Achieving the Millennium Development Goals:

The contribution of fulfilling the unmet need for family planning

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Acknowledgments

This study grew out of a presentation made in Ghana in February 2005 at a regional conference on repositioning family planning. The conference focused in large part on the unmet need for family planning and the potential benefits to countries if this unmet need could be fulfilled. The original presentation benefited especially from collaboration with Jean Pierre Guengant and Norine Jewell. This report expands the original four countries considered to 16 countries. We are grateful for the comments and insights on versions of the study provided by participants during presentations at USAID, Constella Futures, and the University of North Carolina, Chapel Hill (MEASURE Evaluation). In particular, we would also like to thank Carol Shepherd, Tom Goliber, and Suneeta Sharma of Constella Futures for reading the report and providing their insights.

Abbreviations

AIDS	acquired immune deficiency syndrome
BCG	Bacille Calmette Guerin
CPR	contraceptive prevalence rate
CYP	couple-years protection
DHS	demographic health surveys
DPT	diphtheria-pertussis-tetanus
EFA	Education for All
EPI	Extended Program on Immunizations
FIC	fully immunized child
FP	family planning
GAVI	Global Alliance for Vaccines and Immunizatons
GER	gross enrollment rate
HIV	human immunodeficiency virus
ICPD	International Conference on Population and Development
IMR	infant mortality rate
ITN	insecticide-treated net
IUD	intrauterine device
JSI	John Snow, Inc.
KINET	Kilombero Insecticide Treated Nets Project
LLITN	long-lasting insecticide-treated net
MDG	Millennium Development Goal
MMR	maternal mortality ratio
NER	net enrollment rate
OPV	oral polio vaccine
RBM	Roll Back Malaria (Partnership)
TFR	total fertility rate
U5MR	under-five mortality rate
UN	United Nations
UNAIDS	Joint United Nations Program on HIV/AIDS
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNSD	United Nations Statistics Division
WB	World Bank
WHO	World Health Organization

Executive Summary

The Millennium Development Goals (MDGs)—a set of eight, time-bound goals ranging from reducing poverty by half to providing universal primary education—present a major and important challenge to developing countries. The MDGs are set to be met by 2015, but current reports show that many countries are not "on track" to meet the goals by the deadline. If progress continues at the current rate, only the safe water and sanitation MDG will be met by all countries by 2015 (Vandemoortele, 2002).

This report is about one strategy that will make the MDGs easier and more affordable for countries to meet. It shows how meeting unmet need for family planning can help countries achieve the MDGs by reducing the size of the target population groups for the MDGs and therefore lowering the costs of meeting the MDGs. A benefit-cost analysis was applied to 16 sub-Saharan African countries: Burkina Faso, Cameroon, Chad, Ethiopia, Ghana, Guinea, Kenya, Madagascar, Mali, Niger, Nigeria, Rwanda, Senegal, Tanzania, Uganda, and Zambia. Analyses were included for selected targets and indicators of five of the eight MDGs:

- Achieve universal primary education
- Reduce child mortality
- Improve maternal health
- Ensure environmental sustainability
- Combat HIV/AIDS, malaria and other diseases

Given past high rates of fertility, the number of women expected to enter the reproductive age group in the next 10 years will increase by some 35 percent resulting in a 33 percent increase in the annual number of pregnancies. A significant percentage of these pregnancies are either mistimed or unintended. For example, in five of the 16 countries that were studied more than half of the pregnancies were mistimed or unintended. One reason for this is the low use of family planning and the high rates of unmet need for family planning. In Rwanda, for example, 35 percent of women have an unmet need for family planning, suggesting a high level of latent demand and presenting a potential opportunity for increased provision of family planning services.

For each country, two population scenarios were created: one when current unmet need for family planning is met and one when unmet need is not met. The costs of family planning and of meeting selected targets of each of the five MDGs were estimated under both scenarios for each country. Next, the difference in cost between the two scenarios was calculated over the 10-year period from 2005 to 2015. The additional cost of family planning was then compared with the savings that family planning will generate in each of the selected MDG sectors to calculate benefit-cost ratios for each sector and for the country overall.

The analysis shows that the benefits (measured by savings in meeting MDG targets) from meeting unmet need outweigh the extra costs of meeting the unmet need in all countries. Overall, we found that benefit-cost ratios ranged from 2.03 in Ethiopia to 6.22 in Senegal. The greatest potential for cost savings in most countries is in education and maternal heath.

Health benefits for children and mothers were also analyzed. The analysis shows that meeting unmet need can help avert maternal deaths during childbirth by reducing the number of pregnancies and induced abortions. For example in Tanzania, 18,688 mothers' lives could be saved. Reducing unmet need for family planning can also reduce the number of infant and child deaths by reducing the percent of high-risk births. In Ethiopia and Nigeria, more than one million children's lives would be saved.

Thus, while increasing family planning use is not one of the MDGs, a strategy to increase contraceptive use by reducing the unmet need for family planning can play a valuable complementary role and help countries to move closer to achieving their MDGs by freeing up resources to meet these goals while at the same time saving lives.

I. Introduction

The Millennium Development Goals (MDGs) are a set of eight, time-bound goals—ranging from reducing poverty by half to providing universal primary education—that were agreed to by many of the world's countries following the United Nations Millennium Summit in September 2000. Undoubtedly, if the goals are met, standards of living and the quality of life for people in developing countries will improve, but meeting the MDGs by 2015 presents a major challenge because many countries have a long way to go to meet them and the necessary resources are not available.

At the same time, developing countries, particularly in sub-Saharan Africa, face a long-term demographic challenge. Population growth rates remain high and population growth threatens to reverse many of the development achievements being made. Contraceptive prevalence rates remain low and consequently fertility rates are high. Yet, the data available suggest that many women of reproductive age have a high level of latent demand for family planning ("unmet need") and a significant percentage of pregnancies are either mistimed or unintended.

This report presents an analysis of how meeting the unmet need for family planning could help countries in sub-Saharan Africa also meet the MDGs. It shows how increased use of family planning could lower the costs of meeting the MDGs. It furthermore compares those cost savings with the extra costs of increased family planning using a benefit-cost framework. We performed the analysis for 16 sub-Saharan African countries: Burkina Faso, Cameroon, Chad, Ethiopia, Ghana, Guinea, Kenya, Madagascar, Mali, Niger, Nigeria, Rwanda, Senegal, Tanzania, Uganda, and Zambia.

The benefit-cost study was based on selected targets of five of the eight MDGs using a modeling approach. In the sections that follow, we first review the demographic momentum facing the selected countries and the levels of unmet need for family planning and of unintended and mistimed pregnancies. Then we present two population projection scenarios—one based on a continued modest increase in contraceptive prevalence and the other based on meeting current levels of unmet need. We also estimate the extra cost of meeting the unmet need for family planning. Following these sections, we discuss analyses and scenarios based on five MDG models in the areas of education, child survival, maternal health, malaria, and water and sanitation. Considerable research was conducted and is reported to document the basis for projecting the cost implications of meeting various MDG targets. Lastly, we compare the costs of family planning to the reduced costs of meeting the five MDGs' targets, using a benefit-cost framework.

Unmet Need for Family Planning and Unintended and Mistimed Pregnancies

Currently, due to past high fertility, the number of women of reproductive age in many sub-Saharan African countries is large and growing. Table I.1 below shows that in the 16 countries studied, the number of women of reproductive age will grow by nearly 39 million from 2005–2015, an increase of around 35 percent. Consequently, if current fertility rates do not decrease, by 2015, the number of pregnancies each year will increase by around 33 percent during this same period and will continue to grow.

Table I.1: Current and projected number of women of reproductive age and annual pregnancies for all countries from 2005–2015

Country	Women of Reproductive Age			Pregnancies		
	2005	2010	2015	2005	2010	2015
Burkina Faso	3,151,568	3,810,331	4,591,614	924,283	1,110,610	1,324,299
Cameroon	4,142,938	4,758,525	5,381,501	844,497	971,078	1,094,728
Chad	2,218,523	2,604,179	3,040,069	628,545	737,149	863,026
Ethiopia	18,482,428	21,645,968	25,135,402	4,594,650	5,120,203	5,737,605
Ghana	5,579,650	6,362,752	7,149,701	1,113,703	1,274,268	1,425,761
Guinea	2,104,049	2,429,587	2,829,205	558,414	641,540	750,220
Kenya	9,135,223	10,509,438	12,019,874	2,117,151	2,436,874	2,753,877
Madagascar	4,357,190	5,090,212	5,945,063	1,052,736	1,229,248	1,436,291
Mali	3,036,668	3,593,055	4,275,537	925,591	1,090,109	1,284,721
Niger	2,970,671	3,538,301	4,234,561	1,013,044	1,203,600	1,439,823
Nigeria	31,375,164	36,206,664	41,653,816	7,560,117	8,769,477	10,086,390
Rwanda	2,217,331	2,540,819	2,844,927	483,506	577,772	653,750
Senegal	2,833,949	3,276,370	3,749,241	708,079	820,634	936,805
Tanzania	9,880,629	11,434,255	13,174,354	2,397,403	2,772,772	3,185,981
Uganda	6,736,454	8,144,911	9,911,234	2,073,401	2,503,631	3,048,416
Zambia	3,122,792	3,639,284	4,237,155	805,680	935,352	1,086,865
All countries	111,345,227	129,584,651	150,173,254	27,800,800	32,194,317	37,108,558

Source: Based on most recent DHS and authors' calculations.

Unmet need for family planning (FP) is defined as a woman who is fecund, sexually active, not using any contraceptive methods, and does not want a child for at least two years ("spacers") or does not want more children at all ("limiters"). Table I.2 shows that unmet need for family planning is high in many sub-Saharan African countries. This means that many women who want to space pregnancies further apart or want to limit the number of children they have, do not use FP methods. The percentage of women using any method of contraception is low in sub-Saharan Africa relative to developed countries. Table I.2 shows that meeting unmet need for family planning will increase the number and the percentage of women using family planning. In many countries, there are more women with unmet need for family planning than there are women currently using family planning.

Table I.2: Percent and number of women with unmet need and need met

Country	% of Women with Need Met (contraceptive prevalence rate)	Number of Women with Need Met (FP users)	% of Women with Unmet Need	Number of Women with Unmet Need
Burkina Faso 2003	13.8	826,465	28.8	1,115,071
Cameroon 2004	26.0	702,745	20.2	545,979
Chad 1996/97	4.1	51,952	9.7	122,911
Ethiopia 2000	8.1		35.2	
Ethiopia 2005	14.7	817,580	28.6**	3,552,942

Ghana 2003	25.2	826,465	34.0	1,115,071
Guinea 1999	6.2	92,426	24.2	360,761
Kenya 2003	39.3	2,030,055	24.5	1,265,556
Madagascar 2003/2004	27.1	718,331	23.6	625,558
Mali 2001	8.1	179,260	28.5	630,729
Niger 1998	8.2	162,509	16.6	328,981
Nigeria 2003	12.6	2,609,196	16.9	3,499,636
Rwanda 2000*	13.2	63,697	35.6	151,496
Senegal 1997	12.9	194,232	34.8	525,481
Tanzania 1999	25.4	1,370,626	21.8	1,176,364
Uganda 2000/01	22.8	859,272	34.6	1,303,984
Zambia 2001/02	34.2	576,640	27.4	461,986

Source: Most recent DHS reports.
*Represents all women, not only married women.
** Not available in preliminary report.

Even among those women who use family planning, some are still at risk of unplanned or mistimed pregnancies due to method failures. Method failure is highest among users of traditional methods. Table I.3 shows that among those women who use contraception, a significant percentage use traditional, less effective methods; with the exception of Ethiopia in 2005, the percentage using traditional methods ranges from around 20 percent in Kenya to more than 70 percent in Chad. Thus, many pregnancies in these countries are unintended or mistimed not only due to the low use of family planning overall but also because of the high use of less effective contraceptive methods.

Table I.3: Percent of women using modern/traditional contraceptive methods (among FP users)

Country	Contraceptive Prevalence Rate	% Using Modern Methods	% Using Traditional Methods
Burkina Faso 2003	13.8	63.8	36.2
Cameroon 2004	26	48.1	51.9
Chad 1996/97	4.1	29.3	70.7
Ethiopia 2000	8.1	77.8	22.2
Ethiopia 2005	14.7	94.6	5.4
Ghana 2003	25.2	74.2	25.8
Guinea 1999	6.2	67.7	32.3
Kenya 2003	39.3	80.2	19.8
Madagascar 2003/2004	27.1	67.5	32.5
Mali 2001	8.1	70.4	29.6
Niger 1998	8.2	56.1	43.9
Nigeria 2003	12.6	65.1	34.9
Rwanda 2000*	13.2	43.2	56.8
Senegal 1997	12.9	62.8	37.2
Tanzania 1999	25.4	66.5	33.5
Uganda 2000/01	22.8	79.8	20.2
Zambia 2001/02	34.2	74.0	26.0

Source: Most recent DHS reports.
* Represents all women, not only married women.

Many women report a desire to use family planning to either space or limit their pregnancies. Table I.4 shows that the percentage of pregnancies that are either not wanted at that time (mistimed) or not wanted at all (unintended) is high. In five of the 16 countries (Cameroon, Ghana, Kenya, Uganda, and Zambia) over 50 percent of pregnancies were not intended or mistimed, while in the remaining countries, the percentage ranges from 21 percent in Chad to 49 percent in Madagascar and Senegal. These high levels of unintended and mistimed pregnancies are a major public health challenge and also demonstrate a latent unfilled demand for family planning.

Table I.4: Percent of pregnancies that are intended, unintended, and mistimed

Country	% Pregnancies Intended	% Pregnancies Unintended	% Pregnancies Mistimed
Burkina Faso 2003	59	10	31
Cameroon 2004	47	16	36
Chad 1996/97	79	6	15
Ethiopia 2000	54	18	27
Ghana 2003	41	23	36
Guinea 1999	65	12	23
Kenya 2003	44	26	30
Madagascar 2003/2004	51	26	23
Mali 2001	62	11	27
Niger 1998	73	4	23
Nigeria 2003	70	10	21
Rwanda 2000*	74	9	17
Senegal 1997	52	14	35
Tanzania 1999	54	17	29
Uganda 2000/01	48	22	30
Zambia 2001/02	46	22	33

Source: Most recent DHS reports.
* Represents all women, not only married women.

When more women use modern family planning to space and limit pregnancies, the number of unintended pregnancies will fall. This, in turn, will reduce the number of abortions and the number of unintended births. Meeting current unmet need for family planning can help countries achieve many of the MDGs by reducing the number of people needing certain services, such as child immunizations and primary schooling. This will make the MDGs more affordable and easier to achieve. The next section will discuss the demographic assumptions used to create two population scenarios and the cost of family planning under each scenario. Section III will discuss the assumptions made to meet the MDG targets and the cost of meeting the MDG targets under each family planning scenario

II. Family Planning Scenarios

Demographic Assumptions

We projected two population scenarios: (1) a "Base" scenario, when unmet need remains constant; and (2) a "Need Met" scenario, when stronger family planning programs are implemented to meet the current unmet need. The most recent Demographic Health Survey (DHS) for each country was used for data on contraceptive prevalence and unmet need.[1] The baseline contraceptive prevalence rate (CPR) for married women using any contraceptive method (modern or traditional) was used. Total unmet need was disaggregated into unmet need for spacing and for limiting pregnancies.

Under the Base scenario, CPR was held constant at its baseline level through 2020. Under the Need Met scenario, CPR was interpolated on a straight-line basis from the baseline CPR to meet current unmet need by 2020. As Table II.1 shows, the annual percent point increase in contraception required to meet unmet need by 2015 is high. Sustainable annual increases in contraceptive prevalence have been found to average 1.5 points per year (Sinding et al., 1994). Therefore, for feasibility purposes, rather than use a target increase in CPR that may be unattainable, it was assumed that current unmet need would be eliminated by 2020 rather than by 2015 (the MDG target year). Under this assumption, all countries except Ghana will require an annual increase in CPR of less than 2 percent.

Table II.1: Annual percent increase in CPR to meet current unmet need by 2015, 2020

	Current CPR	Unmet Need	Target CPR	Annual % Point Increase 2015	Annual % Point Increase 2020
Burkina Faso 2003	13.8	28.8	42.6	2.4	1.7
Cameroon 2004	26.0	20.2	46.2	1.8	1.3
Chad 1996/97	4.1	9.7	13.8	0.5	0.4
Ethiopia 2000	8.1	35.2	43.3	2.3	1.8
Ghana 2003	25.2	34.0	59.2	2.8	2.0
Guinea 1999	6.2	24.2	30.4	1.5	1.2
Kenya 2003	39.3	24.5	63.8	2.0	1.4
Madagascar 2003/2004	27.1	23.6	50.7	2.0	1.4
Mali 2001	8.1	28.5	36.6	2.0	1.5
Niger 1998	8.2	16.6	24.8	1.0	0.8
Nigeria 2003	12.6	16.9	29.5	1.4	1.0
Rwanda 2000*	7.4	17.7	25.1	1.5	1.0
Senegal 1997	12.9	34.8	47.7	1.9	1.5
Tanzania 1999	25.4	21.8	47.2	1.4	1.0
Uganda 2000/01	22.8	34.6	57.4	2.3	1.7
Zambia 2001/02	34.2	27.4	61.6	2.0	1.4

Source: MEASURE DHS STAT Compiler, most recent DHS survey.
* Represents all women, not only married women.

An important point that was not addressed in the model is that as unmet need is met and contraception methods are accepted, demand for contraception often increases. Assumptions on induced demand were not made. The model only eliminates the demand that *currently* exists by 2020 and not additional future demand. Thus, this is a conservative estimate of demand for family planning.

[1] This means that the base year for the demographic projections varies from country to country. However, comparisons of MDGs are made over the same timeframe (see Section III).

An increase in contraceptive use is not the only effective method for reducing fertility. Four main factors, called proximate determinants of fertility, have a direct affect on fertility. The four proximate determinants are marriage (age at marriage and proportion of women married); contraception (proportion using contraception and effectiveness of method); abortion (proportion of pregnancies that are terminated); and infecundity (lactational amennorhoea and sterility) (Cross, Hardee, and Ross, 2002). Female education and postponing childbearing to a later age have also been strongly linked to decreases in fertility (Cross, Hardee, and Ross, 2002). Thus, increasing CPR is only one of a number of effective methods for reducing fertility rates.

Other assumptions that were made for the population estimates include the country's method mix, effectiveness of contraception methods, and induced abortion rate. The method mix for each country was taken from the most recent DHS and held constant through 2020. This implies that this analysis does not look at the effect of increasing use of modern contraceptive methods, but rather estimates the effect of increased use of any method of contraception. Contraceptive preferences vary widely across countries, and often countries have one preferred method. By keeping the method mix constant, the model does not assume there will be a behavior change among those who use traditional methods to accept modern methods. The model only increases the number of acceptors of family planning.

Effectiveness estimates of contraceptive methods are based on those in the Spectrum/FAMPLAN model.[2] The induced abortion rate for each country was extrapolated from a 1999 report by Stanley Henshaw that estimated the incidence of abortions worldwide at the regional and sub-regional level. The 1995 abortion rate for the African sub-regions was used to estimate the number of abortions in the base year for each country. For each country, the appropriate sub-regional abortion rate (abortions per 1,000 women ages 15–49 was multiplied by the number of women ages 15–49 in the base year (Table II.2). The proportion of abortions to unintended pregnancies was held constant through 2020.

Table II.2: Abortion rate used for countries included in analysis

Country/Region	Abortion Rate	Countries Applied To
Africa	33	N/A
Eastern Africa	41	Ethiopia, Kenya, Madagascar, Rwanda, Tanzania, Uganda, Zambia
Middle Africa	35	Cameroon, Chad
Northern Africa	17	N/A
Southern Africa	19	N/A
Western Africa	37	Burkina Faso, Ghana, Guinea, Mali, Niger, Senegal
Nigeria	25.4	Nigeria

Sources: Henshaw et al., 1999; Henshaw et al., 1998.

Demographic Scenarios

The effect of increasing FP use will depend on a country's level of unmet need for family planning, its current population, age structure, fertility rate, and level of infrastructure. In addition, meeting unmet need will affect each MDG differently. For example, in the short term, the largest effect will be on development goals targeting infants or young children.

The most immediate effect of increasing the number of women using family planning comes through changes in fertility. As seen earlier, the projected number of pregnancies is increasing throughout Africa. Meeting the current unmet need for family planning can reduce the number of unintended pregnancies,

[2] For more information, please refer to the FAMPLAN Manual, Estimates of Contraceptive Methods, page 30.

