The Economic Returns To Investing In Youth In Developing Countries:
A Review of the Literature

James C. Knowles and Jere R. Behrman

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The Economic Returns to Investing in Youth in Developing Countries: A Review of the Literature

James C. Knowles and Jere R. Behrman

Abstract: This is a companion report to Assessing the Economic Returns to Investing in Youth in Developing Countries (Knowles and Behrman, 2003), with focus on the literature reviewed and greater detail in some parts than in the 2003 study. Both papers explore the economic case for investments in youth in developing countries. The current cohort of youth is the largest cohort ever. The economic, social, and demographic context of their lives has undergone enormous change, thus requiring a rethinking and re-evaluation of the range of investments in youth. This reappraisal must incorporate a number of critical features including recognition of the wide range of youth investments, the considerable lag in effects, and the likelihood that youth investments in one area affect investments and behavior in other areas. The paper examines forty-one investments in the following broad categories: formal schooling; civilian and military training, work; reproductive health; school-based health; other health; and community and other. The paper develops a life-cycle approach using cost-benefit analysis to calculate the economic returns to investments in youth. However, the information necessary to apply the methodology is sufficient for only a few investments in a few countries. Moreover, even for these cases, the estimated economic returns vary widely depending on the assumptions used. Despite these limitations, the available evidence suggests that some types of investments in youth, e.g., investments in formal schooling, adult basic education and literacy, some types of school-based health investments (e.g., micronutrient supplements and, under certain circumstances, reproductive health programs), and measures designed to reduce the consumption of tobacco (e.g., increases in the tobacco tax), yield economic returns that are at least as high as are those for many investments in other sectors. The lack of reliable information on the effects of many investments in youth is the most important information gap and the area meriting the highest priority for future research.

Keywords: adolescent health; AIDS; economics of tobacco control; nutrition policy; service delivery

Disclaimer: The findings, interpretations and conclusions expressed in the paper are entirely those of the authors, and do not represent the views of the World Bank, its Executive Directors, or the countries they represent.

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FOREWORD

The authors of this Discussion Paper make a valuable contribution to our understanding of the role of health, nutrition and population as determinants of economic growth and development. Beyond basic rights arguments, the investment in children and youths has important social returns such as future productivity of the workforce and poverty alleviation. Factors contributing to economic growth and prosperity include policies and institutions that foster good governance, private sector investment, trade liberalization, natural resource conservation, basic education, and health. Good health, nutrition and population policies are now, also, recognized as important contributors to economic growth and development. Good health improves growth and development in the following ways: nutrition positively affects labor productivity and growth; fertility and population dynamics affect growth; child health and youth health affect growth. Poor health and unhealthy habits on the other hand, reduces economic growth and development in the following ways (Hammoudi 1999): HIV/AIDS, malaria, tuberculosis (TB) lower labor productivity, growth, and household incomes; tobacco use adds an economic burden on households; disability in most cases, contributes to earnings loss and unemployment; treating diseases and the needed health care systems are expensive.

More than a quarter of the world’s population—1.7 billion people—is between the ages of 10 to 24, and the numbers are growing. The vast majority of these young people—86 percent—live in developing countries where, in many places, they represent 30 percent of the population. To a large extent, the choices young people make—with regard to sex and reproduction as well as to other critical aspects of their lives—will determine the size, health and prosperity of the world’s future population. Youth have many pressing needs. Nonetheless, a stronger and more coherent economic argument for youth investment is needed to spur appropriate action by governments and donors. This Discussion Paper investigates the economic case for investing in youth and makes recommendations on areas for appropriate action.

The timing of this analysis is particularly opportune. Development institutions such as the World Bank and its government partners are increasingly focusing on investments in the 10 to 24 age group as a way to reduce poverty, break the cycle of poverty, build human capital and stimulate economic growth. At the same time, the work complements World Bank-sponsored analyses of investments in the youngest citizens—infants and children. It also feeds into the process to develop a comprehensive World Bank framework on children and youth.

We hope this Discussion Paper, with its innovative methods and provocative findings, will galvanize even greater attention to the problems and promise of youth in developing countries. With a greater understanding of appropriate policies, countries are more likely to give young people the best possible chance to stay healthy, learn, obtain a job or livelihood, and to participate fully in society.

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EXECUTIVE SUMMARY

Youth constitute a large proportion of societies in developing countries and have many pressing health, education, economic, and social needs. Despite the critical value of youth to future well-being, it is possible that countries underinvest in the healthy development of adolescents and young adults. If there is a gap between current and desired social levels of investment in youth development, showing that the social rates of returns to investments in youth are higher than for the alternative use of these resources is likely to strengthen the case for using public resources to close this gap. The results of doing so are likely to include more efficient use of public resources, with possible benefits for many members of society.

Some evidence exists that youth-focused interventions are a cost-effective way to improve health, reduce poverty, and benefit society -- yet there is no full economic analysis of the benefits and costs of youth investments in developing countries. The assessment in Knowles and Behrman (2003) aims to explore the economic case for investments in youth in developing countries by synthesizing the current knowledge of the economic costs and benefits of youth investments, analyzing key gaps in the evidence, and identifying priority research needs. This is a companion paper the intent of which is to provide greater detail than in Knowles and Behrman (2003), particularly with regard to the literature review.

MAJOR THEMES UNDERLYING THE ASSESSMENT:

The current cohort of youth in developing countries is the largest cohort ever, either in the past or predicted for the future, given the stage of the demographic transition in which the developing countries currently are on average, though of course there are variations across countries and regions: This means that whatever investments in youth in developing countries are made have an important impact on a relatively large share of the population. It also means that there may be large resource implications and intergenerational transfers required to make substantial investments in youth.

Major changes have been occurring in the context for youth in developing countries:

the world has become more integrated due to economic, technological, and cultural globalization;

developing countries in which hundreds of millions of youth live – particularly in Asia but also elsewhere -- have experienced historically unprecedented economic growth while smaller but still large numbers of youth have been in countries, particularly in Sub-Saharan Africa, Latin America, the Middle East/North Africa and Central Asia, with limited economic growth or stagnation, often with high rates of youth unemployment;

human capital investments in the form of formal schooling and training have expanded rapidly and have facilitated the exploitation of new technologies and new markets by those in whom such investments have been made;
at the same time, the severe fiscal constraints faced by most developing countries together with reappraisals of the role of governments has led to a situation in which a growing share of the investments in youth, particularly in health and schooling, is financed directly by households rather than through governments;

the health and nutritional environments have changed radically, with rapid transitions in each of these;

cultural norms and legal changes, often related to globalization, have shifted to more emphasis on gender equalities, individualism and materialism.

Therefore it is necessary to rethink and to re-evaluate the range of investments in youth in developing countries – including, inter alia, schooling, training, reproductive health, and other aspects of health including behavioral changes related to food consumption, physical activity and substance use. The large cohort size means that there are pressures on resources that are likely to be squeezed due to the large numbers – therefore strengthening the need for as good a case as possible to justify use of scarce resources for investments in youth in those cases in which such investments are warranted. The changed context means that the economic returns to different investments in youth probably have altered substantially.

This reappraisal of the economic returns to investing in youth in developing countries must incorporate certain critical features. Among these are:

The inclusion of an appropriately wide range of such investments, including their costs and benefits, within a life-cycle context;

The considerable lag in the effects and ultimate outcomes of many of these investments, implying that the choice of an appropriate discount rate may be of considerable importance to the results of the reappraisal;

Consideration of these investments within the frameworks of standard policy concerns of efficiency and distribution and tradeoffs between efficiency and distribution;

Sensitivity to problems in making inferences from behavioral data given endogenous choices (selectivity), important unobserved variables and other measurement and estimation problems.

The likelihood that youth investments in one area impact on investments and behavior in other areas. For example, reducing youth unemployment might strengthen the demand for schooling. Improving nutrition might improve school performance and reduce the health risks of a youthful pregnancy. Curtailing drug use might reduce crime.

Greater clarity regarding such matters as what are costs and what are transfers. Previous literature, for example, confused resource costs with transfers, such as welfare payments.

ORGANIZATION OF THIS PAPER
This literature review is organized more or less parallel to the assessment in Knowles and Behrman (2003), but with more emphasis on the details underlying Sections 2-4. To reassess the economic benefits of investing in youth in developing countries requires frameworks for analysis to organize the existing fragmented and imperfect information. Section 2 presents such frameworks, after a discussion of why such frameworks are essential, with presentation of a basic framework for investments in youth, the problems of empirical inferences, and a basic framework for policy evaluation. Building on this foundation, Section 3 summarizes the effects of a range of basic investments in youth -- schooling, civilian and military training, work, reproductive health, general health and nutrition programs, consumption of tobacco, alcohol and other drugs, mass media programs, and community and other interventions. Section 4 considers the benefits from a variety of investments in youth. Section 5 summarizes some previous studies on the rates of return to selected investments in youth. Section 6 concludes.

ANALYTICAL FRAMEWORK FOR EVALUATING INVESTMENTS IN YOUTH

The review devotes considerable attention to a discussion of the available methodologies for estimating the effects of investments in youth. A broadly applicable analytical framework is developed to:

point to the types of data needed;

help in the specification of empirical models;

facilitate the interpretation of empirical findings;

identify possible estimation problems.

The review discusses the kinds of data available for the purpose of estimating the effects of investments in youth. The relative strengths and weaknesses of macro versus micro data, experimental versus behavioral data, and longitudinal versus cross-section data are examined. The review also highlights issues related to the measurement of key variables, including benefits and costs, educational, health and nutrition outcomes (including problems arising from systematic biases in reporting), and important abstract concepts (e.g., social capital, self esteem, social exclusion).

The review devotes considerable attention to the advantages and disadvantages of randomized experiments. The advantages of randomized experiments are numerous, including:

the ability to control for omitted and unobserved variables;

the possibility to zero in on key relationships that are difficult to observe in behavioral data (e.g., the separate effects of micronutrients);

the possibility of using simple analytical methods to analyze the results;

the opportunity afforded for ethical rationing if resources are limited.
On the other hand, the review identifies a number of shortcomings of randomized experiments, including:

- frequent difficulties in implementation (including the risk of contamination) with attendant difficulties in interpretation of the results;

- possible “Hawthorne effects” (unless experiments are double blind);

- the possibility that future expectations may affect current behavior (particularly when investments are phased into areas randomly);

- the “black box” nature of experiments and their inability to address possible structural change over time;

- their high cost and the related problem that experiments are often too brief to permit the observation of important longer term effects.

Given the limitations of randomized experiments, the review also devotes considerable attention to the possibility of using behavioral data to estimate the effects of investments in youth. The review focuses on a key challenge in using behavioral data, i.e., obtaining parameters of causal relationships, instead of only statistical associations, between variables. The review discusses several possible solutions to this problem, including the use of natural experiments, instrumental variables, and fixed effects estimators. Econometric problems of measurement error, omitted variables, endogeneity, selectivity and identification are also discussed, together with possible solutions. The review concludes that much better data are needed, including more longitudinal data sets, data sets incorporating better measurement, and data sets including a wider range of instruments.

POLICY EVALUATION FRAMEWORK

In addition to an analytical framework, the review also considers how information on the effects of investments in youth can be translated into effective policy. A policy framework is developed that is based on the distinct economic concepts of efficiency and distribution. This framework provides a justification for governmental intervention in investment decisions when either marginal social benefits differ from marginal private benefits or marginal social costs differ from marginal private costs.

According to this policy framework, distributional objectives may provide a separate justification for governmental intervention in investment decisions. For example, the review identifies the broadly supported objective of poverty reduction as an important distributional objective that may justify governmental intervention in some investment decisions. The analytical framework recognizes that in some cases the pursuit of distributional objectives may require a tradeoff in terms of reduced efficiency. However, the best distributional policy is generally one that achieves its objectives with the least possible sacrifice in efficiency.

There are generally a large number of policy options available to the government to promote efficiency and distributional objectives. Since all policies involve costs (e.g., implementation and
monitoring costs, distortionary costs), it is possible to develop a ranking of various policy options (including those designed to promote mainly distributional objectives) in terms of their costs. Policies ranked relatively high in such a policy hierarchy tend to be direct and relatively transparent interventions, such as taxes and subsidies, rather than quantitative restrictions or the direct provision of services by the government.

ALTERNATIVE METHODOLOGIES FOR EVALUATING THE ECONOMIC RETURNS TO INVESTMENTS IN YOUTH

The review considers several alternative methodologies for evaluating the economic returns to investments in youth. It selects cost-benefit analysis (CBA) over cost-effectiveness analysis (CEA) because of the ability of CBA to:

handle multiple outcomes;

provide measures (benefit-cost ratios or internal rates of return) that can be compared directly with those estimated for investments in other sectors;

address broader issues related to efficiency (including whether the objective used to measure “effectiveness” itself represents an efficient use of resources).

The review identifies the greatest challenge in using CBA, as compared to CEA, as the task of assigning monetary values to all possible effects of an investment. One way that this problem has been handled in the literature is to evaluate benefits in terms of their impact on economic growth (which, in effect, reduces cost-benefit analysis to a special form of CEA). The review rejects this approach because of its inability to address all issues related to efficiency (including the efficiency of economic growth) and its complete neglect of distributional issues. Instead, the review supports a definition of benefits that is based on direct productivity effects, whenever possible, but that falls back, when necessary, on an alternative method of valuing benefits that is based on the cost of the least-cost alternative investment that secures the same effect, as used by Summers.

THE EFFECTIVENESS AND COST EFFECTIVENESS OF INVESTMENTS IN YOUTH

The review examines a large number (41) of investments in youth in the following broad categories:

formal schooling

civilian and military training, work;

reproductive health

school-based health;

other health;

community and other.
The literature on these investments identifies a similarly large number of possible effects (39). However, the review finds that reliable estimates of effects are limited for the most part to investments in two categories: formal schooling and school-based health. Even in those categories reliable estimates are available for only a small subset of the hypothesized effects and for only a relatively small number of countries. For example, while there are reliable estimates for some countries of the effect of investments in formal schooling on earnings and labor productivity (and in a few cases, on child labor), there are no reliable estimates of the hypothesized effects of schooling on teenage pregnancies, HIV and STI incidence, youth unemployment, adult and child health and nutrition (including mental health), fertility, drug/alcohol abuse, domestic or civil violence, social exclusion and sexual abuse. For some of these hypothesized effects, estimates based on behavioral (as distinct from experimental) data are available and broadly accepted as valid in the literature. However, the evidence that most of these reported behavioral relationships are causal is either very weak or nonexistent.

Estimates of cost and cost effectiveness are even scarcer than reliable estimates of effects (although in nonformal education and in the training category there are more data on cost than on effectiveness). Evaluation studies in some categories (e.g., reproductive health) routinely omit information on costs. In other cases, the definition of costs, as well as the procedures used to collect cost data and estimate unit costs, are not well documented. Nevertheless, it is clear that many evaluation studies fail to include administrative/implementation costs, while almost all studies fail to include distortionary costs (e.g., the real costs involved in financing the investments). In many cases, costs are incorrectly defined to include transfers.1

The review finds evidence that the effects (and therefore the benefits) of many investments in youth differ significantly by income and gender. For example, school-based health investments benefit only those currently enrolled in school. In many developing countries, secondary students are disproportionately male and from upper-income groups. In the case of formal schooling, investments designed to improve the quality of schooling benefit only those enrolled in school, whereas targeted scholarship programs can be designed to benefit mainly poor and/or female out-of-school children and their families. Investments designed to reduce the consumption of tobacco products or to avert drug and/or alcohol abuse benefit mainly males in many countries, while adult literacy and basic education programs and some types of reproductive health investments benefit mainly females.

The review also finds that the effects (and benefits) of many investments in youth differ significantly according to the country context. For example, the economic returns to investments in schooling and training depend critically on conditions in labor markets. The effects of investments in health (including reproductive health) and nutrition depend critically on current health and nutrition conditions. For example, the effect of interventions such as micronutrient supplementation and deworming depend on the extent of micronutrient deficiencies, the prevalence and intensity of helminthic infections, and on general levels of nutrition and health. Similarly, the effectiveness of many reproductive health investments depends on initial conditions, such as the incidence of HIV infection among adolescents or levels of teen pregnancies.

1 At the same time, public savings in the form of an averted need for transfers is also incorrectly defined as a benefit in many studies.
The review finds that the limited reliable information on all (or even most) of the hypothesized effects of alternative investments in youth makes it difficult to identify cases where the marginal social benefits or costs diverge significantly from marginal private benefits and costs. Without such information, it is difficult to build a case for government intervention in private investment decisions (i.e., for whole or partial government financing of investments as distinct from purely private financing).

THE BENEFITS OF INVESTMENTS IN YOUTH

Two alternative methods are used to assign a monetary value to the estimated effects of alternative investments in youth, as previously mentioned. The first method, called the direct method, involves assigning a monetary value to each effect according to the estimate of the value of the additional production that it enables. For example, the benefits of enhanced labor productivity are estimated on the basis of the corresponding percentage increase in earnings. The review finds that a monetary value can be assigned directly to some, but not all, of the effects of investments in youth. However, the absence of reliable information on the monetary value of some broad effects (e.g., “increased education,” improved health”) suggests a two-step approach in which, first, such broad effects are broken down into a set of components and, second, the components are valued either directly (the preferred approach) or indirectly. This two-step procedure is necessary only when a broad effect, such as “increased education,” is the primary effect of an investment (e.g., a targeted scholarship program). Otherwise, such broad effects can be valued indirectly.

MAIN CONCLUSIONS

The main conclusions of this literature review are as follows:

The available information for evaluating investments in youth in developing countries is very limited
Many of the available studies are not very sensitive to the problems of making inferences from behavioral data
Most studies in this area do not consider whether the estimates that they obtain provide any insight into the efficiency motive for policy interventions
Most of the studies reviewed are not clear about what are the true resource costs versus what are transfers

The above findings imply that the assessment of economic returns to investments in youth in Knowles and Behrman (2003) is severely limited in the extent to which it can provide estimates of the rates of return to different investments in youth based on the available literature. Of course, another implication of the above findings is that there are many important gaps in the literature that it would be desirable to fill in order to improve our knowledge and the foundation for policies related to investments in youth.
ACKNOWLEDGEMENTS

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The authors are grateful to the World Bank for having published this report as an HNP Discussion Paper.
1. INTRODUCTION

Youth – by which we mean, say, people age 10 to 24 -- constitute a large proportion of society and have many pressing health, education, economic, and social needs. Despite the critical value of youth to future well-being, it is possible that countries underinvest in the healthy development of adolescents and young adults. If there is a gap between current and desired social levels of investment in youth development, showing that the social rates of returns to investments in youth are higher than for the alternative use of these resources is likely to strengthen the case for using public resources to close this gap. The results of doing so are likely to include more efficient use of public resources, with possible benefits for many members of society.

Some evidence exists that youth-focused interventions are a cost-effective way to improve health, reduce poverty, and benefit society. For example, as compared to investments in child health and development, investments in youth offer a shorter time lag in some cases between costs and benefits, thereby improving benefit-cost ratios when even a relatively modest discount rate is used. Also, in countries in which there has been under investment in children, investments in youth may offer an opportunity to “catch up” in the area of human capital investments. Yet no one has undertaken a full economic analysis of the benefits and costs of youth investments. Such analysis has been undertaken to a limited extent in wealthier countries such as the United States, but has been very limited in the developing world though similar analyses have recently been undertaken for child health and for early childhood development in the developing world.

The assessment in Knowles and Behrman (2003) aims to explore the economic case for investments in youth in developing countries by synthesizing the current knowledge of the economic costs and benefits of youth investments, analyzing key gaps in the evidence, and identifying priority research needs. This paper provides background for that assessment with considerably greater detail on the discussion of estimation problems and on the current literature.

1.1 MAJOR THEMES

A number of major themes underlie the assessment, and are summarized here:

The current cohort of youth in developing countries is the largest cohort ever, either in the past or predicted for the future, given the stage of the demographic transition in which the developing countries currently are on average, though of course there are variations across countries and regions: This means that whatever investments in youth in developing countries are made have an important impact on a relatively large share of the population. It also means that there may be large resource implications and intergenerational transfers required to make substantial investments in youth.

Major changes have been occurring in the context for youth in developing countries: In recent decades there have been a number of major changes in the context in which investments in youth in developing countries occur:

the world has become more integrated due to economic, technological, and cultural globalization;
developing countries in which hundreds of millions of youth live – particularly in Asia but also elsewhere such as in Botswana and Chile -- have experienced historically unprecedented economic growth while smaller but still large numbers of youth have been in countries with limited economic growth or stagnation, particularly in Sub-Saharan Africa, Latin America, the Middle East/North Africa and Central Asia;

human capital investments in the form of formal schooling and training have expanded rapidly and have facilitated the exploitation of new technologies and new markets by those in whom such investments have been made (Behrman and Sengupta 2002);

at the same time, the severe fiscal constraints faced by most developing countries together with reappraisals of the role of governments has led to a situation in which a growing share of the investments in youth, particularly in health and schooling, is financed directly by households rather than through governments;

the health and nutritional environments have changed radically, with rapid transitions in each of these. The nutritional transition has involved shifts in dietary and physical activity/inactivity patterns from high activity levels and diets relatively low in fat, cholesterol, sugar and other refined carbohydrates and relatively high in polyunsaturated fatty acids and fiber that are typical of poor rural populations to low activity levels and diets relatively high in fat, cholesterol, sugar and other refined carbohydrates and relatively low in polyunsaturated fatty acids and fiber (Popkin 2002a). This transition results in increased prevalences of being overweight and obese and degenerative diseases. The epidemiological transition has involved a shift from high prevalence of infectious diseases correlated with malnutrition, periodic famine, poor sanitation and poor water supplies in relatively low-income populations to high prevalence of chronic and degenerative diseases associated with urban and industrial life styles, such as cardiovascular diseases, cancer and stress (Omran, 1971, Olshansky and Ault 1986, Popkin 2002a). Accompanying this transition are shifts in age-specific mortality patterns and increases in life expectancies. There has been the appearance and rapid spread of new diseases such as HIV/AIDS. There also have been other even more substantial changes with declines of traditional scourges related to communicable diseases and malnutrition and the expansion of noncommunicable maladies related to the diseases of modernity such as cardiovascular, malignant neoplasm and neuro-psychiatric conditions so that though life expectancies have increased significantly and the composition of the burden of diseases has changed substantially (Murray and Lopez 1996, Smith and Haddad 2001, UNDP 2001);

cultural norms and legal changes, often related to globalization, have shifted to more emphasis on gender equalities, individualism and materialism.

Therefore it is necessary to rethink and to re-evaluate the range of investments in youth in developing countries – including, inter alia, schooling, training, reproductive health, and other aspects of health including behavioral changes related to food consumption, physical activity and substance use. The large cohort size means that there are pressures on resources that are likely to be squeezed due to the large numbers – therefore strengthening the need for as good a case as possible to justify use of scarce resources for investments in youth in those cases in which such investments
are warranted. The changed context means that the economic returns to different investment in youth probably have altered substantially.

The reappraisal of the economic returns to investing in youth in developing countries must incorporate certain critical features. Among these are:

The inclusion of an appropriately wide range of such investments, including their costs and benefits, within a life-cycle context;

The considerable lag in the effects and ultimate outcomes of many of these investments, implying that the choice of an appropriate discount rate may be of considerable importance to the results of the reappraisal;

Consideration of these investments within the frameworks of standard policy concerns of efficiency and distribution and tradeoffs between efficiency and distribution;

Sensitivity to problems in making inferences from behavioral data given endogenous choices (selectivity), important unobserved variables and other measurement and estimation problems;

The likelihood that youth investments in one area impact on investments and behavior in other areas. For example, reducing youth unemployment might strengthen the demand for schooling. Improving nutrition might improve school performance and reduce the health risks of a youthful pregnancy. Curtailing drug use might reduce crime.

Greater clarity regarding such matters as what are costs and what are transfers. Previous literature, for example, confused resource costs with transfers such as for welfare payments.

1.2 ORGANIZATION OF THIS BACKGROUND LITERATURE REVIEW

To reassess the economic benefits of investing in youth in developing countries requires frameworks for analysis to organize the existing fragmented and imperfect information. Section 2 presents such frameworks, after a discussion of why such frameworks are essential, with presentation of a basic framework for investments in youth, the problems of empirical inferences, and a basic framework for policy evaluation. Building on this foundation, Section 3 summarizes the effects of a range of basic investments in youth -- schooling, civilian and military training, work, reproductive health, general health and nutrition programs, consumption of tobacco, alcohol and other drugs, mass media programs, and community and other interventions. Section 4 considers the benefits from a variety of investments in youth. Section 5 summarizes some previous studies on the rates of return to selected investments in youth. Section 6 concludes. The major conclusion is that the available information for evaluating investments in youth in developing countries is very limited and many of the available studies are not very sensitive to the problems of making inferences from behavioral data nor do they consider whether the estimates that they obtain provide any insight into the efficiency motive for policy interventions nor are they clear about what are the true resource costs versus what are transfers. This means that the assessment in Knowles and Behrman (2003) is severely limited in the extent to which it can provide estimates of the rates of return to different investments in youth based
on the available literature, Of course it also means that it points to many important gaps in the literature that it would be desirable to fill in order to improve our knowledge and the foundation for policies related to investments in youth.

2. FRAMEWORKS FOR ANALYSIS

This section begins with a discussion of why frameworks for analysis are necessary, then presents a standard analytical framework for the determinants of investments in youth and the impact of such investments, and finally notes the problems in estimating the impact of investments in youth given this framework. While, for concreteness, we frequently use schooling as an example of such investments, the general framework that we summarize can be used for all investments in youth – investments that range from improving their human capital narrowly defined by improving their schooling, training, health and nutrition to improving their social capital and social participation to reducing their exposure to risks at home, in school and in the workplace and through substance abuse or other risky activities. The wide range of possible investments in youth reflects that there are a wide range of possibilities in which the use of current resources affect future outcomes for youth – and, of course, the standard definition of investment is the use of current resources to improve expected future outcomes. Policy changes may improve such investments in youth in terms of the basic policy motives of efficiency and distribution that are discussed in Section 2.5 through providing additional resources. But they also may increase such investments by introducing regulations that promote such investments by, say, improving conditions to reduce health hazards and sexual harassment in the work place or by eliminating or lessening regulations that limit such investments such as hiring/firing regulations and migration restrictions that limit employment and on-the-job learning of youth.

2.1 WHY FRAMEWORKS FOR ANALYSIS ARE NECESSARY

Good analysis of the impact of investments in youth based on available data has tripartite foundations: data, modeling and estimation. These three dimensions are critically interrelated. Data, of course, are essential for empirical analysis, limit the extent to which analyses can be undertaken, and shape most of the estimation problems. If there were available data from well-designed and well-implemented experiments, associations between observed investments in youth and observed outcomes would reveal the underlying causality directly. But for numerous reasons, including costs and ethical concerns, such experimental data are rarely available. Data may be available from so-called "natural experiments" in which, due to some fortuitous happenstance, all unobserved (by analysts) variables are the same in two groups so that, for instance, differences in observed productivities reflect only differences in observed human resource variables. But though such

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2 With random assignment between treatment and control groups, no attrition problems and in which neither the subjects nor those who provided the experimental treatments knew which subjects received treatments and which received placebos (see Section 2.4.1).
natural experiments are a conceptual possibility, it is difficult indeed to find two situations in which all unobserved variables are likely to be identical.3

Therefore, while there may be high returns for some aspects of policy analysis to increase experimental data, most analysis has been and will continue to be based on behavioral data. Such behavioral data can "speak for themselves" regarding associations between youth investments in youth and various outcomes. But they generally cannot "speak for themselves" with regard to what observed determinants – policies or otherwise – cause differences in investments in youth or to what extent observed investments in youth cause different outcomes. The problem is that most data are the result of a number of behavioral decisions taken by households, individuals, bureaucrats, policymakers and others in light of a number of factors unobserved by analysts4. Good analysis of what causes household and individual investments in youth or of what effects such investments have is difficult, and requires a much more systematic approach than simply looking at associations among observed variables.

Modeling provides analytical frameworks for exploring systematically various dimensions of investments in youth, points to what data are needed for such explorations, and to some of the probable estimation issues that should be addressed given the data used. The analytical frameworks provided by models are essential if the empirical estimates are based on behavioral data generated in the presence of unobservables such as innate ability and family connections. The problem, for example, is that youth with greater ability and motivation and better innate health may be more productive directly and may also benefit from higher levels of investments. Therefore it may be

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3 Many studies that purport to be based on such natural experiments have been subject to considerable criticisms. For example, see Deaton (1995) on Knight and Sabot's (1990) claim that the difference between Kenyan and Tanzanian labor outcomes is a natural experiment regarding the type of government, Welch's (1995) comments on Card and Krueger's (1995) claims that such experiences as differences in state minimum wage laws constitute natural experiments, and Rosenzweig and Wolpin's (2000) critical appraisal of "natural experiments in economics." But some of the claims regarding natural experiments are more persuasive. For example the use of multiple births in India as a natural experiment to explore the effect of fertility shocks in Rosenzweig and Wolpin (1980) and of the gender of a new baby to explore the impact of a shock on savings, time allocation, and income in rural India in Deolalikar and Rose (1998).

difficult to sort out the effect of investments in youth per se as opposed to the fact that such investments are correlated with unobserved abilities, motivation and innate health\textsuperscript{5}.

For such reasons, the empirical effects of investments in youth can be analyzed satisfactorily with nonexperimental data only within frameworks that incorporate well the essence of behaviors related to the phenomena of interest. To be interpretable, estimates based on behavioral data require some model of the underlying behaviors, though far too often in the literature the models used are not explicit. Those who are not clear about their framework of analysis may think they are revealing underlying truths unconstrained by such frameworks, but they are instead usually making implicit assumptions that may upon examination not be very plausible.

### 2.2 Analytical Frameworks For The Determinants Of Investments in Youth

Households and the individuals in them are the proximate sources of demands for many types of investments in youth (e.g., schooling, health, social capital, behaviors that lead to productive lives), given their predetermined assets (i.e., physical, financial, and human, including endowments\textsuperscript{6}), production functions related to human resources, public and private services related to investments in youth (i.e., schools, health clinics), and current and expected prices for the inputs used in investments in youth and for the outcomes of the production process. Policies, of course, may enter directly or indirectly into this process through a number of channels ranging from the accessibility and quality of public and private services to the functioning of capital markets for financing investments in youth to the functioning of markets in which these investments are expected to have returns. It is useful to begin with Becker's (1967) Woytinsky Lecture, which provides a simple framework for investments in human resources that captures many of the critical aspects of investments more broadly in youth and which has been widely appealed to in rationalizing empirical studies of the determinants of investments in youth.

Human resource investment demands, under risk neutrality, reflect the equating of expected marginal private benefits and expected marginal private costs (both in present discounted terms) for investments in a given individual (Figure 1).

\textsuperscript{5} Moreover, the biases if there is not control for the underlying behavior may be either upwards or downwards so the usual estimates without control for such behavior may not even establish a priori known upper or lower bounds on the true responses.

\textsuperscript{6} "Endowments" means characteristics that are given independent of behavioral decisions. Genetically determined innate ability and innate health robustness are examples.
The marginal private benefit curve depends importantly, inter alia, on the expected private gains in productivity in all of the ways in which the human resource investment may have impacts. The marginal private benefit curve is downward-sloping because of diminishing returns to investments in youth (given genetic and other endowments) and because, to the extent that investments in youth take time (such as schooling, training and most other forms of education and social capital, as well as search in labor and other markets), greater investments imply greater lags in obtaining the returns and a shorter post-investment period in which to reap those returns. The marginal private cost may increase with investments in youth because of higher opportunity costs of more time devoted to such investments (especially for schooling and training) and because of increasing marginal private costs of borrowing on financial markets (if such markets do not permit borrowing for such purposes, at some point the marginal private cost curve may become very step or vertical). The equilibrium human resource investment for this individual is $H^*$, where the two curves intersect, with both the marginal private benefit and the marginal private cost equal to $R^*$. This equilibrium human resource investment is associated with an equilibrium rate of return, $i^*$, that equates the present discounted value of expected marginal private benefits with the present discounted value of expected marginal private costs. This simple stylized representation of human resource determinants is based on a dynamic perspective, with both benefits and costs not only in the present but also those that are expected in the future and with current period options conditional on past decisions. Thus it is consistent with placing investments in youth in a lifespan perspective, as has been emphasized as critical from a number of different disciplinary perspectives (e.g., Baltes, Rese and Neselroade 1977, Becker 1967, Behrman 2002, Burt, Zweig and Roman 1991, Jessor 1991, Jessor and Jessor 1977).
If the marginal private benefit curve is higher for every level of human resource investment as indicated by the dashed line in Figure 2, all else equal, the equilibrium human resource investment \((H^{**})\) and the equilibrium marginal private benefit \((R^{**})\) both are greater. The marginal private benefit curve may be higher for one of two otherwise identical individuals except for the difference noted below that in many cases may be due directly or indirectly to policies because one individual (or whomever is investing in that individual, such as children’s parents)\(^7\): (1) has greater endowments that are rewarded in schooling (or other human resource) and in post-schooling labor markets; (2) has lower discount rates so that the future benefits of investments in youth have greater value at the time of the investment decision; (3) has investments in youth options of higher quality (e.g., access to higher quality public schools or public health services) so that the marginal private benefits for a given level of private investments are higher, and the equilibrium investments greater\(^8\); (4) has better health and a longer expected life due to complementary investments, so that the post-investment period in which that individual reaps the returns to the investment is greater and therefore the expected returns greater; (5) has greater marginal private benefits to a given level of such investments because of labor market discrimination that favors that individual due to gender, race, language, family, village, or ethnic group; (6) has returns to human resources investments that are obtained more by the investor or the relevant decision maker (e.g., if traditional gender roles dictate that children of one sex, but not the other, provide old-age support for their parents, parental incentives may be greater to invest in youth who are likely to provide such support\(^9\)); (7) has greater marginal private benefits to a given level of investment because of being in a more dynamic economy in which the returns to such investments are greater; (8) has greater marginal private benefits to a given level of such investments because of greater externalities from the human resource investments of others in the same labor market; or (9) lives in a more stable economy so that the discount rate for future returns is lower and thus the marginal private benefit of future returns greater.

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\(^7\) For the last three of these comparisons the otherwise identical individuals would have to live in different economies.

\(^8\) If the investor must pay for greater human resource service related quality, investment does not necessarily increase with a higher quality option. What happens to the equilibrium investment depends upon where the marginal private cost curve for the higher quality option is in relation to the location of the marginal private benefit curve.

\(^9\) Though this tendency may be offset if, for example, human capital substitutes sufficiently for financial transfers in marriage markets (e.g., Rao 1993 explores this possibility for India)
If the marginal private cost is lower for every level of human resource investment as shown by the dashed line in Figure 3, ceteris paribus, the equilibrium human resource investment (H***) is greater, with the marginal private benefit (R***) lower at the higher investment level. The marginal private cost might be lower for numerous reasons, again, most or all of which may be affected directly or indirectly by policies. Compare two otherwise identical individuals except that one individual: (1) has lower private cost access to education and health services related to such investments because of closer proximity to such services or lesser user charges; (2) has less opportunity costs for time used for such investments (e.g., due to gender specialization in household and farm tasks performed by youth); (3) faces lower utility costs of such investments because of cultural norms that favor some activities associated with such investments more for some individuals than for others (e.g., in some societies, it is not thought desirable that girls past puberty mingle with males outside of the family in transit to school or in school so that the preference costs of schooling are lower for boys than for girls)\(^{10}\); or (4) is from a household with greater access to credit because of greater wealth or status or better connections.

\(^{10}\) For this case the marginal utilities of marginal private benefits and costs are equated.
This maximization process leads to dynamic decision rules or demand relations for human resource investments in individual i that depend on all relevant prices P, on all relevant resources R and on all the parameters of the relevant production functions, on preferences and on stochastic factors that, say, may enter into production processes (e.g., weather fluctuations) or reflect preference differences:

(1) \( H_i = H(P, R \mid \text{production parameters, preference parameters, stochastic factors}) \).

The prices include all prices that enter into the investing household’s decision-making process, including the prices paid by the household for goods and services related to investments in youth, other uses of household resources and for transferring resources over time (i.e., the interest rate) and for insuring against uncertainty. At the time that any human resource investment decision is made, these prices include all past and current prices (perhaps embodied in current stocks of human capital), as well as expected future prices (including expected future returns to investments). The resources include all resources of the individual, household (identified by ownership if there is intrahousehold bargaining), educational and health/nutrition institutions, and community that affect any household decisions. These resources include human resources that reflect past investments, financial resources, physical resources, genetic endowments, school characteristics, and general
learning environments. Policies may have impacts directly and indirectly through a number of the prices and resources.

Among the constraints for this maximization process, as noted, are production functions such as that for the direct technical/biological link between “inputs” used to produce human resources and human resource "outputs." The assessment of the direct impact on specific outcomes (as opposed to the total impact in relation 1) of some important policy program components may be attained by estimating these relations. For example, consider a production function for cognitive achievement \( CA_i \) for the \( i \)th child depending on pre-school human resource investments (\( PS_i \)), ability (\( A_i \)), health (\( H_i \)), nutrition (\( N_i \)), school quality (\( Q_i \)), time in school (\( S_i \)), family background characteristics (\( F_i \)) and other factors:

\[
CA_i = CA(PS_i, A_i, H_i, N_i, Q_i, S_i, F_i ...).
\]

There are a number of important questions about this production process so good estimates of such relations might be very informative. For instance how much do resources devoted to schooling and other educational programs improve cognitive achievement? Are resources devoted to schools more effective in their impact on cognitive achievement if a student has better health and nutrition? Greater abilities? Comes from a better family background? Do all of these effects differ by gender? Some of the production inputs, however, are not likely to be observed well or in some cases at all by analysts and some are likely to be determined together with the human resource outcome, all of which can lead to estimation problems that are discussed in Section 2.4.

This simple framework systematizes six critical, common sense, points for investigating dimensions of the determinants and the effects of investments in youth – and how these relate to policy choices.

**First,** the impacts of changes in either micro or macro policies may be hard to predict by policymakers and analysts. If households or firms or other entities face a policy or a market change, they can adjust all of their behaviors in response, with cross-effects on other outcomes, not only on the outcome to which the policy is directed.

**Second,** aggregation to obtain macro outcomes will average out random stochastic terms across individuals or households. But such aggregation does not average out systematic behavioral responses at the micro level. Therefore associations among macro variables can reveal, conditional on the overall context, what are those associations – but not causal effects of processes occurring at the micro level.

**Third,** the marginal benefits and marginal costs of investments in a particular individual differ depending upon the point of view from which they are evaluated: (i) There may be externalities or capital/insurance market imperfections so that the social returns differ from the private returns (Section 2.5) and (ii) there may be a difference between who makes the investment decision (e.g. parents) and in whom the investment is made (e.g. youth). This distinction may be critical for understanding the effectiveness of policies because that effectiveness may depend crucially on what are perceived to be the private effects from the point of view of private decision-makers, and these may differ from the social effects of interest to policymakers.
Fourth, investments in youth are determined by a number of individual, family, community, (actual or potential) employer, market and policy characteristics, only a subset of which are observed in data sets such as are available to analyze the determinants and effects of investments in youth. To identify the impact of the observed characteristics on investments in youth, it is important to control for the correlated unobserved characteristics. For example, if schools with higher quality tend to be in areas in which expected rates of returns from investments in youth tend to be greater but only indicators of school quality and not expected rates of return are observed in the data and if there is not control for the unobserved expected rates of return in the analysis, the impact of school quality on such investments is likely to be overestimated because in the estimates school quality proxies in part for unobserved expected rates of return to these investments.\textsuperscript{11}

Fifth, to identify the impact of investments in youth, it also is important to control for individual, family, community, market and policy characteristics that determine the investments in youth and also have direct effects on outcomes of interest.

Sixth, empirically estimated determinants of, and effects of, investments in youth are for a given macroeconomic, market, policy, schooling and regulatory environment in which there may be feedback both at the local and at a broader level.

### 2.3 Empirical Issues – Measurement

To be able to assess the rates of return to investments in youth, we need to be able to (a) measure what we mean by investments in youth and by various outcomes that might be affected by investments, (b) estimate the impact of investments in youth on the latter measures, and (c) measure the costs of these investments. These are not trivial tasks. This section considers some of the measurement difficulties, using the important example of human resource investments in youth. Section 2.4 then turns to estimation problems.

**Investments in youth:** Key variables for this paper, of course, are indicators of investments in youth. In the case of schooling, most empirical studies represent human resource investments empirically by their years of schooling or highest grade of schooling (or level of schooling) completed. Though “years” and “grades” of schooling are often used as synonyms, they need not be the same if they are used literally and if there is grade repetition, as is widespread in many parts of the developing countries (e.g., in much of Latin America). And since repetition rates often differ by gender, not accounting appropriately for grade repetition may lead to misleading inferences about gender differences in the rate of return to schooling as well as the total rate of return to schooling.\textsuperscript{12} The point simply is that one of the major costs of schooling is the opportunity cost of time in school, which is greater if there is more grade repetition for a given schooling grade attainment. Putting

\textsuperscript{11} If expected rates of return differ across communities or clusters in the sample, they could be controlled in the estimates with community dummy variables (or fixed effects) (e.g., Alderman et al. 1996a for an example for Pakistan).

\textsuperscript{12} Behrman and Deolalikar (1993) provide an illustration of how failure to incorporate grade repetition into the analysis may cause considerable upward biases in estimated returns to schooling. The Mexican rural anti-poverty and human resource program that is discussed briefly in Section 2.4.1 below gives an interesting illustration of how the failure to incorporate gender differences in repetition may lead to misleading inferences.
aside the question of the time spent in school, of course, there are other limitations of grades (years) of schooling as a measure of human resource investments. Probably most important is the implicit assumption that school quality is constant. But empirical measures indicate that school quality varies substantially, so it would be desirable in assessment of the impact of human resource investments in youth to represent not only the time (grades, years) that they spent in school, but also the quality of that schooling. If both the quantity and the quality of schooling should be included, but only the quantity is included as is usually the case, the likely result is to overstate the impact of time in school\textsuperscript{13} and to miss that there is likely to be an important quality-quantity tradeoff.

Besides education or schooling, of course, there are many other types of possible investments in the human resource of youth. Such investments may be directed, for example, at improving health, nutrition, information, social capital, and habitual behaviors that lead to desirable outcomes. Similar problems exist in empirical measurement of these variables as for education, but -- for brevity, we do not elaborate on these. For example, health is often measured by anthropometric indicators, respondent reports or clinical reports on disease histories, respondent reports on capabilities for undertaking certain activities or tests for doing so, or respondents’ self-assessment of health. Some of these indicators may be good measures of particular disease conditions, but that does not make them (or their inverse) necessarily good measures of what people mean by good health. For another example, social capital is often measured by indicators such as participating in group activities, but these are at best imperfect indicators of whether one has social capital in the sense of being able to obtain resources or information at times of need.

Outcome Variables: To measure the impact of investments in youth on various outcomes, of course, one must have measures of the outcomes. Unfortunately there are many problems in measuring these outcomes, both for micro and aggregate data. For some outcomes that may be affected importantly by investments in youth, data usually used in the socioeconomic literature do not include very direct measures -- self esteem and learning capacities are two examples. This may mean that important outcomes are missed when assessing the impact of investments in youth.

For some other outcomes there may be at best imperfect indicators -- for instance, representing health by health-related inputs (e.g., nutrients), reported disease conditions, curative health care, and preventative health measures (e.g., vaccinations). Some of these measurement problems may be systematic, moreover, resulting in biases in the estimated impact of investments in youth. If, for example, those who have less schooling report less sickness for the same health conditions as those who have more schooling (perhaps because the degree of sickness viewed as normal varies inversely with schooling), for example, the impact of schooling on actual sickness will be underestimated.

