCO and UNICEF work, with the capacity to track the effects of targeted interventions to reduce dropout rates and to improve the quality of learning. The size of the impact parameters for these interventions was derived from the meta-analytic literature on such interventions. This model was also used to estimate the costs of the interventions, covering both the cost of achieving higher retention rates and higher quality and the cost of educating the enhanced cohort going forward.

The second model was designed to study the impact of additional years of schooling, higher secondary school completion rates and improved school quality on the subsequent level and type of employment and on the productivity of the cohorts of students shaped by the interventions. This gave rise to the economic benefits of better schooling. The analysis also incorporated the benefits of a reduction in pregnancies and sexually transmitted diseases associated with better education. As indicated in Table 3 below, the estimated BCRs were high, being about 12 for the full sample and reasonably uniform across the major country groupings by income.

Verguet and others [39] have developed the technique of extended cost-effective analysis, which supplements traditional cost-effective analysis by introducing considerations of financial risk and equity. It thus seeks to assess how much financial risk protection and improved health can be purchased for a given level of expenditure. In [39], the authors applied this technique to study the impact of an additional year of schooling on maternal mortality and impoverishment, for adolescent women aged 15–19 years in Niger and India. The model estimates the level of adolescent maternal deaths, of out-of-pocket expenses and of catastrophic health expenditures averted for adolescents by income quintile. In both countries, about half of all maternal deaths are in the lowest quintile, with much lower rates in the upper quintile. In India, all of the catastrophic health expenditures averted are in the lowest income quintile. This analysis brings out the importance of incorporating financial risk and equity into investment analysis.

#### *4.5 Agency and resilience*

The fifth domain in the framework for adolescent wellbeing outlined in [4] is agency and resilience. These issues are discussed in detail in Paper 8 in this series, which notes that ‘the ability of adolescents to make and act on their choices and meet individual and collective aspirations is essential for their holistic well-being’. This domain covers adolescents having a sense of agency and of being empowered, feeling comfortable in their own identity, being equipped to handle adversity, and feeling that they are now fulfilling their potential and will be able to do so in future. Many of the programs discussed under Sections 4.1 to 4.4 above would contribute to enhanced agency and resilience on the part of the adolescents to which they were successfully applied. While Paper 8 reviews a number of programs related to agency and resilience and provides evidence of their effectiveness in a number of domains, we are aware of no benefit-cost analyses of programs directed specifically at agency and resilience. For this reason, the fifth domain is not included in Table 1.

#### *4.6 Synergies between interventions*

One critical issue, implicit in [4] but only occasionally discussed in the literature reviewed above, is that of an improvement in wellbeing in one domain having an impact on wellbeing in other domains. Such an impact exists whenever any characteristic of an adolescent or his or her development

affects their other characteristics or capabilities, now or in the future, or those of their family. Thus, for example: poor nutrition and other forms of ill health affect the ability to learn; limited education affects the ability to learn about and follow best practice health methods, with adverse implications for the adolescent's own health and that of their children; child marriage and a subservient position in the household leads to early childbirth, high lifetime fertility and truncated education; and low educational outcomes tend to lead to an inability to obtain high quality, formal employment and so on.

These linkages apply to both genders, but are particularly important for adolescent girls. They help to 'lock-in' a state of low wellbeing, but also can amplify the impact of policy interventions, as improved outcomes in one area flow on in a synergistic way to benefits in other areas also. One forthcoming study [40] undertakes a cost-benefit study of school feeding in 14 developing countries for which data are available. Rather than just looking at the health or education benefits of school feeding programs, they study benefits in four sectors: health, education, social protection and agriculture. They find that the overall benefits of such programs are several times greater than the health benefits alone, and that the overall BCRs are between 7 and 35, with particular sensitivity to the value of local wages.

Another example is the intergenerational benefit of delaying early marriage, leading to better education for the next generation. Based on findings from a study in 32 sub-Saharan African countries that the children of girls who marry before the age of 18 years have, on average, 1.8 fewer years of schooling [41], Patton et al. [42] estimated that the benefit-cost ratio for delaying marriage based on the effectiveness of targeted education and social norms programs for young women was 8.9. This illustrative result suggests that substantial intergenerational gains are likely to arise from policies that emphasize education and delaying marriage in settings of high and early fertility.

There is an urgent need to assemble, both by meta-analysis and where necessary by new empirical analyses, such quantitative data on these consequences to allow them to play a much greater role in shaping policy. But enough is known about linkages to reinforce the importance of multi-component programs addressing several domains of adolescent wellbeing in a coordinated way.

## **5. The cost of various intervention packages**

An important element of any investment case is accurate identification of the full costs of the interventions being studied. There are many complexities in estimating these costs, particularly carrying cost estimates over from one country where a project was costed, to other countries with different living conditions and currencies. It is also necessary, especially in large scale interventions, to ensure that program and system costs are covered in addition to specific delivery costs. In the case of schools, the cost of achieving a higher retention rate, as well as of educating a larger number of students, must be included.

Table 2 summarises the cost of interventions for six packages of interventions analysed in [18]. The packages covered here contain quite different numbers of interventions, and costs obviously reflect that fact. It should be noted that these costs are expressed per capita over the whole population; costs per adolescent would be on average about five times higher than those shown here. Given that GDP per capita is many times higher for UMICs than for LIC, costs for UMICs would be much higher for LICs.