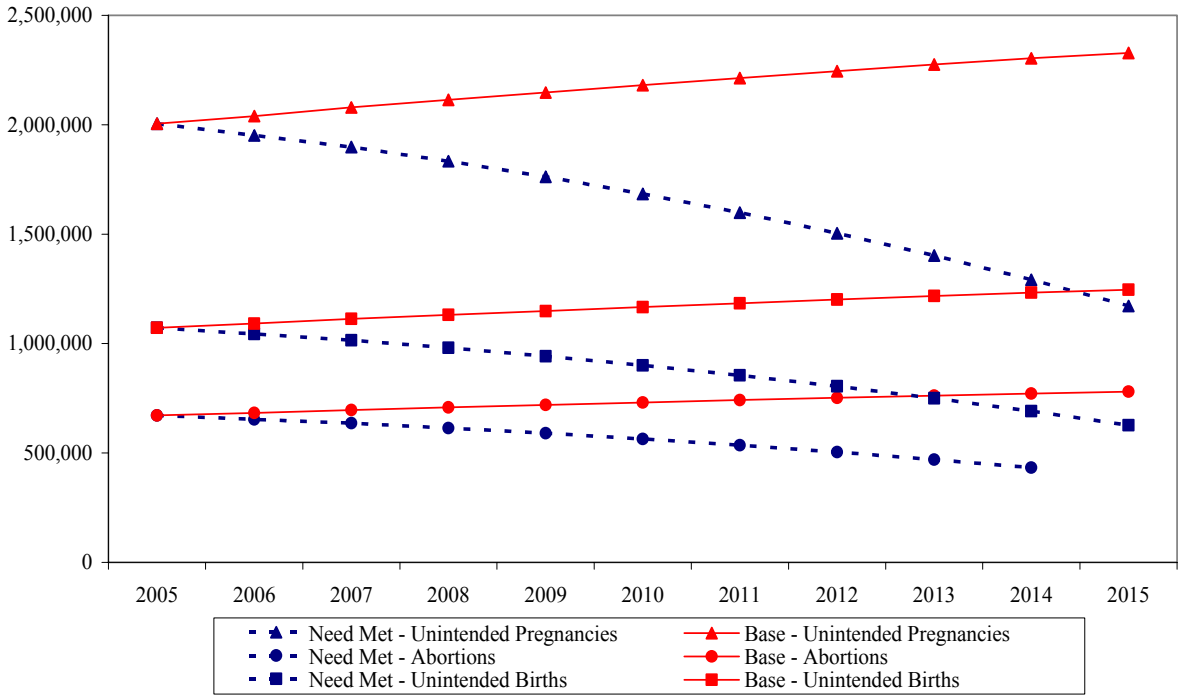
leading to a decrease in the number of abortions and unintended births. Table II.3 shows that the cumulative number of unintended pregnancies, abortions, and unintended births over the next 10 years can be significantly reduced under the Need Met scenario. For example, current projections for Ethiopia estimate an additional 56 million pregnancies over the next 10 years—of which nearly 24 million would be unintended. By meeting unmet need, there would be nearly 6 million fewer unintended pregnancies in Ethiopia alone. This is important because reducing unintended pregnancies would lead to 1.9 million fewer abortions and 3 million fewer unintended births (see Figure II.1.)

Table II.3: Cumulative number of unintended pregnancies, abortions, and unintended births under two population scenarios, 2005–2015

Country	Unintended Pregnancies		Abortions		Unintended Births	
	Base	Need Met	Base	Need Met	Base	Need Met
Burkina Faso	5,071,963	4,428,083	1,572,309	1,372,706	2,840,300	2,479,727
Cameroon	N/A	N/A	N/A	N/A	N/A	N/A
Chad	1,707,105	1,448,032	998,656	847,099	486,525	412,689
Ethiopia	23,932,298	18,101,937	8,017,320	6,064,150	12,803,779	9,684,535
Ghana	8,249,669	6,860,189	2,557,397	2,126,658	4,619,815	3,841,706
Guinea	2,525,616	1,993,870	1,010,246	797,548	1,187,040	937,119
Kenya	14,910,507	11,028,465	4,771,362	3,529,109	8,200,779	6,065,656
Madagascar	6,634,872	5,517,624	2,322,205	1,931,168	3,450,134	2,869,165
Mali	4,576,003	3,433,322	1,487,201	1,115,830	2,493,922	1,871,160
Niger	3,663,591	1,990,812	1,428,800	776,417	1,758,523	955,590
Nigeria	29,235,743	25,785,548	10,232,510	9,024,942	15,202,587	13,408,485
Rwanda	1,571,289	1,461,129	549,950	511,396	817,071	759,786
Senegal	4,322,558	3,012,444	1,339,993	933,858	2,420,632	1,686,968
Tanzania	14,112,055	11,233,559	5,221,460	4,156,417	7,056,027	5,616,779
Uganda	14,398,127	9,782,585	3,671,522	2,494,559	8,854,848	6,016,290
Zambia	5,679,320	4,306,968	1,647,003	1,249,021	3,294,006	2,498,042

*Data are not available for Cameroon.

Figure II.1: Annual unintended pregnancies, abortions, and unintended births under two population scenarios, Ethiopia 2005 - 2015



Meeting unmet need for family planning can also reduce the growth of a country's population. The greatest effects will be seen in the population size of younger cohorts (i.e., children under age 1, children under age 5), since reducing fertility by increasing FP use will affect these cohorts first. Changes in total population will be minimal since projections are only through 2015. If these scenarios were to be projected out to 20 or 50 years, the effects of increased contraceptive use would be much larger. The effect of an increase in FP use will vary based on a country's current population size and on the current unmet need. For example, there will be a larger percentage effect in countries with a higher unmet need, and a larger numerical effect in countries with a large population and higher fertility rate. Table II.4 shows that the largest percentage effect on population size of meeting unmet need would be in Uganda (a 10% decrease in population size), but the largest numeric effect would be in Nigeria (4.4 million fewer people).

Table II. 4: Total population projections under two population scenarios, 2005–2015

Country	Scenario	2005	2010	2015	Difference 2005–2015
Burkina Faso	Need Met	14,069,200	16,858,100	19,934,100	-1,012,300
	Base	14,099,400	17,176,900	20,946,400	-5.1%
Cameroon	Need Met	17,006,100	18,908,000	20,958,000	-506,100
	Base	17,012,300	19,057,500	21,464,100	-2.4%
Chad	Need Met	9,944,610	11,477,400	13,295,900	-250,000
	Base	9,991,880	11,600,300	13,545,900	-1.9%
Ethiopia	Need Met	80,251,544	91,394,856	102,967,952	-3,401,008
	Base	80,251,544	92,241,336	106,368,960	-3.3%
Ghana	Need Met	22,697,148	25,321,550	27,897,582	-1,487,308
	Base	22,748,368	25,825,456	29,384,890	-5.3%
Guinea	Need Met	9,483,220	10,649,500	12,215,400	-603,000
	Base	9,559,270	10,912,200	12,818,400	-4.9%
Kenya	Need Met	36,935,700	42,233,800	47,466,200	-2,819,600
	Base	37,028,300	43,178,800	50,285,800	-5.9%
Madagascar	Need Met	18,756,300	21,419,100	24,281,800	-1,063,300
	Base	18,789,400	21,762,500	25,345,100	-4.4%
Mali	Need Met	13,663,300	15,745,600	18,103,700	-1,058,700
	Base	13,745,000	16,150,200	19,162,400	-5.8%
Niger	Need Met	13,918,500	16,389,200	19,301,400	-888,000
	Base	14,048,000	16,789,600	20,189,400	-4.6%
Nigeria	Need Met	136,684,992	155,342,000	176,359,008	-4,408,992
	Base	136,830,000	156,792,992	180,768,000	-2.5%
Rwanda	Need Met	8,796,889	10,003,926	11,336,514	-306,466
	Base	8,827,566	10,130,825	11,642,980	-2.7%
Senegal	Need Met	11,764,537	13,273,042	14,846,571	-1,424,234
	Base	12,011,892	13,962,620	16,270,805	-9.6%
Tanzania	Need Met	41,117,000	46,538,700	52,681,800	-2,749,100
	Base	41,469,000	47,750,700	55,430,900	-5.2%
Uganda	Need Met	31,149,500	36,302,400	41,959,100	-4,241,100
	Base	31,556,700	37,992,100	46,200,200	-10.1%
Zambia	Need Met	13,390,300	15,137,900	16,990,100	-1,243,500
	Base	13,487,800	15,619,600	18,233,600	-7.3%

Source: Authors' calculations.

Cost Assumptions

Two methods can be used to estimate the cost of FP programs: cost per FP user or cost per couple-years-protection. Cost per FP user is the (public sector) cost of providing FP services divided by the number of

FP users. This method includes both the commodity cost and program costs to maintain the program but excludes investment costs for scaling up resources. Average costs are based on a combination of contraceptive methods and service deliveries. Numerous studies have been conducted on the average cost by FP method (e.g., intrauterine device [IUD], sterilization) and by service delivery mode (e.g., clinic, community-based). Country estimates for average cost per user are summarized in Table II.5.

Table II.5: Expenditures per family planning user for sub-Saharan Africa

Country	Cost per User (US $)
Benin	$17.91
Botswana	$39.50
Burkina Faso	$26.07
Burundi	$18.64
Cameroon	$12.40
Central African Republic	$17.97
Chad	$5.71
Congo	$13.55
Cote d'Ivoire	$56.10
Ethiopia	$14.17
Gabon	$1.39
Ghana	$23.73
Guinea	$45.39
Guinea-Bissau	$16.78
Kenya	$17.92
Lesotho	$92.02
Liberia	$33.77
Madagascar	$8.02
Malawi	$19.63
Mali	$69.07
Mauritania	$99.64
Mauritius	$12.67
Mozambique	$8.80
Niger	$96.60
Nigeria	$15.15
Rwanda	$45.34
Senegal	$61.52
Sierra Leone	$6.87
South Africa	$17.92
Sudan	$7.63
Tanzania	$17.00
Togo	$30.11
Uganda	$42.11
Zaire	$9.16
Zambia	$13.18
Zimbabwe	$14.71

Source: Conly et al., 1995.

Table II.6 provides regional cost estimates of family planning for sub-Saharan Africa. These costs are from a report that estimated regional averages of cost per FP user, assuming economies of scale as the number of FP users increased. The report estimated an average per user cost for sub-Saharan Africa to be from $27.07 in 2000 to $17.13 by 2015 (US$/1998). Including an estimate of 3 percent inflation per year, cost per user was estimated to remain almost constant at around US$27.00 (Dunbar et al., 1999).

Table II.6: Regional estimates of average cost per FP user for sub-Saharan Africa

	2000	2005	2010	2015
Cost per user (US$/1998)	$27.07	$22.75	$18.35	$17.13
Cost per user (US$/1998) with 3% annual inflation	$28.72	$27.98	$26.16	$28.31

Source: Dunbar et al., 1999, Tables 5 and 6.

Cost per couple-years protection (CYP) is the second method used to estimate the cost of FP services. CYP is the number of couples protected from pregnancy during one year, as determined by the use of contraceptives during the year. For each contraceptive method, CYP coefficients are applied to convert contraceptive units to CYPs. For example, 13 units of oral contraception is the standard for providing one couple a full year of protection from pregnancy. In this case, if 13,000 oral contraceptive units are used, we would say that 1000 CYPs had been achieved. Cost per CYP includes both commodity costs and service-delivery costs and is a more comprehensive measurement of cost than cost per FP user because it takes into account use of different contraceptive methods and the amount of contraception necessary to effectively protect from pregnancy. A study of 14 developing countries, including five African countries, found the weighted regional average cost per CYP for Africa to be $11.20 (see Table II.7) (Barberis and Harvey, 1997).

Table II.7: Regional and within country comparison of costs per CYP in sub-Saharan Africa

Country	Mode of Service Delivery	Urban/ Rural	Cost per CYP (US$)
Ghana	Social marketing		$7.86
	Clinic-based services		$11.58
Kenya	Clinic-based services	Urban	$4.27
	Community-based distribution	Rural	$24.34
Nigeria	Clinic-based services and community-based distribution	Both	$6.17
	Social marketing		$14.51
Zaire	Social marketing	Both	$13.53
Zimbabwe	Community-based distribution		$14.96
	Social marketing		$15.89
	Clinic-based services		$19.57
Weighted average			$11.20

Source: Adapted from Barberis and Harvey, 1997, Table 6.

Depending on which costing method is used, estimated annual costs and cumulative costs from 2005–2015 vary. For comparison purposes, $11.20 per CYP was used for all countries in this study. Cost estimates for family planning were similar under both methods for Chad, Madagascar, and Zambia, but varied considerably for other countries (see Appendix 3).

Cost of Family Planning Scenarios

The total cost of family planning was calculated under both scenarios, and the cost of maintaining family planning at current levels was compared with the cost of meeting all unmet need that existed in 2000 by 2020. Table II.8 shows the incremental or additional cost of meeting all unmet need for each country.

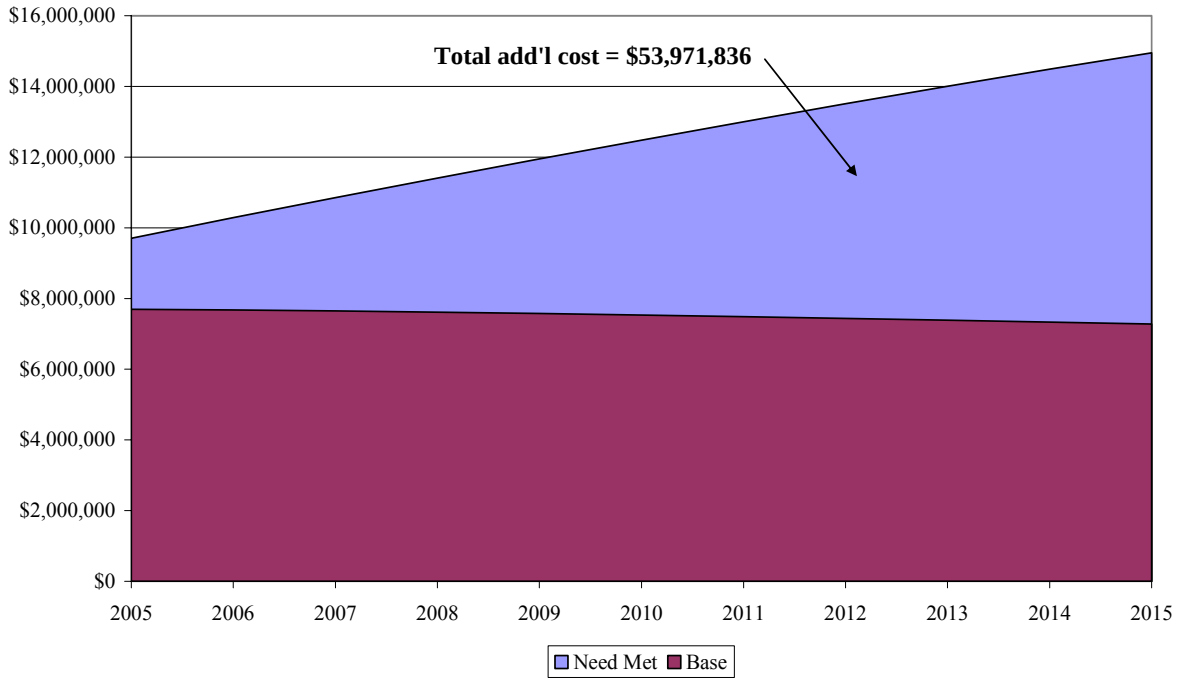
Table II.8: Cumulative incremental cost of meeting all unmet need for family planning by 2005–2015*

Country	Cumulative Incremental Cost (US$ million)
Burkina Faso	$27.5
Cameroon	$14.7
Chad	$4.7
Ethiopia	$102.8
Ghana	$54.0
Guinea	$20.8
Kenya	$71.4
Madagascar	$25.5
Mali	$35.8
Niger	$28.6
Nigeria	$139.5
Rwanda	$6.1
Senegal	$42.7
Tanzania	$71.6
Uganda	$97.4
Zambia	$27.2

*Costs based on the regional average of $11.20 per CYP for comparison purposes.
All costs discounted at 3 percent.

Total cost under both scenarios and incremental cost are described in more detail for Ghana. Because the cost streams that are incurred in the FP program—as well as the MDG programs modeled in subsequent sections—occur over a 15-year period but at different times, we followed standard practice and applied a discount rate. To be conservative, all costs are discounted at 3 percent. For example, Figure II.2 shows that for Ghana the discounted annual FP costs for the base scenario will remain between $7.7 million and $7.3 million versus an increase from $9.7 to $15 million under the Need Met scenario. This means it would cost at total of $136 million over the next 10 years (2005–2015) to meet unmet need, and $82 million to maintain the current contraceptive level. After discounting costs at 3 percent, it would cost an additional $54 million to meet unmet need.

Figure II.2: Annual cost for two family planning scenarios
Ghana (2005 - 2015)



Later, we use the incremental cost of meeting unmet need for each country in a benefit-cost comparison of the savings family planning generates for meeting the MDGs relative to the additional cost of family planning. When the incremental cost is compared with the savings from family planning, a benefit-cost ratio can be analyzed for each country by each selected sector. We present these comparisons in detail in the paper's final section.

III. MDG Scenarios

Background

The United Nations Secretary General's Millennium Development Report published in 2000 served as the framework for drafting the Millennium Declaration (adopted at the Millennium Summit at the United Nation's headquarters in New York in 2000). This document represents countries' resolve to address development issues and poverty eradication by 2015 and to meet the special needs of Africa (United Nations, 2000). This process led to the adoption of the MDGs a year later, which serve as a roadmap for implementing the Millennium Declaration.

The MDGs are a set of quantitative, time-bound goals. There are 8 goals, 18 targets, and 48 indicators. The eight MDGs include reducing poverty, child mortality, HIV/AIDS, malaria, and tuberculosis; improving education, gender equality, maternal health, and the environment; and working toward a global partnership. In keeping with the 20-year framework of the International Conference on Population and Development (ICPD), the MDGs are to be achieved by 2015. Progress is measured at the global, regional, country, and local levels.

International goals similar to the MDGs are not new. Since the United Nations (UN) was created in 1945, it has participated in and promoted global goals—defined as a quantitative, time-bound objectives set by the UN that are applied to a sizeable number of countries. Many of these goals have not been achieved, largely because although they are easy and politically favorable to adopt, they are often impractical and not internalized by the countries that adopt them. The success of the smallpox eradication campaign in 1977, 11 years after the goal was set, is sometimes quoted as the exception to the rule. Richard Jolly recently conducted a review of global goals, and he found that no global goal has been achieved by the target date in *all* countries (Jolly, 2003). However, *some* countries have achieved or even surpassed several goals. According to Jolly, prominent goals that have been successful include:

- Small pox and polio eradication—small pox eradication was achieved in 1977 (11 years after the goal was adopted), and polio eradication is expected to be achieved by 2006 (six years after the target date)
- Child immunization—the goal of 80 percent coverage in each of the six antigens was achieved in 64 developing and 26 transition countries during the 1980s
- Reduction of child deaths from diarrhea by half and diarrhea incidence by one quarter—achieved during the 1990s
- Reducing infant mortality to below 120 by 2000—achieved in all but 12 developing countries
- Eradication of guinea worm—88 percent decline in cases worldwide

Overall, there are many criticisms of the goal-setting process when it is led by the international community and not by local governments. The process is criticized for the lack of ownership nations have in the resulting goals and the top-down approach used in the goal-setting process. Controversy exists over whether current strategies used to increase national ownership of global goals are effective.

Although the MDGs may be seen as another set of multilateral goals promoted by the UN for adoption by developing countries, there are some important differences between the MDGs and the former initiatives. First, they focus on human development and poverty reduction rather than economic growth, which was a major objective during the first three UN Development Decades (UNDP, 2003). Second, the MDGs are not just idealistic goals; they provide time limits and quantifiable outcomes that can be objectively measured and monitored. A third difference that sets the MDGs apart from previous multilateral

initiatives is that, unlike other UN-supported goals that have been inconsistent with one another, the MDGs are linked to the goals set forth by other international conferences.

Many reports, studies, and cost estimates have shown that the MDGs are technically feasible and financially affordable (Vandemoortele, 2002; Delamonica et al., 2004). However, meeting the MDGs poses a major challenge to many countries, and it has become clear that many countries, particularly in sub-Saharan Africa and South Asia, cannot afford to achieve the MDGs without financial assistance from external sources (Vandemoortele, 2002). As we argue in this report, meeting unmet need for family planning is one way of reducing the cost of reaching the MDGs.

MDG Assumptions

The MDG indicators are meant to monitor progress toward reaching the overall target for each MDG. As with any logical results framework, the indicators are linked conceptually to the goals (which have their own measurable targets). Improvements in indicators are seen as progress toward reaching the MDGs. Reaching a target for an indicator, when there are multiple indicators for an MDG, does not mean that the MDG would be obtained. If a country, for example, were to achieve 100 percent vaccination coverage for measles (one of the child survival indicators), it is taken to be a *necessary, but not sufficient*, condition to meet the child survival MDG of reducing the child mortality rate by two-thirds.

This report includes analysis for seven of the 48 MDG indicators. These include:

- Net enrollment ratio in primary education
- Proportion of children age 1 immunized against measles
- Maternal mortality ratio
- Infant mortality rate
- Under-five mortality rate
- Proportion of population with access to an improved water source/sanitation
- Proportion of children under age five sleeping under an insecticide-treated net

Not all indicators for a goal were modeled and, as noted, not all the goals were modeled either.[3] For example, only one of the three indicators for reducing child mortality was modeled—proportion of children under age one immunized against measles. Thus, each MDG scenario should be interpreted as a portion of the total cost (and total savings) of actually achieving the goal. In this regard, the benefits that will be presented later are under-estimates.

Data are based on the concerted efforts made by countries themselves and international organizations such as the UN and the World Bank (WB) to monitor progress toward the development goals. The UN Statistics Division's Millennium Indicators database provided the majority of the baseline MDG data for each country and was supplemented when necessary. See Appendix 1 for all baseline MDG data.