\textsuperscript{13} For public schools, improved school quality effectively shifts the marginal benefits curve upwards (as in the dashed line in Figure 2.2) which induces more time in school, so the quantity and quality are positively correlated. Because of that positive correlation, excluding school quality results in an upward bias in the estimated impact of school quantity that may be considerable (for examples for Brazil, see Behrman and Birdsall 1983, 1985 and Behrman, Birdsall and Kaplan 1996). For private schools, there also may be a shift in the private marginal costs from the dashed to the solid line for higher quality as in Figure 2.3 that may partially or entirely offset the shift in the marginal benefit curve in Figure 2.2 with higher quality.
For some other measures of outcomes there are conventions that are used in the literature that are not clearly sensible. For example, economic gains from reducing mortality are represented at times by the present discounted value of foregone earnings of an individual (e.g., CGCED 2002). For young individuals, such costs can be considerable. For measuring the purely economic cost of survivors, however, this seems an overstatement of the costs of mortality since such individuals also would have consumed – perhaps most of all of their earnings – over their lifetime. For another example, the economic gains from improving the earnings capacities of individuals are some times measured by the reduction of their demands on governmental social welfare systems for transfers (e.g., CGCED 2002). But governmental transfers, though perhaps appropriately viewed as costs from a budgetary perspective, are not resource costs in the sense desirable to evaluate policies. There are likely to be some resource savings if social welfare programs are reduced because some resources are used in running such programs. But such possible resource savings should not be confused with the amount of transfers involved (and the latter probably greatly exaggerate the true resource costs). For one last example, the gains from reducing crime are at times equated with the amount of losses that crime victims suffer due to crime. But, again, a significant component of the costs so calculated are transfers from the victims to the criminals, particularly in crimes due to thefts. The amount of such transfers, once again, is not likely to reflect well the true resource costs of crime. All three of these examples point to substantial difficulties in evaluating benefits and to questionable practices that have been used in some previous studies. We intend to deal with these difficult questions by evaluating the benefits in terms of the least cost alternative way of obtaining the same objective, along lines implemented by Summers (1992, 1994) in a well-known study of the economic benefits of female schooling (see Section 2.6 below). This procedure gives, for hard-to-evaluate-outcomes, what society is willing to pay for alternative ways of attaining the same gain – and thus, if the prices that are used in the evaluation reflect the true social marginal costs of resources, the true resource costs of such gains. Note that this method in principle includes both the direct resource cost gains and the indirect resource cost gains. To illustrate the latter, investments in youth that reduce crime may not only have gains from directly improving the safety of citizens but from indirectly encouraging international tourism and international investments. This procedure accounts for what resources society would be willing to pay for alternative ways of reducing crime in light of all these gains.

Even for the economic outcomes on which there long has been focus in evaluating the impact of schooling, there often are serious measurement problems. At the micro level, people with lesser schooling, for example, may remember income less well, may have more problems in assessing the value of their income because more is in kind or self-produced, and may be subject to greater variations in income because of sporadic employment with seasonal fluctuations. If such factors lead to a tendency to underreport their incomes, then ceteris paribus the returns to schooling will be overestimated due to this systematic error.

For aggregate measures, moreover, the measurement problems are likely to be greater. The rate of growth in real national income/product per capita, for example, is the most widely used indicator of economic growth, and a number of studies relate measures of aggregate physical and human capital stocks or investments to economic growth. Real national income/product per capita is the ratio of the estimated deflated nominal national income (or value added) in any period divided by the estimated average size of the population during that period. To estimate nominal value added, all activities that add value should be included so that coverage is complete. For each such activity,
outputs and non-factor inputs in the relevant period need to be quantified and properly valued. Unfortunately, coverage is never complete and there are serious problems with the methods used for quantification and valuation. The biases and errors associated with incomplete coverage and methods of quantification and valuation are likely to vary over time within a country and probably become less serious as data gathering capacities improve. Further, the extent of biases and their time trends are unlikely to be comparable across countries. For example, at low levels of development families and households perform many activities that tend to be marketized in the development process (e.g., Ben-Porath 1980, Pollak 1985). Because the value of such activities is likely to be underestimated when they are performed by families and households, the marketization of these activities is likely to lead to a measured income growth in a country that is greater than the true increase in per capita income/consumption.

Growth rates of real income are often compared within countries over time and across countries. Because the relative price structure shifts over time as development proceeds and as different sectors experience different rates of technical progress within and across countries, the growth rate of conventional real income estimates over a given period depend on whether the initial or the terminal year is used as the base and on the method of deflation. For international comparisons, in addition, an exchange rate conversion is involved. Thus if some (official, black market, purchasing power parity (PPP) or whatever) exchange rate is used to compare the levels of income at a given time between two countries and growth rates for each for a period preceding that time are computed using a constant domestic relative price structure, anomalous results can arise. For many goods and services in most developing economies, moreover, the opportunity costs of commodities are their world market prices, though domestic resource allocation decisions are driven by often-distorted domestic prices. If distortions are severe, and domestic transformations of imported inputs into tradable outputs are inefficient, it is possible that value added at world prices (computed by valuing tradable inputs and outputs at world prices) in some activities could be, and indeed have been estimated to be negative, in some developing countries (Soligo and Stern 1965 for Pakistan, Bhagwati 1968 for India). From a welfare perspective, only value added at world prices is the appropriate measure (Little and Mirlees 1974). In any case under such circumstances the levels and growth rates of national income (i.e. value added) at world prices differ from those at domestic

14 These problems in part can be addressed. For instance, through chain-linking the problem of using a single base year can be alleviated. And as the base year is changed to a more recent one, the opportunity can be used to expand coverage and use more recent information with an ad hoc revision in the past data for the difference in coverage as compared to the old base year. Such revisions can be quantitatively large. Srinivasan (2001) gives as an illustration that the fiscal deficit of India's central government was estimated to be 8.3 percent of GDP with 1980-1981 as base and 7.1 percent of GDP using the revised series with 1993-94 as base (Government of India 1999, Table 2.1).

15 Srinivasan (2001) provides a “prime example” from the World Bank (1999a, Tables 1.1 and 1.4). According to these tables, in 1997 India and China had GNP per capita of US$370 and US$860 (based on exchange rates of the Bank’s “Atlas” method) respectively and the average annual rate of growth of GNP per capita during 1965-1997 was 2.3 percent in India and 6.8 percent in China. Taken together, these levels and rates of growth imply that China's per capita GNP in 1965 was about 90 percent of India's. Srinivasan claims that “No knowledgeable observer of the two countries would subscribe to this ranking.” Ahmad (1994) illustrates a similar problem by comparing the actual PPP exchange rate converted GDP's of a year with forecasts obtained by applying the domestic GDP growth rate to the PPP converted GDP of some previous years. The differences seem substantial for many countries (see also Heston 1994).
prices (Bhagwati and Hansen 1973). Such problems are compounded even for comparisons across time for the same economy by changes in such distortions over time.

The measurement errors and biases in components of GDP, particularly those that have figured prominently in the recent cross country growth regression literature such as savings, investment, foreign trade, foreign capital flows, demographic variables, labor markets and human resource indicators are serious. This means that not only are there substantial problems in measuring and comparing over time or space real per capita income growth, but also in measuring and comparing most of the alternatives that have been proposed by those who doubt the values of conventionally-measured per capita income growth, such as direct indicators of changes in human resources including those for health and education. These issues are discussed extensively in a special issue on Data Base for Development Analysis in the *Journal of Development Economics* edited by Srinivasan (1994).

**Costs:** There often are problems in measuring the costs of investments in youth. The costs for particular investments, for example, may be intermingled with many other costs in budgets, and therefore be difficult to identify. They also may be spread among various budgets at various levels of aggregation – for example, if teachers salaries are paid by the Ministry of Education but other recurrent expenditures are paid by local governments as in the Philippines. There further frequently is a problem that the budgetary costs do not reflect the true costs because of distortions in market prices, perhaps created by policies. For example, governments may mandate wage rates for some workers such as teachers that may differ from the true scarcity value of such individuals, and then introduce other distortions such as in benefits or job securities in order to attempt to attract enough qualified individuals to these positions. A major problem with evaluating costs, finally, pertains to the nongovernmental costs. Policy-makers often ignore these because they are focused on governmental budgets. But the costs of a program to the private sector may be considerable. For example, many programs require considerable amounts of time of private individuals – time that has opportunity costs in the form of other uses. For another example, as noted above, raising funds for governmental programs in itself may have large distortionary costs.

**Measurement of Policies:** It might seem strange to include policies among the key variables for which there are measurement problems. But there are serious measurement issues regarding what we know at both the micro and the macro level. At the micro level, for example, there is considerable emphasis on the potential for improved outcomes through policies that improve women’s education. But the empirical foundation for these claims in substantial part relates associations between years of schooling and outcomes that are viewed as desirable. Years of schooling is not a policy variable, but the behavioral outcome that reflects the schooling market interaction between household/individual demands for time in schooling and various aspects of schooling supply that generally are indeed conditioned by policies.

Similar problems exist at the macro level. For most empirical explorations, the representation of policy is by aggregate variables that reflect a multitude of behavioral decisions in addition to policies. Two examples of common proxies used in the literature are exports plus imports over GDP as an indicator of trade liberalization and M2 over GDP as an indicator of financial market reform. A major problem with these proxy variables is that they reflect not only or necessarily policies, but reactions to policies by individuals and entities in both the private and the public sectors. As
representations of policies, they are contaminated by responses to the policies and do not necessarily represent the policies \textit{per se}. And the distinction between policy changes and changes in related behavior variables may be important for understanding. For example, Behrman, Birdsall and Székely (2001) report that policy changes related to opening up to international trade flows significantly increased wage variations by schooling levels in Latin America (even with control for all time varying and fixed unobserved country characteristics and cohort variables) but that, controlling for such policy changes, increases in the actual international trade relative to product reduced the spread of wages across schooling levels.

2.4 Empirical Issues – Estimation Of Effects Of Investments In Youth

This paper is concerned with assessing what we know about the rates of returns to investments in youth in developing countries. But obtaining good empirical estimates of the effects of investments generally, and investments in youth in particular, is not easy, in part because of the measurement problems discussed above and in part for other reasons to which we now turn. We first consider the possibility of empirical estimation through experiments and then through econometric estimates using nonexperimental (behavioral) data.

2.4.1 Experimental Evaluation

To assess the impact of a particular change, such as increasing investments in schooling by one year, the ideal would be a double-blind experiment with random assignment to treatment and control groups for the policies of interest. To evaluate a relatively small number of policies, experiments have been conducted. We now discuss one example.\footnote{Angrist, et al. (2000) analyze another example in which students were selected randomly from poor applicants to receive scholarships to attend private schools in urban Colombia. Miguel and Kremer (2001, 2002) analyze the impact of random assignment of deworming programs among schools in Kenya.}

In 1997, the federal government of Mexico introduced the Programa de Educación, Salud y Alimentación (the Education, Health, and Nutrition Program), known by its Spanish acronym, PROGRESA, as part of an effort to break the intergenerational transmission of poverty. PROGRESA has a multiplicity of objectives, primarily aimed at improving the educational, health and nutritional status of poor families, and particularly of children and their mothers. PROGRESA provides cash transfers linked to youth’s enrollment and regular school attendance and to clinic attendance. The program also includes in-kind health benefits and nutritional supplements for children up to age five, and pregnant and lactating women. By the end of 1999, PROGRESA covered approximately 2.6 million families or about 40 percent of all rural families and one-ninth of all families in Mexico.\footnote{PROGRESA has evolved into OPORTUNIDADES under the Fox administration, and has expanded into semi-urban and urban areas (cities up to one million inhabitants) with some modifications such as covering higher grades of schooling and self-selection for applying for enrollments. In 2002 the target is to enroll a million families. If that target is achieved the program will cover over 20 million individuals.} At that time the program operated in almost 50,000 localities in more than 2,000 municipalities and 31 states. PROGRESA’s budget of approximately $777 million in 1999 was equivalent to 0.2 percent of Mexico’s GDP. In early 1998, the International Food Policy Research Institute (IFPRI) was asked to assist the PROGRESA administration to “determine if
PROGRESA is functioning in practice as it is intended to by design.” The evaluation is based on longitudinal data collected from 24,000 households from 506 localities in seven states who were interviewed periodically between November 1997 and November 1999. Of the 506 localities, 320 localities were assigned to the treatment group and 186 localities were assigned as controls.

Specifically, the 320 treatment localities were randomly selected using probabilities proportional to size from a universe of 4,546 localities that were covered by phase II of the program in seven states. Using the same method, the 186 control localities were selected from a universe of 1,850 localities in these seven states that were to be covered by PROGRESA in later phases. Statistical tests confirm that indeed assignment to treatment versus control was random at the community level (Behrman and Todd 1999). As originally planned the localities serving the role of a control group started receiving PROGRESA benefits by December 2000. A number of evaluation studies have been carried out using these data, in most cases exploiting some dimension of the experimental design of the study (Skoufias 2001 provides a synthesis of many of these studies and of the overall program).

PROGRESA has several striking and unusual features from the perspective of social scientists and policy analysts.

(1) PROGRESA based some of its essential components on the outcomes of social science research in the literature. Transfers were given to women, for example, because previous research on intrahousehold allocations suggested that income directed towards mothers had larger associations with investments in children than income directed towards fathers.

(2) PROGRESA used modern social science tools in order to guide its decisions. For instance discriminant analysis was used on census data in the initial stages of identifying target communities and households within those communities and GIS systems were used to systematize information on location of schooling and health services relative to the communities.

(3) PROGRESA recognized that baseline data and longitudinal household and service-provider data with treatment and control groups were essential to serious evaluation of the program and implemented the collection of baseline data (prior to the introduction of the program, which always is the stated intent but often not the realization in various developing country contexts) with longitudinal follow-up and random assignment to treatment and control communities.

(4) PROGRESA, as noted, contracted an outside research agency, IFPRI (a member of the CIGAR group of international agricultural research institutions, with a strong history of data analysis and evaluation in developing countries), to undertake an extensive evaluation of the program.

These are considerable and important features of PROGRESA. Moreover PROGRESA and the key individuals behind PROGRESA not only incorporated such features into their program plans, but – which is much more difficult – gave them sufficient priority that they were carried out reasonably well during the very difficult time of program development, implementation and rapid expansion, all within an environment with not inconsiderable political pressures. PROGRESA already has been a  

18 The same study reports that there are somewhat more significant differences in some variables than would be expected by chance at the household and individual level. But most of these differences, though significant due to the large sample size, are not very substantial.
model for development of related programs and evaluation strategies elsewhere, for example, in Brazil Colombia, Honduras, Nicaragua,. Hopefully these and other programs will build not only on the substantive aspects of PROGRESA, but also learn from and improve upon the program evaluation that has been given considerable thought and high priority by PROGRESA.

Other programs, first of all, usefully could emulate the strengths of PROGRESA in terms of building on existing social science research, data collection and evaluation that are noted above. These are considerable strengths and require substantial commitments to give sufficient priority to these matters in the presence of all of the great pressures and unanticipated problems that a new program inevitably faces. But the result is the potential for much better evaluation of the program and how it or other programs can be modified to improve the attainment of the objectives.

But beyond emulating the strong points of the PROGRESA in the above regards, other programs could improve upon PROGRESA in some respects that would enhance more the evaluation possibilities. Of course some of these improvements from the point of view of evaluation may have political and other costs. We recognize that there are such costs, but have no special insight regarding them, so we do not discuss them here.

(1) The evaluation design could explore a number of aspects that are difficult to explore with the present PROGRESA data or that require imposing a lot of structure to do so. There could be randomly assigned variations (perhaps across communities to avoid invidious comparisons within communities), for example, in the payment schedule for attending different grades of school by gender; in whether the payments are made to mothers, fathers or the children themselves; in whether payments are made to the demand side (households, individuals) or to suppliers (e.g., schools) directly; in whether other components of the PROGRESA package were included; in whether these payments are conditional on attending schooling;

(2) The data collection/evaluation process could be made more independent of the implementing agency. The evaluating agency could be contracted by some other part of the government (not by the implementing agency) and have direct responsibility for collecting the data to be used (rather than having the implementing agency in charge of data collection). Data could be made available for public use earlier. These changes would increase credibility regarding the degree of independence of the evaluation.

Both of these changes are being considered for the evaluation of the expansion of PROGRESA in urban areas in the current OPORTUNIDADES program. But even with such changes, the possibilities for using such experiments for policy evaluation are limited in several respects. First, most such experiments can not be double-blind, with neither the subjects nor the evaluator knowing who received treatment (though some medical experiments can be if, for example, the placebo appears to human senses to be identical with the treatment). That those who are treated know that they are treated may create better performance (i.e. the “Hawthorne effect”). That those who are not treated know that they are not treated may create incentives to obtain treatment through migration, political pressure, market purchases or other means. Second, the argument often is made that new programs can not easily be introduced at the same time throughout a country, so it may be effective in terms of evaluation, as was attempted with PROGRESA, to introduce them in a random set of treatment communities and only later in a random set of control communities. But if members of the
control group know that they will eventually be affected by the program and if they can transfer resources over time, they should immediately adjust their behavior to reflect their changed command over resources due to the expected eventual future direct program impact. If so, the comparison between the program and the treatment groups probably will underestimate the program impact. Of course this is not a problem if members of the control group do not know that eventually they will be affected by the program, but such ignorance may be difficult to maintain because of interactions between members of the treatment and control groups and general information about the new program. In fact in some cases the administrators of the program may tell the control group directly that they will be included eventually in hopes of obtaining their agreement to serve in the control group and to enhance a sense of fair treatment. Third, many experiments cannot be conducted because they are unethical or too costly. Imposing randomly some human resources, particularly related to health and nutrition but also to education, for example, is likely to be viewed as unethical. Even if some such possibilities are not viewed as unethical, they may be very costly in terms of resources or in terms of political costs. Consider the difficulties, for example, with the possibility of randomly assigning schooling among individuals in order to obtain better estimates of the effects of human resource investments in youth as would be desirable for the present study. Fourth, even for the policies for which good experiments can be conducted at a reasonable (resource, ethical and political) cost, they would reveal only the gross changes induced by the experimental treatment conditional on a particular situation, not what would happen in somewhat different circumstances. That is, experiments basically are “black boxes” that reveal the total impact of some change, but do not reveal anything about the underlying structural relations that could be used to infer what would be the effects of other changes.

For such reasons, though it probably would be desirable to increase experimental evaluation of policies and to assure that the experiments that are undertaken are of high quality (e.g., with good baseline data and random assignment of treatment versus control groups), there are severe limits on what policies can be evaluated by experimental means. Nevertheless, the experimental design is an important benchmark against which other means of evaluation should be compared and judged to aid in understanding what are the probable biases that may arise from non-experimental evaluation.

### 2.4.2 Econometric Estimates of Impacts of Investments in Youth

Econometric or statistical methods are used to attempt to circumvent some of the limitations of the data, including that most data that are available for evaluation of the impact of investments in youth are behavioral data and not experimental data.

#### 2.4.2.1 Relations to be Estimated

Econometric analyses of impacts should be based on relations such as those implied in the discussion in Section 2.2. Such relations can be used (i) to estimate directly the underlying structural relations that determine investments in youth or their impact (e.g., human resource production functions analogous to relation 2) in which investments in youth may be one input in the production, for example, of subsequent adult health and (ii) to estimate dynamic decision rules or demand relations for investments in youth or for inputs conditional on past investments in investments in youth (as in relation 1).
Structural Relations -- Production Functions: Structural relations are the basic underlying relations in the models of behaviors such as in Section 2.2. Structural relations are not estimated nearly as often as are the reduced-form dynamic decision rules or demand relations that are discussed below. But one type of structural relations — production functions — are estimated with some frequency. A linear or log-linear approximation to a general production function of the type discussed in relation (2) above with cognitive achievement (CA_i) produced by two categories (vectors) of variables relating to the i_th individual and his/her household (XI) and to the s_th school (XS) and by an explicit stochastic disturbance term (U_i) is: \[ CA_i = a_{XI}XI + a_{XS}XS + U_i. \]

The household vector of variables may include, for example, parent’s schooling and the home learning environment, as well as the schooling to date of the ith individual/youth. The school vector of variables includes aspects of school management and curricula that may be affected directly by policies related to the supply side of schooling. The stochastic term captures random effects that are not correlated with any of the other predetermined right-side variables. It is useful for the discussion below of estimation issues to distinguish among four different subgroups of variables: the superscripts “o” and “u” refer to “observed in the data used” and “unobserved in the data used”, the superscript “b” refers to variables that are behaviorally determined within the model used, and the superscript “p” refers to variables that are predetermined within the model used so that the variable list in the general production function relation is XI^{ob}, XI^{ub}, XI^{op}, XI^{up}, XS^{ob}, XS^{up}, XS^{op}, XS^{up}, U_i. If these were substituted into (2A) each would have its own coefficient “a” with an appropriate superscript to indicate its impact on CA_i. The distinctions among these different variable groups are important because some of the most substantial and most pervasive estimation problems arise from unobserved variables or behaviorally determined variables (see below).

The parameters (a’s) in the production function give the direct impact of the right-side variables, including investments in youth. With good estimates of the appropriate production functions the direct determinants of many outcomes determined by behaviors could be evaluated with considerable confidence to answer many of the questions of interest about direct policy impacts. If good estimates of production functions are embodied in overall models of optimizing behavior, moreover, simulations can be made of the impact of policies given all the relevant behavioral adjustments and of counterfactual policies changes, all conditional on the model. Note that the possibilities of simulating the impact of counterfactual policies exist with the use of structural models even though they are not possible with experiments and may be very difficult to undertake with reduced-form dynamic decision rules. Good production function estimates may be difficult to obtain, however, because of estimation problems discussed below.

19 Linear approximations are used here because they are the simplest forms but they still permit characterization of various estimation issues. Log-linear forms in which all of the variables are replaced by the logarithms of their values (which implies interactions among all the right-side variables) are identical in representation once the variables are redefined. In empirical studies linear and log-linear specifications are very common, but other functional forms also are used at times. For other functional forms the essence of the estimation issues is the same. If the functional form that is used is not a good approximation to the true functional form, there is misspecification error that is akin to omitted variable bias discussed below (with the unobserved variable being the variable that would have to be added to transform the assumed specification to the true functional form).
Reduced-Form Dynamic Decision Rule or “Demand” Relations: A second set of relations that can be estimated to explore the determinants of Investments in youth and the impact of investments in youth are dynamic decision rules or “demand” relations that are conditional on past investments in youth. These relations give some behavioral outcome in the current period as dependent on all predetermined (from the point of view of the entity making the decisions) prices and resources and on the parameters in the underlying production functions and preferences. As noted above, these are the relations that are most commonly estimated. These demand functions in principle are derived explicitly from the constrained maximization behavior of families that is discussed in Section 2.2. As such they incorporate all of the underlying structural parameters that are involved in that process. But all of the choice variables during the period of interest are substituted out, so the demand functions are so-called reduced-form relations because the maximizing behavior that determines such variables has been combined and “reduced” to the relations that give the behavioral outcomes as a function of purely predetermined and expected prices, resources, policies and of the underlying preferences and technologies. In some empirical studies, the underlying structural parameters can be identified from estimation of the demand relations. In most cases, however, demand functions are just posited to result from constrained maximization and the underlying structural parameters are not identified in the estimates, though the demand parameters still are some combinations of these parameters. In such cases, demand functions permit the estimation of the total effects of predetermined variables on the behavioral variables of concern, but not estimation of the exact mechanisms through which determinants act.

On a general level, demand functions can be written with a vector of behavioral outcomes ($Z$) dependent on a vector of prices broadly-defined ($P$) and a vector of resources ($R$). Both the prices and the resources may reflect policies. If there are uncertainties regarding relevant future prices, policies and shocks, then the characteristics known at the time of the decision of interest regarding the distributions of those outcomes should be included. A linear approximation for a family or individual facing prices $P_F$ and with resources $R_{Ff}$ and a vector of stochastic terms ($V_f$) is:

\[
Z_f = b_{PF}P_F + b_{RF}R_{Ff} + V_f.
\]

The resources include predetermined schooling and other human resources. The stochastic term in each relation includes all the effects of all the stochastic terms in all of the production activities in which the family/individual is engaged (i.e., all of the elements of the vector $U_i$), plus perhaps other chance events. Both prices and resources may be observed or unobserved in the data, so it is useful to indicate that distinction here as above in the discussion of production function inputs (again, using superscripts “o” and “u”). There is one such demand relation (or one element in the vector $Z_i$) for every behavioral outcome of the individual/family (and similarly for firms or other entities). Each of these demand relations conceptually includes the same identical right-side predetermined variables so that any predetermined variable that affects any one behavioral outcome may affect all other behavioral outcomes. Good estimates of these relationships, with predetermined investments in youth among the right-side variables, would inform us about the impacts of these investments – an essential component for evaluating the rates of return to these investments.

2.4.2.2 Estimation Problems

There are a number of possible problems in obtaining good estimates of the impact of investments in youth on different outcomes such as those considered in Section 3 below. Therefore what are
presented as estimates of relations such as those that are discussed in Section 2.4.2.1. Often may be biased. These estimation problems share a common characteristic: the disturbance term in the relation actually estimated is not simply an element in $U_i$ or $V_f$ that is distributed independently of all the right-side variables in the relation being estimated, but instead is correlated with right-side variables (e.g., because it is a compound disturbance term that includes unobserved variables as well as $U_i$ or $V_f$ or because of the way that $U_i$ or $V_f$ is defined for the sample used in the estimates).

Measurement error: Measurement error may contaminate any of the observed variables used for estimates of the relations (1A) and (2A). Random measurement error occurs if what is observed is not the true variable, but the true variable plus a random error. As is well known, random measurement error in a right-side variable tends to cause bias in the coefficient estimate of that variable towards zero. Intuitively, if the observed investments in youth are a noisy measure of the true value of investments in youth, the true dependence of outcomes such as cognitive achievement on investments in youth such as their schooling is masked, and the result is an underestimate of the effect of the investment on the outcome. The bias is greater the larger is the variance in the measurement error relative to the variance in the true value. Random measurement error can be reduced with better measurements of the desired concept. Random measurement error can be controlled with instrumental variable estimates if the error in the instrument used is independent of the error in the observed variables of interest, as may occur, for example, with different measures of the same concept.

Omitted variables: In both production function estimates and demand function estimates there may be variables that should be included among the right-side variables but that are not observed and therefore not included. For the production function estimates, for example, there may be unobserved inputs such as inherent ability, motivation, and school management capabilities. In terms of relation (2A) with the subcategories of variables, the basic estimation problem is that the observed right-side variables ($X_{1ob}$, $X_{1op}$, $X_{Fob}$, $X_{Fop}$) may be correlated with the unobserved variables ($X_{1ub}$, $X_{1up}$, $X_{Fub}$, $X_{Fup}$) that are included in the compound disturbance term with $U_i$. Therefore the estimates of the impact of the observed variables include not only their true effects but also part of the effects of any correlated unobserved variables. For the demand relations (1A), the compound disturbance term includes, in addition to $V_f$, the other unobserved variables ($P^{Fis}$, $R^{Fis}$). If any of the observed variables on the right-side of relation (1A) is correlated with any of the unobserved variables, its coefficient estimate is biased because, in addition to its own effects, it is representing in part the effect(s) of the correlated unobserved variable(s). If, say, ability affects the outcome of interest and investments in youth are correlated with ability because individuals with greater ability tend to obtain more schooling, then the usual estimate of the impact of investments in youth on the outcome is likely to be biased (and likely to make investments in youth appear to have a larger effect than

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20 For example, schooling reports from adult siblings or from adult children could be used for this purpose if schooling is a right-side variable as in some recent estimates of the impact of schooling on wages (Ashenfelter and Krueger 1994, Behrman, Rosenzweig and Taubman 1994).

21 The compound disturbance term includes all the unobserved variables unless their effects are controlled in some way.
they really do) because in the usual estimates investments in youth in part are representing the effects of unobserved ability, not only of investments in youth per se.  

As is well known, the sign and magnitude of omitted variable bias depends on the effect of the omitted variable(s) and on its correlation with included variables and their true coefficients. Five means of dealing with omitted variable bias are (i) to measure variables that often are unmeasured (e.g., “ability” could be measured using Raven’s tests, as in Knight and Sabot 1990), (ii) to use fixed effects to control for unobserved variables (which requires multiple observations at the level of aggregation at which the fixed effects are used) as in Behrman and Rosenzweig (1999, 2002a,b), Behrman, Rosenzweig and Taubman (1994, 1996), Behrman, Foster and Rosenzweig (1997a,b), Behrman, et al. (1999), Foster and Rosenzweig (1994, 1995, 1996), Miller, Mulvey and Martin (1995), Pitt, Rosenzweig and Hassan (1990), Rose (2000), Rosenzweig and Schultz (1983, 1985, 1987), Rosenzweig and Wolpin (1986, 1993). (iii) to replace right-side variables with their instrumented values by using identifying instruments that do not appear in the relation being estimated and are not correlated with the disturbance term in the relation being estimated as attempted by Alderman, et al. (1996b, 2001), Angrist (1990), Angrist and Krueger (1991), Angrist and Lavy (1999), Card (1995, 1999), (iv) to compare the behaviors or the “before and after” changes in behaviors of beneficiaries of policies with those of individuals who would be eligible but are in the control group (perhaps with matching on observed characteristics as in Heckman, Ichimura and Todd 1997), and (v) to use randomized data as in Angrist, et al. (2002), Behrman and Hoddinott (2002), Behrman, Sengupta and Todd (2002), Skoufias (2001) and Schultz (2000). All of these approaches have their limitations. Some variables are very hard to measure at reasonable costs. Fixed effects do not permit the estimation of the linear effects of observed variables at the same level of aggregation as the fixed effects (though the effects of interactions among observed variables, such as family background and program characteristics, can be estimated), exacerbate the impact of measurement errors, do not control for unobserved variables, and control for the unobserved fixed variables perfectly only if the true relationship being estimated can be manipulated so that the unobserved fixed effect appears only as an additive linear term. It often is difficult to find identifying instruments that (a) do not appear in the relation being estimated, (b) are independent of the compound disturbance term in the relation being estimated (which includes all of the unobserved variables), and (c) are sufficiently correlated with the observed right-side behavioral variables (though lagged price and other shocks are candidates for panel data). The control group comparisons depend on good assignments of households to the actual and potential beneficiary groups versus those who are not eligible; if there are incorrect assignments, misleading comparisons may be made (though matching may reduce this problem considerably). Matching controls only for observed variables but not unobserved ones. Experiments often are costly, hard to maintain (i.e., keeping control and treatment groups separate), and in some cases not politically possible or ethical (see Section 2.4.1 above).

**Endogeneity:** Endogeneity bias occurs when a variable that is determined within the model appears as a right-side variable in some other relation. Among the relations discussed above, production functions are the ones for which endogeneity most obviously might be a problem because the right-

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22 While we indicate the likely direction of biases in the text, the actual biases depend on the exact difference between the correct specification and the specification used and the covariances among all the variables in both specifications, so the actual biases may not be in the directions that we posit are likely on the basis of first-order effects.
side variables include some behavioral inputs (e.g., health and nutritional status in relation 2A). Included on the right side of that relation is a stochastic term \( V_f \) that, as noted above in Section 2.4.2.1, includes the stochastic terms from all of the production function relations in the model — including those for health and nutritional status. This results in a correlation between health and nutritional status and the stochastic term in the cognitive achievement production function that causes biases in the estimated impact of health and nutritional status on cognitive achievement production. The sign and the magnitude of the bias depend upon the exact structure of the model. If there are no unobserved behavioral inputs in the production function, prices and any other variables that enter into the reduced-form demand relations in (1A), but not directly in the production function, can serve as identifying instruments for controlling for endogeneity.

**Selectivity:** Selectivity bias may result if observations are available only for a selected subset of the sample. A relevant example is for estimating the impact of school characteristics on cognitive achievement tests given at the secondary school level. Such test scores are not observed for everyone in most samples from most developing countries because not everyone attends secondary school. These test scores are only observed for individuals whose expected gains from attending secondary school exceed the cost of attending secondary school, which is likely to differ by socioeconomic class because those who are better off are more likely to be able to self-finance such investments in the presence of imperfect or absent capital markets for investments in youth. The problem is that this subsample is not randomly selected. The subsample selection procedure, with its systematic relation between the disturbance term in the true relation and test scores, creates a correlation between the disturbance term and test scores for the subsample for which estimates of the relation can be made. As a result, if the relation is estimated using only this subsample, a biased estimate of the true relation between test scores and school characteristics is obtained. The standard means of controlling for selectivity is to incorporate the behaviors that cause selectivity explicitly into the model, though in some cases finding observed variables that determine the selectivity but that do not enter into the relation of interest (which is necessary to identify the coefficients of interest) may be difficult.

**2.4.3 Implications for Analysis of Endogenous Policies**

The focus of this paper is on the rate of return to investments in youth, with closely related concerns about policies and how they affect investments in youth and the impacts of those investments. Therefore policy evaluation is of central relevance. Governmental policies of all sorts -- including those related to investments in youth -- are not predetermined, but are made by individuals or groups of individuals with various objectives in mind, including accommodating to pressures from and needs of constituents. This means that it may not be possible to evaluate the impact of governmental policies on various outcomes without controlling for the fact that governmental policies themselves are determined, implemented and monitored as part of a larger set of behavioral decisions. The failure to control for the determinants of governmental policies may cause substantial mis-estimates of their effectiveness. These mis-estimates, moreover, may either overestimate policy effectiveness or underestimate policy effectiveness, depending on what is the nature of the governmental decision. Therefore the usual estimates of policy effectiveness that do not control for the determinants of policies generally can not be assumed to give either lower or upper bounds on the true effects.

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23 If programs are allocated randomly, as is discussed in Section 2.4.1, this problem is avoided.
Rosenzweig and Wolpin (1986) formally develop these points. But the basic intuition is clear from considering the simple example of evaluating the impact on youth learning of special educational programs from cross-sectional data from a number of communities. If the resources devoted to such special educational programs tend to be concentrated in communities that have greater political power, wealth and better-prepared youth net of the effects of the special educational programs and of characteristics that are observed in the data, the association between youth education and resources devoted to special educational programs without control for resource allocation among special educational programs in different communities overstates the effectiveness of the programs on youth education. Those communities that receive more special educational program resources would have had better youth education for other reasons that are correlated positively with the allocation of special educational program resources (as for the dashed line in Figure 2), and *vice versa* for those communities that receive less special educational program resources (as for the solid line in Figure 2). On the other hand, if the resources devoted to such special educational programs tend to be concentrated in communities that have poorer educational environments, greater poverty and less educated youth net of the effects of the special educational programs and of characteristics that are observed in the data, the association between youth education and resources devoted to special educational programs without control for resource allocation among special educational programs in different communities understates the effectiveness of the programs on youth education. In this case those communities that receive more special educational program resources would have had poorer youth education for other reasons that are correlated negatively with the allocation of special educational program resources (as for the solid line in Figure 2), and *vice versa* for those communities that receive less special educational program resources (as for the dashed line in Figure 2). As a result, even if the special educational programs are effective in improving youth education, the simple cross-sectional association between special educational program resources in various communities and youth education may be negative (and, if positive, is an underestimate of the effectiveness of special educational program resources).

Some important dimensions of governmental allocations, the difficulties of determining what underlies such allocations, and the difficulties in determining the impact of such allocations can be illustrated by assuming that a governmental agency allocates resources across subgroups of the population as if it were maximizing some objective function, subject to production function and budget constraints. To make the discussion concrete, consider the allocation of schooling resources among regions by the Ministry of Education, with focus on the tradeoff between maximizing income generated by schooled labor and the extent of equity in average per capita regional income in the economy (in addition to concern about the level of and distribution of schooling per se because of the role of schooling in enriching human resources). Estimates of this model for Brazilian and Mexican schooling resource allocations, for example, indicate that the governmental objective function has a tradeoff between productivity and equity in such allocations, but does not weigh equity enough to make compensating larger investments in poorer than in richer areas (Behrman and Birdsall 1988, Gershberg and Schuermann 1999)\(^{24}\). These results, thus, suggest that governments are

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\(^{24}\) For these estimates particular functional forms must be assumed. Both studies assume that the earnings production functions are quasi log linear and that the governmental objective functions are constant-elasticity-of-substitution (CES). The Brazilian study does not control for the choice aspect in the right-side variables, which Behrman and Taubman (1986) show biases the estimate towards productivity rather than equity. The Mexican study attempts to control for such choices by using instrumental variables.
responsive in their allocations of human-resources-related expenditures not only to productivity considerations, but also to equity. However the equity response is not so strong to offset endowment differentials across regions, just to lessen somewhat their impact on earnings differentials. Therefore in these cases, if there were not control for the endogeneity of school resource allocations across regions, the effectiveness of these resources would be overestimated because better-endowed regions are favored.

The impact of not controlling for what determines the nature of governmental policies on estimates of program effectiveness also has been explored directly in a few recent studies. Pitt et al. (1993), in particular, present illustrative estimates of such effects using pooled time series-cross sectional data for about 3,000 Indonesian sub-districts. In some instances the cross-sectional data without control for program placement are quite misleading. For example the cross-sectional data for 1980 resulted in an underestimate by about 100 percent of the effect of being close to a grade school on school attendance for both males and females ages 10-14 as compared with the pooled data with control for the determinants of the location of new schools (which tended to be in poorer areas). The study also explored what determined program placement. For instance, communities with higher fertility propensities received less family planning support, suggesting that such support was provided where it was most desired (which would result in an overestimate of its effectiveness if the nonrandom program placement were not controlled in the analysis). Thus these results indicate that control for endogenous policy choices can affect substantially the estimated effectiveness of policies on human resources.

While the studies of the impact of endogenous program placement to date are largely framed above in terms of program placement by a central authority, finally, the effects that are estimated could arise from decentralized choices regarding program placement, with parallel problems in terms of estimating policy effects, whether on a micro or macro level. They also could result from differential intensity of programs, not just program placement – e.g., if more (or less) resources were directed towards programs related to youth in more (or less) disadvantaged communities or neighborhoods.

2.5 Private Versus Social Returns, Efficiency And Distribution

Often analyses of the impact of investments in youth are undertaken with a substantial interest in related policy considerations but without consideration of the general rationale for policies. It is just presumed that policies that, say, through increased investments in youth increase some outcome such as subsequent health must be good. But such analyses are of little help in convincing skeptics that scarce resources should be allocated for these purposes, given many competing alternative uses. Moreover they may not provide much in the way of guidelines for choosing among policy alternatives. Therefore it is useful to begin by asking why policy interventions with respect to investments in youth might be desirable.

At a general enough level of abstraction, policy should be chosen in order to maximize social welfare. That begs, of course, the critical political economy question of how the social welfare function is determined. Even if that difficult question is put aside, the practical guidance offered by the injunction to maximize social welfare may seem quite limited. For that reason it often is useful
to think separately of the two standard economic justifications for governmental policy interventions: 1) to increase efficiency/productivity and 2) to redistribute resources, first in isolation and then together.\textsuperscript{25} Both of these apply to policies related to the determination of investments in youth and of outcomes affected by investments in youth.

The policy justifications based on efficiency and on distribution are both firmly rooted in micro dimensions of behaviors as outlined in Section 2.1. That is the case because \textit{both of these standard economic motivations for policy are concerned ultimately with the welfare of individuals as judged by those individuals}. This last statement is emphasized by placing it in italics because economic efficiency is viewed by some as a concern about allocation of things and technical and financial concerns, but \textit{not} as a concern about people. But this reflects a fundamental misunderstanding. To the contrary, economic efficiency ultimately is a concern with the welfare of people as judged not by policymakers or international experts, but by the individual decision-makers involved. There, in addition, is a separate important concern about the distribution of decision-making powers, including the distribution between females and males. But it is important to recognize that the efficiency motive for policy, far from being purely a mechanical or technical concern of “dismal scientists” devoid of concerns about people, is based fundamentally in people’s perceptions of their own welfare.

This section reviews standard economic rationale for policies related to efficiency/productivity and to distribution, concerns that interact. Though such discussions are the standard fare of economic textbooks, these motivations are reviewed here because they often seem to be downplayed or ignored in discussions of appropriate policies and policy analysis, including many of those related to investments in youth.

\textbf{2.5.1 Efficiency/Productivity}

Resources are used efficiently in the economic sense of the term if they are used to obtain the maximum product possible given the quantities of the resources and the available production technologies at a point of time, and over time, and if the composition of that product increases the welfare of members of society as much as is possible given the resource and technological constraints, preferences and the distribution of resource ownership. It is important to note that efficiency is not just a concern about the static use of resources at a point in time, but also is a concern about the use of resources over time and thus productivity and productivity growth over time. An investment (or expenditure) is efficient if the marginal social benefit of the last unit of that investment just equals its marginal social cost\textsuperscript{26}. If the marginal social benefit of a particular

\textsuperscript{25} These two justifications include some other common concerns about policies, such as questions of access and quality of services and sustainability of overall economic development and of particular programs as is discussed in Behrman and Knowles (1998a). However, van der Gaag and Tan (1997) propose poverty reduction as an alternative criterion for the evaluation of investments, given its prominent role in contemporary development policy.

\textsuperscript{26} Three points should be noted. First, economic efficiency is not the same as engineering efficiency because of the incorporation of marginal benefits and marginal costs rather than focusing exclusively on technological efficiency. Second, these marginal conditions for efficiency may not hold if there are, for example, large discontinuities in production processes. In such cases choices may have to be made among a number of different alternatives, using an explicit welfare function to compare among the alternatives. Third, because of uncertainty in the real world this
investment is greater (less) than the marginal social cost, society is not investing enough (is investing too much) and would benefit from increasing (decreasing) the level of investment until the marginal social benefits and costs are equalized.

Although applying the above rule maximizes social gains, private maximizing behavior leads to investments including those related to human resources at the level at which the marginal private benefit of the investment equals its marginal private cost under the assumption that, given the information available to them and the constraints that they face, individuals act in what they perceive to be their best interests, as is discussed in Section 2.2. Figure 1 provides an illustration for investments related to one individual decision maker.

Now consider what happens if the private incentives for investments differ from the social incentives for such investments, first with respect to the marginal benefits and then with respect to the marginal costs.

Let the dashed line in Figure 2 now represent the marginal social benefits for investments related to human resources that are drawn to be greater than the marginal private benefits (rather than the changed marginal private benefits as in the discussion in Section 2.2). In this case the private incentives are to invest at level $H^*$, which is less than the socially-optimal (efficient) level of investment at level $H^{**}$. Therefore there is an efficiency argument for policies to induce or to require private investments at level $H^{**}$ instead of level $H^*$.

Why might marginal social benefits exceed marginal private benefits for investments in youth. Among the most frequent answers to this question are: (1) Investments in education are thought to have not only private benefits to the person being educated, but, by adding to society’s stock of knowledge, social benefits beyond the private benefits (positive “externalities” in the form of effects that are transferred external to markets). Other relevant examples of externalities might be second-hand smoking, controlling contagious diseases such as HIV/AIDS, creating social capital, and developing incentives for legal rather than criminal behaviors. (2) Information on which schooling, health, and employment decisions are made may misrepresent the private rates of return to these investments because it is incomplete or incorrect. For example, youth may not know about contraceptives or about risks associated with STDs. The "public good" nature of information (i.e., that the marginal cost of providing information to another consumer is virtually zero) leads to under-production of information from a social point of view by private markets because private providers cannot cover their costs if they price information at the social marginal cost as required for efficiency. (3) The combination of uncertainty, risk aversion and imperfect insurance markets may result in private incentives to underinvest in human, financial and physical assets that enhance

discussion could be recast in terms of expected values, with concern about possible risk aversion (or something other than risk neutrality). But, for simplicity, we do not do so.

27 The marginal social benefits also could be lower than the marginal private benefits so that the marginal social benefits curve is below the marginal private benefits curve, and policies to attain efficiency would have to reduce the private incentives to the social levels.
economic development from a social point of view because from a social point of view the risks are pooled.\textsuperscript{28}

Now let the dashed line in Figure 3 represent the marginal social costs for investments in youth that are drawn to be less than the marginal private costs.\textsuperscript{29} In this case the private incentives are to invest at level $H^*$, which is less than the socially-optimal level of investment at level $H^{***}$. Therefore there is an efficiency argument to consider the possibility for policies to induce investments in youth at level $H^{***}$ instead of at level $H^*$.

Why might marginal social costs be less than marginal private costs for investments in youth? (1) There may be capital market imperfections for some types of investments (e.g., social capital investments and human resource investments in part because these forms of capital are not accepted as collateral) such that the marginal private costs for such investments exceed their true marginal social costs, which probably is more relevant for individuals from poorer families who cannot relatively easily self-finance such investments. (2) The sectors that provide some types of services (e.g., information, health care, schooling) may produce inefficiently because institutional arrangements do not induce efficient production of an efficient basket of commodities. School teachers and staff, for example, might be oriented towards rewards established by the Ministry of Education or union negotiations, not towards satisfying the demands of clients. Governmental health workers may be more interested in their private practices than in their public work. (3) The sectors that provide services related to investments in youth may produce inefficiently because regulations preclude efficient production of an efficient basket of commodities. For example, regulations that limit hours during which schools are open, or limit textbook choices, or that impose quality standards based on different conditions in other economies or that limit provision of services to public providers, all may result in much greater costs of attaining specific investments than would be possible with less regulations (also see Chomitz and Birdsall 1991). This is not to say that all regulations are bad. In some contexts regulations may be the most efficient means of attaining a goal, particularly if there are certain types of information problems (e.g., those related to the quality of goods and services that can not be easily discerned by consumers). But often regulations, no matter how good might be their intent, are not very effective policy tools (see Section 2.5.3 for further consideration of policy choices).