**Table 2. Estimates of the interventions costs, cost per capita per annum,\* US\$**

	Countries			
	Low income	Lower middle income	Upper middle income	Total
	<b>Average discounted annual cost per capita (\$US)</b>			
Adolescent health services (40 countries)	3.72	3.53	4.36	3.86
HPV vaccinations (75 countries)	0.15	0.10	0.09	0.10
Child marriage (31 countries)	1.76	2.75	0.17	2.27
Intimate partner violence against women (74 countries)	0.07	0.19	0.16	0.17
Education, excluding child marriage cost (72 countries)	8.10	9.53	22.91	14.12
Roads accidents (75 countries)	0.33	0.58	1.44	0.86

Note: \*Measured across the whole population, for the countries in the income group covered by the interventions. Source: [18]

## 6. The return on investment for various packages

BCRs have been reported in Section 4 above for many of the studies covered there. The most comprehensive return on investment results are those in the set of studies reported in six papers [18,19,29,31,35,36]. A summary of these results (drawn from [18]) is provided in Table 3. The results must be interpreted carefully, for several reasons. Different numbers of countries are covered in the various analyses in Table 3, reflecting the availability of data and modelling tools: 40 countries for the OHT interventions, about 75 countries for HPV, education and road accidents, and 31 countries for child marriage. The impact of the interventions varies greatly over time – for example, road safety measures can reduce deaths immediately, while better education builds human capital and productivity over the longer term. This means that level of the discount rate used (here 3%) is a significant factor. It should also be mentioned that the figures shown in Table 3 are unweighted means of the BCR for all countries covered. This approach is adopted to avoid the results for a particular grouping being dominated by one or two very large countries. Finally, some of the results reported in the later papers have varied somewhat from those in [18].

**Table 3. Selected benefit-cost ratios for key interventions, unweighted means**

	Countries			
	Low income	Lower middle income	Upper middle income	Total
	<b>Ratio of net present value of total benefits to costs (3% discount rates)</b>			
<b>Health</b>				
65 interventions modelled through OHT (37 countries)	12.6 (12.0–13.2)	9.9 (9.0–10.8)	6.4 (5.1–7.7)	10.2 (9.9–10.5)
HPV vaccination program (75 countries)	22.4 (21.9–22.9)	12.8 (12.3–13.3)	14.0 (11.7–16.3)	17.0 (16.7–17.3)
<b>Education</b>				
7 interventions (72 countries)	11.0 (10.7–11.4)	12.8 (12.3–13.2)	10.3 (8.7–11.9)	11.8 (11.6–12.0)
<b>Road accidents</b>				
7 interventions (72 countries)	6.6 (6.4–6.8)	5.6 (5.5–5.7)	4.9 (4.4–5.4)	5.9 (5.8–6.0)
<b>Child marriage</b>				
2 interventions (31 countries)	11.6 (9.9–13.3)	7.7 (6.4–8.9)	1.2 (0.9–1.6)	9.2 (8.5–9.9)

Note: Figures shown are unweighted averages for the country groupings shown, to avoidance dominance of the results by one or two large countries. Averages are calculated by using bootstrap techniques. 95% confidence intervals for the averages are shown in brackets. Source: [15].

The key point from the unweighted means of the BCRs for individual countries shown in Table 3 is that, at the all-countries level, all are above 5 (net present value (NPV) of benefits at a 3% discount rate more than five times the NPV of costs) and four of the five are above 10. There is also a pronounced social gradient in these results, with BCRs higher in low income countries than in upper middle income ones in all five cases, although this gradient is less marked for education.

## 7. Conclusion

Human development from birth to adulthood is a long, dynamic process extending over 20 years. It is also a continuous process, with outcomes at each stage affecting wellbeing at subsequent stages. In the past few decades, the global community has rightly given much attention to child and maternal health: in research and policy analysis, in national and international initiatives, and in funding. It is now time for an equivalent effort to be mounted for adolescents.

In research terms, some priorities to build on the knowledge base reviewed here are:

- a growing number of rigorous studies of the impact and cost of interventions to improve adolescent wellbeing, in diverse country settings and across all domains of adolescent wellbeing;
- better understanding of the transition from early and middle childhood into adolescence, and how that transition shapes the effectiveness of interventions for adolescents;
- much greater attention to the linkages between different states of adolescent wellbeing, and hence to the substantial increase in benefits that can be achieved by interventions targeted on a range of synergistic benefits;
- the development of systematic work on the links between the wellbeing of today's adolescents and that of the next generation, of which they will be the parents; and
- building a substantial research program on ways of funding much increased adolescent programs, having regard to massive changes in financial markets and to the emergence of private 'public good' investors.

Given the scale and urgency of the challenge which adolescent wellbeing presents, there is an urgent need for a much expanded programs, at both the international and national levels, to improve adolescent wellbeing. Such programs should make use of the strong synergistic effects that coordinated investments can have, in many areas but especially in education and health. Aligning investments in health and education in this age group has the potential for life-long benefit. Special focus should be given to the needs of adolescent girls, who are particularly vulnerable in many dimensions and who are especially impacted by the 'lock-in' effect of multiple forms of disadvantage.

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