In preparing the MDG projections, we assumed that the MDG was met by 2015 under both population scenarios. For simplicity, it was assumed that a country's progress toward the goal changed linearly from

[3] It is reasonable to assume that some of the omitted goals and indicators would evolve similar to those that were modeled—for example, Goal 3, "Promote gender equality and empower women," and particularly Indicators 9 and 11 under that goal, "Ratios of girls to boys in primary, secondary and tertiary education" and "Share of women in wage employment in the non-agricultural sector." Even though analyses of these indicators were not done, it is reasonable to assume that increased FP use would affect these two gender indicators.

the baseline in 2000 to meet the goal in 2015. Unit cost data for each of the MDG indicators come from a variety of sources. Table III.1 summarizes the unit costs used in this study to estimate the cost of meeting each selected MDG target and indicator. Unit cost data are difficult to estimate and require extensive research. For these estimates, every attempt was made to use country-specific data. When country-specific data were not available, a standard unit cost for all countries was used, based on regional and international averages.

Table III.1: Unit cost data for family planning and each of the MDG indicators

Parameter	Standard/Country-specific	Unit Cost (US$)*	Source
Family Planning			
Cost per couple-years protection	Standard	$11.2	Barberis and Harvey, 1997**
Education			
Cost per Student	Country-specific	$28.4–$112.3	Bruns, Mingat, and Rakotomalala, 2003
Measles Immunization			
Cost per fully immunized child	Standard	$17.0	JSI PEV Model
Burkina Faso	Country-specific	$24.0	ARIVAS, Romaric and Abdoulaye, 1998
Cameroon	Country-specific	$12.7	Waters et al., 2004
Ghana	Country-specific	$16.8	Abt Associates-PHR, Levin and England, 2000
Mali	Country-specific	$24.0	ARIVAS, Diakite and Guitteye, 1998
Senegal	Country-specific	$6.7	ARIVAS, Souleymane, 1998
Safe Motherhood			
Cost per Birth	Country-specific	$28.1–$37.3	Extrapolated from Tinker and Koblinsky, 1993
Safe Water & Sanitation			
Cost per Beneficiary	Standard	$4.6	WHO, 2004
Malaria			
Cost per Treated-Net-Year	Standard	$4.4	Stevens et al., 2005***

*All costs are in US$ and are not inflated.
**Weighted regional average for sub-Saharan Africa.
*** Five-year average. Cost per treated-net-year decreased each year due to economies of scale: Year 1 (1999): $7.68; Year 2: $6.12; Year 3: $5.44; Year 4: $4.25; Year 5: $3.44.

Applying the unit cost to the population estimates described in the previous section, the cumulative cost of achieving the MDG target under both population scenarios was calculated. Since DHS surveys were conducted over a variety of years, the baseline year ranged from 1996 (Chad) to the 2004 (Cameroon). To compare costs and savings across the board, data are presented in the form of cumulative costs and savings over the 10-year period from 2005–2015.

For each of the five selected MDG targets and indicators, modeling assumptions and cost assumptions are described in more detail in each of the following sections. Cumulative costs under both scenarios and savings are then presented for all countries. For illustrative purposes, cumulative costs and savings will be described in more detail for one country. Benefit-cost ratios for each country for each sector are presented in Section IX.

IV. Universal Primary Education

Net Enrollment Ratio in Primary Education

Goal 2: Achieve universal primary education			
Target 3:	Ensure that by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling	Indicator 6:	Net enrollment ratio in primary education
		Indicator 7:	Proportion of pupils starting grade 1 who reach grade 5
		Indicator 8:	Literacy rate of 15-24 year-olds

The second MDG is to achieve universal primary education. The target for this goal is to "Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling" (UNSD website). There are three indicators to measure progress toward reaching the MDG education target. Our analysis will only focus on Indicator 6, net enrollment ratio in primary education.

Current Status vs. Goal

The goal of reaching universal primary education is measured, among other indicators, by looking at the net enrollment ratio (NER).[4] Currently, a few sub-Saharan Africa countries are within reach of achieving 100 percent enrollment, but most countries still have much progress to make (see Figure IV.1).

Niger has the lowest NER, with only 31 percent of children enrolled in primary school, while Rwanda has the highest NER, with over 80 percent of children enrolled. Based on past performance, many of the countries are not on track for meeting the education MDG by 2015. An extra effort to increase enrollment will be necessary to account for population growth.

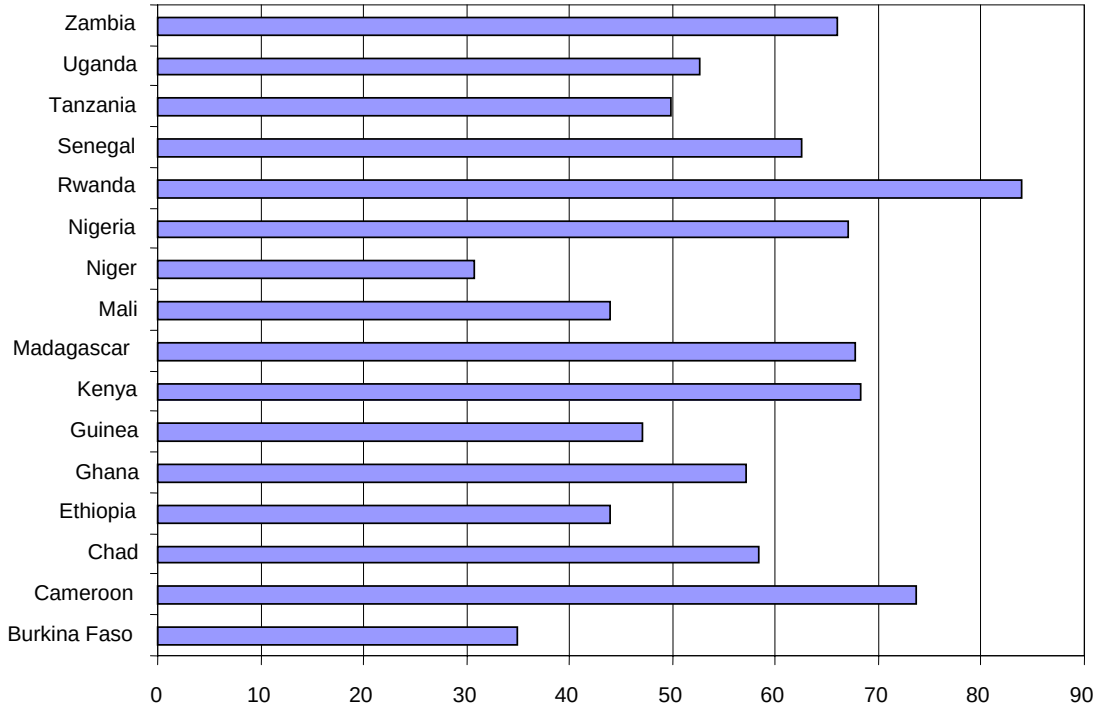
Demographic Scenarios

Baseline data for the number of students currently enrolled in primary school was calculated using NERs reported by the UN Statistics Division (UNSD) for 2000 and population estimates of children ages 6–11. The NER was used instead of the gross enrollment ratio (GER)[5] because NER is one of the indicators for the MDG of universal primary education. NER is also preferable to the GER because it has a theoretical maximum value of 100 percent, whereas GER can exceed 100 percent even when all children are not enrolled in school. Population projections for children ages 6–11 were used because this is the theoretical age of students enrolled in primary school. Although primary education may extend past age 11 in some countries, this factor was not included in the analysis. All population estimates are made using the Demproj and FAMPLAN population projection programs that are part of the SPECTRUM software package. The year 2000 is used as the baseline because the timeframe for all MDGs is from 2000–2015 and because the most comprehensive education data is available for 2000 because of the United Nations Educational, Scientific, and Cultural Organization's effort to provide comparable data for their "Education for All" initiative.

[4] The NER is the ratio of the number of students enrolled in school who are of school age divided by the school-age population times 100.

[5] The GER is defined as the ratio of all enrolled students to the school-age population times 100. Because students can be over or under the nominal school ages, this ratio can be higher than 100.

Figure IV.1 Net enrollment ratios by country, 2000

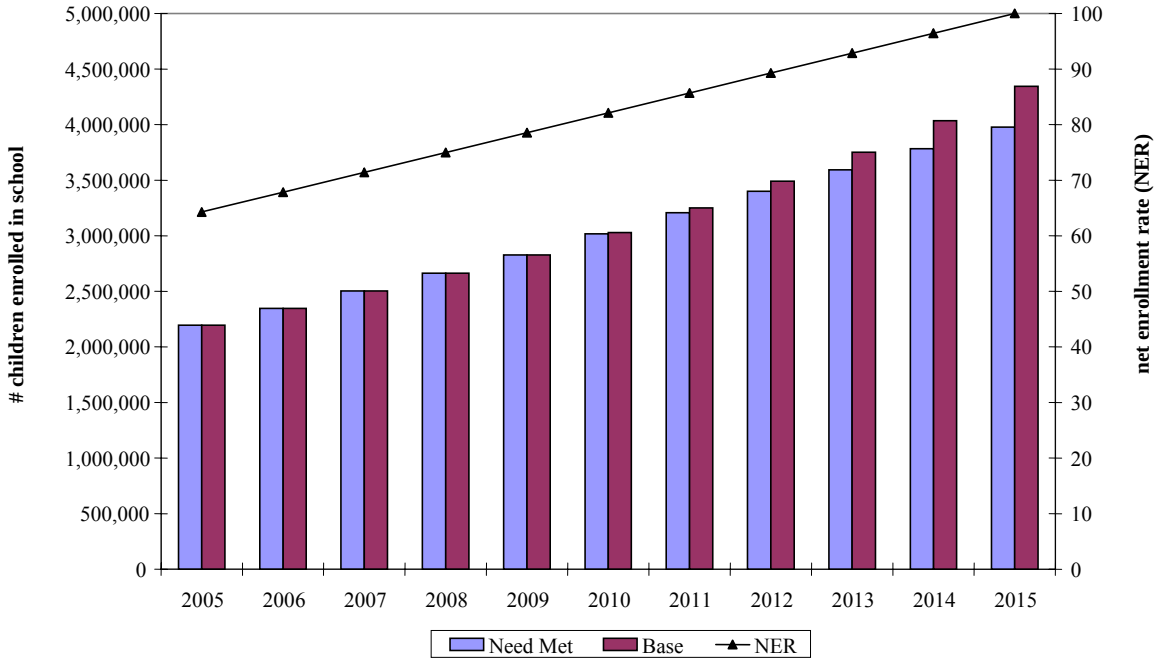


Population estimates of children of primary school age (6–11) were projected for each year under the two population scenarios. It was assumed that the NER would increase linearly from its level in year 2000 to 100 percent by 2015 to meet the MDG target. Next, the projected number of primary school-aged children in each year is multiplied by the corresponding NER for that year (under both population scenarios), which gives the total number of children to be enrolled each year in order to gradually achieve universal primary education by 2015.[6] In Ghana for example, family planning can reduce the number of primary school-age children in 2015 needing education by more than 366,799 and still meet the MDG (see Figure IV.2).

Successfully achieving the education MDG is influenced by the number of children needing education. By implementing strengthened FP programs today, the effects will be realized in 2011 since children are usually first enrolled in primary school at the age of six. As the effects of increased FP use are not immediate, the long-term benefits of family planning are more significant if the timeline is extended past 2015.

[6] Use of the NER may underestimate enrollment projections relative to using the GER because it misses some children who may be in school but are not in the defined school-age population range. Thus, the student projections presented here are conservative.

Figure IV.2: Annual number of children ages 6-11 enrolled in primary school Ghana (2005 - 2015)



Cost Assumptions

To estimate the cost of reaching the education MDG, we performed a review of relevant literature on costing the education goal. Many studies were found—each using different assumptions and goals. Table IV.1 summarizes four studies on cost estimates for achieving the education MDG. Some data include recurrent costs only (e.g., teacher salaries, teaching materials, and school maintenance), while others include recurrent and capital costs (e.g., school building costs). This is just a sample of studies found and should not be considered a comprehensive list.

Table IV.1: Studies estimating costs for achieving the education MDG

Source	Method
Cost and Financing of Primary Education Mehrotra et al., 1997	Estimated country-specific average annual costs for reaching universal primary enrollment by 2015 (US$/1992)
Goals for Development Devarajan et al., 2002	$110.60 per out-of-school child, or 13 percent of GDP per capita for reaching universal primary enrollment (2000–2015)
EFA: How much will it cost? Delamonica et al., 2004	Regional unit costs for achieving universal primary completion (2000–2015)
Achieving UPE by 2015 Bruns et al., 2003	Projected country-specific annual costs for achieving universal primary completion (2000–2015) (recurrent, capital, AIDS costs)

The 2003 WB report by Bruns and others was used as the basis for costing the education MDG. It estimates the global cost of achieving universal primary school completion by modeling recurrent and capital costs at the country level for 48 countries. It also includes separate country-specific cost estimates for overcoming the AIDS pandemic. The WB report includes the most robust research using country-specific data, accounting for improvements in education quality and efficiency gains and accounting for the effect of the HIV pandemic on education. Data was also available for all of the African countries

included in our analysis. One limitation of using data from this WB report is that it focuses on the cost of reaching universal primary completion by 2015, not universal enrollment. Thus, the estimated costs are higher than other reports that analyzed the costs of achieving universal primary enrollment by 2015.

The WB report estimates both current levels of spending (circa 2000) and projected levels of spending from 2001–2015. We considered the implications of extrapolating either of these estimates for our analysis. The former method, holding the cost per student constant at its 2000 level, has two important implications. First, it assumes that the level of spending per student in primary school in 2000 is sufficient to reach the MDG. However, the cost of enrolling out-of-school children may be higher than the recurrent cost of educating children already enrolled in school. Thus, as a country approaches 100 percent net enrollment, the marginal cost per pupil may increase. This is especially true in rural areas where access to education is beset with further travel distances to school and higher opportunity costs of education due to a family's agrarian lifestyle, which children contribute considerably to family income. Second, the method does not take into account efficiency gains and improvements in the quality of education that are also sited as MDG indicators. Improving the quality of education will be a significant burden on countries. In countries where the quality of education is low, repetition rates are high, and teacher pupil ratios are high, the average cost of educating one student will increase as school systems attempt to improve the quality of education. In countries where pupil-teacher ratios are low due to a lack of trust in the education system, efficiency gains will be seen as enrollment increases. Efficiency gains can reduce the cost of achieving universal primary education. For example, eliminating or reducing the percent of children who repeat can significantly reduce the amount of public spending on education. Under-use of teachers is another major cause of inefficiency. Many countries have low pupil-teacher ratios that can be increased without jeopardizing the quality of education.

The latter method, using projected cost estimates, factors in increasing marginal cost and decreasing average cost. We used the yearly estimates of recurrent and capital spending but excluded HIV spending. Table IV.2 shows the range of unit costs each year and the average cost over the 15-year period (Bruns et al., 2003). A more detailed table of unit cost each year for each country is available in Appendix 2.

Table IV.2 Unit costs to meet universal primary education

Country	Cost per Student (2001–2015)	
	Range	Average
Burkina Faso	$65.3–49.5	$54.5
Cameroon	$61.3–112.3	$82.3
Chad	$38.5–32.4	$34.6
Ethiopia	$32.7–28.4	$30.2
Ghana	$33.6–51.4	$42.3
Guinea	$65.2–84.4	$73.6
Kenya	$61.7–90.2	$74.9
Madagascar	$38.2–41.5	$40.1
Mali	$59.0–54.3	$54.0
Niger	$75.9–39.7	$52.4
Nigeria	$53.5–73.2	$63.1
Rwanda	$28.4–34.9	$31.6
Senegal	$78.5–95.1	$85.2
Tanzania	$32.5–48.7	$40.6
Uganda	$37.7–52.4	$44.5
Zambia	$26.9–45.6	$36.2

Cost Scenarios

The estimated number of children enrolled in school each year was multiplied by the annual cost per student to obtain the total spending on primary education necessary to reach the goal of universal enrollment. For example, the annual cost for reaching the education MDG target of 100 percent net enrollment in Ghana under the Base scenario would increase from $83 million in 2005 to $223 million in 2015 for a cumulative total of $1.7 billion over the 10-year period. Under the Need Met scenario, annual cost would increase from $83 million in 2005 to $204 million in 2015 for a total of $1.6 billion over the 10-year period (see Figure IV.3). This reflects a savings of $46.5 million. Discounted at 3 percent, cost savings for the education sector are $35.9 million (see Figure IV.4).

Figure IV.3: Annual costs to meet the education MDG
Ghana (2005 - 2015)

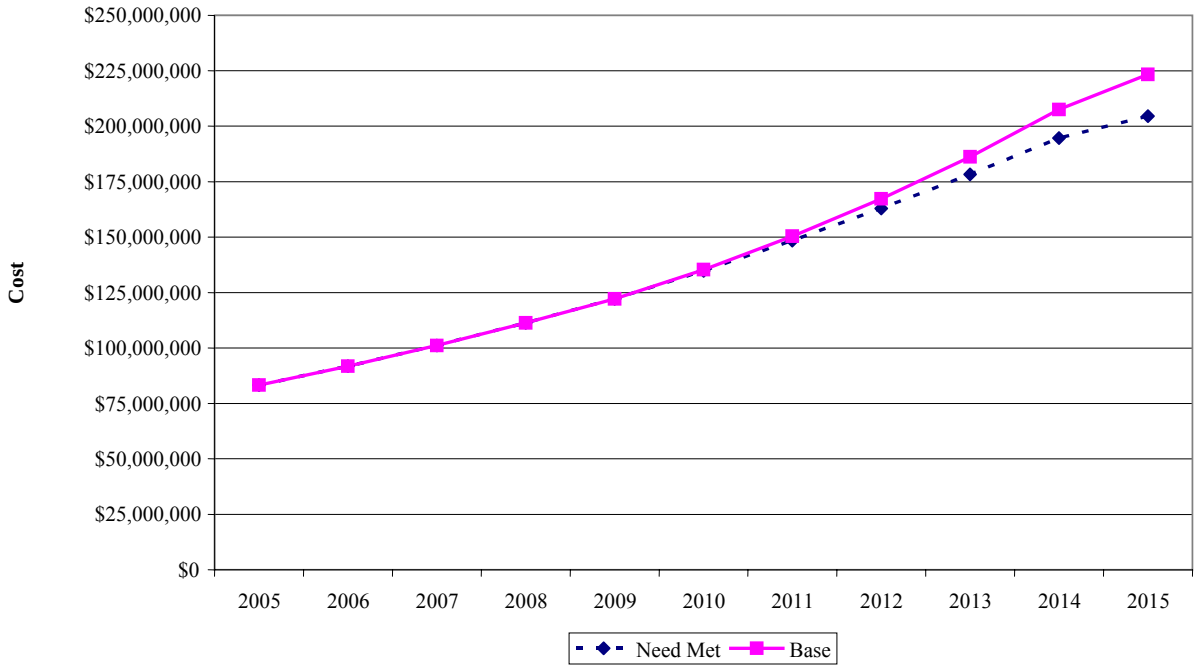
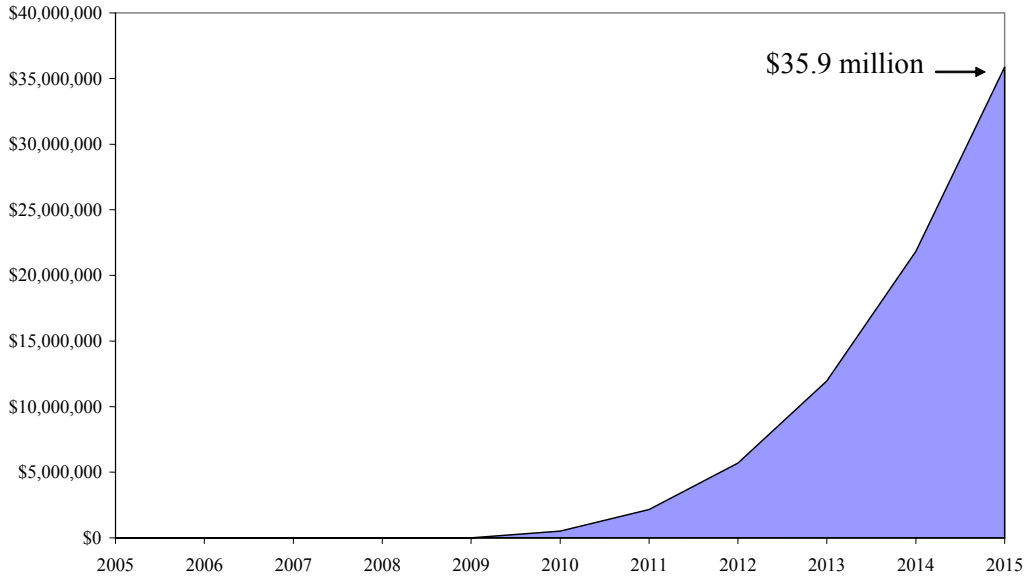


Figure IV.4: Cumulative cost savings for the education MDG
Ghana (2005 - 2015)



Cost savings in the education sector are high for most countries. Although cost savings will not be realized until 2011, or six years from when strengthened FP programs are implemented, the annual cost of educating a child is high relative to the cost of reaching the other MDGs (e.g., immunization unit costs are much lower than education unit costs). Discounted cumulative costs and cost savings over the 10-year period are shown for each country in Table IV.3.