\textbf{2.5.2 Distribution}

Distribution is a major policy motive distinct from efficiency. Distributional concerns, at least officially in pronouncements of governments and of international agencies, often focus on the

\textsuperscript{28} These are three major reasons for a divergence to arise between private and social marginal benefits for investments in youth related to schooling. There may be others as well (e.g., the social discount rate may be lower than the private discount rate, wage and price rigidities may preclude wages and prices from reflecting social marginal benefits and costs, income taxes may cause private marginal returns to schooling investments to be lower than social marginal returns).

\textsuperscript{29} The marginal social costs also could be higher than the marginal private costs, in which case the marginal social cost curve would be above the marginal private cost curve, and policies to attain efficiency would have to reduce the private incentives to the social levels.
command over resources of the poorer members of society\textsuperscript{30}. Society might well want to assure, for example, that everyone has basic schooling even at some efficiency cost (van der Gaag and Tan 1997). Though distributional concerns are often characterized by focus on the distribution of income or other resources among households, there may also be important distributional considerations within households. Household decision-makers are not likely to consider equally the preferences of all household members in allocating household resources. For example, if women have preferences for using more resources to invest in children than do their husbands, these preferences may not be weighed equally as those of their husbands in decisions made by their husbands. Moreover, even if some households as aggregates have sufficient resources to cover what society considers basic needs, certain types of individuals in households may not be allocated what society considers to be sufficient resources for their individual satisfaction of basic needs. A particularly germane example may be child labor. Such labor may contribute importantly to the resources and the welfare of the household decision makers, but may detract from improving the human resources of the child by, for example, exposing the child to health and other risks and limiting the education of the child. Therefore there may be an important intergenerational distributional tradeoff.

\textbf{2.5.3 Policy Choices to Increase Efficiency and to Improve Distribution}

Consider first efficiency. If all other markets in the economy are operating efficiently and there are differences between marginal private and social incentives in a given market related to investments in youth so that private incentives are to invest at level $H^*$ instead of at level $H^{**}$ in Figure 2 or level $H^{***}$ in Figure 3, policies that increase investment to the socially efficient levels increase efficiency. If all other markets in the economy are not operating efficiently, then policies that narrow the differences between private and social incentives in a particular market related to investments in youth do not necessarily increase efficiency and productivity. But, in the absence of specific information to the contrary, such as the existence of two counterbalancing distortions, a reasonable operating presumption is that lessening any one distortion between social and private incentives is likely to increase efficiency.

That still does not indicate what policies would be best to induce investments in youth at level $H^{**}$ in Figure 2 or level $H^{***}$ in Figure 3. There is a large set of possibilities, including governmental fiat, governmental provision of services at subsidized prices, price incentives in markets related to investments in youth, price incentives in other markets, and changing institutional arrangements in various markets. To choose among alternatives, there are two important considerations.

First, it is necessary to realize that policies have costs. These costs include the direct costs of implementing and monitoring policies and the distortionary costs introduced by policies that may encourage socially inefficient behavior (including rent-seeking by both public and private entities). Often policymakers focus only on the direct costs and ignore the distortionary costs that may be much greater because only the direct costs have obvious and visible direct ramifications for governmental budgets. In fact the costs may be sufficiently high that it is not desirable to try to offset

\textsuperscript{30} Many policies, whatever their official justification, however, distribute resources to middle and upper class households. For some examples for human resource-related policies in Viet Nam, see Behrman and Knowles (1998b, 1999) and World Bank (1995).
some market failures by policies.\textsuperscript{31} But, if it is desirable to do so, there is a case generally for making policy changes that are directed as specifically as possible to the distortion of concern because that tends to lessen the distortion costs. An efficiency policy hierarchy can be defined in which alternative policies to attain the same improvement in efficiency are ranked according to their social marginal costs, including direct and distortion costs. This hierarchy indicates the preferential ordering of policies to deal with particular divergences between private and social incentives. For example, it sometimes is argued that female schooling should be subsidized because more-schooled women have fewer children, which relieves budgetary pressures on subsidized schooling and health services. But in this case increasing female schooling through such subsidies would not seem obviously to be high in the efficiency policy hierarchy. It would seem that higher in the efficiency policy hierarchy might be the elimination of any public subsidies for education and health that are not warranted by the marginal social benefits exceeding the marginal private benefits.

Second, there are tremendous information problems regarding exactly what effects policies have, particularly in a rapidly changing world. This is an argument in favor of policies that are as transparent as possible, which generally means higher in the efficiency policy hierarchy with regard at least to distortion costs because more direct policies are likely to be more transparent\textsuperscript{32}. Information problems also provide an argument for price policies (taxes or subsidies) because if there are shifts in the underlying demand and supply relations they are likely to be more visible in a more timely fashion to policymakers if they have impact on the governmental budget than if they only change the distortions faced by private entities as tends to happen with quantitative policies\textsuperscript{33}. Finally information problems in the presence of heterogeneities across communities point to the possible desirability of decentralization and empowerment of users of social services in order to increase the efficacy of the provision of those services, though such considerations must be balanced off against possible economies of scale, higher quality of staff and possibly lower levels of corruption at more centralized levels, as well as intercommunity distributional concerns.

Thus, for efficiency/productivity reasons, particularly given that in the real world information is imperfect and changes are frequent, there is an argument generally for choosing policies as high as possible in the efficiency policy hierarchy defined by the extent of marginal direct and distortionary costs -- and thereby using interventions that are as focused directly on the problem as possible. Note

\textsuperscript{31} If the policies involve public expenditures, as do most policies, it is important to consider the cost of raising the necessary tax revenue to finance the policy. For example, it has been estimated that the distortionary cost (often called the "deadweight loss") of raising a dollar of tax revenue in the United States ranges from $0.17 to $0.56, depending on the type of tax used (e.g., Ballard, Shoven and Whalley 1985, Feldstein 1995). Estimates for some other countries range from $0.18 to $0.85, depending on the tax (van der Gaag and Tan 1997). Harberger (1997) suggests using a shadow price of $1.20-1.25 for all fiscal flows on a project.

\textsuperscript{32} This also is an argument for considering an experimental approach to evaluating policy alternatives when possible -- e.g., rather than introducing a reform country-wide, introduce variants of reforms for schools (and other social services) in randomly selected sites with careful monitoring of the results for both the experimental groups and the control groups. See Section 2.4.1 for discussion of the use of one such experimental approach to policy evaluation in a developing country context.

\textsuperscript{33} Nevertheless there are likely to be some cases, such as providing information regarding the quality of goods and services related to investments in youth, for which quantitative regulations may be higher in the efficiency policy hierarchy than price policies because of the nature of the information requirements.
that this means that, for example, if there is a good efficiency reason for public support for investments in youth, that does not mean that the best way to provide that support is through governmental provision of the relevant services. Higher in the efficiency policy hierarchy than direct governmental provision of such services, for example, may be subsidies or taxes that create incentives for the efficient provision of these services whether the actual providers are public, private or some mixture. On the other hand, policies that discriminate against one type of provider -- for example, by making the availability of such subsidies dependent on whether the provider is public -- are generally likely to be lower in the efficiency policy hierarchy than policies that do not have such conditions.

Now consider distribution. Generally speaking the subsidization of specific goods and services (and even less, the direct provision by governments of goods and services at subsidized prices) is not a very efficient way of lessening distributional problems. Because subsidies are designed to lower prices to consumers, they induce inefficient consumption behavior. Instead, it generally is more efficient (and thus less costly in terms of alternative resource uses) to redistribute income to consumers, allowing them to allocate the income in ways that lead to efficient patterns of consumption. Nevertheless, there are some cases in which subsidization of selected goods and services may be defensible to attain distributional objectives. For example, in cases where it is difficult (and therefore costly) to target the poor households or poor types of individuals within households, subsidizing certain goods and services that are mainly consumed by the poor may be the most efficient policy alternative.

Rather than being concerned with the general command over resources of its poorer members, as noted above, society may deem it desirable that everyone enjoy basic human resource related (and other) services, including basic schooling, nutrition and health care. Such an objective might be obtained through many means. But presumably it is desirable to assure that everyone have these basic options at as little cost in terms of productivity as possible so, rather than ignoring efficiency considerations, it is desirable to choose policies as high as possible in the efficiency policy hierarchy and still assure that the basic service objectives are met. Thus, to obtain a given distributional objective it is possible to define a distributional policy hierarchy in which policy alternatives that obtain that objective are ordered from lowest to highest marginal costs, including both direct and indirect costs. Efficiency goals thus play an important role in interaction with the pursuit of distributional goals, not as independent considerations.

### 2.6 Methodology for Economic Evaluation of Investments in Youth

Assuming that one has reliable estimates of the effectiveness of a set of alternative investments in youth, how can one best evaluate them against the criteria of efficiency and distribution? There are several methodologies available in the literature.

Perhaps the simplest is cost effectiveness analysis (CEA). This consists of ranking a set of related investments according to their cost per unit of effectiveness, where the measure of “effectiveness”

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34 However, even redistributing income may lead to inefficiency because it can affect the work effort of those on both the tax-paying and tax-receiving sides.
should be clearly defined and as narrow as practical, given the range of investments to be analyzed. CEA has been used widely to evaluate alternative investments within a given sector. For example, cost per life saved or cost per disability-adjusted life years (DALYs) are criteria that have been widely used in CEA evaluating alternative investments in the health sector. However, CEA has several shortcomings in the context of evaluating alternative investments in youth. First, it requires a single effectiveness measure. This is impractical in the case of many youth investments because they involve such a wide range of outcomes. Second, CEA does not provide any basis for comparing investments in youth to alternative investments. Third, CEA does not address the efficiency motive for policies, though in some applications it is explicitly directed towards the distributional motive (e.g., what is the most cost-effective way of improving some aspect of the lives of the poor).

Cost-benefit analysis (CBA) is an alternative methodology for evaluating investments that is designed to handle alternative investments that may have several different outcomes. Because it values benefits in monetary terms, CBA obtains results (i.e., benefit-cost ratios or internal rates of return) that readily permit comparisons with alternative investments (e.g., investments in governance, investments in infrastructure). Again, assuming one has reliable estimates of effects, the problem is valuing them in monetary terms. This is often technically challenging and can be politically sensitive as well (e.g., assigning a monetary value to a human life). Although there are several approaches that are used to do this in the literature, we shall focus on two that would appear to be most promising for use in the present context.

The first approach is to define benefits in terms of an investment’s impact on economic growth, typically measured in terms of growth in GNP per capita. This approach was used in the pioneering study by Coale and Hoover (1958) of the economic benefits of fertility reduction. More recently, this methodology was used (in combination with other methods) to estimate the economic benefits of a broad strategy to improve health in developing countries (Commission on Macroeconomics and Health 2001). Econometric estimates of the relationship between cross-country economic growth rates and a list of explanatory variables (e.g., initial income levels, economic policy variables, structural characteristics of the economy) and indicators of population health indicate that each 10 per cent improvement in average life expectancy at birth is associated with an increase in the rate of economic growth of 0.3 to 0.4 percentage points per year, holding other factors constant. Similar econometric analyses have been undertaken with respect to the association of other types of investments in youth (e.g., schooling) with economic growth (Barro and Sala-I-Martin 1995). In the context of the present review, there three main problems with this approach. First, the associations that are found in cross-national analysis may not represent unbiased estimates of the causal effects of investments (due to omitted variable and endogeneity bias). Second, the available cross-national data (apart from possibly schooling) are not sufficiently disaggregated to disentangle the effects of investments in youth from similar investments in the broader population. Third, this approach does not deal well with either the distributional nor the efficiency motives for policies. Because it is on an aggregate level, it is not surprising that it does not deal much if at all with distribution. But it also needs to be made clear that maximizing growth is not the same as the efficiency motive for policy. Too high growth may be inefficient just as too low growth.

35 However, van der Gaag and Tan (1997) argue that since the rate of economic growth has been shown to be the “best way to reduce long-term poverty,” every investment that aims at reducing poverty should be evaluated for its impact on growth.
An alternative approach has been used by Summers and others to analyze the benefits and cost of investing in female education (Summers 1992, 1994, van der Gaag and Tan 1997). Summers developed estimates of the social benefits of investing in girls’ education that go beyond the estimates of the private benefits, which are typically estimated from the relationship between individual earnings and schooling (holding other factors constant). Using Pakistani data, Summers began with estimates of the effect of an additional year of women’s schooling on child mortality, fertility and maternal mortality. He placed a monetary value on these effects by using estimates of the cost of producing similar effects using alternative cost-effective interventions (e.g., the cost per child life saved through measles immunization). He compared these estimates (with some discounting to reflect the lagged nature of the effects) of “social benefits” to the cost of providing an extra year of schooling to women and concluded that investing in girls’ education yielded relatively high returns.

We use the same methodology as Summers where possible to estimate indirectly the monetary value of benefits of investments of youth in this review in cases in which it is impractical to prepare direct estimates. The methodology, though not perfect, appears to be well suited to the evaluation of investments that affect outcomes that cannot easily be monetized. In our estimates of benefits we try to give appropriate attention to the lag between the investment and the expected effects, since with even a modest discount rate (e.g., 5 percent) the delay between investments and the resulting effects can have an important effect on benefit-cost ratios (or on internal rates of return). We also try to examine critically the case for public intervention with respect to each type of investment since benefit-cost ratios by themselves do not shed any light on this issue. Finally, we also try to examine the likely impact of investments on the poor as compared to the non-poor, since distributional concerns are not usually incorporated directly into benefit-cost estimates.

In using the indirect approach to valuing benefits, two caveats are noted. First, the effect(s) of the cost-effective alternative investment has (have) to be the same as the effect(s) for which a monetary value is sought. For example, if the cost per birth averted in a family planning program is used to value the effect of reduced fertility, it is important to adjust that cost for the other benefits that family planning programs provide, e.g., reduced maternal mortality and morbidity, reduced child mortality, ability to space births, and information. Second, it is important not to double count the value of effects that are directly and indirectly estimated (van der Gaag and Tan 1997). For example, if the

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36 Summers’ methodology involves using estimates of cost-effectiveness ratios as a basis for valuing benefits. The implicit assumption is that discounted social benefits are at least equal to discounted social costs in the case of investments in which the cost-effectiveness ratio is at a minimum (e.g., measles immunization). If this is not the case, the cost-effectiveness ratio does not provide an accurate estimate of social benefits and would have to be adjusted downwards.

37 For an example of attempts to reshape CBA to address the issue of the benefits and costs of public interventions, see Devarajan, Squire and Suthiwart-Narueput (1997) and Behrman and Knowles (1998a).

38 Of course, it is conceptually possible to weight benefits differently for different groups. However, this is rarely done in practice.

39 Such adjustments have not been made in previous applications of this methodology (e.g., Summers 1994, van der Gaag and Tan 1997).
The value of enhanced labor productivity is used to value the benefits of increased education among all children, even those who may voluntarily not participate in the labor force (e.g., persons engaged full-time in housework), it is incorrect to include the value of improved health of children as an additional benefit (since this benefit should be reflected already in the enhanced productivity of more educated persons in housework).

Both the benefits and the costs are likely to vary from country to country, for a variety of reasons discussed in the review. One of the main determinants of both benefits and costs is the average level of income in a given country (as perhaps measured by GDP per capita in PPP). This affects benefits in terms of increased earnings, which are often (but not always) an important component of the benefits of a given investment in youth. The average level of income in a given country also affects labor costs, which are often (but not always) an important component of the cost of a given investment in youth. Often (but not always) the two will virtually offset one another, so that the benefit-cost ratio or internal rate of return is unaffected. However, in the case of investments where this is not the case, it will be necessary to adjust benefits and costs for differences in average levels of income. We shall do so if the necessary information is available.

In the case of several investments in youth, the benefits and costs also vary significantly by gender. In such cases if the necessary information is available, we shall prepare separate estimates by gender.

### 3. THE EFFECTS OF A RANGE OF BASIC INVESTMENTS IN YOUTH

We first discuss our estimation strategy for obtaining rates of return to basic investments in youth (Section 3.1). We then consider available estimates of the costs and effects of investments in a number of important policy areas related to youth. We start with several such policy areas related to youth’s primary time uses – schooling, civilian and military training and work (Sections 3.2-3.4). We then consider aspects of health – reproductive health, general health and nutrition, and substance use (Sections 3.5-3.7). We next consider mass media and community programs (Sections 3.8-3.9). In Section 4, we consider the benefits that may result from policies in these areas. Throughout the discussion in Sections 3 and 4 we have included all references to possible effects of investments in youth that we encountered in our literature review, including those that do not appear to be based on reliable (and in some cases, any) empirical evidence. In fact, due to the lack of research in this area, there are far more hypothetical effects mentioned in the literature than empirically documented effects. Even among the latter, many of the cited effects are more accurately characterized as statistical associations. In addition, the estimates of costs that are presented in Section 3 are usually undocumented in terms of their composition or the methodology used to obtain them. It is likely in most cases that they represent expenditures rather than costs, and it is unlikely that they include in most cases estimates of distortionary costs. In Section 5 we summarize some studies that present estimates of the rates of returns to investments in youth (in contrast to Sections 3 and 4 that address components needed for rates of return estimates). In Knowles and Behrman (2003) we show how to use some of the estimates that are reviewed in this background paper to calculate benefit-cost ratios and internal rates of return for illustrative investments in youth.
3.1 **Estimation Strategy**

In this section we combine the piecemeal information that we have been able to find and review to date on the effects and costs (or cost effectiveness) of investments in youth in developing countries as necessary inputs into the estimation of benefit-cost ratios and internal rates of return. We start with a life-cycle perspective and consider the estimated costs at the time the investments are made and the subsequent effects over the life cycle, based on the best estimates that we have been able to find. For the benefits what are needed are the effects of an investment in youth in such areas as schooling, unemployment, mortality and morbidity, teen pregnancies, and HIV infections. The estimation of benefits, which involves assigning an appropriate monetary value to each effect, is discussed in Section 4. We then summarize some studies that present estimates of rates of return to investments in youth in Section 5.

Table 1 lists the alternative investments in youth that are reviewed in this paper. In surveying the literature on youth investments we have found that there are a number of very serious gaps in the information base that would support the kind of estimates we would like to present in our companion paper (Knowles and Behrman 2003). In developing countries, there is very little evaluation of the effectiveness -- and still less, of the cost effectiveness -- of investments in youth. Of the estimates of effectiveness that are available in the literature, many are not persuasive because they are based on behavioral, not experimental, data and do not control for the behavioral choices that led to the investments in youth the effects of which are being evaluated nor for the many measurement problems (Sections 2.3 and 2.4). Where reliable estimates of effectiveness do exist, the measurement is often over too short a period of time to be useful. The absence of reliable estimates of the effectiveness of investments in youth is clearly the biggest gap in the information base on investments in youth. Without reliable information about the effectiveness of interventions, it is impossible to obtain reliable estimates of the benefits and costs of various interventions.

**Table 1: Alternative Investments in Youth**

<table>
<thead>
<tr>
<th>INVESTMENTS</th>
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<tbody>
<tr>
<td><strong>Schooling</strong></td>
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<tr>
<td>School quality-improving investments (e.g., strengthening inputs, administration decentralization, school autonomy)</td>
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<tr>
<td>Scholarship programs</td>
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<tr>
<td>Enforcement of compulsory attendance laws</td>
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<tr>
<td><strong>Training</strong></td>
</tr>
<tr>
<td>Vocational and technical training</td>
</tr>
<tr>
<td>Adult basic education and literacy (ABEL) training</td>
</tr>
<tr>
<td>Military training</td>
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<tr>
<td><strong>Work</strong></td>
</tr>
<tr>
<td>Enforcement of child labor regulations</td>
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<tr>
<td>Enforcement of other employment regulations (e.g., safety regulations, hours of work, minimum wage, restrictions on layoffs)</td>
</tr>
<tr>
<td><strong>Reproductive health</strong></td>
</tr>
<tr>
<td>School-based reproductive health education</td>
</tr>
<tr>
<td>Social marketing of reproductive health services targeted to youth</td>
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<tr>
<td>Youth-friendly reproductive health services</td>
</tr>
</tbody>
</table>
INVESTMENTS

Linked services
Peer counseling programs
Mass media programs
Workplace/community outreach services targeted to youth
Investments designed to delay age at marriage
Reproductive health policy development
HAART treatment of HIV-infected youth

School health investments
School health policies
School-based health education (apart from RH education)
School lunch/feeding
Micro-nutrient supplements administered to school children
Mass de-worming of school children
Water and sanitation facilities in schools
Presumptive malaria treatment of school children
Periodic physical examinations of school children
School health insurance

Other health investments
Increasing the tax on tobacco products
Ban on tobacco advertising and promotion
Anti-alcohol abuse investments
Anti-drug abuse investments
Mass media investments (apart from reproductive health)
Food supplements for pregnant and lactating women
Food fortification
Road accident prevention
Investments to improve the mental health of youth

Community and other investments
Youth centers
Youth development programs
Micro-credit programs targeted to youth
Youth rehabilitation programs
Sports and recreation programs

Even in developed countries, where there has been a lot of research on youth problems, much of the available research is limited to establishing relationships between various risk factors, on the one hand, and various forms of risky behavior and negative outcomes on the other hand (Knowles and Behrman 2003). For example, it is observed that youth who are “connected” to their schools are much less likely to engage in risky behavior. The possibility that the risk factors, the risky behavior and negative outcomes may all be driven by common unobserved factors is seldom considered in this literature. However, the extensive literature on the effects of teenage pregnancy in the U.S. includes a number of important exceptions to this characterization. See, for example, Hofferth, Reid and Mott (2001).
translated into effective policies. For example, the observation that multiple risk factors are often found in a given youth and appear to be associated with risky behavior that is greater than would be expected in an additive model leads the researchers to conclude that interventions should be comprehensive in scope.

Considerable attention has also been given in the youth literature to costing various negative outcomes. This is useful in estimating the potential benefits from various investments in youth. However, much of this research fails to consider the possibility that the same unobserved factors that may have caused the outcomes also affect their estimated costs. For example, in the discussion of teen pregnancy, it is observed that teen mothers complete fewer years of schooling than women who begin childbearing after age 20. However, at least some of this difference is likely reflect the effects of unobserved factor(s) that affects both the probability of becoming a teen mother and schooling (e.g., low self esteem, low native intelligence, limited options). There is also a tendency to include transfer payments (e.g., welfare payments) as part of the economic cost of various negative outcomes.

3.2 Schooling

The problem of children dropping out of school before completing secondary, or even primary, education is a very serious problem in most developing countries. It affects the poor (and other vulnerable groups, such as girls and ethnic minorities) much more than middle- and upper-income groups in many countries. Governments subsidize education heavily in most developing countries. However, the amount of subsidy provided to students varies considerably by school level and among countries. The intense competition for limited school places at higher levels, which is usually resolved through their performance on national exams, results in a situation in which parents who can afford to do so pay considerable amounts of money for the private tutoring of their children. In most regions, girls fail to attend school and drop out earlier than boys. However, in the Caribbean region, while more boys enter school initially, they tend to drop out proportionately more than girls (CGCED 2002). And recent household surveys for almost every country in Latin America indicate that on the average for recent cohorts girls have higher schooling than do boys (Behrman, Duryea and Szekely 1999). Moreover in at least some cases that girls have lower enrollment rates, it has been misinterpreted to mean that they have lower schooling attainment. For example, that girls had lower enrollment rates in rural Mexico prior to the institution of PROGRESA (see Section 2.4.1) was used to justify higher scholarships for girls than for boys in this program. However careful examination of the data collected by PROGRESA prior to the program reveals that even though girls indeed had lower enrollment rates, they had higher schooling attainment on average because the boys failed and repeated grades more than the girls (Behrman, Sengupta and Todd 2002). Thus the enrollment indicator that was used to rationalize greater scholarships for girls than for boys actually reflected that boys were doing worse in school than girls! It would seem, given the lower schooling attainment for boys than for girls, if there was a reason to establish scholarships that differed by gender, they should have favored boys, not girls.

Various educational reforms have been tried in different countries in an effort to make secondary education accessible to a larger number of students, to retain students until they complete secondary school, to reduce apparent inefficiencies associated with high repetition rates, and to improve the
relevance of what children learn in school (e.g., revising the curriculum to include life skills, basic job skills, and reproductive and sexual health). This review characterizes most such investments as investments designed to improve the quality of schools. However, more recently, several countries have recognized that there are also significant constraints on the demand side, particularly in the cases of the poor and girls. They have begun to address such demand-side constraints through the use of scholarships, loans and vouchers. Lastly, some governments have implemented and enforced regulations on compulsory school attendance and child labor that are motivated in part by a desire to increase school enrollments and reduce dropout rates.

3.2.1 Quality improvement of schools

There are many programs in developing countries that are designed to improve the quality of schooling at both the primary and secondary levels. Some of these programs simply provide additional inputs to schools (e.g., teacher training, curriculum improvement, teaching materials). In some other programs, investments are linked to performance. In addition, many developing countries have also decentralized their schools in recent years, in some cases motivated by a desire to improve school quality by making schools more accountable to local communities.

Illustrative investments

Investments in improving the quality of schooling can be classified into one of the following general categories:

- Improving the quality of the inputs used by schools
- Administrative decentralization
- School autonomy

Improved school inputs. The available estimates of the effect of improved school inputs on education suggest that in many cases schools do not use inputs effectively rather than pointing to possible high-return investments in school quality. For example, among 30 studies on the impact on learning in school of teacher-pupil ratios in the survey that is summarized in Table 2, eight found the relationship to be positive, eight negative, and 14 insignificant. Only for teacher education among those included in this table do more than half of studies—but still only 55 percent—find significant positive effects on learning in schools. Qualifications are necessary because of estimation problems, such as are discussed in Sections 2.3 and 2.4, in many of the underlying studies. But the results still strongly suggest that educational inputs often are not used well. This may reflect lack of knowledge of good education production practices and lack of incentives for adopting the best practices due to information problems inherent in the traditional mechanisms for delivery of education.
Table 2: The significance of selected schooling inputs on learning in school from 96 studies in developing countries

<table>
<thead>
<tr>
<th>Input</th>
<th>Number of Studies</th>
<th>Positive (Significant)</th>
<th>Negative (Significant)</th>
<th>Insignificant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher salary</td>
<td>13</td>
<td>4</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>School teacher-pupil ratio</td>
<td>30</td>
<td>8</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>Teacher’s education</td>
<td>63</td>
<td>35</td>
<td>2</td>
<td>26</td>
</tr>
<tr>
<td>Teacher’s experience</td>
<td>46</td>
<td>16</td>
<td>2</td>
<td>28</td>
</tr>
<tr>
<td>School facilities</td>
<td>34</td>
<td>22</td>
<td>3</td>
<td>9</td>
</tr>
</tbody>
</table>

Source: Harbison and Hanushek, 1992

There are widespread claims that school quality typically is low in developing countries. Reported perceptions of educational quality, moreover, may differ among demanders, suppliers, and governmental officials. Knowles, Behrman, Diokno, and McInnes (1998), for example, conducted a stratified random household survey of 1,890 Vietnamese households and linked school and community surveys in 1996 that provide information on differential perceptions of school quality held by household heads and by school heads—and of changes that would most improve school quality by commune heads and by school heads. Several of their results are of interest for the evaluation of assessments of school quality. First, generally for the primary and the lower secondary levels, the household evaluations tend to be lower than those of school heads. It would appear that there is a systematic tendency for those involved on the supply side of schooling to give more positive judgments than those on the demand side, the households. Second, school-head evaluations are much more associated with observed school characteristics than are household-head evaluations. This may be because school heads are better informed than households about school inputs or because households are concerned more with outcomes and not just inputs. Third, school heads and commune leaders differ in their judgments of what changes would most improve school quality. In the judgments of commune leaders, the two changes that would improve schools the most are better physical facilities (38 percent) and improved teacher training (34 percent), with more teachers (12 percent) and higher pay for teachers (10 percent) the next two most commonly mentioned possibilities. But school heads mention “better teacher pay” (20-23 percent of the cases, depending on the school level) more than twice as often. These patterns are consistent with the possibility for school heads that there is a conflict of interest between improving school quality and increasing school staff compensation. So they may overstate the importance of increasing school staff compensation relative to the perceptions of others.

To address the problems of apparent poor school quality, the difficulties of assessing school quality, and the lack of incentives for increasing school quality, many schooling systems are moving from “top-down” to “client-driven” educational institutions. These changes take several forms: decentralizing the system’s administration, increasing school autonomy, moving to demand-side financing (see Section 3.2.2), and relying on private, nongovernmental, and public-private providers. While each of these institutional reforms has pluses or minuses, they are all attempting to address perceived weakness in the previously overly centralized systems.

Administrative decentralization refers to moving responsibilities to smaller jurisdictional units within a country (from nation to province, from province to municipality). Such decentralization is capable of dealing with information problems with local preferences and conditions. It can also lead
to better coordination and enforcement because of the assumed informational advantage in identifying cheaper and more appropriate ways of providing educational services that also fit the local preferences and monitoring the performance of the providers of these services. Finally, it can strengthen the accountability of local institutions, improving quality and cost-effectiveness.

But such decentralization also may have problems. First, local governments and communities may not have the capacities to produce and manage high-quality educational services. So, the information asymmetry can work both ways. The central government may not know what to do; the local government may not know how to do it. That is why the assessment of local capacity is so important when designing decentralization of education. The allocation of responsibilities between center and local governments must be guided not just by the informational advantages in devolution to local authorities—but by local capacities in carrying out the responsibilities to enhance the quality and efficient delivery of services.

For example, in 1992, India’s National Parliament directed each of the states to establish a three-tiered (district, intermediate, and local) governance structure of locally elected bodies known as panchayati-raj, with responsibilities including elementary and secondary education. While there are not good overall assessments of the overall impact of the changes, the states where these institutions have been functioning for some time reportedly have experienced a number of practical problems. In many cases, control of the new bodies has been captured by local elites, and locally elected bodies frequently found it difficult to take control of problems such as teacher attendance. The local tax bases by which the panchayati-raj institutions must raise their revenues are often weak. Decentralization must be accompanied by resources to local institutional development. Indeed, one analyst concluded that this “democratic decentralization” of education can be viewed as an “investment” in the nation’s future and the short run inefficiencies “will be well worthwhile if, in the long run, a culture of participation and vigilance emerges at the community level” (Hannaway 1995, 14).

Another form of “decentralization” -- increasing school autonomy -- is a move to promote greater control of decisions to the school level – generally also comes with mechanisms for greater direct accountability, typically through a greater involvement of the community and parents with the management of the school. For example, in Nicaragua, an ambitious reform of public schools is underway. The reform intends to give school principals, teachers and parents greater autonomy in managing their schools, placing decisions about staffing, supervision of teachers and students, administration, and pedagogy in the hands of a school council composed of these local stakeholders. Having parents sit and vote in the council has made teachers nervous, watchful, and even resentful. On the other hand, teachers also feel they are more able to influence school operations. There is some indication from student test evaluations that where schools are indeed exercising more autonomy, especially with regard to decision areas pertaining to teachers, students perform better (King and Ozler 2000). In El Salvador, the post-conflict government formalized, improved and expanded the community-managed schools that arose spontaneously when the public system broke down during its devastating civil war. Initial evaluations show that even the poorest communities can set up and manage such schools without sacrificing quality. One reason is that parents can and do monitor teachers vigorously -- student miss only about half the number of days due to teacher absenteeism compared to traditional schools (Jimenez and Sawada 1999).
**Effects**

The effects of investments to improve the quality of schools include:

Increased education
Reduced age at which children complete a given level of schooling

**Increased education.** Improvements in the quality of schools can be expected to increase both initial enrollment rates and levels of cognitive achievement and to reduce dropout rates.

**Philippines.** In the Philippines, a randomized experiment was conducted in 30 schools in which two of the four interventions tested included school feeding (Glewwe 2002). Few of the interventions had a significant effect on drop-out rates, and the effect was small in any case. However, large effects were observed with respect to test scores. The largest statistically significant effects (after corrections for selection bias due to differential drop-out rates) were observed for the intervention that combined parent-teacher partnerships (structured meetings between parents and school officials) with school feeding, i.e., ranging between 0.28 and 0.44 standard deviations for math, Filipino, and English test scores. The provision of multi-level learning materials (pedagogical materials for teachers) with parent-teacher partnerships also had significant impacts, from 0.23 to 1.05 standard deviations for Filipino and English (but not for math).

**Kenya.** A World Bank-supported series of randomized experiments designed to test various interventions to improve the quality of schools is currently ongoing in Kenya (Glewwe 2002). The first experiment involved only 14 schools, 7 of which were selected to receive a standard package of assistance provided by a Dutch NGO. There were no statistically significant effects on cognitive achievement, although the intervention did reduce dropout rates (Glewwe 2002). A second experiment studied the effectiveness of providing textbooks in rural primary schools. One hundred schools were randomly divided into four groups. Twenty-five schools were randomly chosen to receive textbooks for the use of children in grades 3-8. After four years, there was very little evidence of a sizeable impact of the intervention on average test scores (although there is some evidence that textbooks benefited the better students). The results suggest that the impact of textbooks is not as strong as some other studies indicate. In 1997, another 25 schools were selected randomly to receive block grants that could be spent according to several options, such as textbooks, other school supplies, or construction of new classrooms. Preliminary analysis shows a small but statistically significant impact on standardized test scores after one year. In 1998, another randomization was done for all 100 schools, and 50 were selected in which teachers received rewards if their students’ performance on standardized tests improved. The data from this last experiment are currently being analyzed.

**Reduced age at which children complete a given level of schooling.** Improvements in the quality of schools can be expected to reduce repeater rates and possibly the age at which children initially enroll in school. However, on evidence of such an effect was found in the literature.

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41 However, teachers were not specially trained to use the textbooks provided in the Kenya study, as they were in the Philippines study.
Cost and/or cost effectiveness

The available cost data usually refers to expenditures, instead of to full costs (which should include distortionary costs related to tax financing). If investments in quality improvements are limited to public schools, as is often the case, distortionary costs should also include the cost of additional enrollment in possibly less efficient public schools.

Gender

There are important differences by gender in many of the hypothesized effects of increased education (e.g., enhanced productivity, reduced fertility, improved health, delayed marriage, averted teen pregnancies, reduced likelihood of violence and civil conflict, increased risk of school-based sexual or physical abuse).

Country context

The country context will affect the benefits from enhanced labor productivity that are associated with an increased number of years of schooling completed and with improved cognitive achievement. Perhaps most important is whether conditions – including importantly those affected by macro and micro policies – are such that the impact of schooling is great due to rapidly changing markets and technological options (Rosenzweig 1995, Schultz 1975, Welch 1970).

Private versus social benefits and costs

Most of the benefits of investments to improve the quality of schools are private, rather than social. However, reductions in fertility and improved adult and child health (associated with increases in the number of years of schooling completed) have an important social dimension given the nature of available markets and policies (e.g., reduced rates of communicable diseases). We qualify this statement by the reference to the nature of markets and policies because they determine whether and the extent of some important differences between private and social benefits. For example, many claim that there are social benefits to reduced fertility in part because of the reductions in public subsidies for schooling and health care that would result. But if schooling and health services are priced so that the social marginal benefits equal social marginal costs (including all the distortionary costs discussed in Section 2.5.1), then there would not be social gains from reducing the numbers schooled and taken care of by the health system through reducing fertility. And if the social marginal benefits do not equal social marginal costs, then – while reducing fertility through increased schooling may increase efficiency – higher in the policy hierarchy discussed in Section 2.5.3 is likely to be changing the prices of schooling and health services so that the social marginal benefits are more equal to the social marginal costs. It is generally recognized as well that increased levels of schooling produce benefits for society as a whole. The possible impact of increased secondary enrollments among boys on the duration of civil conflicts would be a clear social benefit of these investments.

42 However, one US study (Haveman and Wolfe 1984) identified substantial public benefits of education in the areas of crime reduction, improved social cohesion, increased technological improvements, more equitable income distribution, and increased charitable giving.
Distribution

The benefits of investments that improve the quality of schools accrue only to those who are enrolled in school. In many low-income countries, investments designed to improve the quality of secondary schools (and even primary schools, in some countries) are unlikely to benefit many poor children. Even if poor children are in school, some types of investments are unlikely to benefit them to the same extent as non-poor students. In the Kenya experiment, for example, only the top 20 percent of students, as identified in 1996 pretests, benefited from the provision of textbooks. In the Bangladesh FSSAPs, bonuses awarded to schools for good performance went only to the best schools. Similarly, girls and children from ethnic minority groups may benefit less from such investments because their enrollment rates also tend to be low.

3.2.2 Demand-side investments to increase education (i.e., scholarships, loans and vouchers)

Several developing countries have implemented scholarship programs designed to increase school enrollment and performance among the poor, and particularly among poor girls. Most scholarship programs are implemented by governments, either using their own or donor funds. However, smaller scholarship interventions in Kenya and Morocco are trying to involve the private sector in funding scholarships for girls to attend secondary school (Miske, Moore and De Jaeghere 2000). Whether or not scholarship recipients are permitted to use their scholarships in public or private schools may affect outcomes, as discussed below.

Illustrative investments

Mexico. The PROGRESA program in rural Mexico has been discussed in Section 2.4.1 as a good example of how data collection and analysis for policy evaluation can be integrated into program implementation. We now turn to the effects of scholarships offered by PROGRESA on a number of dimensions of schooling outcomes. PROGRESA offered scholarships to children from families designated as below the poverty line through proxy means tests in grades three through nine who attended school at least 85 percent of the school days in order to induce greater schooling attainment. The scholarships were intended to compensate roughly for the opportunity cost of time of children attending school instead of working. Therefore they increase considerably with the grade level, particularly for the lower secondary grades of seven through nine, at which levels prior to the program enrollments declined a fair amount. Because prior to the program enrollment rates were lower for girls than for boys (even though, as noted above, girls had higher schooling attainment on average because boys repeated grades more often), girls were offered somewhat higher scholarships at the lower secondary level. The impact of this program on age of initial school enrollment, successful progression to the next grade, grade repetition, dropping out, and re-entering after dropping out of school has been analyzed by estimating transition matrices for all the possibilities for each age and how they differ between the treatment and control group in the experimental design (Behrman, Sengupta and Todd 2002).43 This approach allows a fuller analysis of program effects than would emphasis on enrollment rates alone, as in most of the previous literature, and it permits simulating the long-run effects of the program (i.e., what would the effects have been if the program

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43 Information on cognitive achievement is available from tests given in the schools only for the first year after the program was initiated and only for a subsample (e.g., not including those who were not in school at the time that the tests were administered). Behrman, Sengupta and Todd (2000) use these data to investigate the possibility of impacts on cognitive achievement but they do not find significant effects on such tests.
had been in place for a child’s entire schooling experience, not just for two years) even though at the time of the evaluation data were available only for two years of program operation.

Nicaragua. The Red de Proteccion Social (RPS) program in rural Nicaragua, which is modeled after PROGRESA, began with a two-year pilot program in 2000 with a budget of US $10 million (Maluccio 2002). The RPS pilot was implemented in two stages. The first stage was implemented in about 6,000 households from 21 randomly selected census districts (comarcas) from among the poorest 42 census districts in six municipalities, on the basis of geographic targeting. Cash transfers were provided to households separately to promote the program’s health, nutrition and food security objectives and its education objectives. All households in the 21 randomly comarcas were eligible for the health, nutrition and food security cash transfer (bono alimentario). The cash transfer was contingent upon attendance by one designated adult household member at bimonthly educational workshops and on bringing their children under 5 for scheduled healthcare appointments. Only households with one or more children age 7-13 who had not completed grade 4 were eligible to receive education cash transfers, which were of three types (a basic household grant, a supplementary grant for each student for student supplies, and a grant for teacher bonuses and school supplies). The education cash transfers were contingent on matriculation and regular attendance. The total of the two transfers amounted to about 21 percent of total annual household expenditures among the recipient households. Data were collected both before and one year after the first phase of the RPS pilot began implementation in both the 21 intervention and 21 control comarcas.

Bangladesh. One of the largest student scholarship programs, the Bangladesh Female Secondary School Assistance Projects (FSSAPs), currently covers approximately three million female secondary school students in the 118 poorest thanas of Bangladesh (about one-fifth of the total). The FSSAPs are funded both by donors (mainly the World Bank and the Asian Development Bank) and by the Government of Bangladesh (World Bank 2000). Stipends of $16 are shared between girls and their schools, provided the girls meet the following criteria: 1) attend school regularly, 2) achieve stipulated minimum grades on internal examinations, and 3) remain unmarried.

Also in Bangladesh, the Government supports a Food for Education (FFE) Program in which food is distributed to parents in poor areas who keep their children in school. The 1998 Bangladesh Poverty Assessment includes a cost-effectiveness analysis of the FFE program (World Bank 1998).

Nepal. The School Scholarship Program (SSP), which is modeled after Bangladesh’ FSSAPs, provides scholarships to girls to attend primary and secondary schools in all 75 districts of the country (Miske, Moore and De Jaeghere 2000). During the 1994-95 school year, there were almost 10,000 beneficiaries of the program.

Brazil. The Child-citizen Stipend Program was begun in 1996 in an effort to reduce child labor (Miske, Moore and De Jaeghere 2000). Stipends were given each month initially to 3,710 children ages 7-14 in 17 municipalities of two states as long as the children remained in school and out of the labor force. By 1998, the program had expanded to cover 117,200 children in 114 municipalities of six states.

Colombia. The government-created the PACES voucher program for secondary school students in 1991 to enable poor children to attend private schools (Miske, Moore and De Jaeghere 2000).
1996, the program (the PACES program) was covering about 100,000 students. Evaluation of the PACES program was facilitated by the fact that vouchers were initially awarded by lottery in areas in which the number of students applying for vouchers exceeded the number available (a natural experiment). An evaluation compared the outcomes of lottery winners and losers after three years (Angrist et al. 2002).

Jamaica. The government helps parents with school and exam fees and provides grants to low-income students enrolled in public universities (CGCED 2002). During the 1997/98 school year, fee assistance was provided to 38,500 students at selected secondary schools at a cost of US$4.0 million (CGCED 2002).

Effects

The effects of scholarships and other demand-side investments designed to increase schooling include:

- Increased education
- Reduced age at which children achieve a given level of schooling
- Reduced adult work effort (a cost)

In addition, some demand-side investments include components designed to produce the following additional effects:

- Improved quality of schools
- Delayed marriage

The findings of evaluations of some programs with respect to these effects are summarized below:

Increased education.

Mexico. In the PROGRESA program, the effects included reductions in grade repetition, dropout rates and increases in rates of reentry after dropping out. These results suggest that focusing on enrollment rates alone would be misleading. The estimated long-run impact of the program would be to increase schooling attainment for 14 year olds by 0.7 grades (almost twice as much as might be inferred from considering only the effects on enrollment) and increase the progression rate from primary to lower secondary by 21 percent. The effects are somewhat larger effects for boys than for girls even though scholarships are higher for girls, perhaps because boys are much more involved in wage labor than are girls so the provision to the household of scholarships in the form of money is a better substitute for what the boys would have been doing were they not in school than for what the girls would have been doing or because the work that boys do more easily can be shifted to accommodate attending school than that which girls do. There are effects of reducing repetition rates even for children who are too young to be in the program, suggesting forward looking behavior (the study does not find evidence of other explanations such as an income effect). Even though the program increased enrollment and thus pressures on school resources, there is no evidence of negative spillover effects on children attending the same schools but who were not eligible for the program.
Nicaragua. In the RPS pilot, initial enrollment (i.e., enrollment at the beginning of the school year) was 22 percent higher in the intervention areas, as compared to the control areas, while continuing enrollment (i.e., enrollment about 3 months before the end of the school year) was 29 percent higher (Maluccio 2002). The retention rate (i.e., the rate of children progressing from one grade to the next) was 8 percent higher in the intervention areas, as compared to the control areas. There was no difference in the program effects on initial or continuing enrollment or on retention rates by sex.

Bangladesh. The FSSAP programs appear to have been successful in increasing female secondary school enrollment rates (which are now almost at parity with those of males) and academic performance, largely, it appears, via improvements in attendance (Miske, Moore and De Jaeghere 2000). However, no rigorous evaluation of the program’s impact is yet available; and some have suggested that the improved academic performance of girls enrolled in the program may be illusory, i.e., that schools may have fudged academic and attendance records to maintain a student’s eligibility (since some of the scholarship money is received by schools). The FSSAP programs have also been criticized by some for poor targeting (i.e., that the subsidies are received only by families with girls in secondary school).

In the case of the FFE program (also in Bangladesh), econometric estimates (based on cross-section household survey data and using instrumental variable estimation) indicate that primary enrollment increased by 21.1 percent for every additional 100 kg of food grains that a participating household received (Ravallion and Wodon 2000).

Colombia. The PACES voucher program evaluation did not find any significant impact on enrollment. However, the evaluation found that lottery winners were 15 percent more likely to attend a private school (Angrist et al. 2002). Lottery winners had completed 0.1 more years of schooling (primarily due to lower repetition rates) and were about 10 percentage points more likely to have completed the 8th grade. The program had no effect on dropout rates. However, lottery winners scored 0.2 standard deviations higher on standardized tests.

Nepal. The SSP has been criticized for awarding too few scholarships to too few girls. However, an evaluation of the USAID-funded Female Education Scholarship Program, which covers only one district (Banke) and which awarded 3,478 scholarships in 1995, found that the program increased enrollment, lowered dropout rates, improved attendance rates, improved girls’ self-confidence and feelings of self worth, increased parent involvement, and improved school finances (Miske, Moore and De Jaeghere 2000).

Brazil. The Child-citizen Stipend Program has apparently been successful in expanding school enrollment and in reducing child labor. However, there is evidence that adults have reduced their work effort as a result of receiving the stipend.

Unfortunately, there are no estimates of the effect of the Jamaican Government’s program of education grants to low-income families on such outcomes as enrollment and number of years of schooling completed (CGCED 2002).
Age at which a given level of schooling is completed. Scholarship programs may have an effect on repetition rates, which would affect the amount of time that children take to complete a given level of schooling. In the PROGRESA program, as mentioned above, it was estimated that 14 year-olds in the program complete about 0.7 years of schooling than 14 year-olds not in the program. In Colombia’s PACES program, lottery winners had completed 0.1 more years of schooling (primarily due to lower repetition rates) and were about 10 percentage points more likely to have completed the 8th grade. Scholarship programs may also affect the age at which children enter school, which would also affect the age at which they complete a given level of schooling. In Nicaragua’s RPS program, the strongest enrollment effects were observed in the younger age groups, suggesting that the program achieved a reduction in the age at which a given level of schooling was completed (Maluccio 2002).

Reduced adult work effort. To the extent that scholarship programs transfer income to households, it is possible that they will have some negative effect on adult work effort. In Brazil, for example, there is evidence that the Child-citizen Stipend Program may have resulted in reduced adult work effort. This is an example of a distortionary cost of investments in scholarship programs (see discussion below of costs).

School quality. Scholarship programs can improve the quality of schools if schools compete for scholarship recipients and/or if scholarships channel additional resources into schools. In Nepal, an evaluation of the USAID-funded Female Education Scholarship Program found that the program improved school finances (Miske, Moore and De Jaeghere 2000). However, in Colombia, a problem of poor quality has been reported in some of the new secondary schools that have emerged as the result of the PACES voucher program (Miske, Moore and De Jaeghere 2000). The Female Secondary School Assistance Projects (FSSAPs) in Bangladesh provided bonuses to schools on the basis of the percentage of female students in Class 10 (the last year of secondary school) that pass a standard national exam (Miske, Moore and De Jaeghere 2000). However, this bonus system did not have any significant effect in improving school quality because the awards went only to the best-quality schools (Miske, Moore and De Jaeghere 2000).

Delayed marriage. Scholarship programs may have an effect on age at marriage beyond the normal effect of school enrollment. For example, the FSSAP programs in Bangladesh impose non-marriage as a condition of eligibility for the scholarship. In the evaluation of Colombia’s PACES voucher program, it was found that lottery winners were less likely to be either married or cohabiting as teenagers.

Cost and/or cost effectiveness

The costs of scholarship programs include the cost of any additional schooling that results (which is often at least partly financed by households), the cost of administering the program, and any discretionary costs related to the financing of the program (e.g., the deadweight cost of collecting the necessary taxes to finance the program) and to any reduced work effort on the part of adults and children. The costs of scholarship investments do not include the cost of the scholarships themselves, which are a transfer.

According to the findings of the evaluation, the Colombian voucher program (PACES) increased annual public educational expenditure by about $24 per lottery winner, taking into account both the
savings that occurred when lottery winners shifted to private schools and the cost of the vouchers (Angrist et al. 2002). Private costs were estimated to be $19 per lottery winner (i.e., the sum of total household cash expenditure on education and the imputed value of children’s time not spent working, less the value of the voucher). Total social cost of the program was estimated to be $43 annually per lottery winner, or $195 over a three-year period (after adjusting for different rates of voucher take-up in each year of the program).

No cost estimates were provided in the evaluation study of the RPS pilot in Nicaragua (Maluccio 2002). However, it was reported that considerable administrative effort was needed to implement the pilot. In addition, adjustments were necessary on the supply side to accommodate the increased number of students (e.g., increasing the number of sessions per day and the number of teachers). In some cases, beneficiary parents were convinced by RPS to use some of their transfers to help pay for a new teacher.

The annual cost per beneficiary in the Jamaican Government’s program of education grants to low-income families is about $104 (CGCED 2002). However, it is unclear whether this estimate represents program costs or expenditure.

**Gender**

Scholarship programs can be targeted to girls, as in Bangladesh. In this case most of the effects are specific to girls. However, if scholarships are not targeted to girls, some of the effects can be expected to differ by gender. For example, many of the components included in the broad increased enrollment effect will affect boys and girls differently (e.g., risk of teen pregnancy, delayed age at marriage).

**Country context**

The enrollment effect of scholarship programs depends on the size of the scholarship in relation to the opportunity cost of the child’s labor (in addition to the other direct and indirect costs of attending school).

**Private versus social benefits and costs**

The scholarships themselves are transfers. However, there are real private costs associated with such investments, including the opportunity cost of the students’ time and the direct and indirect costs of attending school (e.g., school fees, transportation costs, cost of uniforms and books). In cases where scholarships must be spent in public schools, and if public schools are inefficient providers of schooling services (as is often the case), the social marginal cost of schooling may be lower than the private marginal cost.

**Distribution**

Well targeted scholarship programs have the potential to reach the poor and other vulnerable groups (e.g., women, ethnic minorities). There is some independent evidence that the Food for Education (FFE) program subsidies are reasonably well targeted (Ahmed, del Ninno and Chowdhury 2000).

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44 No estimates were reported of the possible effect of the vouchers on adult work effort.
However, the fact that they are linked to actual enrollment may create problems. For example, if scholarships are geographically targeted (e.g., made available in poorer areas, as in Bangladesh) and are too small to affect enrollment among the poor, it is possible that most benefits will accrue to the non poor (including any existing public subsidies to schools). In fact, the FSSAP programs in Bangladesh have been criticized by some observers because the subsidies are received only by families with girls in secondary school.

3.2.3 Enforcement of compulsory school attendance laws

Compulsory school attendance laws may be effective in increasing education by increasing school enrollment and attendance (Basu 1999a).

Illustrative investments
No examples found.

Effects
Investments that raise the age of compulsory school attendance are designed to increase education. Their proximate effects should include a reduction in dropout rates in the grades attended by the targeted age group and therefore an increase in enrollment rates. Because these laws may reduce the time children are available for work, there may be an additional effect (positive) on adult work effort. The possible effects of compulsory school attendance laws therefore include:

- Increased education
- Adult work effort

Increased education. Angrist and Krueger (1991) demonstrate that compulsory school attendance affects school attendance and educational attainment in the US. They estimate that roughly 25 percent of potential dropouts remain in school because of compulsory schooling laws. Compulsory school attendance laws may result in some increase in repetition rates and some reduction in average levels of cognitive achievement if the children whose behavior is affected by such laws do less well in school.

Adult work effort. Households may respond to a reduction in the time children have available for work by expanding the supply of adult labor.

Cost and/or cost effectiveness
The costs of these interventions include the direct cost of enforcing the necessary laws and the cost of providing schooling to additional numbers of children.

Gender
In settings in which female school enrollment is substantially lower than male enrollment, investments to establish and enforce compulsory attendance laws can be expected to affect girls more than boys.
**Country context**

Investments to establish and enforce compulsory attendance laws would have stronger effects and probably greater social and private benefits in countries in which girls’ enrollment rates are substantially lower than boys’ (for reasons discussed below). This type of investment is also more attractive (compared to a scholarship program) in a country with limited public resources for education or in which the costs of financing and administering a scholarship program would be relatively high.

**Private versus social benefits and costs**

To the extent that the social benefits of schooling exceed the private benefits, investment of public funds to establish and enforce compulsory attendance laws can be justified. The case for public investments is likely to be stronger in the case of countries in which girls’ enrollment rates are substantially lower than those of boys because it is widely believed that the social rate of return to additional schooling exceeds the private rate of return to additional schooling to a greater extent among girls than among boys.

**Distribution**

The effects of investments to establish and enforce compulsory attendance laws will have a much greater impact on the poor. To the extent that the laws are complied with, one result will be that the share of public education subsidies captured by the poor will rise. However, the main distributional effect of this type of investment may be inter-generational. Most of the private costs of increased school attendance will fall on parents, and most of the benefits will be received by children. The distributional impact of compulsory school attendance laws is quite different in this respect from scholarship programs, which compensate parents for the loss of their children’s labor.

### 3.3 Civilian and Military Training Programs for Out-of-School Youth

Many youth neither work nor attend school. Some of these youth are openly unemployed, i.e., not currently working but actively searching for work. Youth unemployment rates are typically at least twice, and sometimes three times, national rates. In Jamaica, for example, the unemployment rate among youth ages 15-24 was 33 percent in 1998, compared to a national rate of 16 percent (CGCED 2002). Other youth are not actively seeking work because they do not believe that work is available. Accordingly, unemployment rates tend to understate the magnitude of the youth employment problem. Youth unemployment rates are typically higher among girls. Unemployed youth are more likely to be drug users and to engage in criminal activity (CGCED 2002).

Many governments provide training and skills development programs targeted to unemployed youth. In addition, military service often provides a vehicle for training youth, particularly males with limited schooling. NGOs and for-profit organizations (i.e., commercial training institutions) also provide vocational and technical training in many countries. Unfortunately, there are few studies evaluating the effectiveness of vocational and technical training programs or of military service.
3.3.1 Vocational and technical training

Illustrative investments

Bangladesh has extensive programs of vocational and technical training. These programs have been criticized on many grounds, including the failure to include women and the poor, cost ineffectiveness, and a failure to involve the private sector (World Bank 2000). Many NGOs and some commercial training centers also provide vocational and technical training.

Effects

The possible effects of vocational and technical training include:

Increased education
Averted youth unemployment

Increased education. There are few estimates of the effect of vocational and technical training on cognitive achievement. The few available estimates have not considered the problem of selectivity bias.

Reduced youth unemployment. There are no reliable estimates of the effect of vocational and technical training on the youth unemployment rate.

Cost and/or cost effectiveness

Table 3 compares the cost and effectiveness of Bangladesh Government vocational and technical training programs with those of a large program managed by an NGO.

Table 3: Comparison of cost and effectiveness of government and UCEP (NGO) training institutions in Bangladesh

<table>
<thead>
<tr>
<th>Institution</th>
<th>Annual cost per student (US$)</th>
<th>Completion rate (%)</th>
<th>Examination pass rate (%)</th>
<th>Employment rate (%) of graduates (within 6 months)</th>
<th>Overall success rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
</tr>
<tr>
<td>Government vocational training institutes (VTIs and TTCs)</td>
<td>$500-1,000 (VTIs) $1,500 (TTCs)</td>
<td>80</td>
<td>70</td>
<td>40-50</td>
<td>25</td>
</tr>
<tr>
<td>UCEP (NGO)</td>
<td>$350</td>
<td>95</td>
<td>100</td>
<td>95</td>
<td>90</td>
</tr>
</tbody>
</table>


However, it is noted that one review of the literature concluded that institutionalized pre-employment training for entry-level jobs is not a cost-effective solution to youth unemployment (Dougherty 1989).
Gender
The types of vocational/technical training investments that governments make is likely to affect the gender composition of benefits, particularly if some types of jobs are mainly performed by one gender.

Country context
As with education, the benefits of vocational/technical training are likely to be closely related to the economy’s capacity to use trained labor. However, the benefits of such training may also be affected by opportunities in some countries to export trained labor to other countries.

Private versus social benefits and costs
The case for public subsidies of vocational/technical training is probably weaker than that for general education and even university education. There are no public goods involved and no significant externalities, apart from those possibly associated with youth unemployment (i.e., reduced risk of crime and civil disturbances).

Distribution
As with any subsidized good or service, there is a strong likelihood that demand will exceed supply at the subsidized price. Hence, rationing of admission to vocational/technical training programs is likely. Under these circumstances, it is likely that the non-poor will receive favorable treatment. Many programs also have basic education requirements that tend to screen out the poor (in some cases, as a rationing device) and that serve to increase the problem of selectivity bias in measuring program effects.

3.3.2 Adult basic education and literacy training
In many developing countries, especially very poor countries, there is a large population of youth that have either never attended school or who dropped out before attaining basic literacy and numeracy skills. In Bangladesh, for example, there are currently about 40 million illiterates 8-35 years of age. About 6.3 million of these are working children ages 8-14. In 1996, the incidence of poverty was 48 percent among illiterates, compared to 20 percent among literates (World Bank 2002a).

Illustrative investments
Bangladesh is currently implementing four large-scale non-formal (“mass”) education programs that provide basic education and literacy training to a target population of 34 million learners (World Bank 2000). Two of these programs are targeted to youth. The first is targeted to youth 15-24, is center-based and is implemented by NGOs with funding from the Government. The second program, which is also center-based and implemented by NGOs with government funding, is targeted to children 8-14 who have dropped out of school and are already working. It is a two-year program that also provides some vocational and technical training and training in life skills. In addition to these two programs, the Government itself implements a large literacy program targeted to persons ages 15-45, using a campaign approach and volunteers.
**Effects**

The possible effects of literacy training include:

**Increased education.** The main effect of literacy programs is to produce literate and numerate persons. However, some literacy programs also include other basic education, limited vocational and technical training and training in life skills. The available evidence suggests that the successful completion of adult literacy and basic education courses is associated with many of the favorable outcomes associated with formal schooling (Oxenham and Aoki 2002). Unfortunately, literacy programs are seldom carefully evaluated to determine their effectiveness in terms of cognitive achievement, nor is there usually any attempt to assess how long any effects last after the training ends (Oxenham and Aoki 2002). There are no randomized experiments in this area of education, and there have not been attempts to estimate the rate of return to investment in adult basic education. Nevertheless, in some countries adults spending as little as one year in a basic education course outperform primary school children from grades 3 and 4 in standardized tests (Oxenham and Aoki 2002). One study concludes that literacy equivalent to four years of primary schooling can probably be attained in a course of 9-12 months’ duration providing 350-400 hours of instruction (World Bank 2002e). In order to obtain an estimate of the benefits in monetary terms of investments in adult basic education and literacy (ABEL) investments, it is usually necessary to estimate the level of cognitive achievement attained by a successful trainee in terms of the equivalent number of years of primary schooling completed. It is usually assumed that the level of cognitive achievement of successful ABEL trainees is the equivalent of four years of primary schooling (World Bank 2002b).

**Cost and/or cost effectiveness**

The unit costs of adult basic education programs can vary from US$1.93 in strongly voluntary programs up to $37.00, where several levels of paid staff operate (Oxenham and Aoki 2002).

In Bangladesh, the cost per beneficiary in the center-based program targeted to youth ages 15-24 is about $18 (World Bank 2000). The cost of the center-based literacy program targeted to children ages 8-14 is about $52 per beneficiary. The unit cost of the government’s large-scale campaign program targeted to the population ages 15-45 is about $7-8 per beneficiary.

A recent evaluation of eight adult basic education and literacy (ABEL) projects in five countries (i.e., Indonesia, Bangladesh, Ghana, Senegal and Ivory Coast) during the period 1997-2002 (World Bank 2002b). It found that unit cost per enrolled learner (in terms of current exchange rates) varied between US$5.46 (Indonesia) and $57.67 (Senegal), with a median of $12.85 (Bangladesh). The cost per person completing a course ranged between $11.73 and $73.65, with the cost per person achieving a passing mark in a formal assessment ranging between $11.73 and $76.70. Estimates of the cost per successful learner in constant 1996 US$ were available for four projects, i.e., Ghana-1 ($27.59), Ghana-2 ($37.07), Bangladesh ($20.40) and Senegal ($97.78). Expressed as a ratio to the
estimated cost of four years of primary education, the estimates were as follows: Ghana-1 (13.3 percent), Ghana-2 (17.8 percent), Bangladesh (33.3 percent) and Senegal (15.0 percent).45

Gender
Literacy programs are likely to benefit women more than men in countries where formal schooling has disproportionately benefited men in the past. The rates of return (and particularly, the social rate of return) are likely to favor literacy programs that largely benefit women.

Country context
To the extent that there are substantial economies of scale involved in literacy programs, these investments are likely to yield a greater return in countries with relatively high rates of adult illiteracy. The benefits of literacy programs also are likely to depend on whether the economy provides increased opportunities to literate workers.

Private versus social benefits and costs
As with primary education, there are likely to be substantial social benefits to literacy, and the difference between social and private benefits is likely to be higher among women.

Distribution
Investments in literacy training are likely to benefit the poor more than proportionately (i.e., are likely to be pro-poor investments) because they account for a disproportionate number of the illiterate (Oxenham and Aoki 2002).

3.3.3 Military training
Substantial numbers of male youth in most developing countries enter the military service. While the primary purpose of such service generally is national defense, there often is emphasis on some training, as well as on developing good work habits such as punctuality and discipline, that probably lead to greater subsequent productivity whether in the military or in the civilian work force.

Illustrative investments
No examples found.

Effects
The possible effects of military training include:

- Reduced youth unemployment
- Increased education
- Enhanced national security

45 This comparison is not intended to suggest that the levels of cognitive achievement are similar between those successfully completing an ABEL course, involving 300-400 hours of instruction, and those completing four years of primary school, involving 3,500-4,000 hours of class work. Rather the comparison is provided to adjust for differences in general conditions in these three countries.
Reduced youth unemployment. There may be some effect of military training programs on youth unemployment. However, there is no information on such an effect.

Increased education. Some types of military training may enhance cognitive skills. However, no information is available on this effect.

Enhanced national security. Presumably, a trained military is more effective in promoting national security than an untrained military. However, there is no information on this effect.

Cost and/or cost effectiveness
No information is available on the cost or cost effectiveness of investments in this area.

Gender
Military training is more likely to benefit males than females.

Country context
The benefits of investments in this area are likely to be greater in countries with larger militaries.

Private versus social benefits and costs
Enhanced national security is clearly a public good. Reduced youth unemployment and increased education provide a mix of private and social benefits.

Distribution
In many (if not most) developing countries, military trainees are from poorer socio-economic groups. However, military recruits may not come proportionately from certain ethnic or religious minority groups.

3.4 Work

Work is a major activity for youth, more so at younger ages in poorer countries. Work is often considered a competitor with schooling for the time of youth. To the extent that this is the case, then work lessens human capital investments through formal schooling or training, and thus may increase the income of children’s families in the short run at the cost of lower income-generating (and perhaps other positive effects) in the longer run. But learning to be more productive in an economic sense also generally is thought to occur through work. If so, then children working may be less costly in terms of their long-run options than is often assumed. Moreover, children may work while they are in school. Indeed, some recent estimates for the United States suggest that the usual estimates of the returns to schooling are overstated because they are including as a return to schooling the return in the form of human capital of working while in school (Light 2001).

3.4.1 Child labor and related regulations

One major type of regulation that has been promoted increasingly in developed countries as appropriate for developing countries would outlaw work by children under certain ages, often 16. While the promoters of such legislation may be well-intentioned, it is not clear that this advocacy
always is well-informed about what the alternatives might be. Regulations that effectively preclude child labor in the formal sectors of economies, for example, may result not in more schooling, but in more child labor in unregulated sectors including risky activities such as farming, street-vending, and prostitution. If the intent is to increase human capital investment in children therefore, the gain may be greater by using the carrot of making schooling more attractive (see Section 3.2) rather than the stick of precluding their employment in work than can be regulated. It is also much easier to enforce a law that requires that children attend school than one that requires them not to work (Basu 1999).

Illustrative investments

The International Labour Organisation (ILO) developed the first Minimum Age Convention in 1919 that regulated the age at which children could work (UNICEF 2001). A more comprehensive Minimum Age Convention, Number 138, was adopted in 1973 and remains the international standard. Other important international conventions include the 1989 Convention on the Rights to the Child and the ILO 1999 Convention Number 182 against the Worst Forms of Child Labor.

Illustrative investments would include efforts by governments to enforce prohibitions against child labor or regulations such as appropriate ages for certain types and hours of work and the maximum number of hours children could work per day or per week.

One program in Bangladesh attempted to eliminate child labor in the garment industry. As part of the program, more than 11,000 previously employed children were provided with non-formal schooling and vocational training provided by NGOs (UNICEF 2001).

Effects

The possible effects of the enforcement of enforcing child labor laws and regulations include:

Averted child labor
Reduced labor productivity (a possible cost from loss of work experience)

Reduced child labor. The primary effect of the enforcement of laws designed to eliminate or curtail child labor is to reduce the extent of child labor. The history of child labor laws provides mixed evidence of the effect of such laws on child employment (Basu 1999). However, the effectiveness of the enforcement of regulations related to child labor vary to some extent with the type of regulation that is enforced. For example, enforcement of regulations stipulating the type of work that children can do may reduce the negative health effects of child labor (as children shift to other types of work) without having much effect on schooling or the human capital formed by work experience.

Reduced labor productivity. Some types of child labor may help youth to acquire useful skills. The effects of reducing child labor should include any possible loss in skills that results from lack of on-the-job experience on the part of children who no longer work. It is often assumed (based on
econometric studies of earnings) that one year of lost work experience translates into a one percent reduction in labor productivity.46

Cost and/or cost effectiveness
There is no information in the literature on the cost of enforcing child labor laws in developing countries. In addition to these direct costs, one would want to consider the possible cost in terms of lost work experience. If the benefits include increased education (which should occur if the regulations are effectively enforced), the costs should include the cost of providing the additional schooling.

Gender
There is evidence that boys have higher rates of labor force participation outside the home. Accordingly, they are more likely to be affected by effectively enforced child labor laws.

Country context
The benefits of investments designed to reduce or regulate child labor are directly related to the extent of child labor, and to the extent that it exposes children to health risks. The costs of enforcing child labor laws and regulations may not be very elastic with respect to the number of child workers. If this is true, it would suggest that this type of investment is likely to yield a higher return in countries with significant proportions of children working.

Private versus social benefits and costs
Laws against child labor are usually motivated in part by a desire to see children attend school rather than work. There is a presumption that parental decisions about children’s schooling may not fully reflect the long-run benefits of schooling because parents are not benevolent decision makers and are unable to capture fully the benefits that accrue from investing in their children’s schooling (although in most contexts they are likely to capture some of them through transfers).

Distribution
Enforcement of laws that curtail or eliminate child labor are likely to affect adversely the welfare of poor households to a greater extent than non-poor households. In a nine-country study in Latin America, for example, it was found that poverty rates would be 10-20 percent higher if teenagers were not working (UNICEF 2001). They may also benefit children compared to parents. However, to the extent that the income earned by children is used to pay for schooling (possibly of siblings), the inter-generational distributional effect may be ambiguous.

3.4.2 Enforcement of other employment regulations
Many developing countries have laws and regulations that regulate working conditions (e.g., minimum wage laws, hours of work, occupational safety regulations). Although many of these laws and regulations are beneficial to the work force, some make it unprofitable for firms to expand

46 Some studies of the economic impact of teenage pregnancies in the US have found that a negative effect of teenage pregnancy on earnings via reduced schooling is largely offset by the positive effect on earnings of additional years of work experience gained by teen mothers (Hofferth, Reid and Mott 2001).
employment. This can result in higher levels of youth unemployment. The example of India, which
unlike most of the dynamic and fast growing East and Southeast Asian economies tried to protect the
welfare of labor through the implementation of a variety of legislation, is illuminating. India has
adopted over the years laws that protect trade union rights, guarantee a minimum wage, and prevent
both layoffs and the retrenchment of labor. While the intentions have always been to protect the
welfare of labor, many observers believe the legislation has made the economy much less flexible
and has actually ended up harming the overall interests of labor.

Illustrative investments

In India, regulations governing the retrenchment of labor may be an important factor contributing to
youth unemployment (Basu, Fields and Debgupta 1998). According to the currently amended
version of the Industrial Disputes Act, firms employing 100 or more workers and intending to close
their business, must give at least a 90-day notice to workers or their representatives and to the
government. Ultimately, it is the government that decides on the intended closure after hearing the
positions of both the firm and the workers. Usually, the government denies permission to close.
While the regulations are less stringent for firms employing fewer workers, especially for those with
fewer than 50 employees, the fact remains that workers can still resist being dismissed by appealing
to other laws, such as the Indian Contracts Act of 1972. In view of the inflexibility imposed by the
regulations on retrenchment, Indian firms have responded to them in ways that appear to be harmful
to workers’ interests in general, and particularly to unemployed youth, including: avoiding
particularly labor intensive product lines, adopting more capital intensive production processes, sub-
contracting production to smaller firms and encouraging inter-union rivalries. Although it is difficult
to arrive at a precise quantitative estimate of how these regulations affect employment levels,
employment statistics by firm size suggest that the larger firms that have come under these
regulations have responded by reducing their levels of employment (Table 4).

Table 4: Employment by Firm Size, India 1982/83 – 1990/91

<table>
<thead>
<tr>
<th>Firm Size (measured by employment)</th>
<th>No. of workers In 1990-91</th>
<th>Percent change over 1982-83</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-49</td>
<td>957,922</td>
<td>18.6</td>
</tr>
<tr>
<td>50-99</td>
<td>443,276</td>
<td>-5.2</td>
</tr>
<tr>
<td>100-199</td>
<td>280,631</td>
<td>-28.5</td>
</tr>
<tr>
<td>200+</td>
<td>288,135</td>
<td>-43.0</td>
</tr>
</tbody>
</table>


If it is indeed labor regulations that have been responsible for the apparent decline in employment by
larger firms then the situation is an unfortunate and paradoxical one for Indian labor and the
economy. A law meant to protect labor may have had the diametrically opposite effect by reducing
overall employment opportunities.

Effects

Investments designed to reduce or remove the adverse effects of employment regulations can be
expected to reduce youth unemployment. However, it is important to consider that many existing
employment regulations, particularly in developing countries, have little effect on youth
unemployment either because they are not binding and/or because they are ineffectively enforced (Squire and Suthiwart-Narueput 1997).

Cost and/or cost effectiveness
No estimates of the cost or cost effectiveness of investments of this type are available.

Gender
There may be important gender differences in the benefits from investments in this area, depending on the gender structure of employment in industries affected by employment regulations.

Country context
The degree to which employment regulations are binding and/or effectively enforced is an important country-level characteristic that affects the economic returns to investments in this area.

Private versus social benefits and costs
Private investment in government employment regulations is not an option. Investments of this type are therefore a pure public good.

Distribution
Investments in this area are unlikely to benefit the poor, who are unlikely to be effective candidates for the jobs that might open up in previously regulated sectors.

3.5 Reproductive Health

Age at puberty is dropping worldwide, while age at marriage is increasing everywhere, except in some countries of Latin America and the Caribbean (FOCUS 2001). Most youth worldwide have had their first sexual encounter by age 20, although whether or not this occurs in or before marriage varies across countries. These trends mean that the time span during which single youth are at risk of contracting STIs or becoming pregnant out of wedlock is increasing. Partly as a consequence of these trends, youth in developing countries face many problems in the area of reproductive health. STI and HIV/AIDS infection rates tend to be highest in the 20-24 age group. Teen pregnancy is a problem in many countries, often leading to unsafe abortions or to births with complications (e.g., premature and complicated deliveries, low-birth weight babies, nutritional deficiencies) and to females dropping out of school.

It is estimated that 40 million people worldwide are currently living with HIV or have AIDS. At least one-third of these are young people aged 15 to 24. In 1998, more than 3 million young people worldwide became infected, including 590,000 children under 15. In many countries, over 50 percent of all infections are among 15 to 24-year-olds, who are likely to develop AIDS in a period ranging from several months to more than 10 years (FOCUS 2001, CGCED 2002). In Uganda, infection rates among youth ages 15-19 decreased from 22 percent in the early 90s to 8 percent in 1998, demonstrating that behavior change is possible among youth (FOCUS 2001). This decline was associated with strong political leadership, public awareness campaigns, social marketing of condoms, and voluntary counseling and testing.
Youth often do not have access to contraceptives or, when they do, fail to use them. For example, almost one-half (47 percent) of sexually active youth in the Caribbean region do not use condoms. Even where knowledge about sexuality and contraception is high, as in Jamaica, it does not translate into preventive behavior. (CGCED 2002). As a consequence, 87 percent of teen pregnancies were unplanned. Worldwide, an estimated 29 million women ages 15-19 lack the contraceptive protection they need to avoid pregnancy (FOCUS 2001). Adolescents experience higher rates of contraceptive failure and are more likely to discontinue use than adults (FOCUS 2001). Since many sexual encounters of youth are unexpected, and hence neither the male nor the female is practicing regular contraception, emergency contraception can prevent unwanted teen pregnancies, and it can also prevent unsafe abortions, with all their attendant costs.

Young, unmarried women are more likely to have clandestine or illegal abortions than older women, and they are more likely to suffer from unsafe abortion because they tend to wait longer before having an abortion (FOCUS 2001). Youth are also more likely to experience a spontaneous abortion. Adolescents account for about one-third of all abortion complications. Post-abortion care that is youth-friendly and includes counseling to prevent additional pregnancies is a very important part of a reproductive health program targeted to youth.

Female-genital mutilation, which is geographically concentrated in some African countries, can produce long-lasting physical and mental health problems (FOCUS 2001, WHO 1996a).

Program settings for youth RH programs can be schools, health facilities, mass media, the workplace, or the general community. Popular investments in youth reproductive health include: school-based health education (in some cases linked to services), youth-friendly reproductive health services, social marketing, and peer counseling. Unfortunately, reliable information on the effects of youth reproductive health investments is limited (FOCUS 2001). Many investments have not received thorough impact evaluations using a rigorous design. In addition, only a few evaluations examine the effects of investments on the actual use of health services. Those examining effects on knowledge, attitudes, and practices are limited to school interventions. Many investments in youth reproductive health are small-scale and their effects are often evaluated over only a short period of time. However, one conclusion that emerges clearly from available studies is that interventions are more successful in affecting knowledge than in changing behavior.

**Gender**

The main effects of reproductive health investments in youth include:

- Averted HIV infections
- Averted sexually transmitted infections (STIs)
- Averted teen pregnancies

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47 It is unclear why randomized study designs are so much more widely used to measure the impact of education, health and nutrition investments, as compared to reproductive health investments.
Males and females share approximately equally in the benefits from averted HIV infections, although some country-specific variation is possible. Girls benefit more than boys from averted STIs (since the effects of these infections are generally more severe among girls). Girls also benefit more than boys from averted teen pregnancies.

**Private versus social benefits and costs**

Some of the main effects of reproductive health investments in youth include averting infectious diseases (HIV/AIDS and other STIs). Since there are externalities from averting each case of an infectious disease, there is clearly some role for public investment in this area. In the case of averting teen pregnancies, most of the benefits are private.

### 3.5.1 School-based reproductive health education programs

Women often lack skills needed to communicate their concerns to their sexual partners and to practice behaviors that reduce their risk of infection, such as condom use, which is often controlled by men. Investment in school-based reproductive health education is designed to address this need. Yet in many places, schools are apprehensive about providing sex education or discussions of sexuality because of cultural demands to protect adolescents from sexual experience. Many adults also express a fear that sex education will result in increased sexual activity on the part of youth.

One problem with investments in school-based reproductive health education is that most of the sex education is only offered to high school students, and many of the most vulnerable children have already dropped out before reaching high school (FOCUS 2001).

**Illustrative investments**

Health education programs are being implemented in many schools in Nigeria to increase levels of knowledge, influence attitudes, and encourage safe sexual practices among secondary school students. In one study, the knowledge, attitudes and behaviors of 223 students who received a comprehensive health education intervention were compared to 217 controls (Fawole et al. 1999). Students in the intervention group received six weekly sessions lasting two to six hours, with activities including lectures, film shows, role-play stories, songs, debates, essays, and a demonstration of the correct use of condoms.

In Vietnam, a HIV/AIDS prevention project begun in 1997 involves a pilot life skills course in schools, with teachers trained and supported in skills-based health education (World Bank 2002a). The major focus of the project is on student knowledge, attitudes, values, and behaviors—with an anticipated outcome that the program would also have a positive impact on teaching staff.

In Peru, a skills-based education program on sexuality and HIV/AIDS prevention involved seven weekly two-hour sessions, which included discussions, verbal exercises, role-playing, and familiarization with condoms/contraceptives and lectures (Caceres et al. 1994). Homework promoted interaction with family, friends, and local health institutions. Trained teachers from the schools facilitated the program. The program was evaluated using a quasi-experimental design. A similar program in Jamaica was also evaluated using a quasi-experimental design (Eggleston et al. 2000), while another in Namibia used a randomized design (Stanton et al. 1998, Fitzgerald et al. 1999).
In South Africa, a high school drama-in-education program was used to provide reproductive health education in seven randomly selected schools from seven matched pairs of schools (with the remaining schools receiving only written information and serving as controls) (Harvey, Stuart and Swan 2000). Data were collected from students prior to and six months after the intervention.

**Effects**

The possible effects of school-based reproductive health education programs include:

- Averted HIV infections
- Averted STIs
- Averted teen pregnancies
- Increased sexual activity on the part of youth (a possible cost)

School-based RH programs have been evaluated more often than other types of youth RH programs.

**Averted HIV infections.** UNAIDS (1997) reviewed 53 studies that assessed the effectiveness of HIV and/or sexual health education investments in preventing HIV infection and related health problems among young people (World Bank 2002a). In the review, 22 studies reported that HIV and/or sexual health education delayed the onset of sexual activity, reduced the number of sexual partners, or reduced unplanned pregnancies and STD rates. In addition, 27 studies reported that HIV/AIDS and sexual health education neither increased nor decreased sexual activity or STD rates. The review concluded that school-based interventions are an effective way to reduce risk behaviors associated with HIV/AIDS/STD among children and adolescents. However, a review of school-based interventions by the USAID-financed FOCUS project concluded that some programs had only short-term RH effects on condom use and in delaying first sex that did not last for even two years (FOCUS 2001).

In the Nigerian study mentioned above, the mean number of sexual partners of students in the intervention group decreased, from 1.51 to 1.06, compared to an observed increase in the control group (from 1.30 to 1.39). The program was also successful in increasing condom use (Fawole et al 1999).

According to an evaluation of the Vietnam project mentioned above at the completion of its pilot phase, students demonstrated increased knowledge of HIV/AIDS and its transmission, increased knowledge of ways to avoid infection, improved tolerance, and improved decision-making skills. A UNAIDS evaluation of the project also confirmed that the program had been effective for both students and teachers in terms of building confidence, knowledge, and abilities. However, there is yet no information available on the project’s impact on student sexual behavior such as contraceptive use, community and national pregnancy rates, and rates of STD infection to evaluate the impact of the project on behavior change (World Bank 2002a).

In the Peru project mentioned above, the intervention group showed significant changes in knowledge on sexuality and AIDS, openness towards sexuality, acceptance of contraception, tolerance of people with AIDS, and prevention-oriented behaviors (Caceres et al 1994). The evaluation of the Jamaican program found that, although the intervention appeared not to have had
any effect on the initiation of sexual activity, adolescents in the intervention group were more than twice as likely than those in the comparison group to use contraception at first intercourse (Eggleston et al. 2000). The intervention also appeared to have a positive effect on knowledge and attitudes toward pregnancy and sexuality. In the Namibia study, knowledge also increased significantly in the intervention group, as compared to the control group (Fitzgerald et al. 1999). In addition, a significantly higher percentage of the youth in the intervention group (17 percent versus 9 percent in the control group) remained sexually inactive one year later (Stanton et al. 1998). Among those who initiate sexual activity during that same period, intervention youths were significantly more likely to use a condom (18 percent versus 10 percent).

In a Ugandan program in which primary school children were provided with two years of health education and were interviewed in their final year (at an average age of 14), the percentage of students who reported that they had been sexually active declined significantly (from 42.9 percent to 11.1 percent), while no significant change was recorded in a control group (Shuey et al. 1999).

In HIV prevention modeling done for Honduras (World Bank 2002d), it was estimated that there were 1,507,687 adolescents (i.e., ages 10-19) giving rise to 1,508 new infections per year (not including new infections among adolescents that may be in other risk groups, such as commercial sex workers). It was estimated that 60 percent of adolescents could be reached by an intervention, such as an IEC program, and that, among those reached, the intervention would be 38 percent effective in preventing new HIV infections. In this case, an IEC program covering all adolescents would be able to avert 22.8 percent of all new infections in adolescents, or about 344 new infections averted. However, the estimated effect of the intervention is directly related to the annual incidence of HIV among adolescents (assumed to be only 0.1 percent in Honduras).

In the South African intervention mentioned above, students in schools that received the drama-in-education intervention reported a significant increase in condom use and displayed significantly more positive results in knowledge and attitudes (Harvey, Stuart and Swan 2000).

Averted STIs. The results of the 1997 UNAIDS review referred to above suggest that HIV and/or sexual health education investments can be effective in reducing STD infections. The Nigeria program referred to above resulted in a decrease in the number of sexual partners and an increase in condom use. A school-based intervention in Benin City, Nigeria appears to have been successful in increasing knowledge about symptoms of STIs, in stimulating condom use, and in reducing reported symptoms of STIs in the intervention group (FOCUS 2001).

Averted teen pregnancies. The results of the 1997 UNAIDS review referred to above suggest that HIV and/or sexual health education investments can be effective in preventing unplanned pregnancies among youth. A reproductive health education program in Namibia had an impact in delaying girls’ first sexual encounter after 12 months (Stanton et al. 1998, Fitzgerald et al 1999).

Increased sexual activity on the part of youth. The UNAIDS review referred to above suggest that HIV and/or sexual health education investments concluded that sex education programs do not lead to earlier or increased sexual activity among young people; in fact, the review concluded that the
opposite seems to be true. A review of the same issue by the FOCUS project reached the same conclusion (FOCUS 2001).

Cost and/or cost effectiveness

In Zimbabwe, the AIDS Action Program for Schools, supported by UNICEF, promotes life-skills HIV/AIDS prevention for teachers and pupils. The additional cost of one child-year of AIDS education through this program was estimated at US$0.16 (UNAIDS 1999b).

A recent economic analysis by ACTAfrica (2001) estimates the cost of scaling up coverage of school-based HIV/AIDS prevention programs. The analysis estimates the average unit cost of teacher training and simple materials necessary for the implementation of such programs as US$75 to US$200 (for primary school teachers) and US$121 to US$241 (for secondary school teachers).

In Honduras, the unit cost of providing IEC to adolescents was estimated to be US$10.44 per adolescent (World Bank 2002d). Since there were an estimated 1,507,687 adolescents ages 10-19, the total cost of the intervention would be $15,744,153. Since it was estimated (as discussed above) that such an intervention would avert about 344 new infections among adolescents (i.e., excluding secondary infections, which were assumed to be equal to 0.1 per infected youth), such an intervention would cost $45,789 per averted new infection (or 0.0218 new HIV infection averted per $1,000 invested). Assuming that each infection corresponds to a loss of 34.6 DALYs, the cost effectiveness of an IEC program targeted to adolescents in Honduras would be $1,323 per DALY gained from new infections averted.

A cost-effectiveness analysis of India’s Second National HIV/AIDS Control Project estimated that IEC programs targeted to youth would cost $66.20 per DALY gained ($1,324 per HIV infection averted). By comparison, the study estimated that an IEC program targeting only in-school females would avert very few HIV infections and would have virtually no effect on the spread of the epidemic (World Bank 1999c). This study estimated a cost of $20,000 per HIV infection averted (due to the low incidence of HIV infection in this group) and noted that most of the infections prevented by such a program would also be prevented by sex worker and sex worker client interventions. This study used an optimistic assumption of a 50 percent change in sexual behavior.

In the Peru study mentioned above, the cost (exclusive of research expenses) was $3 per student reached (Caceres et al. 1994).

As reported above, there is no evidence that reproductive health education leads to increased sexual activity on the part of youth (which might otherwise be regarded as a possible cost of this type of investment).

Country context

The benefits and costs will depend on levels of enrollment, particularly in rural areas. The benefits should be greater (and more equitable) in countries with high school enrollment rates and somewhat

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48 It is unclear whether these are cost or expenditure estimates, and if the former, what types of costs are included (e.g., whether they include estimates of distortionary costs).
higher in densely populated areas (since average class size is likely to be higher in such settings). The benefits of this investment are also directly related to HIV incidence rates among youth enrolled in school.

**Distribution**

As with other school-based health programs, the benefits accrue only to those who are enrolled in school. These are predominantly the non-poor and boys, although there is considerable country-specific variation in enrollments by income group and gender.

### 3.5.2 Social marketing of reproductive health services targeted to youth

Social marketing investments can potentially reach many youth who are no longer enrolled in school. Some social marketing investments are designed to promote condom use, while others are designed to promote a broader range of services.

**Illustrative investments**

There are some examples of social marketing interventions in reproductive health that have been targeted primarily to youth. In Zimbabwe, for example, one reproductive health investment included both a social marketing component and a component in which training in how to provide youth-friendly reproductive health services was provided to staff of youth centers and health centers (Kim et al. 1998, 2001). Another example is the SMASH program of PSI, which involved reproductive health interventions (including social marketing) in four sub-Saharan African countries (Agha 2000). There were also linkages to services and peer counseling in most of the countries (see discussions of these interventions below).

**Effects**

The possible effects of social marketing of reproductive health targeted to youth include:

- Averted HIV infections
- Averted STIs
- Averted teen pregnancies

**Averted HIV infections.** The only significant behavioral effects of PSI’s SMASH program, including increased condom use, were found in Cameroon--and not in S. Africa, Guinea or Botswana (Agha 2000). It may be that social marketing is effective in promoting condom use, but its effectiveness in increasing the utilization of clinic-based services has not been established (FOCUS 2001).

In the HIV prevention modeling done for Honduras (World Bank 2002d), it was assumed that a condom social marketing project would be only 9 percent effective in averting new HIV infections among adolescents. A social marketing program covering 60 percent of adolescents (the maximum percentage of adolescents that the study assumed could be reached by any given intervention, thus implying an overall effectiveness rate of 5.4 percent) would only avert an estimated 81 new HIV infections annually (or 89 infections, after factoring in secondary infections), out of a total of 1,508 new infections annually among adolescents.
Averted STIs. The social marketing program in Zimbabwe had a positive effect on the use of services provided by the organizations participating in the program (Kim et al. 1998, 2001).

Averted teen pregnancies. No information available.

Cost and/or cost effectiveness
Schwartländer et al. (2001) have estimated the cost of condom social marketing to be $0.12-$0.25 per male condom distributed. However, the unit cost of a social marketing program targeted to adolescents was estimated to be US$1.70 per condom distributed in the Honduras study. Since it was estimated that 6 condoms would be needed by each adolescent annually, the cost per adolescent would be $10.20. A social marketing program reaching 60 percent of adolescents would cost about $9,227,042 per year (i.e., 904,612 adolescents × 10.20 per adolescent). Since it was estimated above that such a program would avert about 81 new HIV infections (excluding secondary infections), the cost per averted new infection would be about $113,914 (or 0.0088 new infections averted per $1,000 invested). Assuming 34.6 DALYs gained per averted HIV infection, the cost per DALY gained would be $3,292. The main reasons that condom social marketing targeted to adolescents is so much less cost effective than condom social marketing targeted to other groups is the relatively low risk of HIV transmission in this group (incidence was estimated to be only 0.1 percent among adolescents) and the relatively low level of effectiveness among adolescents assumed in the study (9 percent).

Country context
The benefits of social marketing programs targeted to youth will be directly related to HIV incidence among the target group. Benefits and costs are also likely to be affected by such factors as: 1) previous experience with social marketing programs, 2) degree of development of the marketing industry, 3) levels of mass media coverage, and 4) regulations permitting condom advertising.

Private versus social benefits and costs
Social benefits are relatively high for this type of investment, since its focus on condom use is more focused on the prevention of HIV/AIDS and other STIs, as compared to averting teen pregnancies.

Distribution
Some social marketing programs have the ability to reach the poor as well as the non-poor. However, when they involve extensive use of mass media, it is likely that they are less effective in reaching the poor than when other methods are used (since the poor may be illiterate and without access to radio and television).

3.5.3 Youth-friendly diagnosis and treatment of STIs
Adolescents are vulnerable to infection from a wide variety of STIs besides HIV/AIDS. These infections cause a wide variety of effects, but one of the most common effects is infertility. Diagnosis and treatment of STIs also significantly reduces the risk of HIV/AIDS infection. However, youth are often reluctant to seek treatment because of the stigma attached to STIs (FOCUS 2001). Youth in many countries do not have access to “youth friendly” health services. Lack of confidentiality is a problem cited by many youth as an obstacle to obtaining reproductive
health services in the Caribbean region (CGCED 2002). They also often lack even basic information about sex (FOCUS 2001).