Table IV.3: Cumulative costs and cost savings for the education MDG, 2005–2015 (US$ millions)

Country	Total Cost (Base)	Total Cost (Need Met)	Cost Savings
Burkina Faso	$1,121	$1,100	$21.6
Cameroon	$2,176	$2,146	$29.6
Chad	$576	$566	$9.9
Ethiopia	$3,507	$3,484	$23.1
Ghana	$1,329	$1,293	$35.9
Guinea	$1,083	$1,039	$44.3
Kenya	$4,524	$4,410	$114.7
Madagascar	$1,194	$1,174	$20.1
Mali	$1,157	$1,119	$37.9
Niger	$1,054	$1,019	$35.6
Nigeria	$13,830	$13,690	$140.1
Rwanda	$469	$461	$8.3
Senegal	$1,776	$1,596	$180.7
Tanzania	$2,627	$2,511	$116.5
Uganda	$2,616	$2,458	$157.8
Zambia	$855	$817	$37.5

Source: Authors' calculations. All costs discounted at 3 percent.

V. Reduce Child Mortality

Proportion of 1-year-old Children Immunized Against Measles

Goal 4: Reduce child mortality			
Target 5:	Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate	Indicator 13:	Under-five mortality rate
		Indicator 14:	Infant mortality rate
		Indicator 15:	Proportion of 1-year-old children immunized against measles

The fourth MDG is to reduce child mortality. The target for this goal is to reduce by two-thirds the under-five mortality rate. There are three indicators to measure progress toward reaching the target. This analysis will focus on MDG indicator 15, the proportion of one-year-old children immunized against measles, and briefly discuss the effect of FP use on under-five and infant mortality rates.

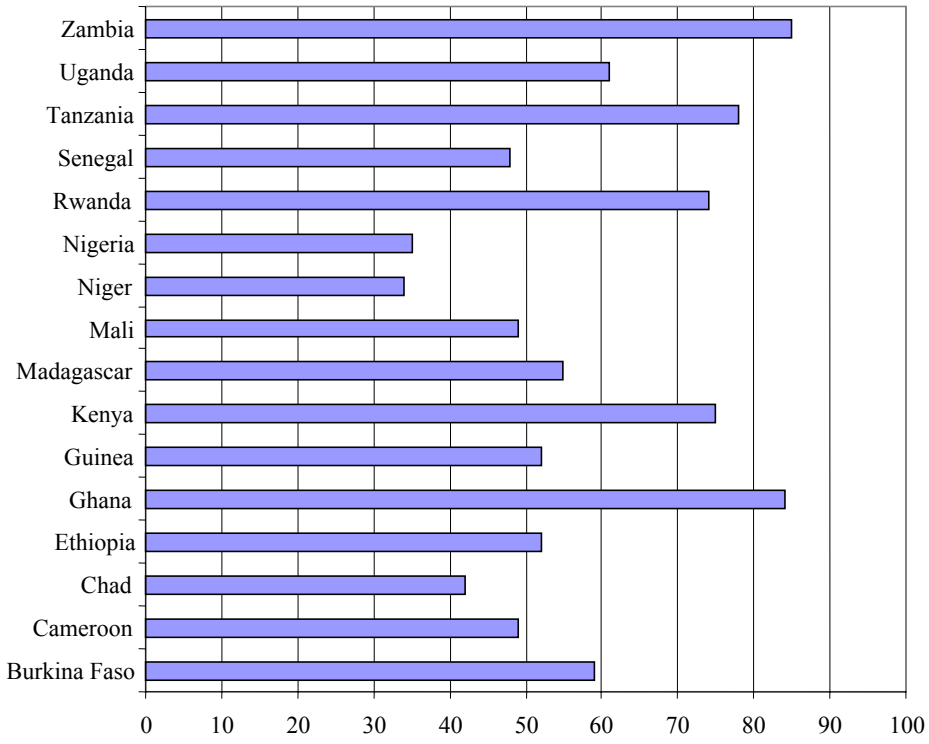
Measles remains a leading cause of death among young children, despite the availability of a safe, effective, and cost-effective vaccine for the past 40 years. More than half a million people died from measles in 2003 and almost half of all deaths occurred in Africa (48%, 252 million) (WHO Fact Sheet, 2005). Measles is one of the most contagious diseases known, and un-immunized persons, especially young children, are among those most susceptible to infection. Global immunization coverage rates for measles were estimated at 77 percent in 2003, with lower coverage rates in the Africa, Southeast Asia, and Eastern Mediterranean regions (WHO Fact Sheet, 2005).

Current Status vs. Goal

The goal of reducing child mortality is measured, among other indicators, using the measles coverage rate as a proxy of overall child health. Currently, there are no African countries that have met the goal of 100 percent coverage for children under the age of one. Success in reaching this target varies across countries. As shown in Figure V.1, coverage rates in 2000 were as low as 35 percent in Niger and Nigeria and as high as 85 percent in Ghana and Zambia.

If progress remains constant, Ghana will achieve this MDG by 2015, but Niger and Nigeria will not. Niger and Nigeria will have to increase coverage by 6.5 percentage points per year over the next 10 years to meet the immunization target. This rate is much higher than progress seen over the 1990s in both of these countries, where coverage actually fell from 54 percent in 1990 to 35 percent in 2000 in Nigeria (UNSD, Millennium Indicators Database, various dates).

Figure V.1: Measles vaccination coverage rates, 2000

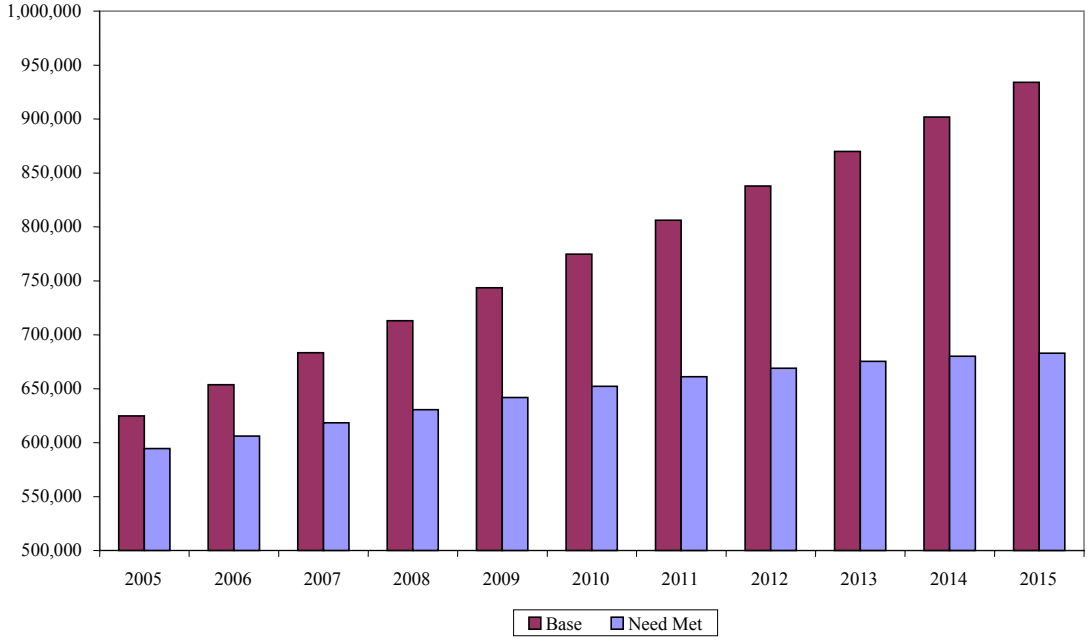


Demographic Scenarios

Baseline data for the number of children who need the measles vaccine were calculated using UNSD coverage estimates for 2000 and population estimates of children ages 0–12 months in SPECTRUM. Population estimates of children ages 0–12 months were projected for each year from 2000–2015 under the two population scenarios. It was assumed that the measles coverage rate would increase linearly from its current level to 100 percent by 2015. The projected number of children in each year was multiplied by the coverage rate for that year to find the total number of additional children that will need to be vaccinated to reach 100 percent coverage by 2015. For example in Ghana, meeting unmet need could reduce the number of children needing measles shots in 2015 by over 250,000 (682,868 vs. 933,849) (see Figure V.2). Over the 10-year period, this would be a cumulative 1,431,176 fewer measles shots (and other immunizations) that would not have to be administered.

Figure V.2: Annual number of children under age 1 needing a measles vaccination

Ghana (2005 - 2015)



A comprehensive strategy for the sustainable reduction of measles mortality was developed by WHO and the UN Children's Fund and endorsed by the World Health Assembly in 2003 (WHO website). As outlined in the WHO Immunization Policy (2002), the four strategies recommended for reducing deaths due to measles include:

- Provide one dose of measles vaccine to a high proportion of infants at nine months of age through routine immunization service. This is the foundation of the overall strategy.
- Give all children between the ages of 9 and 15 months a second opportunity for measles immunization, either through routine immunization services or through periodic mass campaigns.
- Establish and strengthen measles surveillance systems.
- Improve clinical management of measles cases.

A fully immunized child (FIC) receives vaccines for six of the most common childhood diseases through the WHO's Expanded Program on Immunization (EPI) during the first year of life. This consists of a minimum of eight shots received in the first 9–12 months: Bacille Calmette Guerin (BCG) at birth; oral polio vaccine (OPV) with diphtheria-pertussis-tetanus (DPT) at 6, 10, and 14 weeks; and the measles vaccine at 9 months (WHO Immunization Policy, 2002). Table V.1 shows the recommended immunization schedule for a routine EPI program for developing countries (WHO Immunization Policy, 2002).

Table V.1: Immunization schedule recommended by the Expanded Program on Immunization

Vaccine	Age				
	Birth	6 Weeks	10 Weeks	14 Weeks	9 Months
BCG	X				
OPV	X†	X	X	X	
DPT		X	X	X	
Hepatitis B Scheme A* Scheme B*	X	X X	 X	X X	
Haemophilus influenza type b		X	X	X	
Yellow fever					X**
Measles					X***

† In polio-endemic countries
* Scheme A is recommended in countries where perinatal transmission of hepatitis B virus is frequent (e.g., in South-East Asia). Scheme B may be used in countries where perinatal transmission is less frequent (e.g., in sub-Saharan Africa).
** In countries where yellow fever poses a risk.
*** A second opportunity to receive a dose of measles vaccine should be provided for all children. This may be done either as part of the routine schedule or during a campaign.

Cost Assumptions

To estimate the cost of achieving 100 percent coverage of measles vaccinations, this study only costs the first part of the WHO's four-part strategy: "Provide one dose of measles vaccine to a high proportion of infants at nine months of age through routine immunization service." Routine or fixed facilities' costs are the most appropriate cost estimates to use for this part of the WHO strategy. Measles campaign costs are typically much lower than routine program costs. A measles campaign in Tanzania in 2000 had an estimated total cost of US$1,754,376 and vaccinated a total of 2,411,982 children, with the majority of children (98%) being under the age of five (Lydon, 2001). The total cost per vaccinated child was $0.74 (Lydon, 2001). Vaccines delivered through outreach programs typically have much higher costs than routine services because of the extra time and money spent on advertising and travel. Thus, cost estimates for routine services are used over other delivery strategies and instead of cost estimates for measles campaigns.

Due to the variability of inputs for immunization programs, the different delivery strategies used, and the limited availability of cost data, the cost-effectiveness of immunization programs varies widely (DeRoeck, 1998). Many cost-effectiveness studies were conducted in the 1980s using costing guidelines published by the WHO in 1979 (Khaleghian, 2001). Cost studies by the WHO and the REACH project in sub-Saharan Africa during the 1980s found costs ranging from US$5.20 to US$26.60 per FIC (GAVI, 1999). Although the cost per FIC was found to vary widely across countries and across delivery strategy (e.g., routine services, fixed facilities, mobile services, mass campaigns, etc.), it became widely accepted that the average cost per FIC was approximately US$15.00 for the traditional six EPI antigens (DeRoeck, 1998; GAVI, 1999). A review of cost-effectiveness studies in the 1980s and 1990s found that the average cost per child fully immunized through routine services ranged from $2.19 to $26.59 (Khaleghian, 2001).

More recent cost studies conducted in the past 10 years by ARIVA and Abt-Associates also found costs to vary widely by country and delivery strategy, ranging from $6.77 in Senegal's fixed facilities program to $67.68 in Mali's outreach program (GAVI, 1999) (see Table V.2). There was less variability in the cost of immunizations through routine services, ranging from $16.83–24.29. In-depth case studies of immunization programs in Morocco, Bangladesh, and Côte d'Ivoire in 1997/1998 found that the cost per FIC was surprisingly similar ($20.89–24.29) despite variability in input cost (Kaddar et al., 2000).

A 2003 study on financial sustainability plans submitted by developing countries taking part in The Global Alliance for Vaccines and Immunization (GAVI) found that recurrent costs (including vaccines, personnel, transportation, etc.) made up over 85 percent of the overall costs of routine immunization programs and national immunization programs (Lydon, 2003). Case studies in Morocco, Bangladesh, and Côte d'Ivoire found recurrent costs accounted for an even higher proportion of total costs (88–92%) (Kaddar et al., 2000) However, information on total recurrent costs of immunization programs is much less available than information on vaccine costs (DeRoeck, 1998).

Table V.2: Cost per fully immunized child by country and delivery strategy

Country	Year	Strategy	Cost per FIC	DPT3 Coverage (%)	Source	Author
Bangladesh	1997	Routine services	$21.47	98	Abt Associates-PHR	Mahmud Khan and Miloud Kaddar
Burkina Faso	1998	Routine services	$23.95	40	ARIVA	Some Romaric and Traoré Adboulaye
Côte d'Ivoire	1998	Routine services	$24.29	69	Abt Associates-PHR	Miloud Kaddar
Gambia	2000	Fixed facilities and outreach	$37.00	83	ARIVA	Niamké-Eyoua Kodjo
Gambia	2000	Fixed facilities	$28.00	83	ARIVA	Niamké-Eyoua Kodjo
Gambia	2000	Outreach	$47.00	83	ARIVA	Niamké-Eyoua Kodjo
Ghana	2001	Routine services	$16.83	84	Abt Associates-PHR	Ann Levin et al.
Lao PDR	2001	Fixed facilities and outreach	$18.00	53	WHO-Abt Associates	Dan Kress et al.
Lao PDR	2001	Fixed facilities	$11.90	53	WHO-Abt Associates	Dan Kress et al.
Lao PDR	2001	Outreach	$31.00	53	WHO-Abt Associates	Dan Kress et al.
Mali	1998	Fixed facilities and outreach	$27.34	32	ARIVA	Daouda Diakite and A.M. Guitteye
Mali	1998	Fixed facilities	$24.04	32	ARIVA	Daouda Diakite and A.M. Guitteye
Mali	1998	Outreach	$67.68	32	ARIVA	Daouda Diakite and A.M. Guitteye
Mauritania	1995	Fixed facilities and outreach	$17.36	50	ARIVA	Saidou Souleymane
Mauritania	1995	Fixed facilities	$12.81	50	ARIVA	Saidou Souleymane
Mauritania	1995	Outreach	$31.02	50	ARIVA	Saidou Souleymane
Mongolia	2000	Fixed facilities and outreach	$22.00	95	ADB-WHO	Sally Stevenson and Patrick Lydon
Morocco	1997	Routine services	$20.89	95	Abt Associates-PHR	Miloud Kaddar
Senegal	1998	Fixed facilities and outreach	$12.22	59	ARIVA	Saidou Souleymane
Senegal	1998	Fixed facilities	$6.77	59	ARIVA	Saidou Souleymane
Senegal	1998	Outreach	$53.30	59	ARIVA	Saidou Souleymane

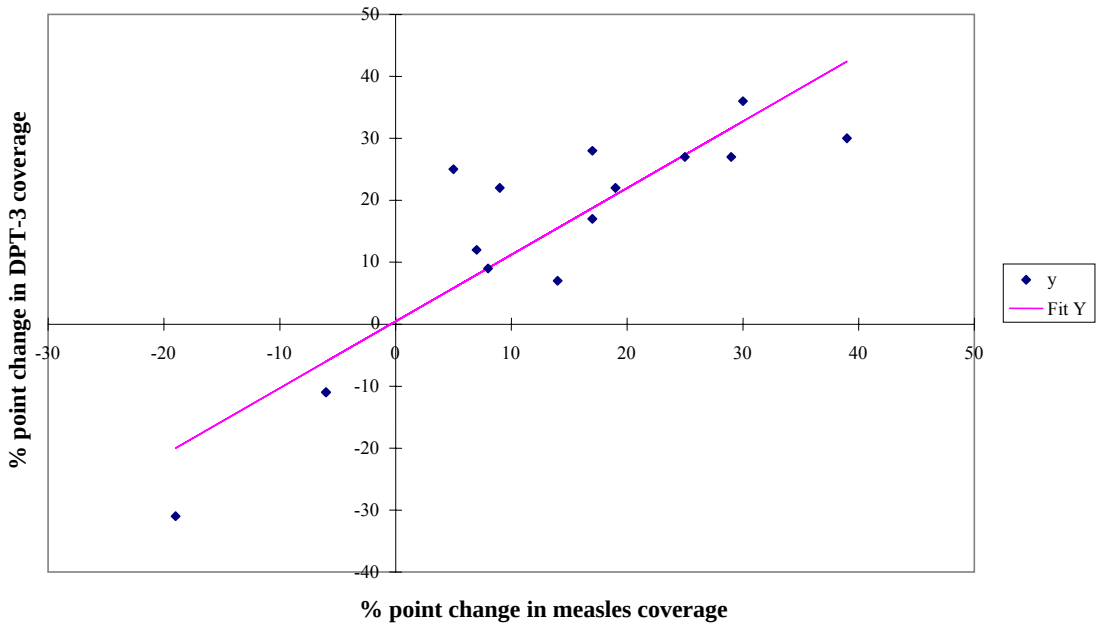
Source: GAVI Immunization Financing Database.

Using cost per FIC will yield a higher estimate than a unit cost estimate strictly for measles. However, the average cost per FIC is appropriate because routine measles vaccinations are almost always a part of a

larger immunization program, and disaggregated costs by disease are not always available or appropriate because of the integrated context in which routine vaccines are delivered. Costing studies have used both DPT-3 and measles coverage rates as an indirect measure of the percent of children fully immunized by the age of one (Khan et al., 2004; Pegurri et al., 2005). DPT-3 is often considered the best proxy of children fully immunized by the age of one because if a child receives the third dose of DPT, it implies DPT-1, DPT-2, and three shots of OPV have also been taken since DPT and OPV are administered together. This represents six of the eight vaccines necessary to be considered fully immunized. Measles is also used as a proxy of full immunization by the age of one because it is the last vaccine to be administered based on the vaccination schedule (received at nine months). Thus, if a child receives the measles vaccination, they have most likely, although not always, received the previous vaccinations. Because the MDGs use measles coverage as a proxy of overall child health, this study uses the cost per FIC as a proxy of the cost of delivering measles vaccinations.

To assess the reliability of measles coverage as an indirect measure of children fully immunized, coverage rates for measles and DPT-3 were compared across all 16 countries in this analysis. For most countries, measles coverage rates were similar to DPT-3 rates, indicating the measles coverage rate is a reasonable proxy of children fully immunized. More importantly, we show how *changes* in DPT-3 coverage and measles vaccination coverage rates compared. In Figure V.3, the percentage point change in coverage rates for DPT-3 and measles from 1990 to 2003 were graphed and a linear regression was estimated. The line of best fit takes the form $Y = .44 + 1.07\,X$. A slope of 1.07 indicates that coverage rates for measles and DPT-3 increased and decreased at approximately the same rate. In the case of Kenya, Nigeria, and Zambia, coverage rates from 1990 to 2003 fell for both measles and DPT-3.

Figure V.3: Percentage point change in DPT-3 and measles coverage (1990 - 2003)



Source: UNICEF, 2005.

An average cost per FIC of $17.00 was used as a proxy of the cost of reaching the target of universal measles coverage for children under the age of one when country-specific data were not available (JSI PEV Model). Data from costing studies were used for Burkina Faso, Cameroon, Ghana, Mali, and Senegal because data were available. The estimate for the fixed facilities program was used for Gambia

($28.00), Mali ($24.00), and Senegal ($6.70) because these costs best estimate routine costs. For Cameroon, the cost of routine vaccinations, excluding costs of immunization campaigns, was $12.73 per FIC (Waters et al., 2004).

Cost Scenarios

The estimated number of 0–12 month-old children under both population scenarios was multiplied by the unit cost. For example, in Ghana, it would cost $143 million cumulatively to immunize all children under the age of one by 2015, with over $15 million required annually to maintain this high immunization level in 2015 (see Figure V.4). Meeting unmet need for family planning would reduce this cost substantially. Under the Need Met scenario, it would cost $119 million over the next 10 years to meet the MDG indicator, a savings of $24 million or $19.8 million when discounted at 3 percent (see Figure V.5).