Various studies have shown that it is difficult to get youth to visit clinics (FOCUS 2001). Youth tend to be healthy and therefore seldom visit clinics in general. There are also barriers to youth, particularly unmarried youth, visiting clinics. These include lack of privacy and a tendency for providers to scold youth. They are more comfortable visiting pharmacies. Youth also rely on traditional cures and remedies and on clandestine and illegal abortions. The provision of youth-friendly voluntary counseling and testing services constitutes an effort to remove the barriers to youth visiting clinics. Youth-friendly services may have cost advantages over other types of interventions because they use existing health infrastructure.

**Illustrative investments**

In Zambia, youth-friendly reproductive health services are provided in several clinics (Nelson and Magnani 2000, Oberzaucher and Baggaley 2002). For example, the Kara Counseling and Training Trust (KCTT), an NGO, began in 1989 as a drop-in center that provided HIV information and counseling to the general public. Today, KCTT provides youth-friendly voluntary counseling and testing services at six sites in Lusaka and one in Choma (Oberzaucher and Baggaley 2002). Youth are encouraged to attend the clinic by young outreach workers and community volunteers. Youth-friendly services have also been provided in Zimbabwe and Ecuador (Moyo et al. 2000, Institute for Reproductive Health 2001)

**Effects**

In order for the provision of youth-friendly services to have any effect, it is necessary for more youth to visit and re-visit youth-friendly clinics. In Zimbabwe, however, no effect of the availability of youth-friendly services on the use of reproductive health services was established (Moyo et al. 2000). In Ecuador, there was no evidence of an increase in the number of new clients due to the provision of youth-friendly services. However, there was evidence of an increase in the proportion of youth clients who made return visits (Institute for Reproductive Health 2001). However, if there is increased use of services, the possible effects of youth friendly-services include:

**Averted STIs**

Averted teen pregnancies

Although youth-friendly reproductive health services are increasingly available, there are not many rigorous evaluations of their effects (FOCUS 2001).

**Averted STIs.** Questions have been raised recently about the effectiveness of the symptomatic treatment of STIs as part of an integrated package of reproductive health services (Askew and Maggwa 2002).

**Averted teen pregnancies.** In Zambia, the provision of youth-friendly services was associated with increases in contraceptive use by youth. However, the evaluation did not find evidence that the increase in prevalence was related to the services. Instead, it found that there were still important
social and psychological barriers at the community level to the use of the clinics by youth (Nelson and Magnani 2000).

**Cost and/or cost effectiveness**

There are no cost estimates available for youth-friendly services. However, Schwartländer et al. (2001) estimate the cost per STI case treated to be $8.34-$9.26. The unit cost of voluntary counseling and testing in the KCTT clinics discussed above has been estimated to be about $7 (Oberzaucher and Baggaley 2002).

STD control in a broader population has a cost per DALY ratio of about $13 and a cost per HIV/AIDS case averted of about $350 (Marseille, Hofmann and Kahn 2002). In a cost-effectiveness analysis of the India’s Second National HIV/AIDS Project, it was estimated that STI management had a cost per DALY gained of approximately $2.35-$6.02 (or $47-$120 per HIV infection averted), depending on the use of laboratory tests and drug costs (World Bank, 1999c). In the case of voluntary counseling and testing, the cost per DALY was $12.77 in one study and $17.78 in another, with cost per HIV/AIDS case averted $249 and $346 respectively.

In the HIV prevention modeling work done for Honduras (World Bank 2002d), the cost of treating STIs diagnosed symptomatically was estimated to be $48.97 per case treated. Among adolescents, the effectiveness of the intervention was assumed to be only 5 percent. The Honduras study also assumed that the base incidence of new HIV infections per 1,000 adolescents was equal to one. Under these assumption, if 1,000 adolescents were treated at a cost of $48,970, the number of infections averted would be 0.05, or a cost of $979,400 per infection averted. Assuming 34.6 DALYs gained per infection averted, the cost per DALY gained would be $28,306.

**Distribution**

Youth-friendly services have the potential to reach the poor, as well as the non-poor, particularly if clinics are located in poor areas and if the services are subsidized.

### 3.5.4 Linked reproductive health services

Linked services involve linking a school-based program of reproductive health education to clinical services available outside the school (FOCUS 2001). Such linked services are typically provided in clinics rather than pharmacies. It is believed that linked services can overcome some of the psychosocial barriers to use of clinics by youth.

**Illustrative investments**

See above example of linked services in Benin City, Nigeria.

In Brazil, an integrated school- and health-clinic-based adolescent health intervention was undertaken by the Bahia state government (Magnani et al. 2001). To address high rates of adolescent pregnancy rates and growing numbers of HIV infections. The project sought to promote responsible sexual and health-seeking behaviors among public secondary-school students, including the use of public health clinics.
Effects

As with youth-friendly STI diagnosis and treatment services, in order for the provision of linked reproductive health services to have any effect, it is necessary for more youth to visit and re-visit clinics providing such services. Assuming that this occurs, the possible effects of linked reproductive health services include:

Averted HIV infections
Averted STIs
Averted teen pregnancies

In the Brazilian study, there was no evidence of increased use of clinical services by youth as the result of the program (Magnani et al. 2001). However, there was evidence that the intervention resulted in increased knowledge of sexual and reproductive health information and had a positive effect on adolescents’ intentions to use public health facilities in the future.

In an intervention in Chile, the program had an effect in delaying first sex, in increasing contraceptive use, and in reducing unwanted pregnancies, but only had a small impact on visits to linked clinics. Apparently, youth obtained their services elsewhere (Murray, Toledo et al. 2000).

In the Benin City, Nigeria program (mentioned above), which was intended to reduce STIs, a linkage to private physicians did increase the use of their services (Coplan et al. in press).

Cost and/or cost effectiveness

There are no cost estimates for programs involving linked services. However, in the HIV prevention modeling done for Honduras (World Bank 2002d), the cost of providing counseling and rapid testing was estimated to be $18.29 per person seeking counseling. Among adolescents, the intervention was assumed to be 9 percent effective. The study also assumed that the baseline incidence rate was one per 1,000 adolescents and that each infected adolescent infected 0.1 others. Under these assumptions, providing services to 1,000 adolescents, at a cost of $18,290, would avert 0.09 infections, at a cost of $203,222 per infection averted (or 0.00492 new infections averted per $1,000 invested). Assuming 34.6 DALYs gained per infection averted, the cost per DALY gained would be $5,873.

Distribution

As with other school-based health programs, the benefits accrue only to those who are enrolled in school. These are predominantly the non-poor.

3.5.5 Peer counseling programs

Peer programs, in which in-school youth are counseled by their peers, have been tried in some developing countries (FOCUS 2001).

Illustrative investments

In Cameroon, the “Entre Nous Jeunes” peer educator program was designed to promote STI/HIV preventive behavior (Speizer 2001). During the 18-month intervention period, the peer educators
were able to reach a large number of young people, particularly those who were sexually experienced and in need of reproductive health information.

**Effects**

The possible outcomes of peer counseling programs include:

- Averted HIV infections
- Averted STIs
- Averted teen pregnancies

No direct findings with respect to the above hypothesized effects have been found in the literature. However, a FOCUS project-sponsored peer counseling project in Peru concluded that it appeared to have positive impacts on knowledge and behavior (Magnani, Gaffikin et al. 2000). Positive effects were also found in evaluations of peer group interventions in Ghana, Nigeria and Cameroon, including a significant positive relationship between contact with a peer educator and modern contraceptive use (including condoms) in Cameroon (Speizer et al. 2000, Speizer et al. 2001). In Zambia, a peer counseling intervention resulted in improved attitudes toward abstinence and condom use and an increased appreciation of the risk of acquiring HIV/AIDS. They also reported a reduction in casual and multiple partners (Agha 2001, Agha and Van Rossem 2002).

However, a review of peer counseling evaluations by the FOCUS project noted that it is very possible that peer group interventions would have been equally successful if implemented by adults (FOCUS 2001). The review also noted that several evaluations of peer counseling programs suggest that the group most affected by the intervention is the peer counselors themselves. Under these circumstances, the FOCUS review questions whether these programs are likely to be cost effective.

**Cost and/or cost effectiveness**

There is no information available on the cost or cost effectiveness of peer education programs.

**Distribution**

As with other school-based health programs, the benefits accrue only to those who are enrolled in school. These are predominantly the non-poor.

### 3.5.6 Mass media programs in reproductive health

Mass media programs have the potential to reach large numbers of youth at modest cost, including youth who are not in school.

**Illustrative investments**

In Paraguay, the radio program “Arte Y Parte” takes a frank and open approach to discussing sex (PSI 2002). Although it has generated controversy at times, after 5 years, it has become a mainstay of the reproductive health landscape in the Asuncion. In addition to its radio program, Arte y Parte uses peer educators, disseminates printed materials and videos, and conducts school workshops.
In Zimbabwe, a six-month multimedia campaign was directed at youth ages 10-24 in five pilot sites (Kim et al. 2001). The project aimed to encourage young people to adopt behaviors that reduce the risk of pregnancy and STIs, including HIV. In order to reach different audiences, the campaign employed a mix of communications channels, including posters, leaflets, newsletters, radio programs, launch events, dramas, peer educators, and a hot line. Baseline and follow-up data were collected from a sample of households in the five intervention and two comparison sites. Measurement of the effects of the campaign was complicated by the fact that residents of both intervention and comparison sites were exposed to some of the pilot interventions (including the radio program) and from the fact that other reproductive health interventions targeted to youth occurred in both intervention and comparison sites at the same time.

Effects

The possible outcomes of mass media programs in reproductive health directed to youth include:

Averted HIV infections
Averted STIs
Averted teen pregnancies

It is difficult to conduct true experiments with mass media projects, since the risk of control group contamination is very high. In the case of the Zimbabwe pilot described above, for example, exposure to the radio programs was nationwide. Another problem with the evaluation of mass media investments is that data are usually collected only a few months after the campaign has been conducted, so that it is often not possible to document effects on key outcomes.

Averted HIV infections. One reproductive health mass media program in Paraguay seems to have had some impact on knowledge but not much on behavior (Magnani, Robinson et al. 2000). Forty-four percent of children were “exposed” to the messages, most through radio broadcasts.49 In the reproductive health mass media pilot in Zimbabwe directed to youth, there was an apparent effect on both knowledge and adolescent use of contraceptives, including condoms (Kim et al. 2001).

In Paraguay, an evaluation of the Arte y Parte program found that the program reached 44 percent of youth and its target area and concluded that project was likely to have contributed to the significant observed increase (from 23.5 percent in 1995 to 33.5 percent in 1998) in the percentage of adolescents reporting use of a condom in their first sexual encounter (Magnani, Robinson et al. 2000).

Averted STIs. No direct information is available on the effect of mass media programs on STIs. However, in the Zimbabwe pilot described above, there was an apparent effect on use of services at health centers and youth centers (Kim et al. 2001).

49 This “exposure” variable records whether a targeted youth actually heard the message or attended an event (e.g., the “launch” events in the Zimbabwe pilot). Exposure in this sense is frequently used in the evaluation of communications programs as an “exogenous” treatment variable, e.g., from the Zimbabwe study report: “The evaluation confirms a clear dose-response relationship between exposure and impact” (Kim et al. 2001). However, exposure in this sense is clearly an endogenous variable.
Averted teen pregnancies. No direct information is available on the effect of mass media programs in averting teen pregnancies. However, in the Zimbabwe pilot described above, there was an apparent effect in promoting abstinence and in the use of contraceptives (Kim et al. 2001).

**Cost and/or cost effectiveness**

As with other reproductive health investments targeted to youth, there is usually no information available on the cost of the investment. For example, in the case of the Zimbabwe pilot discussed above, no information on the cost of the various interventions is provided in the report (Kim et al. 2001). However, Schwartländer et al. (2001) estimate the cost of one mass media campaign to be $490,000, and they estimate that 2-6 campaigns are needed per year for effective prevention of HIV.

In Kenya, a radio program delivering Family Life Education and aimed at young people, cost US$0.03 for each adolescent reached and US$0.12 per adolescent reporting behavior change as a result of participating in the program (UNAIDS 1999a). However, it is not clear whether these are cost or expenditure estimates or, if the former, which costs are included.

**Gender**

There may be differences by gender in rates of exposure to some mass media channels. This was the case in the Zimbabwe pilot discussed above, i.e., mass media exposure was significantly higher among girls.

**Country context**

This type of investment is likely to yield higher benefits in countries with high levels of mass media coverage.

**Distribution**

Mass media programs can reach some poor youth. However, their level of “exposure” is likely to be lower, due to illiteracy and lack of access to radio and television.

3.5.7 **Workplace and community outreach services targeted to youth**

Workplace services can reach youth out of school and in some cases youth working in occupations that are particularly risky (e.g., truck drivers, brothel workers).

Community outreach programs have the advantage of going wherever youth are found (FOCUS 2001). Community outreach is frequently used to provide family planning services and (in sub-Saharan Africa) to spread awareness of the harmful effects of female genital cutting (FGc). In the case of family planning, community outreach programs usually include community-based distribution of contraceptives by a wide range of community workers (e.g., village health workers, TBAs, agricultural extension workers).

**Illustrative investments**

In Thailand, the 100 percent condom campaign encourage sex workers and their clients to use condoms in every sexual contact and made condoms readily available in brothels and other convenient locations (Celentano et al. 1998).
In Lesedi, South Africa, an STD control intervention was conducted in a mining community (UNAIDS 2000). Peer educators were used to recruit women at high risk, who were given presumptive treatment with an antibiotic at monthly intervals. Health education about STDs and HIV were given, and condoms were promoted. A mobile clinic provided syndromic management of STD infections.

In several garment factories in Cambodia, a project provided their mostly young female workers with access to reproductive health education and access to some types of reproductive health services within the factory (FOCUS and CARE 2000).

In Bombay, India, an HIV and STD intervention was directed to 334 sex workers and 20 madams from one site (Bhave et al. 1995). Their HIV and STD infection rates, together with indicators of their sexual practices and knowledge of HIV, were compared to those of 217 sex workers and madams from another site. Data were collected from both groups of women, both prior to the intervention and one year later. The baseline data showed a very high prevalence of HIV infection in both groups (47 percent and 41 percent respectively) and low knowledge about HIV and low experience with condoms.

**Effects**

The possible effects of reproductive health programs conducted in the workplace include:

- Averted HIV infections
- Averted STIs
- Averted teen pregnancies
- Averted female genital cutting (FGC)

**Averted HIV infections.** In Zimbabwe, a randomized workplace peer education program was able to achieve a 30 percent reduction in HIV-1 incidence (Machekano 1998). In the Bombay study, the intervention appeared to be successful in reducing the incidence of HIV (i.e., incidence of HIV was 0.05 per person-year of follow-up in the intervention group and 0.16 in the comparison group, p<0.005). There were also significant differences in tests for syphilis and hepatitis B. In Thailand, the 100 percent condom campaign coincided with sharp declines in HIV and STD incidence among youthful military conscripts (Celantano 1998). HIV incidence declined from 2.48 to 0.55 per one hundred person-years during the period 1991-1995. During this same period, there was a tenfold decrease in STD incidence.

In the garment worker intervention in Cambodia described above, improvements in knowledge were found, but results were not available on behavior because of high levels of refusal to respond to questions about sexual behavior (FOCUS 2001 and CARE 2000).\(^{50}\)

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\(^{50}\) According to the FOCUS (2001) project review, there also may be selectivity bias in these findings, particularly in comparing knowledge between workers who participated and those who did not (although the study also compared workers in intervention factories to those in comparison factories).
In the Indian RH program mentioned above, there were positive effects observed on use of contraceptives, use of ORS, antenatal care, and hospitals for deliveries (Levitt-Dayal and Motihar 2000). However, according to a FOCUS project review of community outreach services, these findings may be subject to selectivity bias (FOCUS 2001).

**Averted STIs.** The intervention in Lesedi, South Africa (described above) resulted in significant declines in STD prevalence among high-risk women and male miners (UNAIDS). Based on these results, a computer model (AVERT) predicted that the intervention had averted 41 HIV infections among high-risk women and 196 infections among male miners. The 100 percent condom use campaign in the Thai Army also appears to have had a strong impact on STI infection rates, although so much else was going on at the time that it may be difficult to attribute all of the impact to the intervention (Celentano et al. 1998). Also, note discussion above of the sharp decline in STD incidence among young Thai military conscripts.

**Averted teen pregnancies.** No information available.

**Averted female genital cutting (FGC).** No information available.

**Cost and/or cost effectiveness**

Schwartländer et al. (2001) estimate that the cost of peer counseling in the workplace is $3.36 per employee reached. They also estimate that the cost of each condom distributed in the workplace is $0.10.

In the HIV prevention modeling done for Honduras (World Bank 2002d), the cost of providing IEC to workers at their workplace was estimated to be $20.88 per worker. The effectiveness of the intervention was assumed to be 23 percent. The study also assumed that the baseline incidence of new infections among workers was one per 1,000 workers (the same as the incidence assumed among adolescents). Under these assumptions, a workplace IEC intervention serving 1,000 workers would cost $20,880 and would avert 0.23 new infections, i.e., a cost of $90,782.61 per new infection averted (or 0.0110 new infections averted per $1,000 invested). Assuming 34.6 DALYs gained per infection averted, the cost per DALY gained would be $2,623.77.

In the Lesedi, South Africa mining community intervention discussed above, the annual cost of the project was 268,000 South African rands. Since the medical cost alone of caring for the estimated 196 miners whose HIV infections were averted by the intervention was estimated to be 2.3 million rands, the mining company decided to pay for the intervention’s future recurrent costs (UNAIDS 2000).

**Gender**

The benefits of workplace interventions may be largely received by one gender or the other, depending on the targeted workplace. In the Cambodia intervention, for example, most garment workers are young females. However, in the Thai Army intervention, most of the beneficiaries were males.
Country context
The benefits of investments in this area are more likely to be higher in countries in which young women are more active in the manufacturing sector (e.g., Bangladesh, Cambodia).

Distribution
Workplace services (depending on the type of workplace served) and community outreach services (depending on the type of community served) may be targeted to provide benefits to poor youth.

3.5.8 Investments designed to delay age at marriage

Particularly in countries in which sexual relations outside of marriage are effectively circumscribed, investments designed to delay age at marriage may be effective in reducing teen pregnancies. Such investments can include government efforts to enforce restrictions on the minimum age at marriage, particularly among females. Remaining single is also frequently a condition imposed on participants in various programs targeted to youth (e.g., the Female Secondary School Assistance Programs in Bangladesh).

Illustrative investments
In a garbage-collecting community in Cairo, one program offers girls the equivalent of about US$150 to remain unmarried until age 18 (FOCUS 2001). This gift is designed to give leverage to girls in interacting with their parents. Although it is not directly related to schooling, this program probably also leads to some increase in female school enrollment.

Effects
The effect of these investments depends on their being able to affect actual age at marriage. Unfortunately, there is no information available on the effectiveness of these investments.

Cost and/or cost effectiveness
In the case of the Cairo example provided above, the cost of $150 per girl is a transfer. The actual cost of the program would include administrative costs and distortionary costs (e.g., possible effect on the work effort of the girl or other family members).

Gender
The effects of investments designed to delay age at marriage are probably much greater in the case of girls, since they tend to marry at younger ages in the absence of such laws.

Country context
The effectiveness of investments designed to delay age at marriage can be expected to vary significantly according to the country context. For example, countries that effectively circumscribe sexual relations among unmarried teens (e.g., some Muslim countries) can expect greater effects in reducing teen pregnancies from investments to delay age at marriage. Countries in which HIV/AIDS prevalence is high can expect greater effects from delayed age at marriage on the risk of HIV/AIDS infection in women. Similarly, countries in which the social status of women is particularly disadvantaged (e.g., some South Asian countries and/or regions within those countries) can expect
stronger effects from delayed age at marriage in terms of possible reduction of sexual and physical abuse directed toward women. Lastly, countries with stronger political and administrative systems are likely to be more effective in enforcing laws on minimum age at marriage.

Private versus social benefits and costs
The benefits of investments designed to delay age at marriage combine both private and social benefits.

Distribution
Investments designed to delay age at marriage are likely to benefit the poor disproportionately, since poor rural women tend to marry at significantly younger ages than non-poor women.

3.5.9 Reproductive health policy development
Policy development in the reproductive health area involves steps taken to convince policy makers of the value of various reproductive health investments in order to gain their support. This is often most critical in the case of investments that are controversial for cultural reasons, such as family planning (in the past), HIV/AIDS, and the elimination of female genital cutting (FGC). Policy development interventions include a wide variety of activities, including presentations to leaders, the development of national policies on youth and/or reproductive health, conferences and meetings, dissemination of research findings to policy makers, and providing briefings to the press. Policy development interventions may be very cost-effective in promoting favorable reproductive health outcomes. However, there is no reliable information on their effectiveness (FOCUS 2001). Many countries have developed policies on reproductive health services for youth, but few countries have successfully implemented the policies.

Illustrative investments
A joint WHO/UNICEF/UNFPA policy statement on FGM and a Regional Plan to Accelerate the Elimination of FGM were published to promote policy development and action at the global, regional and national level.

Effects
The possible outcomes of policy development interventions in youth reproductive health include:

- Averted HIV infections
- Averted STIs
- Averted teen pregnancies
- Averted female genital cutting

Commission on Macroeconomics and Health (2001) credits strong political support for part of the success in bringing down the incidence of HIV/AIDS infection in Uganda and in keeping it low in Senegal.

Several countries where FGM is a traditional practice are now developing national plans of action based on the FGM elimination strategy proposed by WHO, UNICEF and UNFPA. At least eight
African countries have passed laws banning FGM (WHO 1999). However, the laws are not effectively enforced in most of these countries.

Cost and/or cost effectiveness
(need to get some cost estimates from the USAID-funded POLICY project)

3.5.10 Treatment of HIV/AIDS-infected youth

The cost of treating HIV/AIDS patients with highly active antiretroviral therapy (HAART) is coming down rapidly.

Illustrative investments
No examples available.

Effects
The possible effects of treating HIV/AIDS-infected youth with HAART include:

Improved health
Increase in HIV infections (a possible cost)

Improved health. The effect of HIV/AIDS treatment is an improvement in the health of the treated youth. It has been estimated that the average HIV/AIDS infection involves a loss of 34.6 DALYs (Commission on Macroeconomics and Health 2001). As this is an average over all HIV/AIDS victims, the number of DALYs lost per youth infection is probably higher. One needs to make an assumption about the percentage of DALYs that can be recovered through HAART treatment of HIV/AIDS-infected youth. The effectiveness of HAART depends on a variety of assumptions concerning such factors as the development of resistant strains of HIV/AIDS. One study has estimated that the average period of survival of a person treated with HAART in a developing country is 5 years (Schwartländer et al. 2001).

Increase in HIV/AIDS infections. To the extent that treatment keeps infected youth alive and sexually active for a longer period it is possible that it would have negative effects on the number of HIV/AIDS infections. The effect of HAART treatment on the number of HIV/AIDS infections (i.e., the probability that surviving patients infect others) depends on the extent of risky behavior among those receiving HAART treatment and the possible effect of HAART treatment on the risk of infection per sexual contact.

Cost and/or cost effectiveness
The current annual cost of HAART drugs has been estimated to be $450-$3,500 per patient (Commission on Macroeconomics and Health 2001, Schwartländer et al. 2001). In addition, the annual cost of lab monitoring for HAART has been estimated to be $140 (Schwartländer et al. 2001). However, the cost of drugs has been dropping rapidly in recent years.

The cost of this intervention should also include the cost of any additional HIV/AIDS infections that result from the HAART treatment of HIV/AIDS-infected youth.
Gender
The distribution by gender of benefits of investments in HAART treatment of AIDS is likely to follow the gender pattern of HIV infection. Since infected women are often significantly younger than infected men (particularly in Africa), the benefits of HAART treatment in terms of improved health may be greater among females. In settings in which women have fewer sexual partners than males, the risk of secondary infection may be lower from HAART treatment of women.

Country context
This type of investment is likely to yield higher benefit to cost ratios in countries with an effective HIV/AIDS prevention program (so that surviving HIV-infected youth are less likely to infect others) and in a country with a public health system that is sufficiently well developed to support patients being treated with HAART.

Private versus social benefits and costs
There may be significant social costs in the form of other HIV/AIDS infections that result from HAART treatment of HIV/AIDS-infected youth.

Distribution
HAART treatment requires access to modern medical care. It is likely, therefore, that the benefits of HAART treatment investments will be received mainly by middle- and upper-income groups residing in urban areas well served by medical facilities.

3.6 School-based health investments

Ensuring that children are healthy and able to learn and work is an essential component of any effective youth development system. Good health, for example, increases school enrollment, reduces absenteeism, and brings the poorest and most disadvantaged children to school. These children—many of whom are girls—are often the least healthy and most malnourished. They often have the most to gain educationally from better health.

Although school children around the world have a lower mortality rate than infants, it is estimated that the burden of disease among school children ages 5-14 is 11 percent of the total global burden of disease. Micronutrient deficiencies, common parasitic infections, poor vision and hearing, and disability may have a detrimental effect on school enrollment and attendance as well as on cognition and educational achievement. In older children, avoidance of risky behaviors may reduce the dropout rate due, for example, to early pregnancy or reduce the probability of contracting HIV/AIDS.

School health and nutrition programs may provide one of the most cost-effective and sustainable ways to promote the education, health, and nutrition of school children. School health programs help link the health, education, nutrition, and sanitation resources in an infrastructure—the school—that is already in place, is pervasive, and is sustained. While the school system is rarely universal, coverage is often superior to health systems and has an extensive skilled workforce that already works closely with the community. School health programs also provide one of the most important
ways to reach adolescents and the broader community with messages about HIV/AIDS prevention. Health sector specialists have evaluated the value and costs of various health interventions in terms of Disability Adjusted Life Years (DALYs) including school health programs, as shown in Table 5.

### Table 5: Cost effectiveness of various health interventions

<table>
<thead>
<tr>
<th>Health intervention</th>
<th>Cost per DALY gained (1990 US$)</th>
<th>% Total global disease burden averted</th>
<th>Indicate cost in US$ annual cost per capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPI plus</td>
<td>12-30</td>
<td>6%</td>
<td>0.50</td>
</tr>
<tr>
<td>School health &amp; nutrition</td>
<td>20-34</td>
<td>0.1%</td>
<td>0.30</td>
</tr>
<tr>
<td>Family planning services</td>
<td>20-150</td>
<td>3%</td>
<td>0.90</td>
</tr>
<tr>
<td>Integrated management of childhood illnesses (IMCI)</td>
<td>30-100</td>
<td>14%</td>
<td>1.60</td>
</tr>
<tr>
<td>Prenatal &amp; delivery care</td>
<td>30-100</td>
<td>4%</td>
<td>3.80</td>
</tr>
<tr>
<td>Tobacco &amp; alcohol prevention</td>
<td>35-55</td>
<td>0.1%</td>
<td>0.30</td>
</tr>
</tbody>
</table>

Sources: Del Rosso 1996; Claeson, Mawji, and Walker 2000.

School-based programs to deliver simple health services have substantial potential both to improve health (i.e., reduce mortality and morbidity) and to improve the learning of school-age children (WHO 1999). Schools can effectively deliver health and nutritional services provided that the services are simple, safe, and familiar and address problems that are prevalent and recognized as important within the community. School health policies that allow teachers to deliver a simple health package (including anti-helminthics and micronutrient supplements) have been shown to be effective, inexpensive, and acceptable to teachers and parents. However, teachers need to be trained well to monitor and deal with any side effects of treatment, in cooperation with local health workers.

**Gender and Distribution**

Despite the many positive features of school-based health programs, the benefits accrue only to children enrolled in school. In many low-income developing countries, enrollment rates are low among adolescents, and particularly among poor children, ethnic and racial minorities, and girls. Adolescents out of school will not receive any benefits from school health programs and will have to have their needs addressed through other types of investments. This is both an efficiency and distribution concern. Therefore in the following sub-section we discuss other more general health and nutrition programs.

#### 3.6.1 School health policies

School health policies can provide highly visible opportunities for governments and the whole society to demonstrate a commitment to equity, non-discrimination, gender issues, and human rights in all of the schools in their countries (World Bank 2002a). School health policies can cover a broad spectrum of areas critical for the health and development of school-age children. Examples include: policies relating to early pregnancy and exclusion from school, tobacco and tobacco-free schools, in-school water and sanitation, HIV and reproductive health education, sexual harassment and abuse of students, the role that teachers can play in delivering simple health services through schools, and
policies relating to school food services. School health policies need to be clearly communicated to the school population and actively monitored by the PTA and the community.

Examples of specific school health policies by area:

Unwanted early pregnancies and exclusion from school
Do not exclude pregnant girls from school.
Encourage students to return to school after childbirth.
Include family life education in the curriculum.
Prohibit all kinds of gender-based discrimination.

Tobacco and the Tobacco-free School
No smoking in schools by teachers and students.
No selling of cigarettes to children.
No tobacco advertising and promotion.
Higher tobacco prices and no possibility of purchasing cigarettes individually.

Sanitation, Gender, and Privacy, as well as Maintenance of Facilities by the Community
Separate latrines for teachers, boys, and girls.
Safe water in all schools.
Active commitment from PTA for maintenance of water and sanitation facilities.

HIV and exclusion, the content of sex education, and access to condoms
Skills-based health education focusing on HIV/AIDS prevention.
Stimulate peer support and HIV/AIDS counseling in schools.
No discrimination of HIV-positive teachers or students.
Access to condoms.

Sexual harassment and abuse of students (including by teachers)
  • Ensure by law that sexual harassment and violence in the school environment by teachers and pupils is prohibited.
  • Make the law well known and accepted by everyone, empower adolescents to report cases, and enforce effective disciplinary measures for those who abuse.

Role of teachers in delivering a simple package of health interventions
Training and use of teachers to deliver simple health interventions in collaboration with health sector workers and with involvement of the local community.

Food vendors—nutrition and hygiene
Regulation of vendors and the quality, hygiene, and standard of the food provided.

Illustrative investments
In Chad, the school health unit plans to implement an intensive campaign to reach the communities in rural and urban centers throughout the vast country (World Bank 2002a).
Effects
There is a wide range of possible effects of school health policies, depending on their content, including:

Increased education
Improved health
Improved nutritional status
Averted teen pregnancies
Averted HIV infections
Averted STIs
Reduced tobacco use
Averted sexual/physical abuse

Unfortunately, there is currently no information on the effectiveness of school health policies in producing any of the above hypothesized effects.

Cost and/or cost effectiveness

To have an effective school health program, the policies and regulations concerning the health and nutrition of school-aged children have to be well known and understood not only by the administrators but also by the teachers, parents, and children throughout the country (World Bank 2002a). This requires a strategic communication plan entailing various expenses. The costs of communication plans will differ based on the extent that media and operational research are used. An effective program including formative research, strategy formulation, preparation of materials, and implementation can cost from US$110,000 to US$750,000 depending on the size of the country and scope of issues. In Chad, for example, the funds needed to implement the campaign mentioned above will be approximately $50,000 per year or $200,000 per four years for expenses, including technical assistance, seminars, debates, conferences, brochures, posters, television, and radio transmissions.

Country context
The magnitude of the benefits (and whether their distribution is considered equitable) will depend on the level of school enrollment rates. However, the benefits of school health policies should extend beyond the population that attends or has attended school.

Private versus social benefits and costs
Since policy making is generally limited to the public sector, this investment is essentially a public good.

3.6.2 School-based health education (apart from school-based reproductive health education, discussed above)

Millions of school-age children are affected by problems of poor nutrition, infectious diseases, inadequate access to clean water and sanitation, violence, substance abuse, and the increasing threat and burden of living with HIV/AIDS. Children and young people need to be equipped with the
knowledge, attitudes, values, and skills that will help them face these challenges and assist them in making healthy life-style choices as they develop (World Bank 2002a). Health in this context extends beyond physical health to include psychosocial and environmental health issues.

**Illustrative investments**

In Tanzania, the Partnership for Child Development conducted a pilot study in 1968 in the Lushoto district of Tanzania (the Lushoto Enhanced Health Education Project (LEHEP)), focusing on worm infection and personal hygiene, involving teacher-led, innovative and active, participatory health education methodology. A randomly selected group of schools was chosen to implement the project and was compared with a set of randomly selected schools that did not adopt the LEHEP approach (Lansdown et al. 2002).

**Effects**

The possible outcomes of school-based health education (apart from reproductive health) include:

- Reduced tobacco use
- Improved health
- Improved nutritional status
- Averted sexual/physical abuse

**Reduced tobacco use.** No information available.

**Improved health.** In the Lushoto (Tanzania) Enhanced Health Education Project an evaluation of the program offered evidence of improved knowledge and practices in the intervention schools, but not in the comparison schools, particularly with reference to the provision of safe drinking water, water for hand washing, general environmental cleanliness, and health awareness. At the outset of the project, no schools provided drinking water or water for hand washing after using the latrine. By the end of the first year, all schools in the intervention area were doing both. A follow-up survey 15 months after the end of the project year found that many of the healthy behaviors adopted in the intervention schools were still maintained (Lansdown et al 2002). However, the evaluation did not include an examination of health outcomes.

**Improved nutritional status.** No information available.

**Averted sexual/physical abuse.** No information available.

**Cost and/or cost effectiveness**

Lessons on health education require new curriculum development and teacher training. These activities require heavy investment in the beginning but less for sustained implementation. In Vietnam, a health education program was implemented in 25 schools in combination with deworming services. The intervention area covered 18,898 children and 583 teachers. The costs of planning (two workshops), training of all the teachers, producing and distributing children’s booklet and teachers’ guides, providing on-going teacher support and incentives, and monitoring activities, including steering committee meetings and school visits totaled, US$36,796 or US$1.94 per child reached. Of the total, the cost per teacher for training is US$8.92. The costs represent the
development period and implementation during one school year—approximately seven months (World Bank 2002a).

Country context
The benefits of school health education are likely to be higher in countries in which a high proportion of poor children are in school (since the problems addressed by health education are greater among the poor).

Private versus social benefits and costs
To the extent that school health education programs are targeted to infectious diseases, significant social benefits can be expected.

3.6.3 School lunch/feeding programs
School lunch and other school-based feeding programs are used in many countries to ensure that children are not hungry while attending school, to promote healthy dietary practices among school children, and to promote the healthy growth and development of the in-school population (Pfefferman and Griffin 1989). Recent studies suggest that school-age children suffer from higher levels of stunting than previously acknowledged (World Bank 2002a). Data from several studies show that the prevalence of stunting increases with age, indicating a higher proportion of stunted, school-aged children (Stoltzfus et al. 1997, Lwamba et al. 2000). It also appears that adolescent boys are more sensitive to infection and diseases than girls and thus are more malnourished (Lwamba et al. 2000). In addition, studies have shown that linear growth continues beyond the normal puberty growth period (Stoltzfus et al. 1997). This suggests that school-based programs aimed at improving health and nutrition status may have the potential to bring about catch-up growth in stunted, school-aged children (Stoltzfus et al 1998).

At the same time, the “diseases of development”, including obesity, are rapidly becoming much more important in developing countries, including among adolescence. Indeed, the projections of DALYs for 1990-2020 indicate that the largest percentage share will be for cardiovascular diseases, which are related to nutrition as well as to physical activity, not for the much more emphasized communicable disease category (including HIV/AIDS) that in the past has had the largest share of DALYs in developing countries (our calculations are based on DALYs from Lopez and Murray 1996).

Many governments have given private enterprises the responsibility for preparing and delivering a ready-to-eat meal or snack (World Bank 2002a). Some school canteens in Lesotho, for example, are run by former local vendors who successfully bid on the privatized service, while in Nigeria, state and local governments train and license vendors to sell to schoolchildren. In Indonesia, school principals use their power to choose the vendors who serve their schools. Governments need to regulate products sold by commercial vendors as well as the standards of sanitation.

Illustrative investments
Many Latin American and Caribbean countries have school lunch programs, e.g., Argentina, Brazil, Chile, Dominican Republic, Jamaica and Trinidad and Tobago (Pfeffermann and Griffin 1989, CGCED 2002).
Effects

The possible outcomes of school feeding programs include:

Increased education
Improved nutritional status

Increased education. In Jamaica, a school breakfast program resulted in a 10-percent increase in attendance and a 16 percent increase in arithmetic scores after one semester (no effect was seen on spelling performance) (McGuire 1996, Simeon 1998). These results were broadly consistent with those of an earlier controlled hospital experiment conducted in Jamaica in which groups of malnourished and normal children were alternatively assigned to fast prior to having their cognitive skills tested (Simeon, D.T. and S. Grantham-McGregor 1989, Simeon 1998). In the Philippines, a randomized experiment was conducted in 30 schools in which two of the four interventions tested included school feeding (Glewwe 2002). Few of the interventions had a significant effect on dropout rates, and the effect was small in any case. However, large effects were observed with respect to test scores. The largest statistically significant effects (after corrections for selection bias due to differential drop-out rates) were observed for the intervention that combined parent-teacher partnerships with school feeding, i.e., ranging between 0.28 and 0.44 standard deviations for math, Filipino, and English test scores. School feeding alone had statistically significant effects on English (and for math in one of three specifications).

Improved nutritional status. In the Jamaican study discussed above, there was no effect on the amount of weight gained (Simeon 1998). In the case of school feeding programs, it can be expected that some substitution of school-supplied food for home-supplied food may occur, thereby possibly lowering the effect of such programs on nutritional status. However, to the extent that food is shifted to other household members, the effect of such substitution may be mitigated.

Cost and/or cost effectiveness

In Jamaica, the school lunch program for students in selected secondary schools reached 302,000 students in 1998 at a cost of US$10.8 million, $35.76 per student (CGCED 2002).

Trinidad and Tobago has a targeted school-feeding program that reaches about one-third of primary school students, i.e., about 63,000 children at an annual cost of US$22.4 million, or $355 per student (CGCED 2002).

Table 6 below provides some cross-country information on the cost of school feeding programs standardized by controlling for the number of days of feeding and the quantity and quality of the rations provided. The data show that the cost of school feeding programs ranges from $19.25 to $208.59 per 1,000 calories per student for 365 days (1989 dollars). The mean program cost was $88.74, and the median cost was $81.46 (World Bank 2002a). In the case of the programs in the three sub-Saharan African countries, estimates are also available of the cost of delivering the food (since the food cost itself is a transfer). These delivery costs were US$17.24, US$23.75, and US$56.05 per 1,000 kcal per child per day for 365 days in Burkina Faso, Cape Verde and the Gambia respectively. Based on the assumption that the school year is about 180 days (6 school days
x 30 weeks) or half of the 365 days, the cost of delivery only of 1,000 kcal per child per school year would be US$8.60, US$11.90, and US$28 per year.

### Table 6: Cost of school feeding programs in selected countries (1989 US$)

<table>
<thead>
<tr>
<th>Country</th>
<th>Ration (Kcal)</th>
<th>Days per year</th>
<th>Cost per 1000kcal/day/365/days/year (delivery &amp; food)</th>
<th>Number of Beneficiaries</th>
<th>Cost per school year (180 days) (delivery &amp; food)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolivia</td>
<td>325</td>
<td>165</td>
<td>$53.53</td>
<td>N/A</td>
<td>$26.77</td>
</tr>
<tr>
<td>Ecuador</td>
<td>365</td>
<td>165</td>
<td>$61.10</td>
<td>200,000</td>
<td>$30.55</td>
</tr>
<tr>
<td>Guatemala</td>
<td>456</td>
<td>165</td>
<td>$19.25</td>
<td>1,093,000</td>
<td>$09.63</td>
</tr>
<tr>
<td>Honduras</td>
<td>180</td>
<td>165</td>
<td>$24.38</td>
<td>594,393</td>
<td>$12.19</td>
</tr>
<tr>
<td>Paraguay</td>
<td>324</td>
<td>165</td>
<td>$208.29</td>
<td>76,493</td>
<td>$104.15</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>1,109</td>
<td>160</td>
<td>$43.12</td>
<td>315,000</td>
<td>$21.56</td>
</tr>
<tr>
<td>Cape Verde</td>
<td>760</td>
<td>189</td>
<td>$171.43</td>
<td>73,000</td>
<td>$85.72</td>
</tr>
<tr>
<td>The Gambia</td>
<td>850</td>
<td>200</td>
<td>$79.68</td>
<td>83,000</td>
<td>$39.84</td>
</tr>
</tbody>
</table>


Some have tried school snack programs as alternatives to traditional school lunch programs. In a program in Indonesia, for example, locally produced snacks were provided at a cost of US$0.10 to 0.15 per ration per day (approximately US$18 to $27 per school year—180 days). In South Africa, a breakfast program using local food was implemented at US$0.33 per child per day or approximately US$59 per school year—at 180 days. In Bolivia, a snack program consisting of fortified bread and hot chocolate costs in total US$4 per child per year.

**Country context**

School feeding programs are more likely to be cost-effective nutrition interventions when there are suitable targeting mechanisms available to make it possible to identify individual children within schools that are poor and malnourished (Pfeffermann and Griffin 1989). Also, schools must have facilities for preparing meals. Such facilities are often found only in large, urban schools.

**Private versus social benefits and costs**

Most of the benefits of school feeding programs are private, rather than social.

### 3.6.4 Micronutrient supplementation in schools

Estimates from the WHO global database are that 210 million school-age children in developing countries (53 percent of the total) suffer from iron deficiency anemia (IDA). IDA results from a variety of causes, including inadequate iron intake, high physiologic demands in early childhood and pregnancy and iron losses from parasitic infections. There is substantial evidence that IDA in children is associated with decreased physical and mental development and impaired immune function. When levels of anemia exceed 40 percent, it is considered a public health problem requiring the provision of iron supplements (World Bank 2002a).

Iodine deficiency affects an estimated 1.6 billion people worldwide and an estimated 60 million school-age children. The consequences of iodine deficiency, collectively referred to as iodine deficiency disorders (IDD), include severe mental retardation, goiter, abortion, stillbirths, low birth
weight and mild forms of motor and cognitive deficits. Adolescent girls are an important target group for IDD control because of the adverse consequences on fetal development of iodine deficiency during pregnancy and because they generally have a higher prevalence of goiter than boys.

Vitamin A deficiency is widely recognized as an important cause of blindness in children. Mild or sub-clinical vitamin A deficiency causes impaired immune function and an increased risk of morbidity from infectious diseases that can have an effect on school attendance and consequently on academic performance. It is estimated that 85 million school-age children are at increased risk of acute respiratory and other infections because they are deficient in vitamin A (Del Rosso 1999). Vitamin A deficiency also affects iron metabolism so that with any iron supplements taken, subsequent improvement in iron status may be limited when vitamin A status is low. This is increasingly recognized as a potential constraint when considering the impact of school-based iron supplementation.

Illustrative investments
Some pilot studies are described below.

Effects
The possible effects of micronutrient supplementation of school children include:

Improved nutritional status. Iron supplementation typically result in a 5-25 percent increase in hemoglobin levels (McGuire 1996). However, one study of adolescent girls in Tanzania found that weekly doses of 400mg of ferrous sulphate for 4 months did not produce any change in hemoglobin levels, although it did lead to significantly higher levels of serum ferritin and significantly greater weight gains, i.e., +2.4 kg versus +1.4 kg (Beasley et al. 2000). There is also some evidence that supplements provided during the school year may not be sufficient to maintain adequate levels of micronutrients over the summer holidays (van Stuijvenberg et al. 2001).

Cost and/or cost effectiveness
Table 7 provides estimates of the cost of micronutrient supplements. These are only the costs of the drugs. The costs of shipping, handling, and internal delivery as well as training of teachers would be additional. If, however, the micronutrients were combined with an established deworming program (see discussion below on the potential synergies between these two types of investment), much of the needed infrastructure would exist and, therefore, additional costs would be minimal.
Table 7: Cost of micronutrient supplementation in selected countries

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Countries</th>
<th>Cost of drugs (per child per yearly dose)</th>
<th>Cost of delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td></td>
<td>US$0.04</td>
<td></td>
</tr>
<tr>
<td>Iodine</td>
<td></td>
<td>US$0.30-0.40</td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td></td>
<td>US$0.10</td>
<td></td>
</tr>
</tbody>
</table>


Gender

Contrary to popular opinion, adolescent girls do not suffer more than boys from iron deficiency anemia (WHO 2000). However, in some countries, girls enrolled in school may come from higher socio-economic groups than enrolled boys. The distributional impact by gender and income of school-based micronutrient supplementation investments is difficult to predict a priori.

Country context

Clearly the cost-effectiveness of micro-nutrient supplementation is higher in settings in which the prevalence of micro-nutrient deficiencies is greater.

3.6.5 Water and sanitation programs in schools

While the impact of poor sanitation and hygiene is known to be disastrous for infants and young children, it also has an important negative impact on the health of school-age children including adolescents. Diseases such as diarrhea and parasitic worm infections can be effectively addressed by making improvements to water and sanitation facilities. Disease is not the only problem caused by poor sanitation in the school environment. Providing safe and separate sanitation facilities for girls, particularly adolescents, may promote greater school attendance by girls (World Bank 2002a). In particular, girls who are old enough to menstruate need to have adequate facilities at school and normally separate from those of boys. Many children also miss out on time at school because they have to walk long distances to fetch water. When the schoolteacher sends children to fetch water, it is predominantly girls who are sent.

Experience shows clearly that the mere provision of water and sanitation facilities, be it within schools or at household level, will not be sustainable. Facilities need to be maintained and in order to be maintained there must be a recognized need and demand for water as well as sanitation at schools. To improve the sanitation environment of schools and to ensure benefits from safe and clean facilities, behavioral change is needed, leading to a proper use of the facilities as well as organized maintenance of the facilities and sanitation-related behaviors such as hand-washing.

Illustrative investments

In Bangladesh, the Female Secondary School Assistance Projects included assistance to construct water and sanitation facilities in schools.

Effects

The possible outcomes of water and sanitation programs in schools include:
Improved health
Increased education

**Improved health.** No information available.

**Increased education.** Lessons learned from a DPHE-UNICEF study in 1994 and 1998 in Bangladesh showed that provision of water and sanitation facilities in schools increased girls’ attendance by 15 percent. Another school sanitation program in Bangladesh increased girls’ enrolment by 11 percent, a level that is beyond the reach of conventional educational reform. However, an evaluation of the Female Secondary Schools Assistance Projects using cross-section data found no association between water and sanitation facilities in schools and attendance (Miske, Moore and De Jaeghere 2000).

**Cost and/or cost effectiveness**

The construction of latrines and installation of water points can be extremely costly. With advocacy and collaboration with school construction units, however, the actual cost to the school health program is relatively low. The costs of the installations differ greatly because of environmental differences and models used. Table 8 provides some examples.

<table>
<thead>
<tr>
<th></th>
<th>Latrines per school (approximate costs)</th>
<th>Water (approximate costs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senegal</td>
<td>US$1200</td>
<td>US$300 (urban)</td>
</tr>
<tr>
<td>Mauritania</td>
<td>US$500</td>
<td>US$16,000 to US$1,000</td>
</tr>
<tr>
<td>Chad</td>
<td>US$1100</td>
<td>US$700 to US$3,500</td>
</tr>
</tbody>
</table>

*Source: World Bank (2002).*

In addition to the construction and installation of water points and latrines, there are maintenance costs and training costs (World Bank 2002a). The Senegal school health team estimates US$300 per school for maintenance. The school health team in Guinea estimates that the testing of wells will cost approximately US$30 per well. There are also costs of monitoring the latrines and sanitation facilities in schools as well as training the community members for proper maintenance. Communities can also contribute to the construction of sanitation facilities.

**Gender**

The provision of safe water and sanitation facilities in schools is likely to benefit enrolled girls more than enrolled boys since girls are more often sent to fetch water and their enrollment in school appears to be more sensitive to the availability of adequate sanitation facilities. However, in many countries, many fewer girls than boys are enrolled in school.

**Country context**

The benefits of school-based water and sanitation investments can be expected to be lower in areas in which children do not have access to safe water and sanitation facilities while at home.
Private versus social benefits and costs

Since water and sanitation investments are targeted mainly at reducing the incidence of infectious diseases, the social benefits of such investments can be expected to exceed their private benefits.

3.6.6 Mass de-worming in schools

Roundworm, whipworm, hookworm, schistosomiasis, and other flukes and/or guinea worm infect about 400 million school-age children, often with multiple infections occurring in a single child (World Bank 2002a). These parasites consume nutrients from infected children, aggravating any malnutrition present in the child and possibly retarding children’s physical development. This can lead to stunting, low weight in relation to age, and anemia. For example, a study of 3,595 schoolchildren in Zanzibar, Tanzania found that infection with whipworms, roundworms and hookworms were all associated with worse iron status (Stoltzfus et al. 1997b). The strongest association was with hookworm infection, which explained 25 percent of the variation of anemia and 73 percent of the variation in severe anemia.

Children with heavy worm burdens are likely to be absent from school more often than those who are lightly infected or free from worms. Although limited in number, studies show that learning outcomes of healthy children are better than those for children infected with helminths (World Bank 2002a). For example, in one study of 432 children from 42 schools in Indonesia, hookworm infection was a significant negative factor in explaining performance in several tests of working memory with several other variables held constant, i.e., age, sex, parental education and socio-economic status, and nutritional status (Sakti et al. 1999). In another study of Tanzanian children age 9-14, those heavily infected with schistosomiasis (S. haemotobium), and particularly those with poor nutritional status, had significantly lower scores on tests of short-term memory and reaction times, holding a broad range of potentially confounding variables constant (Jukes et al. 2002). However, no association was observed between either moderate schistosomiasis infection or hookworm infection and either educational attainment or other measures of cognitive achievement.

The high prevalence of infections and the development of effective and safe single-dose treatments for worms have led WHO to recommend that schools offer mass treatment when surveys show that the prevalence of intestinal helminths infections exceeds 50 percent (World Bank 2002a). The recommended treatments are albendazole or mebendazole for roundworm, whipworm, and hookworm, and praziquantel for treating schistosomes.

Illustrative investments

The Zanzibar (Tanzania) Ministries of Health and Education implemented a school-based deworming program on Pemba Island in 12 randomly selected schools (Stoltzfus et al. 1998). In another study involving Tanzania, 80,442 students in 577 schools in Volta Region, Ghana and 109,099 students in 350 schools in the Tanga region of Tanzania received a combination of mass and selective treatment for schistosomiasis (The Partnership for Child Development 1999).

51 Global prevalence and number of cases of intestinal helminth infection in school-age children are estimated at: Roundworm 35 percent (320 million), Whipworm 25 percent (233 million), Hookworm 26 percent (239 million) (World Bank 2002a).
In Busia district of Western Kenya, an ongoing World Bank study is evaluating the effect of mass deworming treatment (i.e., treating all students in a school) on the education outcomes (World Bank 2002h). Under this project, deworming treatment (albendazole at six-month intervals and annual doses of praziquantel) is being phased in at 75 primary schools with a combined enrollment of 30,000 students. The treatment was initially phased in at 25 randomly selected schools during the project’s first year, and at 25 additional randomly selected schools during the project’s second year. The last 25 schools, which are currently receiving the treatment, served as controls during the project’s first three years.

**Effects**

The possible effects of anti-helminthic treatment of school children include:

- **Improved health**
- **Increased education**
- **Improved nutritional status**

**Improved health.** Anti-helminthic treatment of school children has been shown to be effective in reducing infection intensity. In the Pemba Island, Zanzibar study referred to above, twice-per-year and three times-per-year deworming treatment had the following effects respectively on the intensity of infection (i.e., measured as eggs per gram of feces) with roundworms (63.1 percent and 96.7 percent), whipworms (40.4 percent and 75.9 percent), and hookworms (35.3 percent and 57.2 percent) (Albonico et al. 1999). In addition, population dynamic theory has predicted that focusing anti-helminthic treatment on school-age children will significantly reduce transmission in the population as a whole (Bundy et al 1990). Large-scale field studies have supported these conclusions. A school-based program in Montserrat treated 95 percent of schoolchildren on a regular basis, producing a decline in infection intensity in both the treated children and the untreated population outside the school (Bundy et al 1990). In a Kenyan study, treating only schoolchildren had almost the same impact on *S. mansoni* re-infection rates, as did a comprehensive program that sought to treat the entire population. Population dynamic models of these data suggest that these observations can be satisfactorily explained only by the assumption that schoolchildren are the major contributors to helminth transmission (Chan and Bundy 1997).

**Increased education.** In the Kenya project described above, after two years, observed effects of deworming treatment included fewer absences and lower dropout rates. However, there has been no effect on test scores (Glewwe 2002). The treatment also produced health and school participation benefits among untreated children in the same schools, as well as in neighboring schools, suggesting that the deworming treated created positive externalities. In a randomized intervention in Jamaica involving 407 schoolchildren age 6-12, treatment for whipworm infection improved school performance (attendance and spelling, but not in reading or math), particularly among children with heavy infection intensities and with poor nutritional status (Simeon et al. 1995). In another randomized intervention in Jamaica involving 159 schoolchildren age 9-12, treatment for both roundworms and whipworms produced improvements in cognitive function (with the effects of whipworm treatment being more important) (Nokes et al. 1992). In a randomized intervention in Sichuan, China involving children age 5-16, treatment for schistosomiasis (*S. japonicum*) improved...
performance on cognitive tests, particularly among younger children (age 5-7) and nutritional status (Nokes et al. 1999).

**Improved nutritional status.** In the Zanzibar program mentioned above, evaluations were conducted at baseline and at six-month and 12-month following treatment. Children who received thrice-yearly mebendazole were compared with children who received twice-yearly mebendazole and with untreated children. The evaluation found that children younger than ten gained 0.27 kg more weight and 0.13 cm more height in the twice yearly group and 0.20 kg more weight and 0.30 cm more height in the thrice-yearly group, compared with the control group. Children younger than 10 with greater height-for-age at baseline had greater weight and height gains in response to deworming. In children 10 and older, overall program effects on height or weight gains were not significant. However, in this age range, younger boys made significant gains in height with thrice-yearly deworming and children with greater height-per-age had greater gains in weight in response to deworming (Stoltzfus et al. 1998a). In the same study, the researchers estimated that the deworming treatment prevented 1,260 cases of moderate to severe anemia and 276 cases of severe anemia in one year in a population of 30,000 schoolchildren (Stoltzfus et al. 1998b). In another large-scale Tanzania study (in the Tanga region), 15 months after deworming treatment (albendazole and praziquantel), the prevalence of anemia was reduced by 25 percent while that of moderate-to-severe anemia was reduced by nearly 50 percent (Guyatt et al. 2001).

**Cost and/or cost effectiveness**

A detailed cost analysis of delivery of albendazole and praziquantel in the school-based programs in Ghana (80,442 children in 577 schools) and Tanzania (110,000 children in 352 schools) has been described by The Partnership for Child Development (1999). The total cost per child treated (cost of drugs plus delivery, including the cost of volunteer workers—but not including capital costs or distortionary costs) of a combination of mass and selective treatment for schistosomiasis using praziquantel, which also involved prior screening at the school level, was US$2.94 in Ghana and US$1.32 in Tanzania. The costs of treating intestinal nematodes with albendazole which was given as a fixed dose to all children was US$0.27 in Ghana and US$0.26 in Tanzania. The largest component of this cost in most cases was the drugs themselves, with delivery forming a smaller proportion of the total cost. The exception was the cost of delivery of praziquantel in Ghana, which was slightly higher than the cost of the drug; because dosage of praziquantel is individualized additional training was necessary (World Bank 2002a) (Table 9).

In the Tanga, Tanzania study referred to above, the cost of delivering antihelminthic drugs (albendazole and praziquantel) was estimated to be about $1 per treated child, while the cost per anemia case prevented was estimated to be $6-8 (Guyatt et al. 2001).

In their Kenya study referred to above, Miguel & Kremer (2001) estimate a cost of the program per additional year of school participation of only US$3, and a benefit-cost ratio of approximately 10:1.

It has been estimated that it would cost between $0.31 to $0.57 per student treated to provide mass anti-helminthic treatment to Vietnamese school children (Carrin et al. 1999).

Warren et al. (1993) estimated that the cost per Disability-adjusted Life Year (DALY) gained from anti-helminthic control ranges between US$6 and $33.
### Table 9: Cost of school-based anti-helminthic treatment in selected countries

<table>
<thead>
<tr>
<th>Drug</th>
<th>Countries</th>
<th>Cost of drugs (per child per yearly dose)</th>
<th>Cost of delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albendazole for intestinal worms</td>
<td>Ghana, Tanzania, and India</td>
<td>US$0.03-0.20</td>
<td>US$0.03-0.07</td>
</tr>
<tr>
<td>Praziquantel for Schistosomiasis</td>
<td>Ghana, Tanzania</td>
<td>US$0.20-0.71</td>
<td>US$0.21-2.39</td>
</tr>
</tbody>
</table>


**Country context**

The benefits of de-worming will be higher in areas with high prevalence of helminthic infections (Belli and Appaix 2002).

**Private versus social benefits and costs**

There is evidence from several school-based anti-helminthic interventions (as noted above) that treatment of school children leads to significant decreases in infection rates among other population groups. This finding suggests that school-based de-worming yields significant social benefits in addition to the private benefits received by the school children who are treated.

**3.6.7 Presumptive malaria treatment of school children**

Malaria is an important source of school absenteeism in many developing countries.

**Illustrative investments**

In a small pilot area in Malawi, Save the Children (US) has been treating students for malaria with Fansidar (World Bank 2002a). Presumptive malaria treatment is required in this part of Malawi for those with basic symptoms such as fever because of the nature of malaria in Malawi, as well as the growing resistance of the disease to the standard treatment (chloroquine). Fansidar has a one-dose application that makes treatment easier. The pilot program provides schools with first aid kits that include Fansidar. Unfortunately, there is no information available yet on the effectiveness of the intervention.

**Effects**

The possible effects of presumptive malaria treatment of school children include:

- Improved health
- Increased education

**Improved health.** No information available.

**Increased education.** In the Congo malaria was found to be responsible for 36 percent of absenteeism in the high transmission season but only 3 percent in the low transmission season (Belli and Appaix 2002). Cerebral malaria also leads to cognitive impairments, but no convincing evidence has demonstrated impairments associated with less severe forms of malaria (Belli and Appaix 2002).
Cost and/or cost effectiveness

The cost for Fansidar is US$0.80 for two tablets, which is the treatment dosage. Panadol (US$0.16 for two tablets) is also administered with Fansidar to suppress the effects of the fever. In addition to the costs of the drugs and delivery of them to the school, costs for training teachers, and sensitisation would have to be considered.

Country context

The benefits of investments in the presumptive malaria treatment of school children will be higher in areas with higher malaria prevalence.

Private versus social benefits and costs

Since malaria is an infectious disease, the social benefits of malaria treatment are likely to exceed the private benefits.

3.6.8 Periodic physical examinations of school children

Physical examinations of school children by health personnel are generally not cost-effective and often inequitable since the exams may reach only children in urban secondary schools attended by the more affluent children. Physical examination is rarely linked to referral. (World Bank 2002a). More cost-effective screening and referral services within school health programs have been realized when properly trained teachers, instead of health workers, have been used in the screening process.

Illustrative investments

The KwaZulu-Natal Province, South Africa, has 5,000 schools with an enrolment of 2.8 million pupils (World Bank 2002a). Many of the schools are in rural areas with limited access to health facilities. The school nurse:pupil ratio ranges from 1:1,000 in urban areas to 1:9,000 in rural areas. Health teams, led by a trained nurse, aimed to visit enrolled children at least once during their years in primary school. However, evaluations revealed that only 10.7 percent of school health teams visited all of their target schools. In one rural region, only 36 percent of schools were visited. The service was able to screen 18 percent of the province’s pupils. About 11 percent of school health teams carried out the required follow-up with their target schools.

A school health program in Chile was entirely based on teachers but was linked to the health system by effective referral mechanisms (World Bank 2002a). This program achieved 96 percent coverage. Unfortunately, however, no information is available on its effectiveness.

Effects

The possible effects of periodic examinations of school children include:

Improved health
Increased education

Unfortunately, no information is available on the effects of these investments.
Cost and/or cost effectiveness
The cost of the South African program was US$11.5 per child screened, excluding costs of referral and follow up.

The cost of the Chilean program was US$1.8 per child screened.

A full medical visit is estimated to cost about US$7 per child in Senegal. This estimate is based on previous experience of schools in the capital cities of the regions of Senegal in which medical staff was available and they did not have to travel far to see the students. The cost represents the real costs of the examination but does not take into account possible follow-up such as the costs of treatment.

Country context
The Chilean model is practical only where there is an effective health care system to which children can be referred.

Private versus social benefits and costs
Benefits are likely to be predominantly private.

3.6.9 School health insurance
School health insurance can be an effective way to finance the cost of school health programs while also providing risk-pooling services to school-age children. Although school-age children are generally a relatively healthy age group (Senderowitz 1995), hospital admissions average about 6 percent among school children in Ho Chi Minh City, Vietnam (Carrin et al. 1999).

Illustrative investments
In Ho Chi Minh City, Vietnam, the annual premium for basic school health insurance in 1998 was about $1.50 for primary school students, about $1.80 for junior high school students, and about $2.15 for senior high school students (Carrin et al. 1999). Benefits included: 1) basic health services at the school level (in school clinics), 2) inpatient examination, diagnosis, testing and treatment at a public facility, with access to higher level care if necessary, 3) emergency outpatient care at public hospitals, and 4) funeral expenses. Students could obtain additional coverage (including non-emergency outpatient care at hospitals) by paying an additional annual premium of about $3.60. These relatively low rates reflect the fact that most public health facilities in Vietnam are still partially subsidized by the Government. They also reflect the fact that the benefits did not include eyeglasses or services provided by Government-sponsored vertical programs, such as TB, malnutrition, and reproductive health.

Egypt has school health insurance program that covers all school children, The program is partly financed by parents, partly financed by the Ministry of Public Health, and partly financed by a tax on cigarettes. Students receive primary care in special school clinics and referral care at Social Security facilities. (find out the cost of the program)

Effects
The possible outcomes of school health insurance include:
Increased education
Improved health
Expanded access to risk pooling services

Increased education. No information available.

Improved health. No information available.

Expanded access to risk pooling services. Although catastrophic health care costs are relatively rare in the school-age population, there is a welfare gain from the provision of risk pooling services in connection with school health insurance. The welfare gain is proportional to the extent to which the insurance coverage reduces the variance of the risk of health care costs (and is therefore most sensitive to the degree to which insurance reduces the risk of catastrophic losses).

Cost and/or cost effectiveness
The Vietnam school health insurance program, which is voluntary, is entirely financed by the premiums paid by parents. In Egypt, the school health insurance program is financed in part by the premiums paid by parents and in part by a tax on tobacco products. However, the cost of the premiums is not a cost of health insurance. The costs of health insurance include the administrative and marketing costs of the insurance program as well as any distortionary costs. The latter include the cost of any excessive consumption of medical care induced by moral hazard as well as any distortionary costs related to the financing of health insurance. Unfortunately, no information is available on these costs.

Country context
The benefits of school health programs are likely to be higher in countries in which there is an adequate health system in place.

Private versus social benefits and costs
The benefits of school health insurance investments are likely to be mainly private. However, to the extent that school health insurance programs have a strong health education component, there may be reductions in infectious diseases that provide social benefits.

3.7 OTHER HEALTH INVESTMENTS IN YOUTH

Not all youth can be reached by school-based health programs, especially when interventions are targeted to older youth who are less likely to be enrolled in school. Non-school-based health investments include investments designed to reduce consumption of tobacco, alcohol and other drugs, mass media interventions, food stamp and food fortification programs designed to improve the nutritional status of youth and their children, and investments designed to improve the mental health of youth.

There are rapid expansions of use of tobacco, alcohol and other drugs in developing countries, especially among youth. Tobacco use is one of the chief preventable causes of death in the world.
The adverse health effects of tobacco use among smokers are well known. Tobacco use generally begins during adolescence and continues through adulthood, sustained by addiction to nicotine. Recent trends indicate an earlier age of initiation and rising smoking prevalence rates among children and adolescents (World Bank 1999a). If these trends continue, tobacco use will result in the deaths of 250 million of the people who are children and adolescents today. The vast majority of children exposed to environmental tobacco smoke (ETS) do not choose to be exposed. Given that more than one billion (one US thousand million) adults smoke worldwide, WHO estimates that around 700 million, or almost one-half of the world’s children, breathe air polluted by tobacco smoke. There are strong advocates for limiting or reversing these expansions through a range of policies, including increasing prices, limitations on advertising, and prohibition on use (particularly for minors).

Twelve countries conducted the Global Youth Tobacco Survey project in 1999 to provide more information on tobacco use among schoolchildren and to enhance the capacity of countries to design and implement their own tobacco control and prevention programs (World Bank 2002a). The survey showed that between 10 and 33 percent of 13 to 15-year-old children smoked—a percentage that was found to be higher among boys than girls. One-fifth or more of young people begin smoking before the age of 10. There is a higher risk of being addicted or becoming heavy smokers when smoking begins at such a young age. The survey also showed that laws restricting the sale of tobacco to young people are seldom enforced.

The substantial number of exposed children and the evidence that environmental ETS causes illness in children constitutes a substantial public health threat. Governments have a responsibility to legislate to control exposure to tobacco smoke in public spaces such as schools. Educational strategies, including effective education on health risks to children, are likely to be more effective when culturally specific public policy is in place. The overall goal is to protect this vulnerable group from exposure and support and help them to avoid starting unhealthy smoking habits and addiction.

### 3.7.1 Increasing the tax on tobacco products

Increasing the tax on tobacco products is widely believed to be one of the most cost-effective investments in youth.

**Illustrative investments**

In South Africa, during the 1990s, the government increased its excise taxes on cigarettes sharply, i.e., by more than 450 percent (World Bank 1999a). As a percentage of the retail price, taxation increased from 38 to 50 percent. Although smuggling increased (from about 0 percent to 6 percent of the market), total tax revenues more than doubled in real terms. Sales fell by 20 percent.

**Effects**

The possible effects of an increase in the tobacco tax include:

- Reduced tobacco use
- Increased government tax revenue

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Reduced tobacco use. It is estimated that a tax increase of 10 percent on the price of cigarettes would reduce demand by about 8 percent in low- and middle-income countries and that the effect would probably be greater among youth (World Bank 1999a). In China, it has been estimated that a 10 percent increase in the tax on tobacco products would lead to a 5 percent reduction in consumption (World Bank 1999a).

Increased tax revenue. In China, it has been estimated that a 10 percent increase in the tax on tobacco products would lead to a 5 percent increase in tobacco tax revenue (World Bank 1999a). There is no benefit to the increase in tax revenue. However, there may be direct administrative costs and distortion costs associated with the tax increase. For example, higher taxes tobacco taxes need to be combined with strong measures against smuggling. Worldwide, it is estimated that about 30 percent of internationally traded cigarettes are smuggled (World Bank 1999a).

Cost and/or cost effectiveness
The available evidence suggests that tobacco control is highly cost-effective when compared to alternative health investments (World Bank 1999a). In developing countries, the cost per DALY gained from an increase in tobacco taxes has been estimated to be between US$5 and $17 (World Bank 1999a).

The cost of increased government expenditure to control smuggling is part of the cost of raising taxes on tobacco products. Unfortunately, no information is available on the cost of such investments.

Gender
In developing countries, smoking rates are much higher among men than among women, as was the case a few decades ago in developed countries. This suggests that males will benefit more than females from investments designed to reduce the consumption of tobacco.

Country context
The benefits from investments in this area should be greater in countries in which smoking prevalence among adults is higher. Benefits are also likely to be higher in countries that are better able to enforce taxes on tobacco products (e.g., curb smuggling).

Private versus social benefits and costs
Because of the adverse effects of tobacco use on others (e.g., the effects of second-hand smoking), the social benefits of investments in restricting tobacco use are likely to be substantially higher than the private benefits. The fact that smokers tend to die earlier in life and may save social security systems substantial sums in pension outlays is not really a counter argument, since pension payments are a transfer.

Distribution
Investments in this area are likely to benefit all income groups.
3.7.2 Ban on tobacco advertising and promotion

**Illustrative investments**
No specific developing country examples available.

**Effects**
The possible effect of a ban on tobacco advertising and promotion is reduced consumption of tobacco products.

Reduced tobacco use. There are no data on the effectiveness of investments to implement a ban on tobacco advertising and promotion in developing countries. However, in developed countries, it has been estimated that a comprehensive ban on cigarette advertising and promotion leads to a decrease in consumption of about 7 percent (World Bank 1999a).

**Cost and/or cost effectiveness**
Despite the absence of data on effectiveness, the cost per DALY of a package of non-price measures designed to reduce tobacco consumption in low- and middle-income countries has been estimated to be between US$68 to $272 (World Bank 1999a).

**Gender**
In developing countries, smoking rates are much higher among men than among women, as was the case a few decades ago in developed countries. This suggests that males will benefit more than females from investments designed to reduce the consumption of tobacco.

**Country context**
The benefits from investments in this area should be greater in countries in which smoking prevalence among adults is higher and in which tobacco products are actively promoted in the media.

**Private versus social benefits and costs**
Because of the adverse secondary effects of tobacco use (e.g., the effects of second-hand smoke), the social benefits of investments in restricting tobacco use are likely to be substantially higher than the private benefits. The fact that smokers tend to die earlier in life and may save social security systems substantial sums in pension outlays is not really a counter argument, since pension payments are a transfer.

**Distribution**
Investments in this area are likely to benefit all income groups.

3.7.3 Anti-alcohol abuse interventions

Effective policies include increased taxation of alcohol products, bans on promotion to youth, and minimum drinking age laws (Jernigan 2001). Education policies have been shown to be less effective in changing behavior.
Illustrative investments
No examples available.

Effects
The main effect of anti-alcohol investments is a reduction in the prevalence of alcohol abuse. Restrictions on the minimum drinking age and changes in tax rates for alcoholic beverages in developed countries have been shown to have an impact on traffic fatalities, cirrhosis and violence (Jernigan 2001).

Cost and/or cost effectiveness
There is no information available on the cost or cost effectiveness of investments in this area.

Gender
In developing countries, substance abuse rates are much higher among men than among women (WHO 2000, Jernigan 2001). This suggests that males will benefit more than females from investments designed to reduce substance abuse.

Country context
Benefits are likely to be greater in countries in which adult alcohol abuse is more prevalent.

Private versus social benefits and costs
Since alcohol abuse imposes significant costs on others (including those outside the abuser’s own household), the social benefits of investments in this area are likely to exceed the private benefits.

Distribution
Investments in this area are likely to benefit all income groups.

3.7.4 Anti-drug abuse interventions
Drug abuse is a serious public health concern in both developing and developed countries. A wide range of substances causes harmful effects.

Illustrative investments
The ILO implemented a Norwegian-funded project in five countries (Malaysia, Egypt, India, South Africa and Zimbabwe) during 1998-99 designed to mobilize small and medium-sized businesses to prevent substance abuse (ILO 2002). The workplace programs targeted youth, the group with the highest drug use, as well as parents, families and employers. Activities included primary prevention, the rehabilitation of drug-abusing employees, and the identification of drug pushers among employees.

Effects
The effect of these investments should be to averted drug and alcohol abuse, which should in turn enhance labor productivity, improve health, reduce health care costs and avert crime (see Section 4). In the ILO project mentioned above, for example, an evaluation survey was carried out at the end of
the project in Malaysia. Over 80 percent of the respondents reported improvements in business performance, including increased productivity, decreased work-related accidents, reduced absenteeism, and decreased medical care costs.

Cost and/or cost effectiveness
No information is available on the cost or cost effectiveness of these investments.

Gender
In developing countries, substance abuse rates are much higher among men than among women (WHO 2000). This suggests that males will benefit more than females from investments designed to reduce substance abuse.

Country context
Benefits of investments in this area are likely to be greater in countries in which adult drug abuse is more prevalent.

Private versus social benefits and costs
Since drug abuse imposes significant costs on others (e.g., crime), the social benefits of investments in this area are likely to exceed the private benefits.

Distribution
Investments in this area are likely to benefit all income groups.

3.7.4 Mass media interventions (apart from reproductive health)

Mass media investments can be used to alter norms and values that affect youth development. The media can also be used to provide positive role models for youth and to provide health education. Mass media investments can be used to target and change behaviors in areas such as smoking and substance abuse. Mass media campaigns (e.g., using print media, radio or television) can typically reach a large share of the population with important health-related messages. Among the messages that can be most effective are those designed to inform youth about the risks from tobacco use.

Illustrative investments
In Southern and Eastern Africa, the multimedia Sara initiative helps adolescent girls make important decisions, such as whether to remain in school (UNICEF 2002a). The episodes encourage discussion of key issues such as teenage pregnancy, HIV/AIDS, the unequal workloads of girls and boys, sexual abuse and early marriage. The Sara initiative also tries to develop negotiating skills for use in convincing adults about the need to remain in school or to avoid female genital cutting.

In South Africa, the radio and television show “lovelife” provides youth an opportunity to discuss a wide range of previously taboo subjects, such as adolescent sexuality (UNICEF 2002a). The program has gained wide acceptance among the general public.

Effects
The possible effects of mass media investments include:
Increased education
Improved health
Improved mental health
Averted teen pregnancies
Averted HIV infections
Averted STIs
Delayed marriage
Reduced tobacco use.
Averted drug/alcohol abuse
Averted sexual/physical abuse
Averted female genital mutilation

However, mass media investments designed to change social norms and cultural practices have not been carefully evaluated, and consequently there is no information on the effects of these investments.

**Cost and/or cost effectiveness**
There is no information on the cost or cost effectiveness of mass media investments, apart from those narrowly focused on reproductive health.

**Gender**
There may be differences by gender in the incidence of benefits from investments in this area, depending on differences by gender in exposure to various channels of mass media.

**Country context**
The benefits of investments in this area will be higher in countries in which mass media penetration is higher.

**Private versus social benefits and costs**
Since many of the types of youth behavior that are likely to be targeted by mass media programs impose significant social costs (e.g., crime, tobacco use, drug/alcohol abuse), social benefits are likely to exceed private benefits.

**Distribution**
It may be difficult to reach the poor with mass media investments, since they are often illiterate and may not have access to radio or television.

**3.7.6 Food supplements for pregnant and lactating women**

**Illustrative investments**
Several countries in Latin America and in the Caribbean region support targeted food stamp programs (Pfeffermann and Griffin 1989, CGCED 1989). In Jamaica, for example, food stamp assistance to pregnant youth and to women with children under 6 years of age, as well as to the poor,
the elderly and the disabled, reached 263,000 beneficiaries at a cost of US$10.8 million in 1998 (CGCED 2002).

In Chile, there is a government-sponsored complementary feeding program for pregnant women, breastfeeding women and children under 5 (Pfeffermann and Griffin 1989). Those determined not to be at risk are provided with a package of food, while those determined to be at risk are provided with substantially greater benefits, including continuing medical examinations at National Health Service clinics. The program covers about 70 percent of the eligible population.

In the World Bank-supported Bangladesh Integrated Nutrition Project, more than half of enrolled pregnant and lactating women receive food supplements. Eighty percent of women receive iron tablets during pregnancy, while 90 percent receive Vitamin A supplements during the postpartum period (Tinker, Finn and Epp 2000). The project also serves newly weds.

**Effects**

The possible effects of food supplement programs targeted to youth include:

**Improved nutritional status**

Improved nutritional status. One would expect that food supplements would have a positive impact on all dimensions of nutritional status, except the prevalence of obesity. In the Bangladesh project, the number of low birth weight babies declined by 30 percent (Tinker, Finn and Epp 2000). Studies carried out in Guatemala showed that food supplementation during pregnancy resulted in significant increases in children’s birth weight, physical growth, and cognitive development up to the age of three (World Bank 2002c). The Chilean food program has virtually eliminated severe child malnutrition as a health problem (Pfefferman and Griffin 1989).

**Cost and/or cost effectiveness**

The cost of the Jamaican food stamp program in 1998 was $41.06 per beneficiary (CGCED 2002).

The cost of the Chilean food supplement program for pregnant women is about $30 per beneficiary (Pfeffermann and Griffin 1989). Each case of severe malnutrition averted saves the health system an estimated $650.

Iron supplementation of pregnant women costs about $1.7 per pregnancy per year, and breastfeeding promotion and support costs just US $2.00-3.00 per beneficiary year.

**Gender**

Apart from the benefits that accrue to mothers, the benefits of these programs should be fairly equally distributed between male and female youth.

**Country context**

The benefits of these investments are likely to be higher in countries in which levels of malnutrition are higher and/or in countries with effective systems for targeting programs to the poor.
Private versus social benefits and costs
The benefits of these programs are mainly private.

Distribution
Particularly when programs are effectively targeted, investments in this area can be expected to be pro-poor.

3.7.7 Food fortification
Iron-deficiency anemia is the most widespread and serious nutritional problem among both male and female adolescents. It can hamper both physical and mental development. Although most iron supplementation programs are school-based, this is not the only way to address the problem.

Illustrative investments
One example in Iran is mentioned below.

Effects
The possible effects of food fortification programs include:

Improved nutritional status

Improved nutritional status. In Iran, after six months of fortifying food with iron, anemia rates were reduced by one half (FOCUS 2001). Iron fortification typically results in a 5-25 percent increase in hemoglobin levels (McGuire 1996).

Cost and/or cost effectiveness
There is no information available on the cost or cost effectiveness of investments in this area.

Gender
Anemia is a more serious health problem among adolescent and young women than among males.

Country context
The benefits of investments in this area are likely to be greater in countries where the micronutrient deficiency addressed through fortification affects a higher percentage of the population.

Private versus social benefits and costs
Benefits are likely to be mainly private.

Distribution
Investments in this area will benefit persons with micronutrient deficiencies, who are predominantly the poor.
3.7.8 Investments to improve the mental health of youth

One of the most rapidly growing areas of health problems in developing countries is mental health. Indeed available estimates for the developing countries indicate that the second largest increase in the percentage share of DALYs in developing countries in 1990-2020 will be neuro-psychiatric conditions, second only to cardiovascular diseases – and with much larger increases than some other often more emphasized conditions, such as HIV/AIDS (our calculations are based on DALYs as estimated by Murray and Lopez 1996). Yet there are very few programs directed toward mental health problems of youth, and even fewer good evaluations of the programs that do exist.

Illustrative investments
There are no example available.

Effects
There is no information on the effects of investments designed to improve the mental health of youth.

Cost and/or cost effectiveness
There is no information on the cost or cost effectiveness of investments designed to improve the mental health of youth.

Gender
There is substantial evidence that boys and girls respond to mental stress differently (WHO 2000). Worldwide, three times as many girls than boys attempt suicide, while three times as many boys commit suicide (WHO 2000).

3.7.9 Investments to Decrease Road Accidents among Youth

Road accidents are an important cause of mortality and morbidity among youth in developing countries. The problem is most often not one of youthful drivers but of youthful pedestrians, cyclists, and public transport users.

Illustrative investments
There have been a number of road safety activities aimed at school children in developing countries, but there are few evaluations of their effectiveness and most such activities are unreported. TRL International has developed pilot road safety education programs in India and Ghana. In both countries, only one school year age group was selected (in Ghana, it was the 10-11 year age group). TRL has also prepared a road safety curriculum for Uganda.

In Bangalore, India, activities supported by the National Institute of Mental Health and Neuro Sciences include: promoting helmet legislation, reducing drinking and driving, and strengthening prehospital care, and development of hospital-based surveillance.

52 However, this pattern differs in China and India, where the number of female suicides exceeds the number of male suicides (WHO 2000).
Some NGOs have also been active in road safety (e.g., the Institute for Road Traffic Education in India (www.irte.com) and the Youth Association for Social Awareness in Lebanon (www.yasalebanon.com). The private sector (e.g., Shell and Renault) has also participated in some programs.

**Effects**

In the TRL International pilots in Ghana and India, evaluation was restricted to changes in knowledge and to teacher feedback.

Reviews by the Cochrane group and the CDC have been pessimistic about the potential for crash and injury reduction from education and training programs in schools.

**Costs and/or cost effectiveness**

There is no information on the cost or cost effectiveness of investments in this area.

**Gender**

In some countries, particularly those in which travel by women is restricted, the beneficiaries of investments in this area are likely to be predominantly male.

**Country context**

The benefits of investments in this area will be greater in countries in which road travel and traffic is relatively heavy.

**Private versus social benefits and costs**

Since youth are less often the cause of injuries than the victims in developing countries, the benefits of investments in this area are more likely to be private than social.

**Distribution**

The beneficiaries of investments in this area are more likely to be middle- and upper-income youth in urban areas.

### 3.8 Community and other investments

#### 3.81 Youth centers

Youth centers also typically provide recreational, educational and vocational training services. They also try to address other youth problems, such as smoking, drinking and drug abuse. Youth centers sometimes also provide reproductive health services as one of many services (FOCUS 2001).

**Illustrative investments**

No examples were found.
**Effects**

The possible effects of youth centers include:

- Increased education
- Averted teen pregnancies
- Averted HIV infections
- Averted STIs
- Averted youth unemployment
- Averted crime
- Averted drug/alcohol abuse
- Reduced tobacco use

There are few rigorous evaluations of the effects of youth centers. An additional evaluation problem in the case of youth centers is that it is usually not possible to identify which program components had the greatest impact.

In one youth center in Lome, Togo, there was no evidence that the center had any effect on either knowledge or use of contraceptives, although knowledge of condoms was higher among youth using the center (Kouwonou and Amegee 2001).

**Cost and/or cost effectiveness**

The available evidence suggests that youth centers are not cost effective because most youth use the centers for recreation, rather than for RH services (FOCUS 2001). Youth centers have been discontinued by some organizations for this reason. There is only one study of the cost effectiveness of youth centers (Phiri and Erulkar 1997).

### 3.8.2 Youth development programs

Youth development programs involve many parts of a community typically and usually address a wide range of youth issues, including reproductive health in some cases (FOCUS 2001). The broad community involvement in these programs is one reason that these programs may be more effective than other investments designed to achieve similar effects. Another possible reason is the broad range of services that they provide.

Integrated service models have been used in the US and elsewhere and have been found to be the most effective and sustainable approaches to providing youth services (FOCUS 2001). To be effective, they must develop effective collaboration between various public, NGO and private providers of youth services and the communities they serve. Integrated service models provide a comprehensive and integrated range of youth services instead of the typically fragmented services that are found in most communities.

**Illustrative investments**

Some comprehensive youth programs have been implemented in developing countries, particularly in Latin and Central America and in the Caribbean. In addition to Mexico’s PROGRESA program discussed above, Burt (1998) describes programs in Honduras (Proyecto Alternativas) and Trinidad
and Tobago (Servol) that appear to have been successful, although formal evaluations were not done for either program. The absence of evaluations has been identified as a common problem in many youth programs operating in the Caribbean region (CGCED 2002).

**Effects**

The possible effects of youth development programs include:

- Increased education
- Averted teen pregnancies
- Averted HIV infections
- Averted STIs
- Averted youth unemployment
- Averted crime
- Averted drug/alcohol abuse
- Reduced tobacco use

In the US it has been suggested that comprehensive youth programs have an impact greater than the sum of their parts, due to the strong positive associations among various adolescent risk factors (FOCUS 2001, CGCED 2002). However, this leads to evaluation problems inasmuch as it is usually not possible to identify which program services had the greatest impact.

In one youth development program in India, there were significant differences in a wide range of outcomes as compared to young women in comparison communities (Levitt-Dayal and Motihar 2000). However, the intervention group self-selected themselves to participate, so this may explain at least some of the observed differences. (This was referred to above as a reproductive health community outreach investment. We will have to classify it correctly after reading the primary source.)

**Cost and/or cost effectiveness**

There is no information on the cost or cost effectiveness of youth development programs in developing countries.

### 3.8.3 Micro-credit programs targeted to youth

The discussion of investments to this point has focused on human resources. But it is important to note that there might be higher returns to investments in physical or financial capital as compared to investments in human capital. One study in the Caribbean region, for example, has identified constraints to the ownership of property and goods as an important constraint in the transition to adulthood (CGCED 2002).

**Illustrative investments**

In Jamaica, the government supports a micro-credit program (Micro Investment Development Agency) that was originally targeted to poor youth ages 18-25 (CGCED 2002). However, youth participation rates have been low (less than 10 percent of beneficiaries).
A World Bank project in Lebanon (Lebanon-Community Development Project) had a component that supported NGOs providing credit to youth (World Bank 2001).

**Effects**
The possible effects of micro-credit programs targeted to youth include:

Enhanced labor productivity
Averted youth unemployment

Enhanced labor productivity. Youth labor productivity may be enhanced by attaining more nearly optimum combinations of capital and labor than would be possible in the absence of these investments (due to capital market imperfections). Micro-credit programs also sometimes provide entrepreneurial training.

Averted youth unemployment. No information available.

**Cost and/or cost effectiveness**
There is no information on the cost or cost effectiveness of micro credit programs targeted to youth.

**Gender**
Many micro-credit investments are effectively targeted to women and other vulnerable groups.

**Country context**
The benefits of investments in micro credit programs are likely to be greater in areas in which there is limited access to commercial banks and other sources of credit.

**Private versus social benefits and costs**
Capital market imperfections may mean that that the social rate of return to this type of investment exceeds the private rate of return, as for human resource investments.

**Distribution**
Micro-credit programs can be effective in reaching the rural poor.

**3.8.4 Youth rehabilitation programs**
Many countries have programs that are designed to deal with youth who lack an appropriate family environment or who have already come into conflict with the law. Some of these programs offer in-family care as an alternative to institutionalization, which tends to be expensive.

**Illustrative investments**
No examples found.

**Effects**
The possible effects of investments in youth rehabilitation programs include:
Increased education
Averted teen pregnancies
Averted HIV infections
Averted STIs
Averted youth unemployment
Averted crime
Averted drug/alcohol abuse

Unfortunately, no information is available on the effects of these investments.

Cost and/or cost effectiveness
There is no information on the cost or cost effectiveness of youth rehabilitation programs in developing countries.

3.8.5 Sports and recreation programs targeted to youth

Governments in many countries support sports and recreation programs targeted to youth. Private organizations also support a variety of clubs for youth in many countries. Art, theater, music and other cultural programs are also frequently targeted to youth. These programs are designed to keep youth engaged in positive activities and to provide opportunities for positive development. However, they are rarely linked to training and other youth programs (CGCED 2002).

Illustrative investments
No examples found.

Effects
The possible effects of investments in sports and recreation programs targeted to youth include:

Increased education
Improved health
Averted crime
Averted drug/alcohol abuse
Improved self esteem
Reduced tobacco use

Unfortunately, there is no information available on the effects of these investments.

Cost and/or cost effectiveness
There is no information on the cost or cost effectiveness of these investments.

Gender
In some countries, participation in sports and recreation programs may be predominantly male.
4. BENEFITS

The preceding discussion of the variety of possible investments in youth indicates that there is a wide range of possible effects from these investments. In order to carry out cost-benefit analysis of these investments, it is necessary to assign monetary values to these possible effects. In some cases, it is possible to develop estimates of benefits directly in monetary terms that permit comparisons with costs and with other impacts that also are measured directly in monetary terms, such as the monetary value of enhanced labor productivity. The review refers to benefits estimated in this way as “directly estimated” benefits, which is the preferred approach. However, in cases where it is conceptually or practically difficult to value benefits directly in economic terms, the review also develops estimates based on the least amount of money society currently spends to secure the same effects, as discussed above. The review refers to benefits estimated in this way as “indirectly estimated” benefits.\(^{53}\)

The preference is to assign monetary values directly to the effects of investments, where feasible. Consequently, the review attempts to provide a basis for doing so whenever possible. However, in the case of very broad effects such as “increased education” or “improved health,” the direct valuation of benefits can be a daunting task. In cases where such effects are identified as one of several possible effects of an investment (and not likely to be the primary effect, in terms of the overall estimate of benefits), the indirect method can be very useful and is certainly preferable either to ignoring the effect completely or simply calling attention to its existence and then ignoring it (which is the tendency in most cases found in the literature). However, in cases where an effect such as “increased education” is expected to be the primary effect of an investment (e.g., a targeted scholarship program), it is impractical to value the effect indirectly and is necessary to value it directly, as discussed below.

Broad effects, such as “increased education” or “improved health,” are difficult to value directly because they are associated with a package of component effects. The literature may provide less guidance for valuing the package than it does for valuing at least some of its components. Accordingly, when such broad effects need to be valued directly, it may be useful first to identify their various components and then to value each of these either directly (the preferred approach) or indirectly (the second-best approach). For example, in the case of “increased education,” one of its components is enhanced labor productivity. Since there is a substantial literature on the relationship between increased education and enhanced labor productivity, on the one hand, and on how to assign a monetary value to enhanced productivity, on the other hand, it is usually possible to value this component directly. However, other components of increased education (e.g., reduced teen pregnancy, reduced crime, reduced fertility) are more difficult to value directly, and an indirect valuation may be more practical.\(^{54}\) The review attempts to identify the components of such broad effects in order to facilitate such a two-step valuation process, in cases where it is necessary to value effects directly.