Figure V.4: Annual Costs to meet Immunization MDG
Ghana (2005 - 2015)

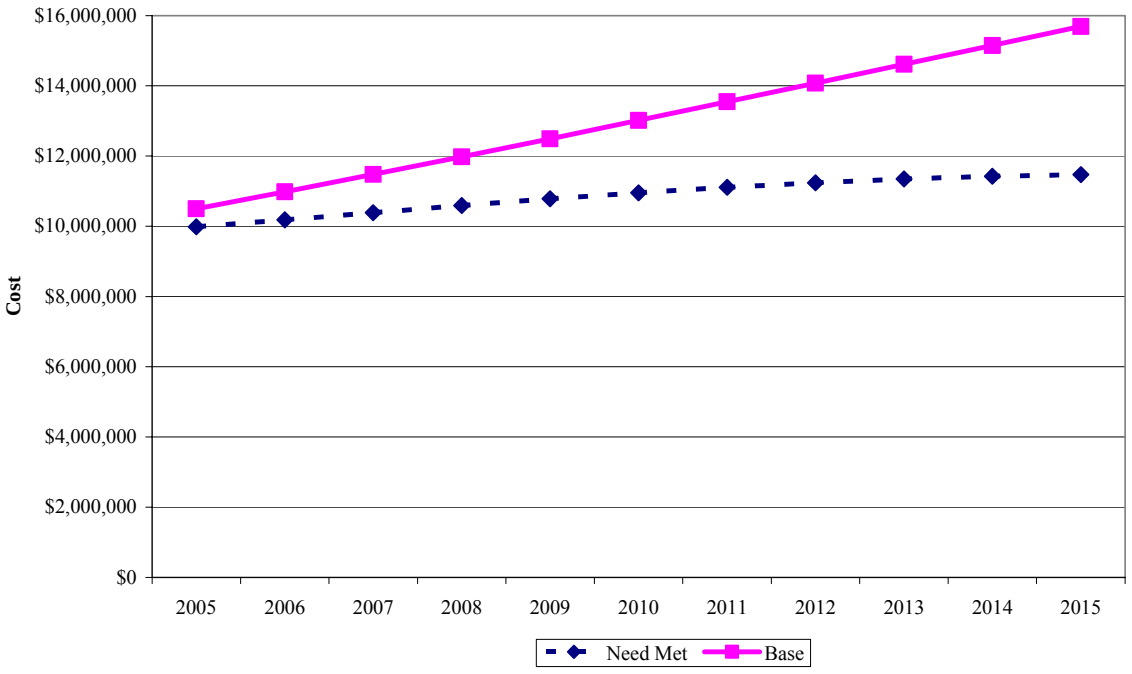
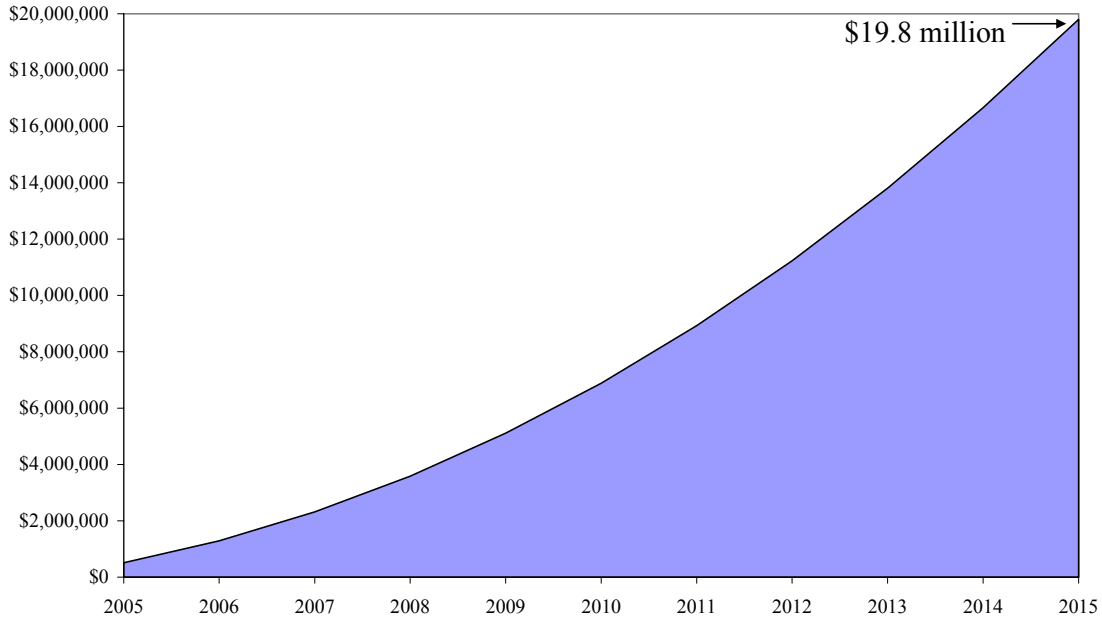


Figure V.5: Cumulative Cost Savings for Immunization Goal
Ghana (2005 - 2015)



Cost savings from immunizations are smaller than education cost savings due to a lower unit cost. However, cost savings from fewer immunizations begin to accrue the year after stronger FP programs are implemented because immunization costs affect children under the age of one. This leads to a significant cost savings over the 10-year period because there is not a lag of six years to realize the effect of lower fertility from increased FP use. Countries will see cost savings immediately. Cumulative costs and cost savings for each country are summarized in Table V.3.

Table V.3: Cumulative costs and cost savings for the meeting the immunization target, 2005–2015 (US$ millions)*

Country	Total Cost (Base)	Total Cost (Need Met)	Cost Savings
Burkina Faso	$146.5	$128.6	$17.9
Cameroon	$57.1	$52.5	$4.6
Chad	$67.1	$64.3	$2.8
Ethiopia	$460.9	$416.9	$44.0
Ghana	$122.9	$103.1	$19.8
Guinea	$57.8	$50.7	$7.1
Kenya	$228.3	$191.2	$37.1
Madagascar	$105.3	$92.1	$13.2
Mali	$132.3	$113.9	$18.4
Niger	$103.1	$92.6	$10.5
Nigeria	$706.3	$654.2	$52.1
Rwanda	$58.5	$54.5	$4.0
Senegal	$53.9	$42.3	$11.6
Tanzania	$261.5	$226.4	$35.1
Uganda	$241.6	$189.1	$52.5
Zambia	$93.0	$76.3	$16.7

*All costs discounted at 3 percent.

Infant and Under-Five Mortality

There are two paths by which changes in contraceptive use can lead to reductions in the number of under five and infant deaths. The most direct path is through the reduction in the number of births and hence in the number of infants and young children at risk of dying.

The second path is through a reduction in the proportion of births classified as "high risk." This would lead to a reduction in the infant and under-five mortality rates. The DHS defines high-risk births as those that fall into one of the following risk categories (the four "toos"):

- Mother under age 18 (too young);
- Mother over age 34 (too old);
- Birth less than 24 months after previous birth (too close); and
- Birth to a mother who has had more than three births (too many).

DHS collects data on the risk factors facing women and on infant and child mortality. The data from a cross section of 37 countries where a DHS was conducted for two or more years are presented in Figure V.6 and clearly demonstrate the relationship between births in the above risk categories and the under-five mortality rates (U5MRs). Each point shows how the percentage of births in a high-risk category is associated with a level of child mortality. As the percentage of high-risk births falls, so do under-five mortality rates. A similar picture holds for the infant mortality rate (IMR).

As depicted in Figure V.7, another relationship pertains to total fertility rates (TFRs) and the percentage of births in a high-risk category. Higher fertility is often associated with long periods of childbearing; thus, more births occur in the "too young" and "too old" categories. Moreover, births spaced too closely together often occur in high-fertility societies, with high parity and high fertility essentially the same.

Figure V.6

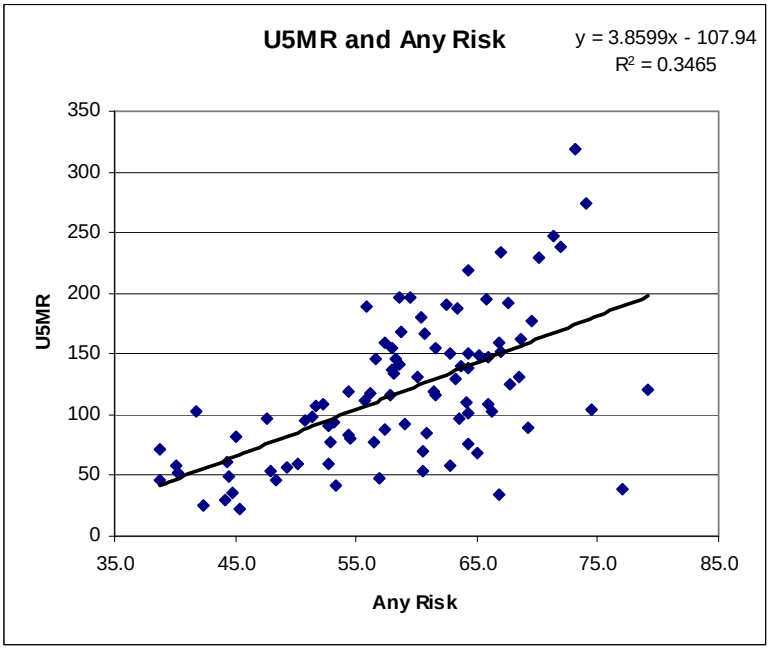
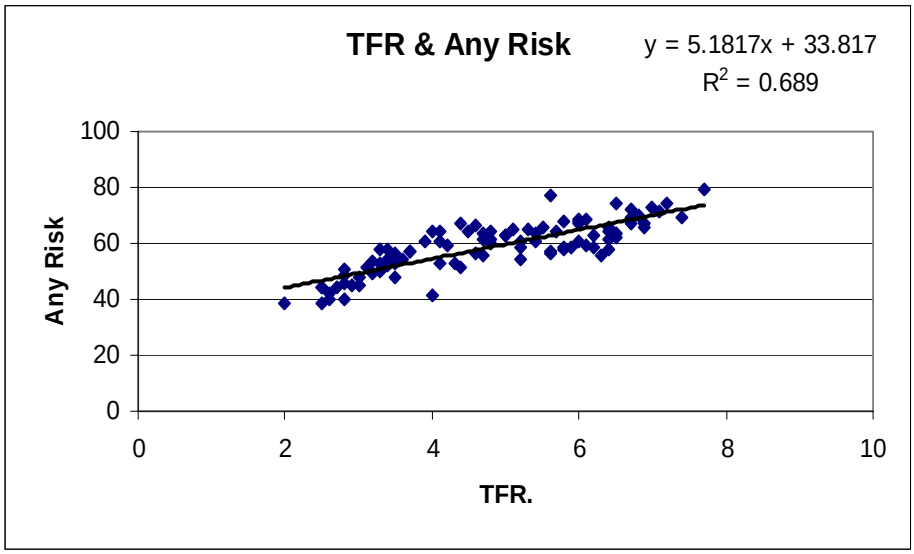


Figure V.7



Source: Various Egypt DHS.

Using data from a cross section of several DHS, we followed Ross's analysis[7] and established the slope[8] of the relationship between the changes in infant and child mortality rates and the changes in the percentage of at-risk births. We also estimated slopes for changes in TFR and changes in the percentage of at-risk births. We then used the relationships to model the effects of changes in contraceptive use (through changes in fertility) on infant and under-five mortality associated with changes in the counterfactual scenario. Thus, the pathway for the model is as follows:

CPR → TFR → Percent of births at risk → IMR
CPR → TFR → Percent of births at risk → U5MR

We were therefore able to use these relationships to estimate how a lower level of fertility can affect infant and under-five mortality rates under the Need Met scenario.

Table V.4 below shows the percentages of births in each country that are in any risk category according to the latest DHS. The second column summarizes the effect of the Need Met scenario on under-five mortality. It shows the cumulative number of under-five child deaths averted due to fewer births and fewer births in a high-risk category.

Table V.4: High-risk births and cumulative child deaths averted under the Need Met scenario

Country	Percentage of Births Any Risk	Cumulative Child Deaths Averted (2005–2015)
Burkina Faso	60	240,753
Cameroon	60	96,357
Chad	68	56,857
Ethiopia	63	1,144,767

[7] Email communication from John Ross, July 16, 2005.
[8] The slope is the change in infant or child mortality rates due to a change in the percent of high-risk births.

Ghana	53	199,952
Guinea	67	119,227
Kenya	56	434,306
Madagascar	61	185,960
Mali	70	284,576
Niger	74	280,203
Nigeria	65	1,080,156
Rwanda	59	72,751
Senegal	64	213,277
Tanzania	57	495,786
Uganda	67	796,296
Zambia	59	244,241

Source: Various DHS and authors' calculations.

VI. Improve Maternal Health

Maternal Mortality Ratio

The fifth MDG is to improve maternal health. The target for this goal is to reduce the maternal mortality ratio (MMR) by 75 percent. There are two indicators to measure progress toward reaching the target. This analysis will only focus on Indicator 16, the maternal mortality ratio.

Goal 5: Improve maternal health			
Target 6:	Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio	Indicator 16:	Maternal mortality ratio
		Indicator 17:	Proportion of births attended by skilled health personnel

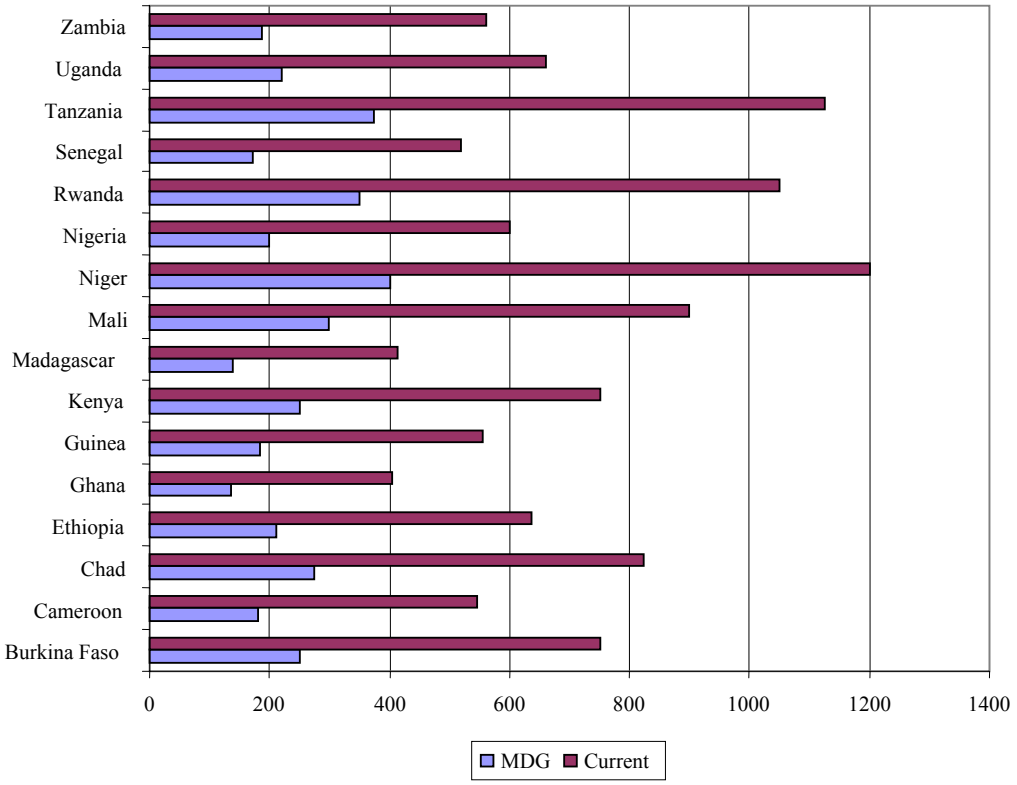
The WHO estimates that more than 500,000 women die every year in pregnancy or childbirth, and that 99 percent of all maternal deaths occur in the developing world (WHO website, no date). In addition, abortion complications account for 13 percent of all maternal deaths (WHO website, no date). This section will focus on the cost of reaching the fifth MDG and the savings that a strengthened FP program can generate to help countries meet this target. In addition, it will discuss the additional maternal deaths and abortions averted as a result of meeting unmet need for family planning. These benefits can both reduce the cost of reaching the maternal health goal and lead to additional health improvements in line with the MDG.

Current Status vs. Goal

The goal of improving maternal health is measured using the MMR, which is defined as the number of maternal deaths per 100,000 live births. Because the target for this indicator is to reduce the MMR by three-quarters, the MDG target is different for each country. Figure VI.1 shows MMR data for 2000 and the MDG target for each country.

The higher the baseline MMR, the more improvements a country has to make in their healthcare infrastructure. Niger with the highest MMR (1200) has to improve services to achieve 800 fewer deaths for every 100,000 live births in order to meet the MDG target of an MMR of 400. Based on past performance, many countries are not on track for meeting the maternal health goal by 2015. The rate of maternal mortality has actually increased in some countries since 1990.

Figure VI.1 Current MMR and MDG



Demographic Scenarios

Baseline data for MMRs are from UNSD, and the model assumes the MMR will decrease linearly from its current level to meet the MDG by 2015. Costs of improving antenatal care and hospital facilities to improve maternal health outcomes are based on the number of pregnancies or the number of pregnant women who encountered (used) the health system. SPECTRUM was used to project the total number of births for each country from 2005–2015. The number of births each year was then multiplied by the MMR for the corresponding year to estimate the number of maternal deaths that would occur during childbirth each year under both population scenarios. The number of maternal deaths averted due to increased FP use was then calculated by subtracting the number deaths under the Need Met scenario from the number of deaths under the Base scenario.

Table VI.1 shows the projected number of annual births under both scenarios for all countries. The growth rates from 2005–2015 for annual births are significantly lower under the Need Met scenario for all countries, and the birth rate actually decreased for Ghana (-1.6%) and remained constant for Kenya. Figure VI.2 graphically depicts annual births increasing in Ghana under the Base scenario to nearly 1 million births per year in 2015 and decreasing slightly under the Need Met scenario. Over the 10-year period, this would result in more than 1.5 million fewer births. Table VI.2 summarizes the cumulative number of births from 2005–2015 for all countries.

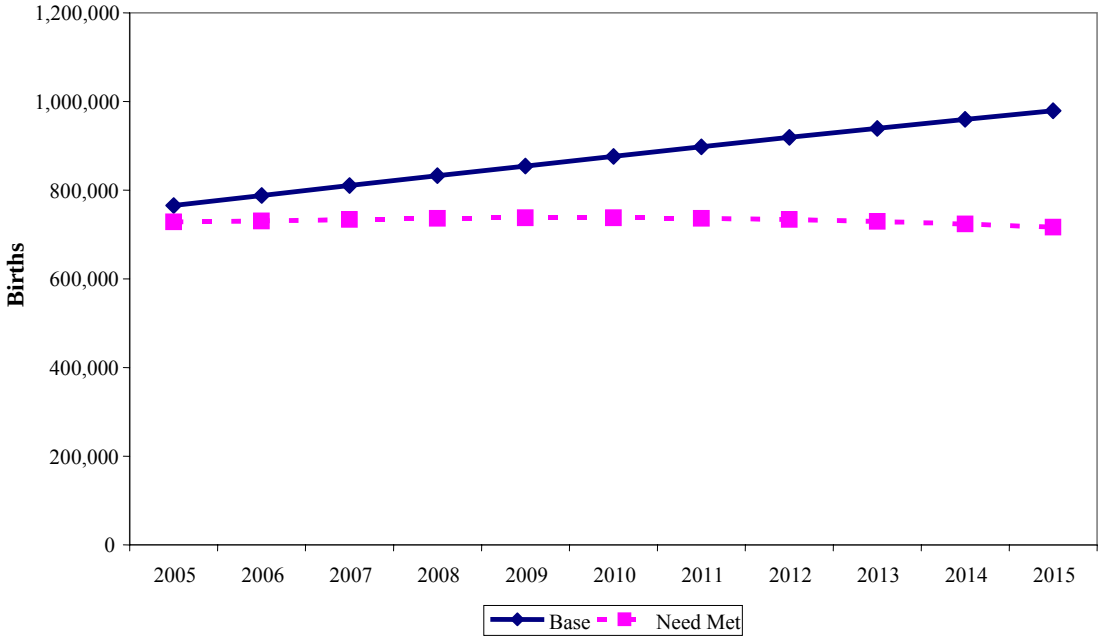
Table VI.1: Projected annual births under both population scenarios by country, 2005–2015

Country	Scenario	2005	2010	2015	% Change 2005–2015
Burkina Faso	Need Met	664,610	730,731	788,133	18.6
	Base	686,661	824,213	981,003	42.9
Cameroon	Need Met	583,013	627,880	662,675	13.7
	Base	589,905	678,514	764,315	29.6
Chad	Need Met	457,376	528,211	608,670	33.1
	Base	469,780	550,871	645,244	37.4
Ethiopia	Need Met	3,325,727	3,395,396	3,453,791	3.9
	Base	3,325,727	3,723,883	4,211,604	26.6
Ghana	Need Met	728,057	737,674	716,190	-1.6
	Base	765,072	876,154	979,202	28.0
Guinea	Need Met	380,696	411,936	453,314	19.1
	Base	406,805	466,900	546,444	34.3
Kenya	Need Met	1,398,753	1,417,990	1,398,739	0.0
	Base	1,465,823	1,687,405	1,901,013	29.7
Madagascar	Need Met	711,719	758,827	803,721	12.9
	Base	736,047	859,359	1,004,205	36.4
Mali	Need Met	651,492	707,671	761,365	16.9
	Base	691,825	814,171	957,989	38.5
Niger	Need Met	729,302	829,228	946,957	29.8
	Base	773,106	918,207	1,098,351	42.1
Nigeria	Need Met	5,663,382	6,255,277	6,831,386	20.6
	Base	5,773,969	6,702,406	7,708,651	33.5
Rwanda	Need Met	364,194	421,791	460,302	26.4
	Base	376,978	452,617	512,729	36.0
Senegal	Need Met	444,356	468,002	479,561	7.9
	Base	510,778	592,270	675,777	32.3
Tanzania	Need Met	1,555,777	1,682,983	1,800,340	15.7
	Base	1,676,986	1,939,285	2,226,790	32.8
Uganda	Need Met	1,372,247	1,462,888	1,544,931	12.6
	Base	1,530,287	1,847,389	2,249,620	47.0
Zambia	Need Met	528,046	547,098	560,410	6.1
	Base	573,072	664,738	772,073	34.7

Table VI.2: Cumulative births from 2005–2015 by country

Country	Scenario	Cumulative Births 2005–2015	Difference
Burkina Faso	Need Met	8,018,282	-1,090,343
	Base	9,108,626	
Cameroon	Need Met	6,883,356	-574,366
	Base	7,457,722	
Chad	Need Met	5,832,468	-257,132
	Base	6,089,599	
Ethiopia	Need Met	37,254,840	-3,839,990
	Base	41,094,830	
Ghana	Need Met	8,042,307	-1,578,025
	Base	9,620,332	
Guinea	Need Met	4,556,127	-625,309
	Base	5,181,436	
Kenya	Need Met	15,510,884	-3,030,613
	Base	18,541,497	
Madagascar	Need Met	8,342,721	-1,158,144
	Base	9,500,865	
Mali	Need Met	7,779,579	-1,224,947
	Base	9,004,526	
Niger	Need Met	9,162,903	-1,016,093
	Base	10,178,996	
Nigeria	Need Met	68,775,987	-5,124,378
	Base	73,900,364	
Rwanda	Need Met	4,594,016	-346,690
	Base	4,940,706	
Senegal	Need Met	5,120,461	-1,396,198
	Base	6,516,659	
Tanzania	Need Met	18,494,008	-2,896,488
	Base	21,390,496	
Uganda	Need Met	16,077,011	-4,434,856
	Base	20,511,867	
Zambia	Need Met	6,006,227	-1,341,354
	Base	7,347,581	

Figure VI.2: Annual projected births under two population scenarios
Ghana (2005 - 2015)



Cost Assumptions

After the 1994 *ICPD Programme of Action* was produced, which outlined goals for reproductive health, cost estimates for implementing the program were then calculated. ICPD maternal health goals were broad and actually more encompassing than the MDGs. Thus, a cost estimate of reaching the ICPD goal would be higher than a cost estimate of reaching the maternal health goals defined by the MDGs. Since ICPD, there have been attempts to estimate costs and to correct the original cost estimates of implementing a comprehensive reproductive health program (Dunbar et al., 1999). Most of these estimates are aggregated at the global level. For purposes of estimating the unit cost of reducing the MMR by two-thirds at the country level, this study focuses on the unit cost estimates from literature examining programs that aim to make pregnancy and childbirth safer ("safe motherhood"). Table VI.3 summarizes cost studies for implementing a generic safe motherhood program in sub-Saharan Africa adapted from an annotated bibliography put out by the Bay Area International Group (Fraser et al., 2002). It should be noted that all of these studies, except the cost study performed in Uganda, are based on models and hypothetical situations.