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\(^{53}\) When indirect estimates of benefits are used, care must be taken to find an alternative intervention with the same effects. Otherwise, the estimates have to be adjusted.

\(^{54}\) However, in the case of some of the hypothesized effects of increased education (e.g., increased self esteem), even indirect valuation may be difficult.
This section of the review is organized into three subsections. The first subsection discusses estimates of the benefits of directly monetizable effects, such as “enhanced labor productivity.” Only direct methods for valuing these types of effects are discussed. The second subsection discusses estimates of the benefits of outcomes that are broader and more difficult to value directly, such as “increased education” or “improved health.” In this subsection, the review discusses both direct approaches to valuing the benefits (using the two-step procedure discussed above) and indirect methods based on the cost of cost-effective alternative investments currently used to obtain the same effects (the Summers method discussed above). The third subsection discusses the valuation of benefits that are particularly difficult to value in monetary terms, such as “enhanced social capital” or “enhanced self esteem.” In some cases, possible approaches to valuing these effects are discussed.

An important general point is that many of the estimates that are interpreted to be effects are not persuasive because they are based on behavioral, not experimental, data and do not control for the behavioral choices that led to the investments in youth the impacts of which are being evaluated nor for the many measurement problems (Sections 2.3 and 2.4). We give a number of examples below.

4.1 DIRECTLY MONETIZABLE EFFECTS

4.1.1 Enhanced labor productivity

Labor productivity is enhanced by investments that lead to additional education (as reflected in improved cognitive achievement), including those that result from additional schooling, improved quality of schools, adult basic education and literacy programs, and vocational/technical training programs. Labor productivity is also enhanced by some health and nutrition investments.

The estimated percentage increase in labor productivity can be multiplied by an estimate of annual earnings among the target youth population to obtain an estimate of the annual benefits from enhanced labor productivity.

4.1.2 Increased utilization of labor

Increased utilization of labor can result, for example, from investments designed to reduce levels of youth unemployment.

The benefits of increased utilization of labor can be estimated by multiplying the estimate of the percentage underutilization of labor by the potential earnings of the relevant sub-group (e.g., in the case of youth, the product of the number of youth in the labor force and their average earnings). However, this approach is likely to over-value benefits. Unemployed youth are not likely to be a random sub-sample of youth in the labor market. Instead, controlling for usually observed characteristics such as years of schooling, they are likely to be less skilled, motivated and prepared for the labor market than other similar youth in terms of observed characteristics who have jobs.
4.1.3 Increased adult work effort

This benefit can be estimated directly as the product of the estimated percentage increase in adult work effort and the average annual level of adult earnings.

4.1.4 Expanded access to risk pooling services

Private insurance markets typically are not developed as much as would be desirable from a social perspective because of the standard insurance market problems of “moral hazard” (i.e., encouraging too risky behaviors) and “adverse selection” (inducing purchase of insurance mainly by high-risk individuals). Public policies can address in some cases these problems. For example, mandatory insurance can eliminate adverse selection. In addition to health insurance, some social safety networks – for example, unemployment insurance – financed by income taxes effectively pool job market risks for laborers, including some youth.

The benefits of risk pooling services associated with health insurance accrue to the families of all those insured, whether or not the individuals incur reimbursable medical care costs. The existence of benefits from expanded access to risk pooling services assumes that families are risk averse. The benefit is equal to the difference between the premium the household is willing to pay and the expected value of the benefits received by the insured (Phelps 1992, Behrman and Knowles 1998a).

For example, the annual benefit of risk pooling per insured youth is estimated to be $1.50 in Cambodia, based on 1997 data. An estimate of the variance in monthly health care expenditure among youth ages 10-19 ($25), obtained from the 1997 Cambodian Socio-Economic Survey, is used together with an assumed per capita annual income of $100 and an assumed value of the income elasticity of the marginal utility of income of one (i.e., the percentage change in a person's marginal utility of income for a one percent change in the person's income) to obtain an estimate of annual risk premium for one insured youth ($1.50). This estimate is directly proportional to the variance in monthly health expenditure among youth and to the assumed value of the income elasticity of the marginal utility of income. It is inversely related to the annual per capita level of income (e.g., the estimate would be halved if the annual per capita level of income were $200 instead of $100 and would be doubled if the variance in monthly health care expenditure were $50 instead of $25).

4.1.5 Reduced age at which children achieve a given level of schooling

The benefits from reducing the age at which children achieve a given level of schooling arise from providing the child more years in which to obtain the benefits from a given level of schooling. These benefits can be estimated directly by multiplying the fraction of one year gained by the average annual earnings of a new entrant into the labor force with the appropriate level of schooling completed (there is no need to discount the estimated increase in lifetime earnings because it is assumed that the earnings are added at the beginning of the person's work period).

4.1.6 Reduced cost of medical care

This benefit can be estimated directly by multiplying the average annual expenditure on medical care among the target group of youth by the estimated percentage reduction in medical care costs.
4.1.7 Increased tax revenue

There is no economic benefit from increased tax revenue per se. However, there is a possible economic benefit from raising tax revenue by means that involve reduced administrative and/or distortionary costs. For example, in the case of increasing the tax on tobacco, distortionary costs include the loss of utility to smokers from shifting some of their tobacco consumption to other products. However, the social benefits of such a shift in consumption patterns may largely offset these distortionary costs.

4.2 Broad effects not easily monetized directly

This subsection discusses the valuation of broad effects of investments in youth that are more difficult to value directly in monetary terms. In each sub-subsection the review first discusses the literature relevant to estimating each effect directly, using the two-step procedure discussed above. This consists of evidence relating the broader effect to each of its various components, i.e., the components of each broad effect. Direct estimates can then be obtained as the sum of the products of each component and its unit benefits (the unit benefits of the various components are discussed in the other sub-subsections). Each sub-subsection also discusses possible approaches to valuing the effect indirectly, i.e., valuing the effect on the basis of the cost of the least-cost investment that produces the same broad effect.

4.2.1 Increased education

4.2.1.1 Direct estimates of the benefits of increased education

Increased education is a very broad effect that includes the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

- Enhanced labor productivity (Section 4.1.1)
- Reduced fertility (Section 4.2.16)
- Improved health (Section 4.2.8)
- Reduced violence and civil conflict (Section 4.2.19)
- Reduced child labor (Section 4.2.3)
- Averted social exclusion (Section 4.3.5)
- Averted youth unemployment (Section 4.2.2)
- Averted teen pregnancy (Section 4.2.4)
- Averted HIV infection (Section 4.2.5)
- Averted STI (Section 4.2.6)
- Averted drug/alcohol abuse (Section 4.2.12)
- Averted physical and/or sexual abuse (Section 4.2.13)
- Improved mental health (Section 4.2.8)

Unfortunately, strong evidence on the relationship of increased education to the above components is limited mainly to the effect of increased education on enhanced labor productivity. However, the available evidence for other components is also reviewed.
**Enhanced labor productivity.** There are some direct estimates available of the effect of improved cognitive achievement on earnings or production that can be valued in terms of market prices (Glewwe 2002). In these cases, these estimates can be used directly to calculate the benefits of additional education in terms of enhanced productivity, under the standard assumption in the case of earnings that market wages reflect marginal productivities. However, even in these cases available estimates may overstate, perhaps substantially, the impact of improving the cognitive achievement of a given individual because most estimates do not control for the fact that individuals with better innate endowments for health or for ability or with better family connections tend to receive higher wages for given observed educational levels as well as have higher investments in their schooling and probably higher cognitive achievement. Studies that do control for endogenous investments in education tend to find less substantial, but still significant effects of cognitive achievement and health/nutrition on wages (e.g., Alderman, et al. 1996b, Behrman, Ross and Sabot 2002, Glewwe 2002).

Much more common for increased education is the need to base estimates of the benefits of additional education in terms of enhanced productivity on estimated relationships between earnings and the number of years of schooling completed (as a proxy for improved cognitive achievement, though time in school is only one of a number of inputs into the production of cognitive achievement). These estimates, again, may be subject to bias if, for example, individuals with more ability or better family connections or who attend better schools attain more schooling and higher wages. A number of studies suggest that such biases may be considerable – resulting in estimated impact of years of schooling that are as much as twice their true effects (e.g., Behrman and Birdsall 1983, Behrman and Rosenzweig 1999, 2002c). Though surveys of earnings function estimates suggest that the private returns to primary schooling in developing countries average 20 to 30 percent (e.g., Pscharopoulos 1994), more careful estimates that control for who gets more schooling suggest rates of return more on the order of magnitude of 8-10 percent.

Estimates of the private rate of return to additional years of schooling can then be multiplied by an estimate of annual earnings at various ages to obtain estimates of the annual benefits in enhanced labor productivity from additional years of schooling completed. In some cases, it is possible to convert improvements in cognitive achievement (as measured by scores on standard achievement tests) for youth into approximately equivalent years of completed schooling by comparing the mean levels of test scores by school grade level (e.g., the mean test scores of 8th versus 7th graders or of 9th versus 8th graders). Estimates of the rate of return to schooling (see discussion above) and mean expected annual earnings can then be used to estimate the gain in earnings associated with a given improvement in cognitive achievement if direct estimates of earnings/productivity –cognitive achievement relations are not available. This methodology is used in Angrist et al. (2002), which exploits the random assignment of private schools by lottery among those eligible and interested in poor urban populations in Colombia to obtain good estimates of the impact of private versus public schooling on cognitive achievement of youth, in order to translate the estimated impacts on cognitive achievement into affects on earnings/productivities.

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55 Given the limitations in the interpretation of years of schooling as representing education in earnings functions when time in schooling is but one input into cognitive achievement, it is not clear that there is a gain from relying on earnings function estimates that use years of schooling rather than ones that use cognitive achievement directly.
Reduced fertility. In many countries, there are sharp differentials in fertility by number of years of schooling completed among both men and women (but usually sharper among women). It is now widely believed that the strong association between fertility and female schooling is causal in nature, rather than reflecting the effects of unobserved factors that affect both schooling and fertility (although some recent studies have questioned this conclusion). In one study using data from 100 countries it was estimated that each additional year of schooling completed by women resulted in a 0.23 decrease in the total fertility rate (World Bank, 2002g). Evidence on the effect of cognitive achievement (as distinct from years of schooling) on fertility, and on which cognitive skills are responsible for the effect, is quite limited (Glewwe 2002).

Improved health. It is widely believed that increased education contributes positively to adult health, despite the fact that better educated respondents in household surveys often report higher morbidity rates (Strauss and Thomas 1998). It is certainly the case in most countries that educated women are more likely to use professional health care when pregnant, during and following an obstetric delivery; and this increased use of professional health care is likely to result in some improvement in their health (i.e., reduced morbidity and mortality from pregnancy-related causes). In most countries, children of educated mothers also enjoy better health and improved chances of survival (World Bank 2002g). How much of the positive association between children’s health and the mother’s schooling is due to the effects of schooling, as opposed to unobserved factors, is presently unknown. There is some evidence from Morocco that child health (as measured by height-for-age) is most closely related to mother’s health knowledge, as opposed to more general cognitive skills (Glewwe 2002).

Reduced violence and civil conflict. Collier and Hoeffler (1998) and Collier, Hoeffler and Soderbom (2001) found that male secondary school enrollment rates were inversely related to the probability of a civil conflict, while rates at the beginning of a civil war were inversely related to its duration. The latter estimated relationship suggests that an increase of 10 percent in the male secondary school enrollment rate is associated with an 18 percent reduction in the duration of a civil conflict. However, this variable is so closely correlated with per capita income, the two variables cannot be included in the same regression.

Reduced child labor. Children who are out of school are more likely to be working (Grootaert and Kanbur 1995). However, children may also decide not to attend school because of their work responsibilities, rather than the reverse. Compulsory schooling laws, if enforced, can be effective deterrents to child labor. In Brazil, for example, the Child-citizen Stipend Program was begun in 1996 largely for this purpose (Miske, Moore and DeJaeghere 2000). The program is reported to have been successful in reducing child labor. In the Nicaragua RPS program, the percentage of children age 10-13 who were working decreased by 9 percent in the intervention areas, as compared to the control areas (Maluccio 2002). The average number of hours worked per week by children reported working decreased by 9 hours in the intervention areas, as compared to the control areas. The program effect on child labor was three times larger among boys, as compared to girls (reflecting the substantially larger reported child labor of boys prior to the program).

Averted social exclusion. Failure to do well on competitive exams can stigmatize a youth and lead to social exclusion (CGCED 2002).
Averted youth unemployment. Children out of school are more likely to be unemployed. However, it is possible that the absence of employment opportunities for youth leads in some cases to higher enrollment levels than would otherwise occur.

Averted teen pregnancy. Youth in school or who have completed school are less likely to be sexually active than youth outside of school, although the difference in rates of sexual activity between boys in school and boys out of school is not as marked as with girls (FOCUS 2002, WHO 1998). School enrollment is often associated with delayed age at marriage. In Bangladesh, for example, the NGO BRAC has founded 30,000 nonformal primary schools in which 70 percent of the pupils are girls age 6-14 (by design). In the areas served by these schools, the proportion of girls 13-15 who are married dropped from 29 to 14 percent, while the proportion 16-19 who are married dropped from 72 to 64 percent in the participating villages (FOCUS 2002). Particularly in countries in which sexual relations outside of marriage are effectively circumscribed (e.g., some Muslim countries), there may be a strong negative effect of increased school enrollment on teen pregnancy.

Averted HIV infections. Youth who are in school or who have completed school are less likely to engage in unsafe sex (FOCUS 2002, WHO 1998, World Bank 2002g, Magnani et al. 2002).

Averted STIs. See preceding discussion.

Averted drug/alcohol abuse. In the Caribbean region, male out-of-school youth ages 13-19 are reported to be most at risk of substance abuse and involvement in drug dealing (CGCED 2002).

Averted physical and/or sexual abuse. Schools in many developing countries also use corporal punishment, which is especially harsh in the case of male children (CGCED 2002). Worldwide, 40 to 47 percent of sexual assaults are perpetrated against girls ages 15 or younger, most often by a male relative, neighbors, or by a male teacher (World Bank 2002a). Young girls frequently report that their early sexual experience was coerced, often due to lack of economic power or the need to be approved to pass from one grade to the next in school.

Improved mental health. Children who do well in school have enhanced self esteem and are less likely to suffer from depression. In some schools, children who do not perform well are subject to ridicule. In Nepal, an evaluation of the USAID-funded Female Education Scholarship Program found that the program improved girls’ confidence and feelings of self worth (Miske, Moore and DeJaeghere 2000).

4.2.1.2 Indirect estimates of the benefits of increased education

In some cases (i.e., when increased education is not the primary effect of an investment), it may be useful to value the benefits of increased education as the cost of alternative cost-effective investments to increase education. Possible examples might be the cost of investments designed to improve the quality of schools or the cost of scholarship programs.
4.2.2 Averted youth unemployment

4.2.2.1 Direct estimates of the benefits of averted youth employment

Averted youth unemployment is a broad effect with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

Increased utilization of labor (Section 4.1.2)
Enhanced labor productivity (Section 4.1.1)
Averted teen pregnancies (Section 4.2.4)
Averted crime (Section 4.2.14)
Averted alcohol/drug abuse (Section 4.2.12)

Increased utilization of labor. Unemployed youth represent an available productive resource that is either under-utilized or not utilized at all. It has been estimated, for example, that if youth unemployment were eliminated, GDP would be 1.36 percent higher in Barbados and 7.54 percent higher in Jamaica (CGCED 2002). However, estimates of the effect of a given investment on the utilization of labor (e.g., an investment designed to reduce youth unemployment) need to consider that some of the youth who may benefit from such investments may have been previously employed or in school. In such cases, the estimate of this effect should reflect their marginal gain in productivity (as possibly reflected in their earnings) as the result of the investment.

Enhanced labor productivity. The costs effects of youth unemployment also include the adverse impact on unemployed persons’ human capital from being idle at a time when they would otherwise be gaining valuable workforce experience. When labor productivity is enhanced because unemployed youth are put to work and therefore gain work experience, the benefits from their enhanced productivity can be estimated from earnings regressions that also yield estimates of the private rate of return to work experience, again under the assumption that wage rates equal marginal productivities. The estimated rate of return to work experience can be multiplied by an estimate of annual earnings at various ages to obtain estimates of the annual benefits from additional work experience. While many estimates of earnings relations include a variable that is called “previous work experience,” most of the available estimates are for so-called Mincerian (1974) “potential work experience” that is defined by age minus years of completed schooling minus the legal age of starting schooling. This may be a very imperfect proxy for actual work experience if individuals start school at different ages, have different progress rates through school, have work experience while in school, and have intermittent work experience after completing schooling. All of these phenomena are common in most developing countries. Very few studies use actual work experience to estimate the returns to such experience, and those that do in some cases find fairly different effects than what is found by using potential experience (e.g., Alderman, et al. 1996b, Behrman and Rosenzweig 2002c).

Averted teen pregnancies. It has been suggested that unemployed girls are more likely to become teen mothers (UNICEF 2002a).

Averted crime. It has been suggested that unemployed youth are more likely to engage in criminal activity (UNICEF 2002a).
Averted alcohol/drug abuse. It has been suggested that unemployed youth are more at risk of alcohol and drug abuse (UNICEF 2002a). For example, unemployed out-of-school youth in many Caribbean countries tend to join drug-dealing gangs and are also prone to participate in violent political activity (CGCED 2002). In Argentina, rates of drug use are higher among unemployed youth (World Bank 1999b).

4.2.2.2 Indirect estimates of the benefits of averted youth unemployment

The cost of employment programs targeted to youth might be used to value the benefits of averted youth unemployment. These might include public works employment programs (preferably those targeted to youth), subsidization of private sector jobs for youth, and investments designed to improve the performance of employment agencies or otherwise improve the flow of information to youth about job opportunities.

4.2.3 Reduced child labor

4.2.3.1 Direct estimates of the benefits of reduced child labor

Reduced child labor is a broad effect with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

Increased education (Section 4.2.1)
Improved health (Section 4.2.8)
Averted HIV infections (Section 4.2.5)
Averted STIs (Section 4.2.6)
Averted physical and/or sexual abuse (Section 4.2.13)

It is important to recognize that the mix of the above components is likely to vary significantly by sex. For example, males are probably more likely to engage in work that is dangerous to their health, while girls are more likely to engage in work that exposes them to the risk of HIV infection, STIs and sexual and physical abuse. Accordingly, this is one broad effect the benefits of which should probably be disaggregated by sex.

Increased education. Some child labor, including household work by girls, can compete with school attendance (UNICEF 2002a). Indeed, there is fairly strong evidence that child labor and school attendance are negatively associated. However, some types of child labor (particularly employment in family owned businesses and farms) may not conflict with school attendance and may complement knowledge gained in school (Basu 1999). Child labor may also provide funds to the family that can be used at least in part to finance children’s education.

Improved health. Some child labor (particularly outside the home) exposes children to health risks. For example, children working in the tanning industry are exposed to dangerous chemicals. However, children working in the home or in family enterprises also often are exposed to poor working conditions that are unregulated – such as smoky environments within houses due to poor cooking and heating systems or chemical exposures on family farms.

Averted HIV infections. Many adolescent girls work as commercial sex workers, where they are exposed to HIV infection and other STIs (UNICEF 2002a).
Averted STIs. See preceding discussion.

Averted physical and/or sexual abuse. Adolescent girls are frequently employed as domestic workers and are particularly vulnerable to sexual and physical abuse (UNICEF 2002a).

4.2.3.2 Indirect estimates of the benefits of reduced child labor

Indirect estimates of the benefits of reduced child labor might be made by referring to the cost of alternative cost-effective investments with the same effects. Examples might be scholarships for children to attend school, investments to support the enforcement of regulations against child labor, or other investments designed to reduce poverty. Investments in family planning may also reduce child labor (Grootaert and Kanbur 1995).

4.2.4 Averted teen pregnancy

In developed countries, the public benefits of teen pregnancies (and the benefits from averting them) are usually calculated in terms of additional health and welfare costs\(^{56}\) that are incurred as the result of a teen pregnancy. Such estimates also typically include the private costs to the woman and her family in terms of forgone earnings (which are also reflected in lower tax contributions).

In developing countries, where expenditures on welfare programs (and personal tax rates) are much lower and health conditions much poorer, the main costs of teen pregnancies (and hence the benefits in averting one) may be in the form of adverse health impacts for the mother and her child, as well as any reduction in labor productivity from leaving school prematurely.

In Jamaica, it has been estimated that the lifetime cost of each cohort of teen mothers is $63 million (CGCED 2002).

4.2.4.1 Direct estimates of the benefits of an averted teen pregnancy

Averted teen pregnancy is a broad effect that includes the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

Improved health (Section 4.2.8)
Increased education (Section 2.2.1)
Reduced fertility (Section 4.2.16)
Averted abortions (Section 4.2.17)
Averted social exclusion (Section 4.3.5)

Improved health. Teen pregnancies and deliveries often involve complications and, consequently, much greater risk of maternal mortality and morbidity (e.g., obstetric fistula), as compared to pregnancies of women in their twenties (Mensch 2002, Ransom and Yinger 2002). For example, it is estimated that the likelihood of maternal mortality is 20-200 percent higher among women 15-19, as

\(^{56}\) Although it is common to include additional welfare costs associated with teen pregnancies as a “cost” of teen pregnancies, and therefore as part of the benefits of investments that reduce teen pregnancies, welfare costs usually involve a substantial transfer component, which is not, strictly speaking, a cost.
compared to older women (Mensch 2002). Pregnant girls 10-14 are five times more likely to die of maternal causes (FOCUS 2002). However, it is also possible that some of these outcomes may be due to unobserved factors related to both health and teen pregnancy (Mensch 2002). Most of the studies available for developing countries do not address selectivity bias (Buvinic 1998). The US research on the consequences of teen pregnancy has demonstrated the importance of addressing selectivity bias (Hofferth, Reid and Mott 2001). It is also important to distinguish between the effects of teen pregnancies and those of first pregnancies, which share many of these same characteristics (Mensch 2002).

The negative health effects of teen births also extend to children, who are 1.5 - 2.0 times more likely to die than children born to women in their twenties. The children of teen mothers are more likely to suffer from fetal growth retardation, premature birth and low birth weight, and are more likely to die during infancy (Mensch 2002).57

**Increased education.** Pregnant teens are more likely to drop out of school. In developed countries, there is some evidence that teen mothers at least partially compensate for reduced levels of formal education by gaining additional work experience. However, such an effect is probably less likely in developing countries. The available research in developing countries does not adjust for the possible role that unobservables may play in determining the education outcomes of women who become pregnant as teens (Buvinic 1998).

**Reduced fertility.** Teen pregnancies initiate childbearing at younger ages and may lead eventually to higher completed fertility (Buvinic 1998).

**Averted abortions.** Many teen pregnancies end in abortions, while the risk of complications from abortion is much higher among teens, who often obtain clandestine abortions even in countries where abortion is legal. Since teens tend to wait longer before obtaining an abortion, the risk of complications is also much higher on this account. It has been estimated that teens account for as much as one third of all abortions and as much as 80 percent of all abortion complications.

**Averted social exclusion.** In some settings, a pregnant teen and her child are subjected to social exclusion.58 However, Buvinic (1998) finds no evidence of such an effect in reviewing research in the Caribbean, Central and Latin America.

**4.2.4.2 Indirect estimates of the benefits of an averted teen pregnancy**

The benefits of averting teen pregnancies can be valued indirectly on the basis of the cost of providing family planning services to youth per teen birth averted.

57 There is also some evidence that the children of teen parents do less well in their lives, i.e., that their school performance is poorer and that they are more likely to be teen parents themselves and engage in criminal activity. However, it is again important to consider that some of these outcomes may be due to the same unobserved characteristics that led to teen pregnancy in the first instance (Ribar 1999, Hofferth, Reid and Mott 2001).

58 However, Mensch (2002) notes that, unlike in the US, much teen pregnancy in developing countries occurs within marriage. She notes that in many developing countries there may be a benefit to childbearing at later teen ages (e.g., 18-19) in that it may improve a young woman’s position within her family and in Africa, where much childbearing occurs prior to marriage, it may even enhance a woman’s marital chances.
4.2.5 Averted HIV infection

4.2.5.1 Direct estimates of the benefits of an averted HIV infection

An averted HIV infection is a broad effect with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

- Improved health (Section 4.2.8)
- Averted secondary HIV infections (Section 4.2.5)
- Averted secondary TB infections (Section 4.2.7)
- Reduced cost of medical care (Section 4.1.6)
- Averted orphans (Section 4.2.21)
- Averted social exclusion (Section 4.3.5)
- Increased education (Section 4.2.1)

**Improved health.** There is a lag of 5-8 years between the prevention of an infection and the occurrence of these benefits. In the absence of any treatment, it is probably reasonable to assume that a person dies within one-two years of showing symptoms (Barnett and Whiteside 2000, Schwartländer et al. 2001, CGCED 2002). A recent report issued by WHO estimates that each AIDS death results on average in the loss of 34.6 DALYs (Commission on Macroeconomics and Health 2001). The children of HIV-infected parents are at risk of becoming infected themselves.

**Averted secondary HIV infections.** There is a risk that each HIV-infected person will infect one or more others. The degree of risk (i.e., the expected number of secondary infections) depends on how much at-risk behavior the infected person engages in. In AIDS modeling in Honduras, for example, it was assumed that an average infected adolescent would infect 0.1 others (World Bank 2002d). However, the secondary infection rate is very sensitive to the population infected (and particularly to the number of sexual partners per annum and to HIV prevalence in each partner). For example, the same report estimates that an infected sex worker would infect 6.4 others.

**Averted secondary TB infections.** TB is the most common opportunistic infection and is the leading cause of death among HIV-infected persons (Oberzaucher and Baggaley 2002). HIV/AIDS increases the percentage of active cases among those infected earlier in their life with TB (Barnett and Whiteside 2000). The risk of developing active TB increases from about a 10 percent lifetime risk to about a 10 percent annual risk in those infected by HIV (Oberzaucher and Baggaley 2002). Increasing the number of active TB cases also increases the risk of transmitting TB to the general community. In Zambia, where the national HIV/AIDS prevalence is estimated to be 20 percent, the number of reported TB cases has increased five-fold (ACC/SCN 2001).

**Reduced cost of medical care.** Even in the absence of special investments designed to treat HIV/AIDS patients, HIV infections result in additional health care costs for the treatment of

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59 In India, a cost-benefit analysis of the World Bank-supported Second National HIV/AIDS Control Project assumed that an average HIV infection resulted in a loss of “at least 20 discounted DALYs” (World Bank, 1999c).

60 To simplify matters, it may be desirable to include the estimated number of secondary infections in the estimated primary effect. However, doing so will affect the timing of the benefits.
opportune infections (e.g., TB) and for palliative care. It has been estimated that each AIDS case results in additional annual medical care costs equal to 2.7 times the level of per capita GNP (Barnett and Whiteside 2000). According to one study in Thailand, the families of AIDS patients spent about $1,000 during the person’s last year of life, the equivalent of per capita national income (UNICEF 2002a). Schenwald et al. (2001) estimate that the lifetime cost of palliative care per AIDS patient is $75, while the lifetime cost of opportunistic infections is $300. They estimate that the annual cost of opportunistic infection prophylaxis is $32. A cost-benefit analysis of India’s Second National HIV/AIDS Control Project estimated that each HIV infection averted saved $384.40 in public sector treatment costs and $964.54 in total treatment costs (World Bank, 1999c). There is also a relationship between the amount of resources devoted to the treatment of HIV/AIDS patients and their health (i.e., the number of DALYs assumed to be lost per infection). This should be taken into account in calculating the expected loss of DALYs (see discussion above).

Averted orphans. HIV/AIDS has already produced millions of orphans. In Zambia, for example, there are an estimated 650,000 AIDS orphans (i.e., children who have lost either or both of their parents) under the age 14 (ACC/SCN 2001).

Averted social exclusion. HIV/AIDS victims are often ostracized by their communities (Cohen 1999).

Increased education. With a heightened risk of HIV/AIDS infection, parents may not be as willing to invest in children’s education because both their risk of infection and/or their children’s will reduce the expected future benefits from schooling relative to the immediate gains from child labor (Belli and Appaix 2002). In addition, orphaned children are much less likely to attend school. In Benin, for example, only 17 percent of children 10-14 one or more of whose parents has died attend school, compared to 50 percent among children with both parents living (UNICEF 2002a).

Alternatively, a direct estimate of the benefits of averting an HIV/AIDS infection might be based on the estimated macroeconomic impact of HIV/AIDS infections.61 For example, it has been estimated that the forgone earnings of those dying from AIDS in the Caribbean in a single year (2000) amounted to between 0.01 and 0.37 percent of GDP (CGCED 2002). According to a recent report issued by WHO, a 10 percent improvement in life expectancy at birth (with other factors held constant) is associated with a rise in economic growth of at least 0.3 to 0.4 percentage points per year (Commission on Macroeconomics and Health 2001). There are estimates available of the impact of the AIDS epidemic on life expectancy at birth.62 However, these macroeconomic growth impacts, even if correct, are not equivalent to the efficiency gains that are usually used to measure benefits in cost-benefit analysis.

Yet another alternative is to base a direct estimate of the benefits of averting an HIV infection on a broad estimate of the economic cost of each DALY gained. As previously mentioned, a recent report issued by WHO estimates that each AIDS death results on average in the loss of 34.6 DALYs

61 The most widely used macroeconomic model of AIDS impact is MacroAIDS, developed by John Cuddington of Georgetown University, Washington, DC (Barnett and Whiteside 2000).

62 For example, the Spectrum models developed by The Futures Group International (Barnett and Whiteside 2000).
The same report advises valuing a DALY as 1-3 times the level of annual earnings. Again, in using this method to value the benefits of averting an HIV infection, it is important to factor in the fact that females typically become infected at much younger ages than males (Cohen 1999).

### 4.2.5.2 Indirect estimate of the benefits of an averted HIV infection

It is to value the benefits from an averted HIV/AIDS infection indirectly by referring to the cost of alternative cost-effective investments that would produce the same effect, i.e., the cost per infection averted of cost-effective investments to prevent HIV infection (e.g., the cost of interventions targeted to high-risk groups per HIV infection averted) or the cost of cost-effective alternative health investments that produce a similar gain in DALYs.

### 4.2.6 Averted sexually transmitted infection (STI)

The principal sexually transmitted infections, apart from HIV/AIDS, are syphilis, gonorrhea, chancroid ulcers, herpes, and chlamydia.

#### 4.2.6.1 Direct estimates of the benefits of an averted STI

An averted STI is a broad effect with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

- **Improved health** (Section 4.2.8)
- **Reduced cost of medical care** (Section 4.1.6)
- **Averted HIV infections** (Section 4.2.5)
- **Averted infertility** (Section 4.3.2)

**Improved health.** The review could find no estimates of the effect of averting STI infections on improved health (e.g., the number of DALYs gained).

**Reduced cost of medical care.** The review did not find any estimates of the savings from averting STIs in terms averted costs of diagnosing and treating STIs.

**Averted HIV/AIDS infections.** Randomized trials in Mwanza district, Tanzania involving the syndromic diagnosis and treatment of STIs established that STI treatment can reduce the risk of contracting HIV/AIDS. The estimated effect was a 38 percent reduction in HIV infection over a period of two years in the general population. However, another randomized intervention involving mass STI treatment (mass administration of antibiotics) at 10-month intervals in Rakai district, Uganda failed to obtain similar effects after 20 months (UNAIDS 2000). Another randomized trial is ongoing in Masaka district, Uganda, involving IEC interventions with and without STD treatment. Longitudinal epidemiological studies suggest that various STDs increase the risk of HIV infection by a factor of 4 or more. STD interventions without control groups suggest that STD treatment effectively halves the risk of HIV infection in high-risk groups. An expert group convened by UNAIDS to review the preceding evidence concluded that there is overwhelming evidence supporting the effectiveness of STD treatment in reducing the risk of HIV infection (UNAIDS 2000).
In Managua, where vouchers providing free STD detection and treatment services were distributed to commercial sex workers from 1995, HIV prevalence in sex workers was 0.8 percent in 1991, 1.3 percent in 1997 and 2.0 percent in 1999, “a rate of increase well below that observed in the sex worker populations of other major cities [in Nicaragua]” (Sandiford, Gorter and Salvetta 2002).

**Averted infertility.** The benefits of diagnosing and treating STIs also include reduced risk of infertility, particularly among women (Tinker, Finn and Epp 2000).

### 4.2.6.2 Indirect estimates of the benefits of an averted STI

Indirect estimates of the benefits from averting STIs might be made by referring to the cost of alternative cost-effective investments with the same effects. However, it is difficult to find investments whose effects are limited to the prevention of STIs (i.e., that do not include the prevention of HIV or teen pregnancies as additional outcomes). Accordingly, an indirect estimate might be based on the cost of cost-effective alternative investments designed to obtain an equivalent gain in DALYs, e.g., the cost per DALY gained from investments in HIV prevention.

### 4.2.7 Averted TB infections

#### 4.2.7.1 Direct estimates of the benefits of an averted TB infection

An averted TB infection is a broad effect with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

- Improved health (Section 4.2.8)
- Reduced cost of medical care (Section 4.1.6)
- Averted secondary TB infections (Section 4.2.7)

**Improved health.** The DALYs lost from a TB infection depend on whether or not the infection is diagnosed and treated effectively, and at what stage.

**Reduced cost of medical care.** TB treatment is relatively expensive, compared to many other infectious diseases. A cost-benefit analysis of India’s Second National HIV/AIDS Control Project estimated that the 564,000 HIV infections averted by the project would lead to an indirect benefit of $5 million in reduced treatment costs of secondary TB infections (World Bank, 1999c).

**Averted secondary TB infections.** The number of other persons likely to be infected is directly related to the timeliness and effectiveness of treatment.

#### 4.2.7.2 Indirect estimates of the benefits of an averted TB infection

An indirect estimate of the benefits of averting a TB infection can be based on the estimated number of DALYs lost from each TB infection and the cost per DALY gained of other cost-effective health investments targeted to adults (e.g., tobacco prevention at $42.50 per DALY gained).

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63 To simplify matters, it may be desirable to include the estimated number of secondary infections in the estimated primary effect. However, doing so will affect the timing of the benefits.
4.2.8 Improved health

4.2.8.1 Direct estimates of the benefits of improved health

Improved health is a broad effect with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

- Reduced cost of medical care (Section 4.1.6)
- Enhanced labor productivity (Section 4.1.1)
- Increased education (Section 4.2.1)

Reduced cost of medical care. Healthier individuals have to spend less on medical care to maintain their health capital.

Enhanced labor productivity. Improved health can effect labor productivity by affecting: 1) labor force participation, 2) the number of hours worked per week, and 3) productivity per hour worked. The available evidence suggests that improved health has some impact on labor supply but only a limited impact on labor productivity, except possibly in populations with very poor health status (Strauss and Thomas 1998).

Increased education. Healthier children and adults are more productive in learning (Belli and Appaix 2002).

In the case of investments for which there are estimates of health effects in terms of disability-adjusted life years (DALYs), it is possible to value these benefits by multiplying the DALYs by an estimate of the monetary value of a DALY. For example, the Commission on Macroeconomics and Health (2001) has estimated that the monetary value of a DALY is 1-3 times annual earnings.

4.2.8.2 Indirect estimates of the benefits of improved health

Indirect estimates of the benefits of health effects can be obtained from the cost of cost-effective alternative investments that improve health. For example, averted maternal deaths associated with an averted teen pregnancy might be converted to a monetary benefit by using an estimate of the least-cost alternative investment that averts maternal deaths, e.g., antenatal care, professionally assisted obstetric delivery care, emergency obstetric care. According to one study, the cost per DALY gained from investments in prenatal and delivery care is about $40 (Claeson, Mawji and Walker 2002). If the effect refers to averted infant and child deaths associated with an averted teen pregnancy, the effect can be converted to a monetary benefit by using an estimate of the least-cost alternative investment that averts infant and child deaths. For example, the same study referred to above estimates that the cost per DALY gained from investments in the integrated management of childhood illness is about $40 (Claeson, Mawji and Walker 2002). However, according to the same study, investments in immunization (EPI Plus) are estimated to have a cost per DALY gained of only about $14.50.

Table 10 provides some estimates of the cost per DALY from several alternative “best practice” health of investments. It has been estimated by UNAIDS (as reported on the World Bank website) that a comprehensive package of cost-effective prevention programs would avert HIV infections at a
cost of about $1,000 per infection averted. Since it has been estimated by the Commission on Macroeconomics and Health (2001) that each HIV infection is associated with a loss of 34.6 DALYs, this corresponds to a cost per DALY gained of $28.90.

However, the cost per DALY gained of investments to prevent HIV/AIDS infections depends critically on how efficiently the funds are allocated among interventions (World Bank 2002d). For example, research in Honduras estimated that only $1 million invested in the three most cost-effective interventions (i.e., social marketing of condoms, free distribution of condoms to persons displaying risky behavior, and IEC targeted to high-risk populations) would avert 5,888 HIV infections (assuming that 34.6 DALYs are gained for each averted HIV infection, this corresponds to a cost of $4.91 per DALY gained). If instead, $9 million were invested and distributed equally among the other 9 interventions examined, only 3,617 infections would be averted (corresponding to a cost of $71.91 per DALY gained).

Table 10: Cost-effective “best practice” public health and clinical services

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Definition</th>
<th>Cost per DALY</th>
<th>Annual cost per capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated management of childhood illness (IMCI)</td>
<td>Case management of acute respiratory infections, diarrhea, malaria, measles, and malnutrition; immunization, feeding/breastfeeding counseling, micronutrient and iron supplementation, antihelminthic treatment and referral</td>
<td>40.00</td>
<td>1.60</td>
</tr>
<tr>
<td>Immunization (EPI Plus)</td>
<td>BCG at birth; oral polio vaccine at birth, 6, 10, 14 weeks; hepatitis B at birth, 6 and 9 months (optional); measles at 9 months; tetanus toxoid for women of childbearing age</td>
<td>14.50</td>
<td>0.50</td>
</tr>
<tr>
<td>Prenatal and delivery care</td>
<td>Prenatal care and clean/safe delivery by a skilled birth attendant</td>
<td>40.00</td>
<td>3.80</td>
</tr>
<tr>
<td>Family planning</td>
<td>Information and education; availability and correct use of contraceptives</td>
<td>25.00</td>
<td>0.90</td>
</tr>
<tr>
<td>AIDS prevention program</td>
<td>Education on safe behavior, condom promotion, STD treatment, safe blood supply</td>
<td>4.00</td>
<td>1.70</td>
</tr>
<tr>
<td>Programme</td>
<td>Description</td>
<td>Cost (USD)</td>
<td>Benefit (USD)</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>---------------------------------------------------------------------------------------------------</td>
<td>------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Treatment of STDs</td>
<td>Case management using syndromic diagnosis and standard treatment algorithms</td>
<td>2.00</td>
<td>0.20</td>
</tr>
<tr>
<td>Treatment of tuberculosis</td>
<td>Directly observed treatment short-course; case detection by sputum smear microscopy among symptomatic patients, standardized treatment regimen of six to eight months; directly observed treatment for at least initial two months.</td>
<td>4.00</td>
<td>0.60</td>
</tr>
<tr>
<td>School health program</td>
<td>Health education and selected health interventions, e.g., deworming, micronutrient supplementation, school feeding</td>
<td>22.50</td>
<td>0.30</td>
</tr>
<tr>
<td>Tobacco and alcohol program</td>
<td>Tobacco tax; information and education</td>
<td>42.50</td>
<td>0.30</td>
</tr>
</tbody>
</table>

*Source: Claeson, Mawji and Walker (2000).*

### 4.2.9 Improved nutritional status

There are several dimensions to nutritional status among youth, including: height, body mass, obesity, anemia, iodine deficiency, Vitamin A deficiency, and the birth weight of children. Improved nutritional status can be reflected in anthropometric measures (e.g., height for age, weight for height, body mass index) or in assessments of the presence of micronutrient deficiencies (e.g., iodine, Vitamin A, iron). The World Bank estimates that the economic, socio-economic, and health benefits of sustained elimination of micronutrient deficiencies alone could contribute as much as 5 percent of gross domestic product annually, to an affected country, for an investment of less than 0.3 percent of gross domestic product (World Bank 2002c). Returns per dollar invested in terms of lives saved, increased lifelong wages and decreased disability are impressive, as shown in Table 11.
<table>
<thead>
<tr>
<th>Under-nutrition Interventions</th>
<th>Cost per life saved ($)</th>
<th>Returns to program cost (wages only)</th>
<th>Cost per discounted health life year gained ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Supplements</td>
<td>18,337</td>
<td>1.4</td>
<td>234</td>
</tr>
<tr>
<td>Nutrition Education</td>
<td>797</td>
<td>32.3</td>
<td>10.2</td>
</tr>
<tr>
<td>Integrated PHC-N</td>
<td>9,966</td>
<td>2.6</td>
<td>127</td>
</tr>
<tr>
<td>Food Subsidies</td>
<td>42,552</td>
<td>0.9</td>
<td>375</td>
</tr>
<tr>
<td>School Feeding</td>
<td>--</td>
<td>2.8</td>
<td>534</td>
</tr>
<tr>
<td>Iron Deficiency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplementation of pregnant women only</td>
<td>800</td>
<td>24.7</td>
<td>12.8</td>
</tr>
<tr>
<td>Fortification</td>
<td>2,000</td>
<td>84.1</td>
<td>4.4</td>
</tr>
<tr>
<td>Iodine Deficiency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplementation of reproductive-age women only</td>
<td>1,250</td>
<td>13.8</td>
<td>18.9</td>
</tr>
<tr>
<td>Supplementation (all persons under 60)</td>
<td>4,650</td>
<td>6</td>
<td>37</td>
</tr>
<tr>
<td>Fortification</td>
<td>1,000</td>
<td>28</td>
<td>7.5</td>
</tr>
<tr>
<td>Vitamin A Deficiency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplementation (under 5 only)</td>
<td>130</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td>Fortification</td>
<td>400</td>
<td>16</td>
<td>12.3</td>
</tr>
</tbody>
</table>


4.2.9.1 Direct estimates of the benefits of improved nutritional status

Improved nutritional status is a broad effect with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

- Enhanced labor productivity (Section 4.1.1)
- Increased education (Section 4.2.1)
- Improved health (Section 4.2.8)
- Improved mental health (Section 4.2.10)
- Improved self esteem (Section 4.3.4)

However, not all of the above effects are hypothesized to result from improvements in some dimensions of nutritional status.

Height

Enhanced labor productivity. Estimates within an earnings function framework for male adults in urban Brazil suggest an elasticity of wages with respect to adult height of 7.7 (controlling for education, the elasticity is about 4) (Strauss and Thomas 1998). They also present evidence of a strong positive relationship between height and employment. However, the authors caution that it is very difficult to determine what part of the observed relationships is causal from height to wages. In
Guatemala, nutritionally-stunted sugar cane cutters earned 5 percent less per day worked and were estimated to earn 14 percent less over their lifetimes (McGuire 1996).

Increased education. In China, one standard deviation of height decrement was associated with a reduction of one-third year of schooling completed by third grade, i.e., a 10 percent loss (McGuire 1996). In Vietnam, after controlling for age, sex, district and school, stunted children had significantly lower scores on tests of mathematics and Vietnamese language (Hall et al. 2001). In Brazil, a 10 cm gap in height is associated with an additional 1.5 years of schooling (Strauss and Thomas 1998). Again, however, it is inappropriate to conclude that the observed relationship is necessarily causal from height to education.

Improved health. There is some evidence that adults who are shorter of stature suffer from more chronic disease than taller adults. Shorter women also are more likely to experience complications during obstetric delivery. Maternal height is directly related to a child’s birth weight (McGuire 1996).

Body mass

Enhanced labor productivity. In Colombia, a 10 percent reduction in lean body mass among workers was associated with a 40 percent reduction in tons of sugar cane cut per day, and in India, a 30 percent reduction in lean body mass was associated with 20 percent lower wage rates (World Bank 2002c). A number of other estimates in the literature that control for the behavioral choices relating at least to shorter-run nutrition, also find considerable effects in poor populations (e.g., Behrman, Foster and Rosenzweig 1997a, Deolalikar 1988, Foster and Rosenzweig 1994, Haddad and Bouis 1991, Sahn and Alderman 1988, Strauss 1986; Behrman 1993 surveys much of this literature). Strauss and Thomas (1998) present evidence of a strong relationship between body mass and both wages and employment in Brazil.

Obesity

Enhanced labor productivity.

Improved health. There is considerable evidence that obesity in youth is likely to continue into adulthood and lead to a variety of health disorders, such as heart disease and diabetes.

Improved self esteem. Surveys of students in nine Caribbean countries revealed that 31 percent are not satisfied with their weight (UNICEF 2002a). About one-sixth reported using one of the following methods to lose weight: dieting or exercise, laxatives, vomiting, or diet pills. Many girls in particular have eating disorders (e.g., bulimia, anorexia). About one of ten youth with anorexia die of the disorder (UNICEF 2002a).

Anemia

Enhanced labor productivity. A carefully controlled study in China showed that treating iron-deficient female factory workers improved their productivity by 17 percent (Asian Development Bank 1999). A 1979 experimental study investigated the impact of iron deficiency anemia on the productivity of adult Indonesian rubber plantation workers. There was increased latex collection among anemic workers taking iron tablets, compared to pre-supplementation yields, whose
productivity then matched that of non-anemic workers (World Bank 2002c). However, there was considerable attrition in the experimental sample, and it is unknown whether the attrition was random with respect to unobservables that also may affect productivity (Strauss and Thomas 1998). Another Indonesian study, conducted in 1986, found that iron treatment resulted in increased productivity of anemic female tea harvesters. It has been estimated that a 10 percent increase in hemoglobin levels is associated with a 15 increase in productivity (McGuire 1996).

**Increased education.** There is some evidence that improved nutritional status (and particularly the absence of some types of micronutrient deficiencies) contributes to improved cognitive achievement of children attending school (Behrman 1996a, Pollitt 1990, Pollitt, et al. 1993, Pollitt 1997, Belli and Appaix 2002). In the case of iron deficiency anemia, the evidence is fairly strong (based on a review of 11 studies) that among school-age children lower scores on tests of cognition or school achievement can be improved and in some cases reversed after iron treatment (Nokes et al 1998). For example, in a study on the impact of iron deficiency on the school performance of 9-11 year old Indonesians, it was demonstrated that anemic children scored lower on standardized achievement tests than non-anemic children. Scores improved by over 10 percent after 12 weeks of supplementation (World Bank 2000c). In Chile, for example, normal children performed 10-400 percent better on standardized tests than anemic children (McGuire 1996). Similar studies in other countries (but not in one large study in Thailand) have found a 5-25 percent improvement in achievement test scores following iron supplementation (McGuire 1996). In one randomized Tanzanian study involving younger children (age under 5), iron supplementation improved language and motor development (Stoltzfus et al. 2001). Similarly, in one South African study, cognitive function and school attendance improved significantly when children age 6-11 were fed biscuits fortified with iron, iodine and beta-carotene) for 43 weeks during a 12-month period (van Stuijvenberg et al. 1999).

**Improved health.** Micronutrient deficiencies in adults can also result in morbidity and mortality. Micronutrient deficiencies may account for 20 percent of maternal mortality, and increase rates of still-birth and under-five mortality (World Bank 2002c, McGuire 1996).

**Iodine deficiency**

**Enhanced labor productivity.** In one study, based on a review of the literature, cretinism was assumed to reduce productivity by 50 percent, while other forms of iodine deficiency were assumed to reduce productivity by 5 percent (McGuire 1996).

**Increased education.** Iodine deficiency has well documented effects on IQ scores, even among noncretinous persons (McGuire 1996, Belli and Appaix 2002). In Zaire and Ecuador, a differential of about 15 percent was found between iodine-deficient and non-deficient children. A review of 18 studies estimated the average differential impact of iodine deficiency on IQ scores at 13.5 percent (McGuire 1996). There is also evidence of a positive correlation between iodine repletion and school enrollment. However, randomized trials with iodine supplementation alone have failed to find any benefit for cognitive function of school children (Belli and Appaix 2002).

**Improved health.** Iodine deficiency increases the rate of stillbirths and infant deaths significantly (McGuire 1996). In Asia, it is estimated that iodine deficiency results in 2.6 stillbirths per 1000 live births and 2.4 neonatal deaths per 1,000 live births.
Improved mental health. Iodine deficiency can impair physical and mental development and, in severe cases, lead to mental retardation (World Bank 1999c, McGuire 1996).

Vitamin A deficiency

Enhanced labor productivity. In one study, based on a review of the literature, it was assumed that partial blindness due to vitamin A deficiency reduced productivity by 25 percent, while total blindness reduced it by 50 percent (McGuire 1996).

Increased education. See comments above with respect to anemia. Vitamin A deficient youth may also be more prone to absences from school due to a greater incidence acute illness.

Improved health. Severe vitamin A deficiency can lead to blindness (McGuire 1996). It has been estimated that addressing vitamin A deficiency can result in a 23 percent reduction in mortality among children 2 to 6 years of age in areas where vitamin A deficiency is common (McGuire 1996).

Improved nutritional status (iron deficiency). In one South African study, the presence of marginal vitamin A deficiency limited the effectiveness of an iron supplementation intervention (van Stuijvenberg et al. 1997).

Birth weight

Enhanced labor productivity. In the case of low birth weight, recent estimates suggest 15 percent lower earnings as adults for every kilogram less of weight at birth (Behrman and Rosenzweig 2002b).

Improved health. Low birthweight babies (under 2,500 grams) are 40 times more likely to die during the first postnatal month and 5 times more likely to die between 1 and 12 months of age than normal birthweight babies (McGuire 1996).

4.2.9.2 Indirect estimates of the benefits of improved nutritional status

Indirect estimates of the benefits of improved nutritional status can be made by referring to the cost of cost-effective alternative investments that also improve health and/or nutritional status. Examples might be growth monitoring, food and vitamin supplements given to pregnant women and to infants and children under 5, food subsidies, food fortification programs, food stamps, school lunches, media campaigns.

4.2.10 Improved mental health

In the context of the investments in youth discussed in Section 3, improved mental health effects occur mainly in the form of a reduced risk of depression (and attendant suicides) and in improved self esteem among youth.

4.2.10.1 Direct estimates of the benefits of improved mental health

Improved mental health is a broad effect with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):
Enhanced labor productivity (Section 4.1.1)
Improved health (Section 4.2.8)
Reduced cost of medical care (Section 4.1.6)
Averted crime (Section 4.2.14)

Enhanced labor productivity. Mental retardation and other forms of mental illness can reduce labor productivity.

Improved health. Neuropsychiatric disorders account for 11 percent of the global burden of disease, second only to infectious diseases (World Bank, 1999c). Depression and other neuro-psychiatric conditions account for 24.6 percent of DALYs lost among women (Tinker, Finn and Epp 2000). Worldwide, an estimated 100,000 adolescents commit suicide annually (UNICEF 2002a).

Averted crime. Youth with untreated mental health problems are more likely to be involved in crime (UNICEF 2002a).

Reduced cost of medical care. No information was obtained in the review of the cost of medical care averted by improved mental health.

4.2.10.2 Indirect estimates of the benefits of improved mental health

If estimates of the number of DALYs gained by improving mental health are available, the benefits of improved mental health can be estimated on the basis of the cost of alternative cost-effective investments having the same effect. For example, according to the data in Table 10, the cost per DALY gained from investments in prenatal and delivery care is estimated to be about $40, while the cost per DALY gained from investments in tobacco and alcohol control is estimated to be about $42.50.

4.2.11 Delayed marriage (females only)

4.2.11.1 Direct estimates of the benefits of delayed marriage

Delayed marriage (among females only) is a broad effect with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

Increased education (Section 4.2.1)
Averted teen pregnancies (Section 4.2.4)
Reduced fertility (Section 4.2.16)
Averted HIV infections (Section 4.2.5)
Averted STIs (Section 4.2.6)
Averted physical and/or sexual abuse (Section 4.2.13)

Increased education. Women who marry at a young age generally drop out of school (UNICEF 2002A).
Averted teen pregnancies. In developing countries, many teen pregnancies occur to married women (UNICEF 2002A).

Reduced fertility. Women who marry younger have relatively little power compared to their husbands and may therefore end up with a larger number of children (Tinker, Finn and Epp 2000, FOCUS 2002, UNICEF 2002A). They also begin childbearing at younger ages (UNICEF 2002A).

Averted HIV infections. Unequal power in sexual relationships exposes women to increased risk of HIV infection and to other STIs (Tinker, Finn and Epp 2000, UNICEF 2002a, 2002c).

Averted STIs. See preceding comment.

Averted physical and/or sexual abuse. Women marrying at a younger age tend to be subjected to more domestic violence and sexual abuse than women marrying later.

4.2.11.2 Indirect estimates of the benefits of delayed marriage

Indirect estimates of the benefits from delayed marriage might be made by referring to the cost of alternative cost-effective investments that have the same effects. Examples might be investments designed to increase school enrollment among adolescents and investments to enforce minimum-age-at-marriage laws.

4.2.12 Averted drug/alcohol abuse

In the US, it has been estimated that a US$1 investment in programs aimed at the prevention of drug and alcohol abuse yields savings of US$5.69 (Del Rosso and Markek 1996). Worldwide, alcohol accounts for 5 percent of deaths and 3.5 percent of DALYs lost, i.e., more than tobacco or drug abuse (Jernigan 2001). Cohen (1998) presents an analytical framework for estimating the life cost of heavy drug use in the US. According to Cohen, the costs of drug abuse include the following components:

- The retail cost of drugs consumed by drug users (discounted to reflect the risk premium for drug distributors)
- Drug treatment costs
- Lost productivity (including lost productivity due to premature death)
- Medical care costs associated with drug use
- Cost of crime committed by drug abusers (included cost of drug-related crime)
- Third-party costs (e.g., crack babies, abused or neglected children)

Cohen estimates that the discounted (at 2 percent) lifetime cost of a heavy drug user is $370 to $970 thousand dollars.

4.2.12.1 Direct estimates of the benefits of averted drug/alcohol abuse

Averted drug and alcohol abuse is a broad effect with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

- Enhanced labor productivity (Section 2.1.1)
Reduced cost of medical care (Section 4.1.6)  
Averted crime (Section 4.2.14)  
Improved health (Section 4.2.8)  
Improved mental health (Section 4.2.10)  
Averted HIV infections (Section 4.2.5)  
Averted STIs (Section 4.2.6)  
Averted physical and/or sexual abuse (Section 4.2.13)

Enhanced labor productivity. Youth who abuse drugs and alcohol may be less productive in their work and school activities (UNICEF 2002A). However, Cohen (1998) reports that the available evidence in the US between drug abuse and productivity (although the studies cited exclude heavy drug users and dealers who have left the legitimate labor force and productivity losses due to premature death).

Reduced cost of medical care. It has been estimated that the cost of providing health care to a drug addict is about 80 percent higher than the cost of health care for an average person in the same age group (World Bank 1999b).

Averted crime. Youth who abuse drugs and alcohol are more likely to commit crime. Substance abuse is a major risk factor in violence (World Bank 1999b, UNICEF 2002a, 2002c).

Improved health. The World Health Organization (WHO) estimates that substance abuse accounts for about 4 percent of the global burden of disease and injury from all causes (World Bank 1999b). Increases in taxes on alcoholic beverages have been shown to reduce rates of traffic fatalities (Jernigan 2001).

Improved mental health. Substance abuse is a major risk factor in suicides (World Bank 1999b, Jernigan 2001). One study in the US found that suicides rates were 8 percent higher among youth ages 19-20 in states that had a minimum drinking age of 18 as compared to those with a minimum drinking age of 20 (Jernigan, 2001).

Averted STIs and HIV infections. Intravenous drug use substantially elevates the risk of HIV infection (World Bank 1999b, UNICEF 2002c). Other types of substance abuse are an important risk factor in STDs and HIV (World Bank 1999b, UNICEF 2002a). Researchers in the US have found a link between changes in beer taxes and the prevalence of gonorrhea among youth ages 15-24 (Jernigan 2001).

Averted physical and/or sexual abuse. Alcohol abuse by men is a leading cause of physical and/or sexual abuse among women (Tinker, Finn and Epp 2000, UNICEF 2002a, WHO 2000).

4.2.12.2 Indirect estimates of the benefits of averted drug/alcohol abuse

An indirect estimate of the benefits of averted drug/alcohol abuse can be obtained by examining the cost effectiveness of alternative investments designed to reduce drug and alcohol abuse among youth. In the case of alcohol, the most cost-effective alternative investment might be providing additional resources to enforce a rise in the price of alcoholic beverages (e.g., resources to prevent smuggling of alcoholic beverages). Estimates of the cost effectiveness of anti-drug programs might
also be widely available. Alternatively, an indirect estimate might be based on an estimate of the number of DALYs gained by averting one drug and/or alcohol abuser and an estimate of alternative cost-effective investment that yield additional DALYs.

4.2.13 Averted physical and/or sexual abuse

Sexual abuse and violence are serious problems that transcend racial, economic, social, and regional lines. Much physical abuse takes place in the home. Harsh corporal punishment is widely practiced by parents and is usually most severe for male children (WHO 2000). Schools in many developing countries also use corporal punishment, which is especially harsh in the case of male children. Sexual abuse occurs both inside and outside of the home, with more of the victims being female (WHO 2000). Violence is frequently directed at females and youth who lack the economic and social status to resist. Adolescents and young women in particular may experience abuse in the form of domestic violence, rape, honor killings, and sexual exploitation. Globally, about 30 percent of women are subjected to rape, beaten, or otherwise abused during their lives (Tinker, Finn and Epp 2000).

4.2.13.1 Direct estimates of the benefits of averted physical and/or sexual abuse

Averted physical and/or sexual abuse is a broad effect with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

- **Improved mental health** (Section 4.2.10)
- **Averted teen pregnancies** (Section 4.2.4)
- **Averted HIV infections** (Section 4.2.5)
- **Averted STIs** (Section 4.2.6)
- **Averted crime** (Section 4.2.14)
- **Averted drug/alcohol abuse** (Section 4.2.12)

**Improved mental health.** Among women, sexual abuse during childhood increases the likelihood of mental depression as an adult (Tinker, Finn and Epp 2000). Sexual and physical abuse are believed to be risk factors for mental illness, risky sexual behavior and crime (World Bank 2002a, WHO 2000).

**Averted teen pregnancies.** Girls who are sexually abused are more likely to become pregnant as teens and to contract STIs and HIV (UNICEF 2002a, WHO 2000).

**Averted HIV infections.** See preceding comments.

**Averted STIs.** See preceding comments.

**Averted crime.** See preceding comments.

**Averted drug/alcohol abuse.** Youth who were sexually or physically abused at home are more likely to engage in substance abuse (WHO 2000).
What is needed are estimates of the relationship between sexual and physical abuse and the above outcomes. This type of information may be very difficult to get in developing countries. The prospects for obtaining indirect estimates of the benefits of averting physical and/or sexual abuse are more promising (see discussion below).

4.2.13.2 Indirect estimates of the benefits of averted physical and/or sexual abuse

In developing countries, the most commonly used investments to avert the physical and/or sexual abuse of youth are media based. UNICEF, in particular, has sponsored mass media campaigns to reduce physical and/or sexual abuse in many countries. The cost effectiveness of these programs can be used as a basis for developing an indirect estimate of the benefits of averted cases of physical and/or sexual abuse.

4.2.14 Averted crime

In Trinidad and Tobago it has been estimated that the cost of a single criminal during a 6-month period (the average prison term in Trinidad and Tobago) is equal to US$11,813 (CGCED 2002). This figure includes the following costs: arrest ($3,133), court appearances ($3,107), the cost of incarceration for six months ($2,576), and six months of forgone earnings of the criminal ($2,999). However, these estimates are only a subset of the potential benefits of averted crime listed below.

Cohen (1998) presents an analytical framework for estimating the lifetime cost of a criminal in the US consisting of the discounted sum of the costs of each type of offense committed. The cost of each type of offense committed includes the following components:

- Victim cost of crime (including the cost of pain and suffering as well as tangible losses)
- Cost of criminal justice investigation, arrest, adjudication
- Cost of incarceration
- Opportunity cost of offender’s time while incarcerated

4.2.14.1 Direct estimates of the benefits of averted crime

Averted crime is a broad effect with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

- Enhanced labor productivity (Section 4.1.1)
- Reduced direct costs of crime (see discussion below)
- Improved health (Section 4.2.8)

**Enhanced labor productivity.** The opportunity cost of prisoner’s time spent in prison, less the value of their labor in prison work (prisoner’s labor should be valued on the basis of an estimate of the value of its marginal product, since wages paid to prisoners are usually less than this).

**Reduced direct costs of crime.** The direct costs of crime include: investigation costs (depends on the proportion of crimes that are investigated), arrest costs (depends on the proportion of crimes for which an arrest is made), court costs (depends on the proportion of crimes that are prosecuted), the direct cost of the incarceration of criminals (depends on the number of criminals who are convicted and sentenced to prison), the cost of damaged property (but not the cost of property that is
transferred from owners to thieves, as that is a transfer), the cost of crime deterrence systems (including the cost of anti-theft devices in cars and security guards, as well as protective fencing and other fixed costs), and any secondary costs of crime (e.g., depressant effect on tourism).64

**Improved health.** Reduced cost in the morbidity and mortality of criminals and their victims.

Given the complexity involved in directly estimating the benefits of averted crime (and the likelihood that the estimates would vary widely from one country to another), it may be more practical to use indirect estimates of these benefits.

### 4.2.14.2 Indirect estimates of the benefits of averted crime

Indirect estimates of the benefits of averted crime can be obtained by referring to the cost of alternative cost-effective investments to avert crime. However, although estimates of the cost effectiveness of crime prevention interventions have been made for the US and possibly other developed countries, this review could find no estimates for developing countries.

### 4.2.15 Averted female genital cutting

Female genital mutilation (FGM), or “female circumcision,” as it is sometimes called, refers to all procedures involving partial or total removal of the external female genitalia or other injury to the female genital organs, whether for cultural, religious or other non-therapeutic reasons. The most common form of FGC (accounting for about 80 percent of cases) is excision of the clitoris with partial or total excision of the labia minora. It is estimated by WHO that between 100 and 140 million girls and women have undergone FGM, most of whom are in Sub-Saharan Africa. FGM is usually performed by a traditional practitioner using crude instruments and without any anesthetic.

#### 4.2.15.1 Direct estimates of the benefits of averted female genital cutting

Averted female genital cutting includes the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

- **Improved health (Section 4.2.8)**
- **Improved mental health (Section 4.2.10)**

**Improved health.** The short-term health effects of FGM include severe pain, shock, hemorrhage, urine retention, ulceration of the genital region and injury to adjacent tissue (WHO 1996a). Hemorrhage and infection can result in death. Long-term effects of FGM include cysts and abscesses, keloid scar formation, damage to the urethra resulting in urinary incontinence, painful sexual intercourse (dyspareunia), and difficulties with childbirth. (estimates of DALYs lost?)

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64 In one analysis, an increase in the crime rate by one percent was associated with a decrease of 0.5 to 0.75 percent in the number of tourist arrivals (Levantis and Gani 2000). Although revenue from tourism is not a direct benefit in the sense used in this review, it is clear that some countries place a high value on tourism. The Thai Government, for example, has allocated 8.8 billion baht (about US$ 210 million) to spur the tourism industry in FY 2003 (Bangkok Post, June 18, 2002).
Improved mental health. FGM may leave a lasting mark on the life and mind of a woman who has undergone it (WHO 1996a, Tinker, Finn and Epp 2000). In the longer term, it may lead to women suffering feelings of incompleteness, anxiety and depression.

Averted HIV infections. When girls undergo FGM as a group, there is a risk that they will be infected by other members of the group. Women who have undergone FGM are also at greater risk of becoming infected during sexual intercourse, due to the presence of scar tissue (WHO 1996a).

4.2.15.2 Indirect estimates of the benefits of averted female genital cutting
Indirect estimates of the benefits of averted female genital cutting can be made by referring to the cost of alternative cost-effective investments that can produce comparable gains in DALYs among women.

4.2.16 Reduced fertility
Some investments in youth (e.g., scholarship programs, reproductive health education) can be expected to lead to reductions in fertility.

4.2.16.1 Direct estimates of the benefits of reduced fertility.
Reduced fertility is a broad effect with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

- Enhanced labor productivity (Section 4.1.1)
- Increased education (Section 4.2.1)
- Improved health (Section 4.2.8)

Enhanced labor productivity. Merrick (2002) summarizes the recent research suggesting that fertility reduction may be associated with social benefits in the form of enhanced labor productivity (due to higher levels of physical and human capital investment in the wake of rapid fertility decline) more rapid economic growth and poverty reduction. Estimates are available in several studies of the impact of lower fertility on the rate of economic growth. However, this is not easily converted into a benefit in the sense in which this term is used in this review. Moreover there are some basic questions about such estimates because they effectively assume that there are no non-monetary values to having children. That is, if parents choose to have another child because it would increase their welfare and if such a decision has no effect on the income generated by the parents, then this approach implies that they are worse off because their per capita income has decreased even though they made a choice to improve their welfare.

Increased education. See preceding comment.

Improved health. Pregnancy exposes women of all ages to increased risk of morbidity from such causes as anemia, malaria, hepatitis, and tuberculosis, as well as to increased risk of maternal mortality (Tinker, Finn and Epp 2000). The health of children may also be improved when women have fewer pregnancies.
**4.2.16.2 Indirect estimates of the benefits of reduced fertility.**

Given the difficulty in directly estimating the benefits of reduced fertility, indirect estimates may be preferable. The cost per birth averted by family planning program investments is a reasonable starting point for an indirect estimate of the benefits of reduced fertility. However, family planning programs produce several outcomes in addition to reduced fertility (e.g., improved maternal and child health, the ability of couples to space births, and information about various options available for limiting and spacing births). An estimate of the benefits associated with these other outcomes should be subtracted from the estimate of the overall cost per birth averted for the purpose of developing an indirect estimate of the benefits of reduced fertility. For example, it has been estimated that investments in family planning provide health benefits at a cost of about $25 per DALY gained (Claeson, Mawji and Walker 2000).

**4.2.17 Averted abortion**

Of an estimated 180 million pregnancies that occur each year in developing countries, 36 percent are unplanned and 20 percent end in abortion (Alan Guttmacher Institute 1999). Of the estimated 46 million abortions that occur annually, almost 36 million occur in developing countries while about 20 million occur in countries in which abortion is illegal. While the annual rate of abortions among women of reproductive ages is roughly equal in developing and developed countries, rates of illegal and unsafe abortion are much higher in developing countries. In developing countries, for example, about 53 percent of abortions are unsafe, i.e., either performed by someone who does not have the necessary skills and/or performed in an unsafe environment.

**4.2.17.1 Direct estimates of the benefits of an averted abortion**

An averted abortion is a broad effect with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

- **Improved health** (Section 4.2.8)
- **Reduced cost of medical care** (Section 4.1.6)
- **Averted infertility** (Section 4.3.2)

**Improved health.** Abortion is a leading cause of maternal mortality in most countries. The mortality risk from abortion is much higher in developing countries where the procedure is often illegal, e.g., 330 deaths per 100,000 abortions, as compared to between 0.2 and 1.2 per 100,000 abortions in developed countries. In sub-Saharan Africa, the mortality risk is about 680 deaths per 100,000 abortions. Approximately 19 percent of maternal deaths occurring each year are the result of abortions. (need an estimate of the number of DALYs that are lost from an unsafe abortion).

**Reduced cost of medical care.** About one-third of women obtaining an unsafe abortion experience serious side effects, but fewer than one-half of these women receive hospital care (Alan Guttmacher Institute 1999).

**Averted infertility.** In addition to mortality and morbidity, an additional frequent consequence of unsafe abortions is frequently infertility.
4.2.17.2 Indirect estimates of the benefits of an averted abortion

Indirect estimates of the benefits of an averted abortion can be based on estimates of the cost of family planning services per abortion averted (which can be estimated crudely as the cost of pregnancies averted divided by the proportion of pregnancies terminated by abortions).

4.2.18 Reduced tobacco use

4.2.18.1 Direct estimates of the benefits of reduced tobacco use

Averted tobacco use is a broad with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

Improved health (Section 4.2.8)
Improved nutritional status (i.e., increased birth weight among the children of smokers) (Section 4.2.9)
Reduced cost of medical care (Section 4.1.6)

**Improved health.** The full effects of tobacco use on health outcomes take several decades to develop (World Bank 1999a). However, the available evidence suggests that about one of every two tobacco users die from tobacco-related causes. Among 1,000 15 year-old smokers it has been estimated that about 125 will die during middle age from smoking and another 125 during old age (World Bank 1999a). Besides smokers, the health of many others is affected by smoking (including the children of smokers, as discussed below).

Smoking by pregnant women also substantially increases the risk of a spontaneous abortion (World Bank 1999a). Babies born to smokers are 35 percent more likely to die during infancy.

**Improved nutritional status.** In high-income countries, babies born to smokers are more likely to have low birth weight. Those who survive infancy are likely to have less schooling and lower earnings as adults – recent estimates suggest 15 percent less earnings for every kilogram less of weight at birth (Behrman and Rosenzweig 2002b).

**Reduced cost of medical care.** A great deal of money is expended to treat tobacco-related diseases. However, the effect of tobacco use on the cost of health care is not as great as it might first appear to be because the shorter lifespan of smokers reduces their lifetime health care costs relative to non-smokers (World Bank 1999a).

4.2.18.2 Indirect estimates of the benefits of reduced tobacco use

Indirect estimates of the benefits of reduced prevalence of tobacco use can be made by referring to the cost of cost-effective alternative investments that have the same effects. Probably the most cost-effective investment to reduce the use of tobacco is to invest in the necessary enforcement measures that support a rise in the price of tobacco (e.g., measures designed to prevent the smuggling of tobacco products). Another possibility would be to use the cost of alternative cost-effective health investments that would have the same effects in terms of gains in DALYs.
4.2.19 Reduced violence and civil conflict

4.2.19.1 Direct estimates of the benefits of reduced violence and civil conflict

Reduced violence and civil conflict is a broad effect with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

Improved health (Section 4.2.8)
  - Improved mental health (Section 4.2.10)
Reduced cost of medical care (Section 4.1.6)
Increased education (Section 4.2.1)
Reduced crime (Section 4.2.14)
Averted HIV infections (Section 4.2.5)
Averted STIs (Section 4.2.6)
Averted physical and/or sexual abuse (Section 4.2.13)
Increased social capital (Section 4.3.1)

Improved health. Civil conflict can result in the loss of limbs from land mines and other causes among both combatants and the civilian population.

Improved mental health. Civil conflict may do considerable damage to the mental health both of youth participating in the conflict and their innocent victims (Verhey 2001, UNICEF 2002A).

Reduced cost of medical care. Reduced violence and civil conflict can reduce significantly the need for medical care to treat its victims (e.g., the victims of land mines).

Increased education. In developing countries, most soldiers are between the ages of 10 and 24 (UNICEF 2002A0). Many youth participating in civil conflict permanently interrupt their educations (Verhey 2001).

Reduced crime. Demobilized troops are often the source of increased crime for many years following civil conflict.

Averted HIV infections. Youth who are in the military are more likely to contract HIV and STIs from prostitutes providing services around military barracks (UNICEF 2002c).

Averted STIs. See preceding comment.

Averted sexual and physical abuse. Many girls and young women are raped or otherwise sexually or physically assaulted during civil conflicts (UNICEF 2002a). In many cases, such forced rapes lead to HIV infection (UNICEF 2002c).

Increased social capital. According to one study, violence erodes physical, social, and natural capital (Moser and Shrader 1999). Another study assesses the costs of youth violence in Latin America and the Caribbean (Moser and van Bronkhorst 1999).
4.2.19.2 Indirect estimates of the benefits of reduced violence and civil conflict

This review could not find any reliable estimates of the cost of cost-effective alternative investments to reduce violence and civil conflict. However, cross-national research on civil conflict suggests that civil conflict is both more likely to occur and is more likely to continue for a longer period of time in countries with lower GDP per capita (Collier and Hoeffler 1998, Collier, Hoeffler and Soderbom 2001).\textsuperscript{65} This suggests that an alternative measure that would also reduce the expected duration of civil conflict might be the cost effectiveness of an investment designed to increase the level of GDP per capita. The cost of such an investment could be obtained by dividing a hypothetical increase in investment by an estimate of the incremental capital-output ratio (ICOR). The effectiveness of such an investment could be estimated from the basis of the results reported in Collier and Hoeffler (1998) and Collier, Hoeffler and Soderbom (2001).

4.2.20 Averted orphans

HIV/AIDS is causing rapid increases in the number of orphans in many countries. These orphans face many obstacles in life.

4.2.20.1 Direct estimates of the benefits of averted orphans

An averted orphan is a broad effect with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

Reduced cost of orphanage care (see discussion below)
Increased education (Section 4.2.1)
Reduced child labor (Section 4.2.3)
Improved health (Section 4.2.8)
Improved nutritional status (Section 4.2.9)
Improved mental health (Section 4.2.10)
Averted social exclusion (Section 4.3.5)

Reduced cost of orphanage care. Schwartländer et al. (2001) estimate that the annual cost of caring for an AIDS orphan is $416. They also estimate that the annual cost of orphan living assistance is $58.

Increased education. AIDS orphans have very high school dropout rates (UNICEF 2002c). Schwartländer et al. (2001) estimate that orphans require annual school fee assistance of $25.

Reduced child labor. AIDS orphans sometimes have no alternative but to engage in child labor to support themselves (UNICEF 2001).

No information was encountered in the review on the relationship between an averted orphan and its remaining hypothesized components.

\textsuperscript{65} Unfortunately, Collier, Hoeffler and Soderbom (2001) report that while the male secondary school enrollment rate and the level of per capita income are both highly significant when included in their regression model, the two variables are statistically insignificant when both are specified in the model.
4.2.20.2 Indirect estimates of the benefits of averted orphans

An indirect estimate of the benefits of averting orphans might be based on the cost of alternative cost-effective investments that have the same effect. One example might be the cost of averting maternal deaths, which also averts orphans (since the definition of orphans in the context of the HIV/AIDS epidemic is usually children who have lost one or both parents).

4.3 Difficult effects to value monetarily

4.3.1 Increased social capital

The main problem in attaching a monetary value to the benefits of increased social capital is to identify a suitable quantifiable indicator of social capital. Although social capital is a very broad concept (and inherently multidimensional), the degree of community participation is often used as an indicator of the strength of social capital (Woolcock and Narayan 2000). Narayan and Pritchett (1999) developed an index of social capital at the household and community levels in Tanzania that included density and characteristics of informal and formal groups and networks. The dimensions of the index included group functioning, financial and in-kind contributions to groups, participation in decisionmaking, and heterogeneity of membership. Other indicators of social capital have been based on the perceived level of trust among members of a community. An alternative and much simpler indicator, for which there is likely to be more data available, is the crime rate.

An indirect estimate of the benefits of increased social capital can be based on the cost of the least-cost means of changing an indicator of the strength of social capital, such as levels of community participation or the crime rate.

4.3.2 Averted infertility

The benefits of averted infertility consist of a complex mix of private (at least some of which are subjective) and social benefits and costs. The benefits of averted infertility might be estimated indirectly on the basis of what some couples are willing to pay to correct infertility surgically. However, since most infertile couples in developing countries do not make such expenditures, the estimate should probably be averaged over all infertile couples, rather than those who actually incur such expenditures.

4.3.3 Enhanced national security

An indirect estimate of the benefits of enhanced national security can be obtained on the basis of the cost of cost-effective alternative investments having the same effect.

4.3.4 Improved self esteem

Improved self-esteem is a broad effect with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

Improved mental health (Section 4.2.10)
Averted teen pregnancies (Section 4.2.4)
Averted crime (Section 4.2.14)
Averted drug/alcohol abuse (Section 4.2.12)
Reduced tobacco use (Section 4.2.18)

It would be very difficult to find reliable estimates of the above effects. However, the benefits of improved self-esteem might be estimated indirectly by using the cost of alternative cost-effective investments that also produce improved self-esteem among youth.

4.3.5 Averted social exclusion

Social exclusion is a multi-dimensional concept that includes: 1) exclusion from economic means, including unequal access to economic goods and services that determine human capital, 2) unequal access to labor markets and social protection programs, 3) exclusion from participatory mechanisms that affect public service programs, and 4) unequal access to political rights and civil liberties (CGCED 2002). Social exclusion can occur from a variety of causes. In some countries, social exclusion can be gender-related. In other cases, it may be a consequence of ethnicity, race, caste or religion. Social exclusion can also result from residence in an urban ghetto or from failure to gain admission to a good school (in some countries, children from different schools wear different color uniforms, so it is easy to identify children’s degree of success in school). In some settings, pregnant women or mothers, and particularly single mothers (and even their children), are denied access to some social and cultural services. In other cases, children of immigrants can be denied access to schooling and other social services.

Social exclusion is a broad effect with the following components (the references in parentheses refer to the sub-subsection discussing the unit benefits of a given component):

- Enhanced labor productivity (Section 4.1.1)
- Increased education (Section 4.2.1)
- Improved health (Section 4.2.8)
- Improved self esteem (Section 4.3.4)

In the context of this review, averted social exclusion is identified as a possible effect of investments that increase education and that avert teen pregnancies. It is difficult to identify measurable indicators of social exclusion in either of these cases. The benefits of averted social exclusion can in principle be estimated indirectly by referring to the cost of cost-effective alternative investments that produce the same effect. Possible such investments include: affirmative action programs, efforts to enforce laws and regulations designed to prevent discrimination, and mass media campaigns designed to promote social inclusion. Affirmative action policies have been implemented in several Asian countries. In India, for example, tribal people are eligible for special development assistance under the Tribal Sub-Plan, jointly funded and administered by the central and state governments. Malaysia has perhaps made the most extensive use of affirmative action to address problems of ethnic disparity. Since the early 1980s, Malays receive preferential treatment in employment, school admissions and government contracts. The Malaysian Government systematically favors the education of Malay children through scholarships and other subsidies (Grootaert and Kanbur 1995). Some analysts (e.g., Bardhan) have raised the possibility that there may be some efficiency cost
associated with affirmative action programs. However, there may not be any reliable evidence on this issue.

5. EXISTING BENEFIT-COST ANALYSES OF INVESTMENTS IN YOUTH

There are only a few existing studies in which the benefits and costs of investments in youth are calculated. Some of these studies are reviewed briefly in this section.

5.1 NUTRITION INVESTMENTS IN THE PHILIPPINES

A benefit-cost analysis was prepared for three nutrition interventions that were tested in the Philippines and that were designed to eliminate severe vitamin A deficiency (Popkin et al. 1980). The three different interventions were the distribution twice yearly of a mass dosage of vitamin A capsule, vitamin A fortification of monosodium glutamate (MSG), and a public health intervention that used paraprofessionals for an education, sanitation, immunization, and horticulture program. Each program was operated in four ecological areas over a 2-year period. Program benefits included reduced mortality, blindness, morbidity and treatment costs. Benefits did not include transfers (i.e., reduced welfare payments and increased taxes). Costs included private household costs (including the opportunity cost of time) and excluded research costs. Although the study used relatively high discount rates (8 percent and 15 percent), the results of the study indicated that the fortification and mass dosage capsule interventions provided discounted benefits much greater than their discounted costs. The relatively poor showing of the public health intervention may have been due to the narrow range of benefits for which it was evaluated. The study’s results also indicate that the interventions yielded higher returns among youth age 7-16 than among children age 1-6. This difference is mostly attributed to the effect of discounting future benefits over a longer period in the case of children.

5.2 FOOD FOR EDUCATION (FFE) PROGRAM IN BANGLADESH

The annual FFE program cost needed to encourage an additional poor child to attend primary school was estimated to be $66.4, while the estimated annual cost for an additional very poor child to attend was estimated to be $95 (Ravallion and Wodon 2000). No information on the composition of costs was provided in the study. Benefits in the form of additional per capita consumption enjoyed both by the child attending school and his/her family when the child reaches adulthood was estimated to be $69.9 for the poor child and $52.6 for the very poor child. After netting out the value of the food grains received under the program (presumably because they represented a transfer, but without including any estimate of social benefits), the internal rate of return is estimated to be 8.11 for the very poor and 11.50 for the poor. The report concludes that the FFE program is “cost effective” as an education program. However, it suggests that a cash stipend program might be more cost effective because of the likelihood that it would involve lower administrative costs.
5.3 PACES SCHOOL VOUCHER PROGRAM IN COLOMBIA

Total social cost of the program was estimated to be $43 annually per lottery winner, or $195 over a three-year period (after adjusting for different rates of voucher take-up in each year of the program). However, there is no evidence that the cost estimate included any estimate of distortionary costs related to financing or possible adverse work incentives. The evaluation estimates that the additional 0.12-0.16 years of schooling completed by lottery winners would raise their annual incomes by about $36-48 per year (based on an estimated rate of return to schooling of 10 percent in Colombia and predicted average annual earnings of $3,000). Additionally, the estimated increase of 0.2 standard deviations in test scores among lottery winners is estimated to be the equivalent of about one full year of schooling (based on the mean test scores by grade of US Hispanic students taking the same test), which if correct would translate into an additional gain of about $300 in annual earnings. Clearly the estimated gain in earnings (even if heavily discounted) would exceed the program’s cost in any cost-benefit analysis (even if the estimated benefits from improved cognitive achievement are ignored).

5.4 PROGRESA SCHOLARSHIP PROGRAM IN MEXICO

The PROGRESA scholarship program and its estimated effects are summarized in Section 3.2.2. The benefit-cost ratio of this program also has been estimated based on those effects and additional information (Behrman, Sengupta and Todd 2002). The financial cost of the program primarily is the cost of the scholarships that are awarded monthly for the ten months of the school year for eligible children who attend at least 85 percent of the time plus the cost of a once-a-year book allowance plus the per family member share of a general subsidy that PROGRESA provides to each eligible family based on a poverty level proxy means test. The effect of increasing schooling attainment by about 0.7 is translated into a benefit in this evaluation by using the present discounted values of income effects over the life cycle based on prior estimates of the impact of schooling on income in Mexico. This exercise leads to estimates of a benefit-cost ratio of 1.7 for a real interest rate of 5 percent (2.7 for a real interest rate of 3 percent, illustrating the sensitivity of these estimates to the choice of discount rate). There are no spillover effects in the sense that there is no impact on the schooling of children who are not participants in the program but who attend the same schools as children who are participants.

In certain respects, this is a high-quality evaluation because of the experimental data that were available to evaluate the program and the careful analysis of the effects that permitted multiple channels and the estimation of the effects had the program been in place for the whole career of children even though it would be necessary to collect data for roughly a decade before it would be possible to have direct observations on the effects for the program over a child’s school career. Nevertheless, the discussion above in Sections 2.5, 2.6 and 3.2 point to several definite limitations of this evaluation. (1) The cost estimates do not include the administrative costs of the program (that have been estimated to be relatively low, on the order of magnitude of 10 percent, but which still would by themselves reduce the benefit-cost ratio) nor the distortionary costs of raising governmental revenues for the program (which, together with administrative costs of 10 percent, would reduce the benefit-cost estimate to one if they were 40 percent of the total program expenditures, which is not a huge number in comparison, for example, with estimates of Ballard,
Shoven and Whalley (1985) and Feldstein (1995). (2) The cost estimates do not include the opportunity cost of time of children to attend school. Even though the level of the scholarships was rationalized on the basis of compensating families for lost income due to less work with increased school attendance, the evaluation data do not include longitudinal information on time worked by children that would permit the incorporation of this cost. (3) The costs do not include any additional resource costs due to additional school inputs that may have been used to accommodate the induced changes in schooling. Unless the schools previously had unutilized capacities, the fact that no spillover effects were found suggests that school inputs were increased (but, unfortunately, there is not direct evidence on changes in school inputs). (4) The effects include only those on schooling attainment, not on education in some broader sense as represented, for example, by cognitive achievement (though based on partial data, Behrman, Sengupta and Todd (2000), as noted above, do not find significant effects on such tests in the first year of the program). (5) The benefits include only the income benefits and not the larger array of possible benefits that we argue may be important because of the broad effect of education. (6) The available information does not permit an assessment of possible efficiency gains from the program (except that the increased enrollment is consistent with a capital market constraint on investments for poor households prior to the program). For instance, they provide no way to assess whether there are any positive spillovers on others subsequent to the completion of school of one individual having more schooling. (7) This evaluation seems to confuse transfers with resource costs in representing costs (see Section 2.5.4). The benefit-cost estimates, thus, are overstated because of the failure to include additional school input, administrative and distortion costs and understated due to the inclusion of transfers as a cost (so that it is conceivable that the problems noted may cancel one another out).

5.5 INCREASING THE QUALITY VERSUS THE QUANTITY OF BASIC SCHOOLING IN RURAL PAKISTAN

Increasing the quantity of schooling an individual receives is likely to raise his or her cognitive skills. Improving school quality is likely to have the same effect. Increasing the quantity of schooling -- by providing a primary education to children who otherwise would not go to school, or by providing a middle school education to children who otherwise would leave school upon the completion of primary school -- entails substantial costs. Similarly, improving the quality of schools has costs. However, in this case, there is little or no change in the opportunity cost of student time -- a large component of the total cost of schooling.

The evaluation of the rates of return to increasing the quantity versus the quality of schooling is difficult because it requires considerable data: information on what schools are producing -- e.g., cognitive achievement, what are the effects of that product on outcomes of interest such as wage rates, what are the inputs into the production of that outcome -- such as student time in school, teacher quality, student-teacher ratios, what are the costs of improving schooling quality and of the time that children spend in school, and what are the determinants of a number of behavioral decisions such as how much time an individual spends in school and whether an individual subsequently participates in the labor market. Behrman, Ross and Sabot (2002) developed a conceptual framework for undertaking such estimates, collected most of the necessary data for rural Pakistan, and made estimates with methods that control for the key behavioral choices and for unobserved determinants of education.
They find that higher cognitive skills are rewarded with higher wages in rural Pakistan, presumably because more skilled workers are more productive. Because they are more skilled, graduates of even low-quality primary schools earn more than uneducated workers. In like manner, graduates of high-quality primary schools and graduates of middle schools who attended low-quality primary schools earn more than students who complete only low-quality primary schools.

Increasing the quantity and improving the quality of schooling are alternative means of increasing the productivity and earnings of the labor force. Their estimates are that the social rate of return to enabling the graduate of a low-quality primary school to complete middle school -- 2.8 percent -- is low compared to improving school quality -- 13.0 percent -- or providing access to a low-quality primary school -- 18.2 percent. The relatively high rate of return to improving quality reflects the absence of any additional opportunity cost to the students and the absence of higher capital costs for students already enrolled in school. In this context, it appears that productivity and equity concerns both point towards expanding primary schools, even if they are of lower quality. And, because few boys now lack access to basic schooling, girls will benefit disproportionately.

This study again points to some of the difficulties in undertaking such evaluations. Even with the special data collected for the study, for example, it was not possible to identify with confidence the relative importance of components of teacher quality (i.e., the relative importance of factors such as teacher experience, teacher schooling, teacher training). This study also, once again, limits the measurement of the effects of changes in schooling to the value of labor market outcomes, and provides no information on possible efficiency reasons for interventions.

5.6 Increasing the Quantity versus the Quality of Basic Schooling in Ghana

In Ghana, Glewwe (1996) combined estimates of the effect of several specific school quality improvements on cognitive achievement with estimates of the effect of cognitive achievement on earnings to obtain estimates of the rates of return to each type of quality improvement. He obtained an estimated rate of return of 6-7 percent for providing textbooks, 15-25 percent for providing blackboards, and 13-24 percent for repairing classrooms with leaking roofs. All of these estimated rates of return were higher than the estimated rate of return to an additional year of schooling in Ghana (4 percent-6 percent).

6. Conclusions

Some analysts and policy makers claim that youth-focused interventions are a cost-effective way to improve health, reduce poverty, and benefit society in developing countries. Yet no one has undertaken a full economic analysis of the benefits and costs of youth investments in the developing world. Such analysis has been undertaken to a limited extent in wealthier countries such as the United States, but has been very limited in the developing world, apart from investments in formal schooling.
This background paper is for such an assessment, which we present in Knowles and Behrman (2003). We have attempted to indicate what we might want to know about investments in youth in order to inform the basic policy motives of efficiency and distribution and what are the difficulties in obtaining good estimates of the costs and benefits of investing in youth. The latter indeed present considerable challenges. We then have reviewed a large number of studies of the effects, cost, cost effectiveness and benefits and costs of investments in youth in varying developing countries. This review does provide some of the needed components for the assessment in Knowles and Behrman (2003). But it also points to many gaps. Moreover, and very importantly, many studies that seem to confidently present estimates of associations as if they are measuring causal effects probably are misleading because they do not deal well with the estimation problems that we discuss in Section 2 above. Furthermore, almost none of these studies seriously and persuasively consider the differences between private and social impacts, costs and rates of return that is at the heart of the efficiency motive for policies. And many do not address explicitly the distributional motives for policies. Thus this review concludes that, thought there are many studies related to investments in youth, what we know with confidence from the existing literature about causal effects and about policy motives for investing in youth is strikingly, perhaps shockingly, limited.
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The Economics of Priority Setting for Health Care: A Literature Review

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