Table VI.3: Cost studies for safe motherhood

Source	Method	Costs	Included Costs Missing Costs	Comments
Tinker and Koblinsky, 1993	• This model illustrates selected economic, health, and demographic characteristics, and related safe motherhood program costs for three settings (low, medium, and high infrastructure). • Program includes: FP; management of abortions, improvements in delivery and community education; prenatal, postnatal, and postpartum care; referral for labor complications; safe birth kits; and iron and folate tablets.	US$ (1993) Costs vary by maternal deaths averted Cost per birth (marginal) • Setting A (20%) = $27.71 • Setting B (66%) = $34.31 • Setting C (80%) = $56.76 Cost per birth (average) • Setting A (20%) = $28.24 • Setting B (66%) = $92.01 • Setting C (80%) = $280.17	√ Staff costs √ Training √ Contraceptives √ Equipment & supplies √ Transportation, vehicles & maintenance √ Annualized investment costs	➢ Marginal and average costs ➢ Analysis shows that costs vary from one setting to another ➢ Sub-Saharan Africa best fits Setting A
Cowley P. and Bobadilla J.L., 1995.	• This model uses indicators to categorize hypothetical countries into low, middle, and middle II income ranges • Provide social marketing, FP delivery care; management of labor/obstetrics, obstetric complications, and abortion; neonatal care; postnatal care	US$ (1994) Model Population = 500,000 95% coverage (of target population) Cost per birth (average) • Low-income = $51 • Middle-income = $243 Low-income country Costs vary by % of facility-based fixed costs: (Health Post, Health Center, Hospital) 40%; 30%; 20%: $51 per birth 70%; 70%; 70%: $32 per birth 10%; 10%; 10%: $59 per birth	√ Vaccines and drugs √ Equipment √ Lab tests √ Surgery √ Salaries √ Maintenance of capital	➢ Average costs ➢ Low-ncome country estimates assume 40% of cases referred. 10% from Health Post to Hospital, 20% from Health Post to Health Center, 10% from Health Center to Hospital. ➢ Per birth costs increase as referral rates increase.
Weisman et al., 1999	• A cost study conducted by the WHO in	1996 Population Igana District: 1.1	√ WHO Mother-Baby Package	➢ Average and marginal costs

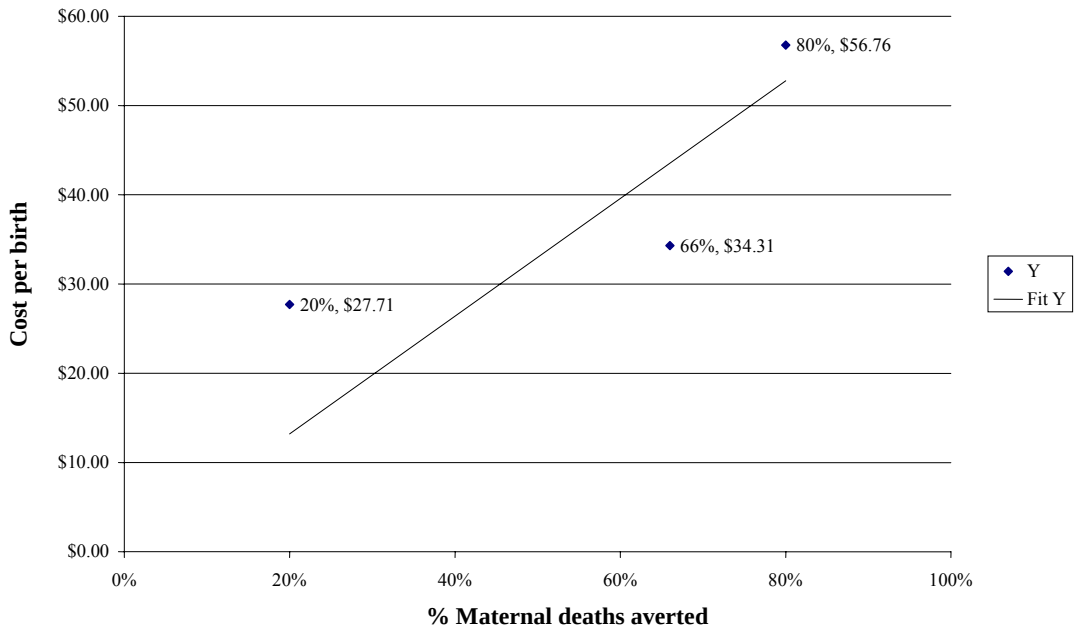
Source	Method	Costs	Included Costs Missing Costs	Comments
	Uganda on the costs of implementing the WHO Mother-Baby Package	million Per capita costs = $0.90 (marginal) Per capita costs = $1.40 (average) Cost per birth: $17.13 (marginal) Cost per birth: $25.70 (average)		➢ Excludes capital costs ➢ Average per capita costs = $1.80, including capital investments
Walsh and Measham, 1994	• This cost analysis uses indicators to create models for high and low mortality countries • Only costs for high mortality countries are shown. The first model is based only on implementing a family planning program, with costs varying on contraceptive prevalence. The second model is based on implementing either a program with only family planning, family planning and a limited obstetric program, or family planning and a moderate obstetric program	US$ (1993) Population = 1 million <u>High mortality country w/ FP only</u> Assumes MMR= 1,000 Costs vary based on CPR 20%: $12.14 per birth 40%: $43.88 per birth 60%: $158.55 per birth <u>High mortality country</u> Assumes CPR=20% Costs vary by % MMR reduction FP only (0%): $12.14 per birth (average) FP w/ limited obstetrics (20%): $23.80 per birth (average) $11.66 per birth (marginal) FP w/ moderate obstetrics (40%): $48.58 per birth (average) $36.43 per birth (marginal)	√ Limited effort: post-natal care, birth attendants; upgrade of centers and establishment of 4 new centers; investment in emergency transport system. √ Moderate effort: community outreach, post-natal care, nutrition and pregnancy, risk screening; increase health posts to 1/10,000; increase health centers; train staff; emergency transportation √ Postnatal care	➢ Average and marginal costs ➢ Marginal costs most appropriate if estimating cost of a safe motherhood program, excluding contraceptive costs (assuming CPR of 20%)

Adapted from: Fraser et al., 2002. Costing Cairo: An annotated bibliography of the cost literature on ICPD Programme of Action components in sub-Saharan Africa, Bay International Group (BIG), University of California, Berkeley, 2002. Adapted to include per birth costs instead of per capita costs.

This analysis assumed that in order for countries to meet the maternal health MDG and to effectively reduce the maternal mortality ratio, a safe motherhood program would have to be implemented country-wide. To estimate the cost of implementing a safe motherhood program, the cost estimates in the Tinker and Koblinsky report (1992) were used. This report estimated the average per birth as well as the cost of an extra birth (or marginal cost) under three types of settings: low, medium, and high infrastructure. Setting A (low) was considered most appropriate for countries in sub-Saharan Africa because they generally have a low level of infrastructure and high fertility rate. For Setting A, it was estimated that if an additional $27.70 per birth were invested annually to improve maternity care, 20 percent of maternal deaths could be averted. Estimates for Settings B and C were significantly higher but would result in a higher percentage of deaths averted. This is because for each additional death averted, the marginal cost increases. In resource-poor settings such as sub-Saharan Africa, small, inexpensive improvements can help improve maternal health outcomes.

Because countries will have to avert more than 20 percent of maternal deaths to meet the MMR target, we extrapolated the unit cost estimates for all three levels of maternal deaths averted and estimated a line of best fit. This also allowed for country-specific cost estimates based on a country's MMR in 2000 and on the fertility rate (i.e., births per year). We assumed the y- intercept was zero on the assumption that if a country were not trying to improve maternity care, no additional costs would be incurred. Figure VI.3 shows the line of best fit for these three points.

Figure VI.3. Line of best fit for maternal health unit cost



Source: Adapted from Tinker & Koblinsky (1992)

The line of best fit took the form:
*Cost per birth = 65.97 * (% deaths averted) + 0*

This regression was applied to each country in the analysis to estimate a unit cost. Percent deaths averted was calculated by subtracting the cumulative number of maternal deaths under the Base scenario from the cumulative number of deaths that would have occurred if the MDG were not met and dividing by the

latter.[9] The percent of deaths averted was then used in the above equation to estimate the cost per birth for that country. In general, countries with the highest MMR have the highest unit cost because they have the most deaths to avert, but this is not always the case. Table VI.4 shows the unit cost for each country ranges from $28.15–37.27 per birth.

Table VI.4: Cost per birth to meet the maternal health MDG

Country	% Maternal Deaths Averted	Cost per Birth*
Burkina Faso	46	$30.32
Cameroon	43	$28.15
Chad	57	$37.27
Ethiopia	51	$33.80
Ghana	45	$29.87
Guinea	53	$34.93
Kenya	45	$29.92
Madagascar	46	$30.14
Mali	50	$32.95
Niger	54	$35.95
Nigeria	46	$30.05
Rwanda	52	$33.98
Senegal	55	$36.50
Tanzania	53	$34.89
Uganda	52	$34.25
Zambia	50	$32.86

*Cost estimates are based on a linear regression of percent deaths averted and cost per birth.

As indicated in Table VI.3, the annual operating costs from the World Bank report include the cost of contraceptives. Thus, this may be an overestimate of the cost of implementing a safe motherhood program (since it includes the cost of family planning), which we already take account of. However, the unit cost estimates used in this report are slightly lower than those suggested by Walsh and Measham (1994) of $36.43 per birth, excluding family planning costs, and those found by Cowley and Bobadilla (1995) of $51 per birth, assuming a low-income country where 40 percent of cases are referred. Although this is a crude estimate of country-wide spending for implementing a safe motherhood initiative, it is a reasonable estimate.

Cost Scenarios

The unit cost (based on the percent of averted maternal deaths the country needs to meet the MDG) was multiplied by the annual number of births under both population scenarios. Table VI.5 shows the cumulative costs of implementing a country-wide safe motherhood program and the cost savings under the Need Met scenario.

[9] $[\text{Maternal Deaths}_{(\text{Status quo})} - \text{Maternal Deaths}_{(\text{Base})}]/\text{Maternal Deaths}_{(\text{Status quo})}$

Table VI.5: Cumulative costs and cost savings for the maternal health MDG, 2005–2015 (US$ millions)

Country	Total cost (Base)	Total Cost (Need Met)	Cost Savings
Burkina Faso	$236.8	$209.6	$27.2
Cameroon	$180.5	$167.2	$13.3
Chad	$194.8	$186.8	$8.0
Ethiopia	$1,194.6	$1,089.3	$105.3
Ghana	$247.2	$208.2	$39.0
Guinea	$155.5	$137.2	$18.3
Kenya	$477.0	$402.1	$74.9
Madagascar	$245.8	$217.0	$28.8
Mali	$254.6	$221.1	$33.5
Niger	$313.7	$283.2	$30.5
Nigeria	$1,907.6	$1,780.6	$127.0
Rwanda	$144.2	$134.3	$9.9
Senegal	$204.4	$161.5	$42.9
Tanzania	$641.2	$556.6	$84.6
Uganda	$601.8	$475.4	$126.4
Zambia	$207.3	$170.7	$36.7

Source: Authors' calculations.

Maternal Deaths Averted

In addition to the cost savings noted above, many maternal deaths are averted due to implementing stronger FP programs. We estimated the effect of lower fertility on the number of mothers who would have lost their lives due to pregnancy or childbirth complications. While we are not able to link the MMR statistically with fertility as we did for infant and under-five mortality, we can calculate the effect of lower fertility on maternal deaths through its impact on the number of births. Table VI.6 shows the cumulative number of mothers' lives saved as a result of the Need Met scenario.

Table VI.6 Cumulative maternal deaths averted due to the Need Met scenario

	Maternal Deaths Averted (2005–2015)
Burkina Faso	4,962
Cameroon	1,954
Chad	1,151
Ethiopia	12,782
Ghana	3,962
Guinea	1,987
Kenya	14,040
Madagascar	2,918
Mali	6,512
Niger	6,821
Nigeria	18,849
Rwanda	2,120

Senegal	4,007
Tanzania	18,688
Uganda	16,877
Zambia	4,474

Source: Author's calculations.

VII. Combat HIV/AIDS, Malaria, and Other Diseases

Percent of Population Under Age Five Using Insecticide-treated Nets

The sixth MDG is to combat HIV/AIDS, malaria, and other diseases. There are two targets for this goal and seven indicators to measure progress toward reaching those targets. This analysis will only focus on Target 8 and Indicator 22, the proportion of the population using effective measures to prevent malaria. Specifically, this study looks at the percent of children under age five using insecticide-treated nets.

Goal 6:	Combat HIV/AIDS, malaria and other diseases		
Target 7:	Have halted by 2015 and begun to reverse the spread of HIV/AIDS	Indicator 18:	HIV prevalence among 15 to 24-year-old pregnant women
		Indicator 19:	Contraceptive prevalence rate
		Indicator 20:	Number of children orphaned by HIV/AIDS
Target 8:	Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases	Indicator 21:	Prevalence and death rates associated with malaria
		Indicator 22:	Proportion of population using effective malaria prevention and treatment measures
		Indicator 23:	Prevalence and death rates associated with tuberculosis
		Indicator 24:	Proportion of tuberculosis cases detected and cured under directly observed treatment short course

There are over 300 million cases of malaria each year, resulting in more than 1 million deaths (RBM Infosheet[10]). Africa is home to *Plasmodium falciparum*, the most fatal strand of malaria. Africa bears the burden of approximately 90 percent of all malaria deaths, with most deaths occurring in children under the age of five (RBM Infosheet). The economic costs of malaria are also significant. Countries with high malaria transmission have historically had much lower annual growth than countries without malaria, and malaria has been estimated to cost Africa more than US$12 billion every year in lost gross domestic product (RBM Infosheet[11]). Malaria not only results in lost life and lost productivity due to illness, but also hampers the development of children through absenteeism in school and permanent neurological damage from severe episodes of malaria.

Insecticide-treated bed nets (ITNs) have been found to reduce the incidence of malaria by 50 percent compared with no nets and by 39 percent compared with untreated nets (Lengeler, 2004). A review of randomized control trials in Africa found ITNs can reduce the number of deaths in children under five by one-fifth, saving about five to six lives for every 1,000 children protected with ITNs (Lengeler, 2004). This may even underestimate the efficacy of ITNs because nets treated with insecticide provide both a personal protection from mosquitoes as well as a community effect. This means that ITNs have been found to decrease the incidence of malaria among nonusers by reducing the number of mosquitoes in the

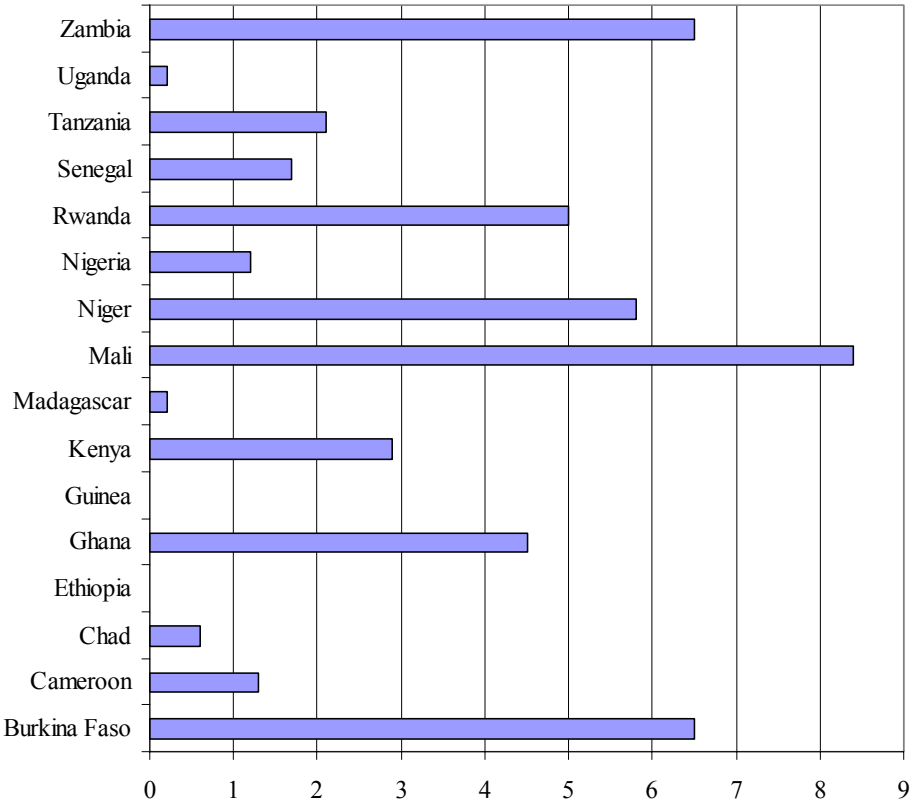
[10] http://www.rollbackmalaria.org/cmc_upload/0/000/015/367/RBMInfosheet_6.pdf.
[11] http://www.rollbackmalaria.org/cmc_upload/0/000/015/363/RBMInfosheet_10.pdf.

area (up to several hundred meters) (RBM, 2003). ITNs are also highly cost-effective. In a low-income country in sub-Saharan Africa, the cost-effectiveness of ITNs for reducing mortality in children under five is US$19.85 per disability-adjusted-life year (DALY) averted, and US$4.10 per DALY averted where only insecticide is provided for existing nets (Goodman et al., 1999).

Current Status vs. Goal

The Roll Back Malaria Partnership was formed in 1998 with the express goal of halving malaria mortality by 2010. The African Summit in Abuja, Nigeria, in April 2000, reinforced this goal, with African leaders agreeing to the target of at least 60 percent of children under the age of five and pregnant women having access to affordable insecticide-treated nets by 2010 (RBM, 2000). Although progress has been rapid in the past few years, most African countries are far from reaching this goal. Among the 16 countries in this analysis, coverage rates for ITNs in 2000 were extremely low (see Figure VII.1), requiring countries to increase coverage by as much as 5 or 6 percent per year to meet the target of 60 percent coverage by 2015. Where data were not available, a 0 percent coverage rate was assumed.

Figure VII.1: Use Rate of ITNs by Children Under 5 (2000)



Demographic Scenarios

To estimate the number of ITNs needed to achieve the target, assumptions were made regarding a feasible rate of scale up in coverage, the number of children protected by one net, and the average time period an ITN remains effective.

First, baseline data for the number of under-five children needing an ITN was calculated using UNSD coverage estimates and SPECTRUM projections for the number of children under the age of five (0–59 months) under both population scenarios. It was assumed that ITN coverage rates increased on a straight-line basis from the 2000 level to 60 percent by 2015. Although the model is optimistic in terms of scale up, the rate of increase in ITN coverage is not unprecedented. The Kilombero Insecticide Treated Nets Project (KINET) project[12] in two districts in Tanzania saw ITN coverage of infants increase from less than 10 percent to more than 50 percent three years later (Armstrong-Schellenberg et al., 2001). In Malawi, the percent of children under age five who slept under an ITN the previous night increased from 8–35 percent between 2000 and 2003 (Stevens, 2005). As seen in Table VII.1, our model assumes a lower rate of change is maintained over a longer period of time. Second, it was assumed that one ITN sufficiently covered two children. This is a high estimate. The Millennium Project assumed one net covered 1.67 people in its needs assessment of Ethiopia.[13] Third, instead of estimating the average life of an ITN, unit cost estimates are based on cost-per-treated-net-year, or the annualized cost of delivering a net and retreating it every six months.

Table VII.1: Comparison of scale-up of ITN coverage for children under five

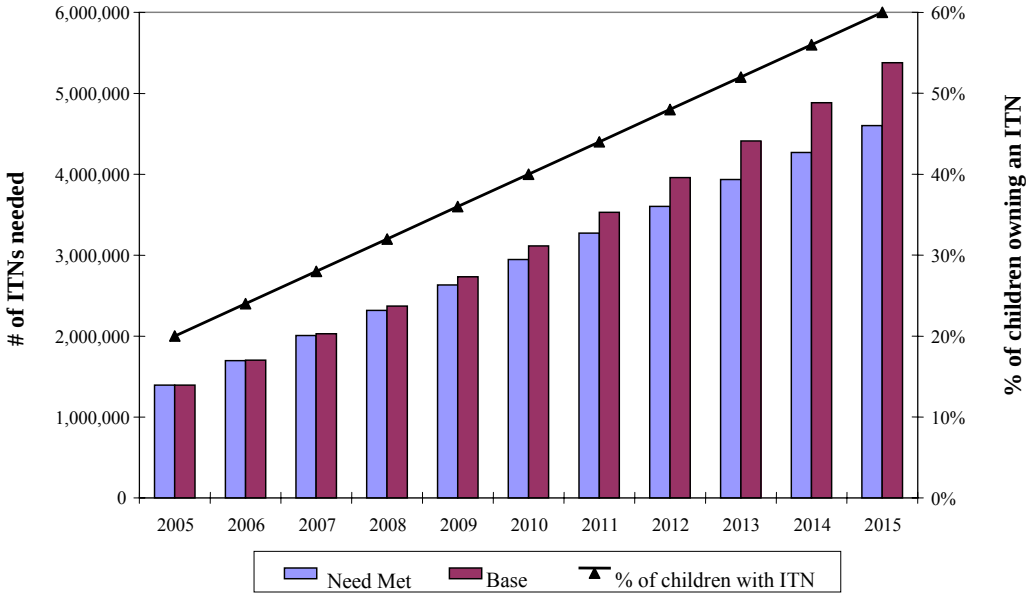
	Tanzania (KINET)	Malawi	Our Model
Total percentage point increase	40	27	60
# of years	3	3	15
Annual percentage point increase	13.3	9.0	4.0

Based on these assumptions and the demographic projections for the number of children under five years old, the number of ITNs needed was calculated. For example in Ethiopia, meeting FP needs can reduce the number of children needing an ITN in 2015 by 1.5 million in the year 2015 (see Figure VII.2). This is important in reducing the number of ITNs needed to protect children from malaria. The number of ITNs needed to achieve the MDG target in Ethiopia would be much lower if unmet need for family planning were met. For example, under the Base scenario, scale up of ITNs will have to increase to 5.3 million ITNs in 2015 to meet the 60 percent target. Figure VII.2 shows that under the Need Met scenario, the MDG can be achieved with 4.6 million ITNs in 2015. Over the 10-year period, this amounts to 2,833,040 fewer ITNs.

[12] KINET was a large-scale social marketing program of insecticide-treated nets for malaria control in two rural districts in Southern Tanzania. It was implemented from July 1996 to June 2000.

[13] This model assumed 68 percent of the population was at risk for malaria and 30 percent of those at risk were eligible for an ITN. It then assumed five people per family and three long lasting ITNs per family were required, with replacement every four years.

Figure VII.2: Annual number of ITNs needed to meet the malaria MDG Ethiopia (2005 - 2015)



Cost Assumptions

We reviewed cost estimates from three large-scale malaria prevention programs using ITNs in sub-Saharan Africa and a prospective cost estimate for Ethiopia released by the Millennium Project. Unit cost estimates varied across studies (see Table VII.2).

Table VII.2: Comparison of unit cost estimates for ITNs

Study	Type	Unit Cost
Tanzania (KINET)	Retrospective Study (three years)	$8.30 per ITN $13.38 per treated net year
Malawi Blantyre Insecticide Treated Nets Project	Retrospective Study (five years)	$5.04–1.92 per ITN from 1999 to 2003 Average over five years: $2.63 per ITN $7.69–3.44 per treated-net-year (1999–2003) Average over five years: $4.41 per treated-net-year
The Gambia National Impregnated Bednet Programme	Retrospective	$3.30 per ITN
Malaria Task Force Report (Ethiopia)	Prospective Model (2005–2015)	$5 per LLITN $2 per net (delivery) $0.40 per existing net for re-treatment

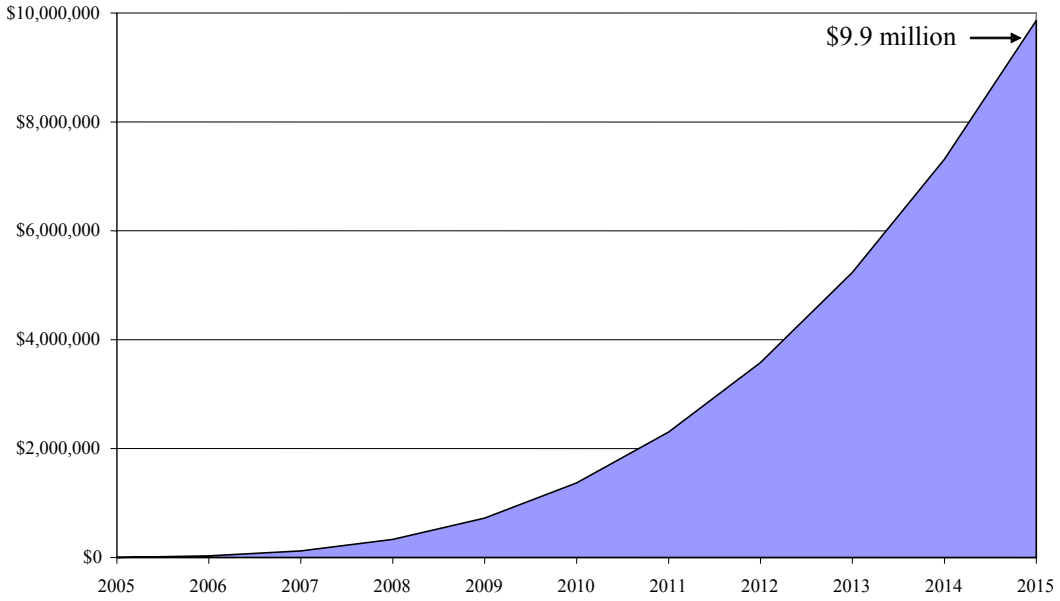
The Malaria Task Force Report assumed long-lasting, insecticide-treated nets (LLITNs) had to be replaced every four years but did not have to be re-treated for their expected life (United Nations Millennium Project, 2005). Other community trials estimated costs in terms of cost per ITN delivered and cost-per-treated-net-year. Cost per ITN delivered does not include the cost of maintaining old nets. Thus, cost per treated-net-year is a more appropriate estimate of costs because it factors in how long a net is

effective in protecting against malaria.[14] An average cost of $4.40 per treated-net-year was used in this analysis to estimate the cost of reaching the target.

Cost Scenarios

The demographic projections were multiplied by the unit cost ($4.40 per treated-net-year) to estimate the total cost of meeting this MDG, as represented by meeting the Abuja target for ITN use under both population scenarios. For example, the cumulative cost from 2005–2015 for Ethiopia under the Base scenario is $156 million compared with $143 million under the Need Met scenario. This is a savings of $12 million or approximately $9.9 million, discounted at 3 percent (see Figure VII.3). Table VII.3 summarizes the cumulative costs under both scenarios and the cost savings for all countries. Nigeria has the highest potential cost savings of $12.7 million.

Figure VII.3: Cumulative cost savings for the malaria MDG
Ethiopia (2005 - 2015)



[14] Both cost estimates in Tanzania and Malawi assumed untreated nets and nets older than six months provided no coverage. Cost per treated-net year was $6.70 in Tanzania when effectiveness was assumed to be 12 months versus six months.

Table VII.3: Cumulative costs and cost savings for the malaria prevention MDG, 2005–2015 (US$ millions)*

Country	Total Cost (Base)	Total Cost (Need Met)	Cost savings
Burkina Faso	$27.9	$25.0	$2.9
Cameroon	$19.7	$18.3	$1.4
Chad	$20.4	$19.6	$0.8
Ethiopia	$130.4	$120.6	$9.8
Ghana	$29.6	$25.3	$5.3
Guinea	$16.5	$14.7	$1.8
Kenya	$55.4	$47.3	$10.1
Madagascar	$27.1	$24.1	$3.0
Mali	$27.3	$24.1	$3.2
Niger	$31.7	$28.9	$2.8
Nigeria	$208.6	$195.9	$12.7
Rwanda	$15.5	$14.5	$1.0
Senegal	$22.8	$18.4	$4.4
Tanzania	$69.4	$61.1	$8.3
Uganda	$65.3	$52.8	$12.5
Zambia	$23.7	$19.9	$3.8

Source: Authors' calculations.
* All costs discounted at 3 percent.

VIII. Ensure Environmental Sustainability

Proportion of Population with Sustainable Access to an Improved Water Source
Proportion of People with Access to Improved Sanitation

The seventh MDG is to ensure environmental sustainability. There are three targets for this goal and seven indicators to measure progress toward reaching those targets. This analysis will only focus on Target 10 and Indicators 29 and 30, the proportion of the population with sustainable access to an improved water source and improved sanitation. The MDG is to reduce by half the proportion of people without sustainable access to safe drinking water and sanitation.

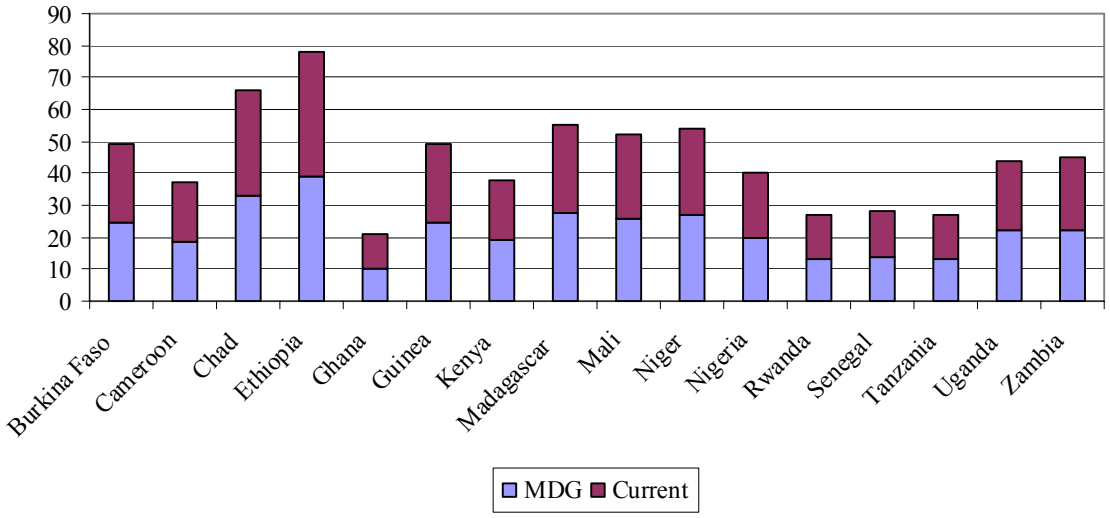
Goal 7:	Ensure environmental sustainability		
Target 9:	Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources	Indicator 25:	Proportion of land area covered by forest
		Indicator 26:	Land area protected to maintain biological diversity
		Indicator 27:	GDP per unit of energy use
		Indicator 28:	Carbon dioxide emissions per capita
Target 10:	Halve by 2015 the proportion of people without sustainable access to safe drinking water	Indicator 29:	Proportion of population with sustainable access to an improved water source
Target 11:	By 2020 to have achieved a significant improvement in the lives of at least 100 million slum dwellers	Indicator 30:	Proportion of population with access to an improved sanitation
		Indicator 31:	Proportion of people with access to secure tenure

Approximately 1.1 billion people do not have access to safe and sufficient drinking water (WHO website) and 2.4 billion people, about one-third of the world's population, lack adequate sanitation (WHO, website). Approximately 88 percent of diarrhoeal disease is attributable to unsafe water and inadequate sanitation and hygiene, and nearly 90 percent of the 1.8 million people who die from diarrhoeal disease each year are children (WHO, 2004). In addition, six million people are visually impaired by trachoma, a disease related to lack of face washing (WHO, 2004). Improving access to safe water and better hygiene practices can reduce trachoma morbidity by 27 percent (WHO, 2004). In addition, better management of water resources reduces transmission of malaria and other vector-borne diseases. Thus, improving water and sanitation is closely linked with other MDG objectives, such as reducing malaria and improving child health.

Current Status vs. Goal

Meeting the water and sanitation MDG is the only goal the world is currently "on-track" to achieve by 2015. However, national-level performance for this MDG varies widely across countries. Similar to the MMR indicator, since the target for this indicator is to reduce the proportion of people without access to water by half, the MDG target is different for each country. Figure VIII.1 shows baseline data for 2002 and the MDG target for each country. Ethiopia has the highest percentage of people without access to an improved water source (78%). This means Ethiopia will have to provide water and sanitation services to an additional 39 percent of the population to meet the MDG. In other words, only 22 percent of the population in 2002 had access to water and sanitation services; to meet the MDG, 61 percent of the population in 2015 will have to have access. This is especially challenging given Ethiopia's population is continuing to grow.

Figure VIII.1 Current and Target Proportion of People without Access to Safe Water



Demographic Scenarios

In general, the percent of people with access to an improved water source is higher than the percent with improved sanitation. We opted to model this MDG based on the percent of people with access to an improved water source because this would be a conservative estimate of costs (and therefore savings). Baseline data on the percent of people with access to an improved water source and improved sanitation are from the UNSD for 2002. It was assumed that progress toward the goal of halving the proportion of people *without* access to improved water was made from the base value in a linear fashion so that half of those currently without access were reached by 2015 (i.e., a straight-line interpolation was used).

The percentage increase each year necessary to reach the goal by 2015 was then multiplied by the estimated total population of the country under both population scenarios to calculate the number of "new" people with safe water and sanitation services. For example, in Ghana, 21 percent of the population lacked safe water and sanitation services in 2000. This means 79 percent of the population or approximately 17 million people had adequate water and sanitation. To meet the MDG, the government will have to provide water and sanitation to an additional 1 percent of the population each year. Under the Base scenario, an additional 648,591 people will need water and sanitation in 2005, and an additional 920,465 people will need services in 2015. Figure VIII.2 shows that the annual number of "new" people needing water and sanitation services to meet the MDG is much lower under the Need Met scenario. Figure VIII.3 shows for Ghana the cumulative number of "new" people" required to have access.

Figure VIII.2: Annual "new" population with safe water and sanitation Ghana (2005 - 2015)

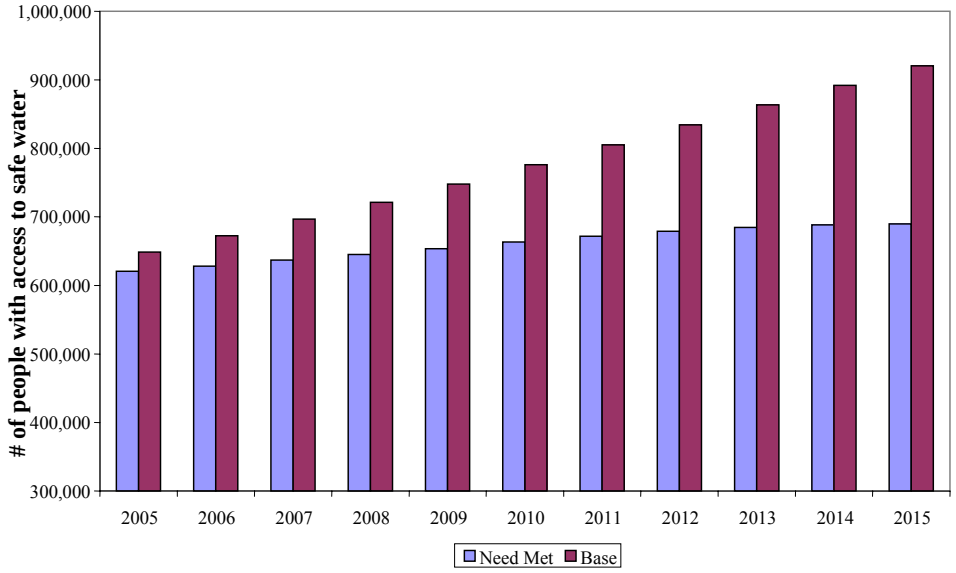
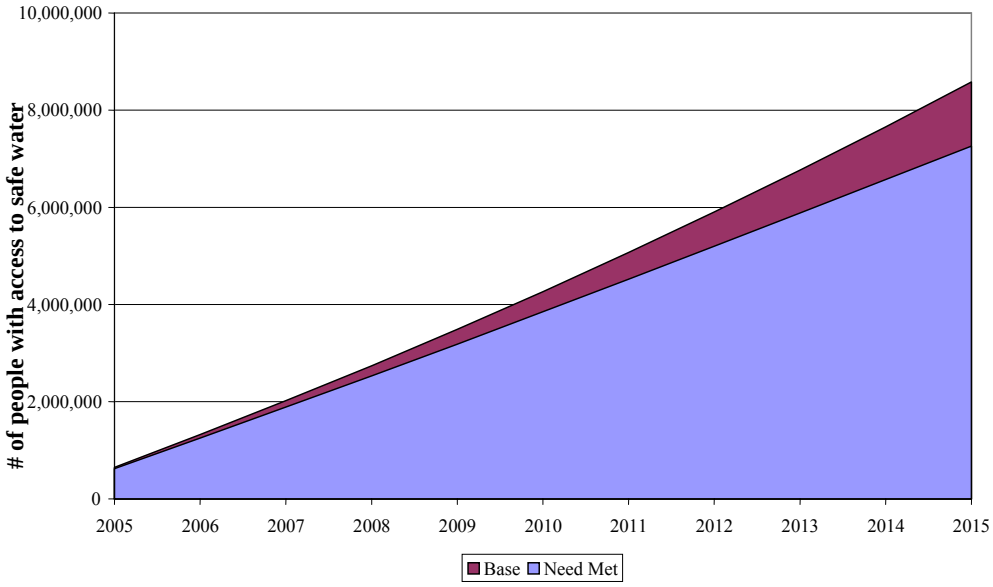


Figure VIII.3: Cumulative "new" population with safe water and sanitation Ghana (2005 - 2015)



Cost Assumptions

To estimate unit costs, we examined two reports estimating the cost of reaching the water and sanitation MDG. First, the Water and Sanitation Task Force Report performed a needs assessment of five developing countries for the UN Millennium Project. It provides estimates for investment needs for 2005, 2010, and 2015. Cost estimates include both capital and operating costs disaggregated by urban and rural areas and by water provision, sanitation, and wastewater treatment. This report assumed gradual scaling-up of investments, because over time, operating and maintenance costs are generally higher than initial capital costs (WHO, 2004). Table VIII.1 presents the subtotal costs and per capita costs estimated for

Ghana in the Task Force Report. Cost estimates for Ghana increase from $5.40 per capita in 2005 to $10.00 per capita in 2015.

Table VIII.1: Total cost estimates for meeting Target 10 in Ghana, 2005–2015 (US$/2003)

Category	2005	2010	2015	Total 2005–2015	Average 2005–2015
Water Provision					
Total Cost	73,845,121	98,008,339	124,737,719	1,091,193,179	99,199,380
Per Capita	3.4	4.1	4.7		4.1
Sanitation					
Total Cost	35,865,808	54,127,630	117,226,554	664,146,505	60,376,955
Per Capita	1.6	2.2	4.4		2.5
Total (including waste water treatment & hygiene education)					
Total Cost	116,910,706	166,335,759	262,804,715	1,913,555,617	173,959,602
Per Capita	5.4	6.9	10.0		7.2

Second, the Water, Sanitation, and Health Protection of the Human Environment division of the WHO in 2004 conducted an analysis estimating the costs of extending access to water supply and sanitation on a regional basis. Incremental cost estimates to reach new populations included both investment and recurrent costs. Cost estimates were reported as annual costs per person reached (versus per capita) under five different possible interventions for all WHO sub-regions. Intervention 2 is defined as reaching the millennium targets of halving the proportion of people who do not have access to improved water sources *and* improved sanitation facilities by 2015 (Hutton and Haller, 2004). The annual cost per person reached under Intervention 2 for the Africa WHO sub-region AFR-E is $4.60 (US$/2000) (Hutton and Haller, 2004, Table 14) and $4.70 for sub-region AFR-D. Per capita costs for comparison purposes to the Task Force report are estimated at $2.20 for sub-region AFR-E and $1.90 for AFR-D. This report, which estimates costs at the regional level versus the country level, provides much lower cost estimates than those provided by the task force for Ghana, Tanzania, and Uganda.

Below is a comparison of the cumulative costs for Ghana using unit cost estimates from both reports (see Table VIII.2). Estimates of annual spending required to meet the MDGs' targets vary substantially. The low-cost estimate of $4.60 per person reached was used in this report.

Table VIII.2: Comparison of annual and cumulative costs under three unit cost estimates

Level of Estimate	Source (methodology)	Ghana		
		Unit Cost	Annual Cost (US$ millions)	Cumulative Cost (US$ millions)
Low	WHO Report (per person reached)	$4.60	$5–42	$254
Medium	WHO Report (per capita)	$2.10	$47–61	$598
High	Millennium Project (per capita)	$7.20[1]	$116–262	$1,913

[1] Scaled up from $5.40 per capita in 2005 to $10.00 per capita in 2015.

Cost Scenarios

The cumulative "new" population with water and sanitation services each year was multiplied by the unit cost of supplying improved water and sanitation services to estimate the total cost of meeting this MDG

under both population scenarios. Costs for meeting the water and sanitation goal will increase steadily each year as more people gain access and need to maintain access. For countries far from reaching the goal, the annual cost will be higher than for countries with more people who currently have access to improved water and sanitation. This goal will also be relatively easier to meet for countries with smaller populations. Table VIII.3 summarizes the cumulative costs of meeting this MDG under both population scenarios for all countries.

Table VIII.3: Cumulative costs and cost savings for the water and sanitation MDG, 2005–2015 (US$ millions)*

Country	Total cost (Base)	Total cost (Need Met)	Cost savings
Burkina Faso	$199.8	$188.4	$11.4
Cameroon	$148.3	$142.3	$6.0
Chad	$186.3	$182.9	$3.4
Ethiopia	$1,260.5	$1,234.2	$26.3
Ghana	$210.3	$188.6	$21.7
Guinea	$139.0	$130.5	$8.5
Kenya	$429.1	$393.2	$35.9
Madagascar	$230.4	$218.9	$11.5
Mali	$201.9	$188.7	$13.2
Niger	$255.3	$242.8	$12.5
Nigeria	$1,493.1	$1,438.4	$54.7
Rwanda	$120.8	$115.8	$5.0
Senegal	$197.4	$171.4	$26.0
Tanzania	$592.2	$545.4	$46.8
Uganda	$533.1	$474.3	$58.8
Zambia	$185.1	$168.5	$16.6

Source: Authors' calculations.
* All costs discounted at 3 percent.

The costs under both scenarios are high since the entire population is in need of safe water and sanitation (i.e., not just children, women, etc.). The savings under the Need Met scenario are significant but not as large as in other sectors. This is primarily because the effect of meeting unmet need on the size of a country's total population is minimal within the first 10 years—the timeframe of this analysis. As with all of our cost estimates, long-term savings are even higher if the analysis is done beyond 2015.

However, this is especially true for sectors that have recurrent costs such as water and sanitation services and education. Since these services have to be provided every year and are not just a one-time investment, the potential cost savings of meeting unmet need for family planning is high in the long term.

Figure VIII.4 shows that, in Ghana, cost savings from meeting unmet increases each year as more of the population is being reached. Over the 10-year period, Ghana could save $21.7 million (see Figure VIII.5).

Figure VIII.4: Annual Savings for meeting the water and sanitation MDG Ghana (2005 - 2015)

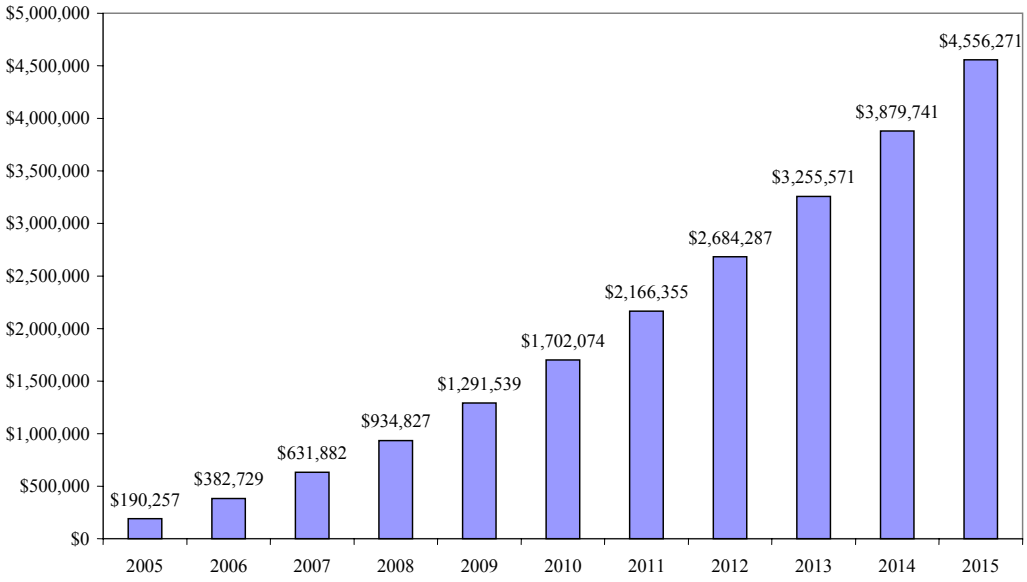
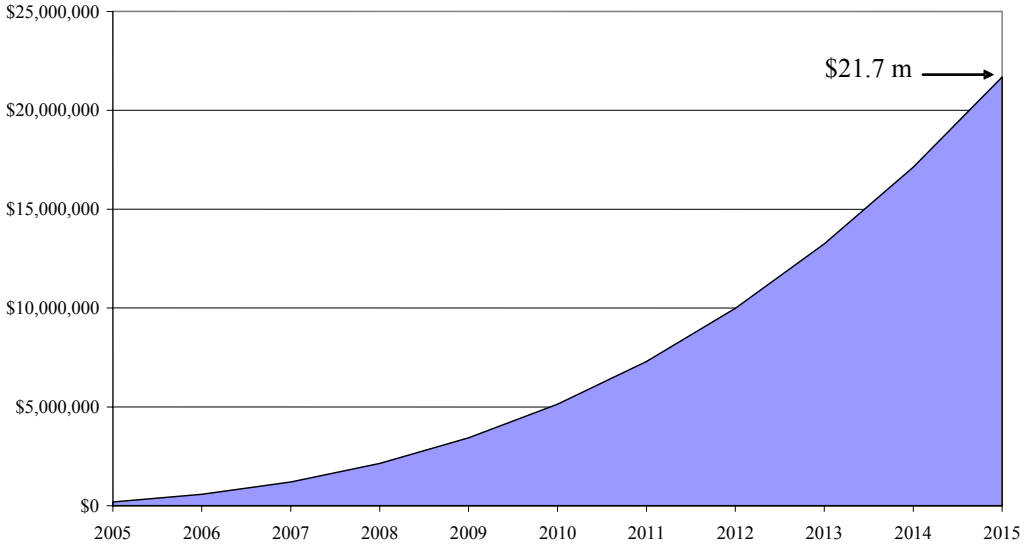


Figure VIII.5: Cumulative cost savings for meeting the water and sanitation MDG Ghana (2005 - 2015)



IX. Benefit-Cost Comparison

Benefit-cost ratios were calculated by comparing the cost of family planning, discussed in Section II, with the cost savings from each of the five MDG in terms of the selected targets. Although it is assumed that countries will try to meet all the MDGs concurrently, benefit-cost ratios are presented for each MDG indicator in order for countries to assess which sector family planning has the largest affect on. A total benefit-cost ratio of the savings from all five MDG sectors combined relative to the cost of family planning is also presented.

In general, cost savings from meeting FP needs are greatest in the education sector and for improving maternal health (see Table IX.1). Based on each country's current status in each sector, family planning will have a greater effect in different sectors. For example, in Cameroon and Guinea, family planning will generate the most cost savings in the education sector. However, in Ethiopia and Madagascar the greatest cost savings would be realized by safe motherhood initiatives.

Table IX.1: Cost of family planning, cost savings for achieving the MDGs' targets, and benefit-cost ratios by MDG sector

Country	Cost and B/C Ratio	Family Planning*	Education	Immunization	Water and Sanitation	Maternal Health	Malaria	Total
Burkina Faso	Cost	$27.5	$21.6	$17.8	$11.4	$27.2	$2.9	$80.9
	B/C ratio		0.79	0.65	0.41	0.99	0.11	2.95
Cameroon	Cost	$14.7	$29.6	$4.6	$6.0	$13.3	$1.4	$54.9
	B/C ratio		2.01	0.31	0.41	0.90	0.09	3.72
Chad	Cost	$4.7	$9.9	$2.9	$3.4	$8.1	$0.8	$25.0
	B/C ratio		2.10	0.61	0.71	1.70	0.16	5.29
Ethiopia	Cost	$102.8	$23.1	$44.0	$26.3	$105.3	$9.9	$208.5
	B/C ratio		0.22	0.43	0.26	1.02	0.10	2.03
Ghana	Cost	$54.0	$35.9	$19.8	$21.7	$39.0	$4.3	$120.6
	B/C ratio		0.66	0.37	0.40	0.72	0.08	2.23
Guinea	Cost	$20.8	$44.3	$7.1	$8.6	$18.3	$1.8	$80.0
	B/C ratio		2.13	0.34	0.41	0.88	0.09	3.85
Kenya	Cost	$71.4	$114.7	$37.1	$35.9	$74.9	$8.0	$270.6
	B/C ratio		1.61	0.52	0.50	1.05	0.11	3.79
Madagascar	Cost	$25.5	$20.1	$13.2	$11.5	$28.8	$3.0	$76.4
	B/C ratio		0.79	0.52	0.45	1.13	0.12	3.00
Mali	Cost	$35.8	$37.9	$18.5	$13.2	$33.5	$3.2	$106.4
	B/C ratio		1.06	0.52	0.37	0.94	0.09	2.97
Niger	Cost	$28.6	$35.6	$10.5	$12.5	$30.6	$2.8	$91.9
	B/C ratio		1.25	0.37	0.44	1.07	0.10	3.22
Nigeria	Cost	$139.5	$140.1	$52.1	$54.7	$127.0	$12.7	$386.6
	B/C ratio		1.00	0.37	0.39	0.91	0.09	2.77
Rwanda	Cost	$6.1	$8.3	$4.1	$5.0	$9.8	$1.0	$28.2
	B/C ratio		1.36	0.66	0.81	1.60	0.10.160	4.59
Senegal	Cost	$42.7	$180.7	$11.7	$26.0	$42.8	$4.4	$265.6
	B/C ratio		4.23	0.27	0.61	1.00	0.10	6.22
Tanzania	Cost	$71.6	$116.5	$35.1	$46.8	$84.6	$8.3	$291.3
	B/C ratio		1.63	0.49	0.65	1.18	0.12	4.07
Uganda	Cost	$97.4	$157.8	$52.4	$58.8	$126.4	$12.5	$407.9
	B/C ratio		1.62	0.54	0.60	1.30	0.13	4.19
Zambia	Cost	$27.2	$37.5	$16.8	$16.6	$36.7	$3.8	$111.3
	B/C ratio		1.38	0.62	0.61	1.35	0.14	4.09

*FP costs based on the regional average of $11.2 per CYP for comparison purposes. FP costs per FP user available by country.

Table IX.2 shows the total benefit-cost ratio for each country and its rank relative to the other countries in the analysis. Senegal has the highest benefit-cost ratio with increased family planning resulting in MDG cost savings of more than six times the cost of family planning.

Table IX.2: Comparison of benefit-cost ratios by country

Country	B/C Ratio	Rank
Burkina Faso	2.95	13
Cameroon	3.72	9
Chad	5.29	2
Ethiopia	2.03	16
Ghana	2.23	15
Guinea	3.85	7
Kenya	3.79	8
Madagascar	3.00	11
Mali	2.97	12
Niger	3.22	10
Nigeria	2.77	14
Rwanda	4.59	3
Senegal	6.22	1
Tanzania	4.07	6
Uganda	4.19	4
Zambia	4.09	5

*FP costs based on regional average of $11.20 per CYP for comparison purposes. Costs per FP user available by country.

X. Conclusion

We have seen that meeting the MDGs will be a challenge for the 16 sub-Saharan countries studied in this report. Many of the countries are a long way from meeting the target levels of the indicators and the cost of meeting these development goals is high, as documented in the above sections.

An additional challenge to meeting the MDGs is that the size of the target populations will continue to grow, leading to a spiraling in the costs of meeting the MDGs. Due to past high levels of fertility, the countries studied have a demographic momentum that implies a continued increase in the number of women entering reproductive age and consequently increases in births. This is likely to continue if the current low levels of contraceptive use continue. However, as discussed, there is an opportunity to increase contraceptive use because of a high latent demand for family planning as measured by unmet need for family planning. If this unmet need were to be met, fertility would be reduced and with it population growth. This, in turn, would reduce the costs of meeting the MDGs.

We prepared projections based on two FP scenarios for each of the 16 sub-Saharan African countries in the study and for five selected MDGs. These were used to prepare benefit-cost calculations. Based on these calculations we can conclude that increased investments in FP programs will lead to significant savings in terms of the costs of meeting the MDGs that we examined. These cost savings ranged from a little more than $2 in Ethiopia for every extra dollar spent on family planning to more than $6 in Senegal.

Significant health benefits for children and mothers can also result from increased FP use. The number of maternal deaths that could be averted during childbirth due to reductions in the number of pregnancies and induced abortions would be significant. Furthermore, there would be reductions in the number of infant and child deaths due to fewer high-risk births. Hence, in addition to cost savings for meeting the MDGs, meeting the unmet need for family planning also helps to achieve the anticipated health benefits of the MDGs.

Although increasing FP use is not an MDG, clearly, it can play a valuable complementary role and could help countries move closer to achieving their MDGs by freeing up resources to meet these goals. Efforts made by countries to improve FP use will therefore assist with other strategies underway to meet the MDGs. FP investments can create cost savings in meeting MDG sector targets, thereby freeing up funds for meeting those or other MDGs; additionally, FP investments contribute directly to health-related MDGs by savings lives of children and mothers.

Appendix 1. Baseline Data for MDG Indicators, 2000

Country	**Net Enrollment Rate**	**Measles Immunization** (% of children immunized at age 1)	**Maternal Mortality Rate** (per 100,000 live births)	**% of Population Without access to Water ***	**Infant Mortality Rate** (# of infant deaths under age 1 per 1,000 live births)	**Under-5 Mortality Rate** (# of child deaths per 1,000 live births)	**Insecticide-Treated Nets**** (% of children under age 5 using an ITN)
Burkina Faso	35	59	1000	49	107	207	6.5
Cameroon	73.6	49	730	37	95	166	1.3
Chad	58.3	42	1100	66	117	200	0.6
Ethiopia	43.9	52	850	78	116	176	0
Ghana	57.1	84	540	21	62	100	4.5
Guinea	47	52	740	49	112	175	0
Kenya	68.2	75	1000	38	77	120	2.9
Madagascar	67.7	55	550	55	84	137	0.2
Mali	44	49	1200	52	124	224	8.4
Niger	30.7	34	1600	54	159	270	5.8
Nigeria	67	35	800	40	102	205	1.2
Rwanda	84	74	1400	27	118	203	5
Senegal	62.5	48	690	28	80	139	1.7
Tanzania	49.8	78	1500	27	104	165	2.1
Uganda	52.7***	61	880	44	85	145	0.2
Zambia	66.1	85	750	45	102	182	6.5

Source: UNSD database.
* Water and sanitation data for 2002.
** Year varies, most recent data used unless 2000 available.
*** 1990 estimate.

Appendix 2. Education Unit Cost Data, 2001–2015

Country	Base Year	2001	2005	2010	2015	Cumulative/ Average
Burkina Faso	1998					
Cost per Student (Recurrent Only)	$45.4					
# pupils in public primary education		966,686	1,449,109	2,160,307	2,695,049	
Recurrent Spending (2001–2015) (millions)		$39.8	$56.0	$86.1	$123.1	$1,138.1
Capital Spending (2001–2015) (millions)		$23.4	$23.4	$23.4	$10.2	$338.0
Total Spending (2001–2015) (millions)		$63.2	$79.4	$109.5	$133.3	$1,476.1
Recurrent cost per student		$41.1	$38.6	$39.9	$45.7	$40.6
Capital cost per student		$24.2	$16.2	$10.8	$3.8	$13.7
Total cost per student		$65.3	$54.8	$50.7	$49.5	$54.3
Cameroon	1999					
Cost per Student (Recurrent Only)	$49.1					
# pupils in public primary education		1,818,735	2,221,036	2,796,471	3,363,276	
Recurrent Spending (2001–2015) (millions)		$83.5	$126.7	$211.8	$369.9	$2,887.2
Capital Spending (2001–2015) (millions)		$28.0	$28.0	$28.0	$8.0	$400.3
Total Spending (2001–2015) (millions)		$111.6	$154.7	$239.8	$377.8	$3,287.6
Recurrent cost per student		$45.9	$57.0	$75.7	$110.0	$71.4
Capital cost per student		$15.4	$12.6	$10.0	$2.4	$10.9
Total cost per student		$61.3	$69.7	$85.7	$112.3	$82.3
Chad	2000					
Cost per Student (Recurrent Only)	$18.5					
# pupils in public primary education		863,945	1,189,112	1,688,434	2,222,467	
Recurrent Spending (2001–2015) (millions)		$13.9	$21.4	$36.5	$65.6	$498.4
Capital Spending (2001–2015) (millions)		$19.3	$19.3	$19.3	$6.3	$276.6
Total Spending (2001–2015) (millions)		$33.3	$40.7	$55.8	$71.9	$775.0
Recurrent cost per student		$16.1	$18.0	$21.6	$29.5	$21.0
Capital cost per student		$22.4	$16.2	$11.4	$2.8	$13.6
Total cost per student		$38.5	$34.2	$33.1	$32.4	$34.6
Ethiopia	1999					
Cost per Student (Recurrent Only)	$13.3					
# pupils in public primary education		6,531,142	8,673,516	11,740,242	14,541,320	
Recurrent Spending (2001–2015) (millions)		$88.5	$130.7	$219.6	$363.7	$2,939.5
Capital Spending (2001–2015) (millions)		$124.8	$124.8	$124.8	$49.0	$1,796.2
Total Spending (2001–2015) (millions)		$213.3	$255.5	$344.4	$412.7	$4,735.7
Recurrent cost per student		$13.6	$15.1	$18.7	$25.0	$17.9
Capital cost per student		$19.1	$14.4	$10.6	$3.4	$12.3

Total cost per student		$32.7	$29.5	$29.3	$28.4	$30.2
Ghana	1999					
Cost per Student (Recurrent Only)	$25.5					
# pupils in public primary education		2,259,865	2,565,653	2,976,762	3,316,089	
Recurrent Spending (2001–2015) (millions)		$62.2	$83.5	$119.2	$163.0	$1,604.5
Capital Spending (2001–2015) (millions)		$13.8	$13.8	$13.8	$7.5	$201.0
Total Spending (2001–2015) (millions)		$76.0	$97.3	$133.0	$170.5	$1,805.4
Recurrent cost per student		$27.5	$32.5	$40.0	$49.2	$37.4
Capital cost per student		$6.1	$5.4	$4.6	$2.3	$4.9
Total cost per student		$33.6	$37.9	$44.7	$51.4	$42.3
Guinea	2000					
Cost per Student (Recurrent Only)	$35.4					
# pupils in public primary education		722,643	972,763	1,316,368	1,568,544	
Recurrent Spending (2001–2015) (millions)		$35.0	$53.9	$86.5	$130.4	$1,140.6
Capital Spending (2001–2015) (millions)		$12.1	$12.1	$12.1	$2.1	$171.3
Total Spending (2001–2015) (millions)		$47.1	$66.0	$98.6	$132.4	$1,311.9
Recurrent cost per student		$48.5	$55.4	$65.7	$83.1	$63.0
Capital cost per student		$16.7	$12.4	$9.2	$1.3	$10.6
Total cost per student		$65.2	$67.8	$74.9	$84.4	$73.6
Kenya	1999					
Cost per Student (Recurrent Only)	$58.1					
# pupils in public primary education		4,900,689	5,339,342	5,903,562	6,424,283	
Recurrent Spending (2001–2015) (millions)		$302.2	$366.8	$462.0	$579.3	$6,435.8
Capital Spending (2001–2015) (millions)		$0.0	$0.0	$0.0	$0.1	$0.1
Total Spending (2001–2015) (millions)		$302.2	$366.8	$462.0	$579.4	$6,435.9
Recurrent cost per student		$61.7	$68.7	$78.3	$90.2	$74.9
Capital cost per student		$0.0	$0.0	$0.0	$0.0	$0.0
Total cost per student		$61.7	$68.7	$78.3	$90.2	$74.9
Madagascar	1998					
Cost per Student (Recurrent Only)	$22.3					
# pupils in public primary education		1,617,692	1,927,989	2,414,953	2,945,190	
Recurrent Spending (2001–2015) (millions)		$40.8	$53.4	$75.7	$114.6	$1,053.3
Capital Spending (2001–2015) (millions)		$20.9	$20.9	$20.9	$7.8	$301.0
Total Spending (2001–2015) (millions)		$61.7	$74.3	$96.7	$122.4	$1,354.3
Recurrent cost per student		$25.2	$27.7	$31.4	$38.9	$30.7
Capital cost per student		$12.9	$10.9	$8.7	$2.6	$9.4
Total cost per student		$38.2	$38.6	$40.0	$41.5	$40.1
Mali	1998					
Cost per Student (Recurrent Only)	$30.0					

# pupils in public primary education		948,908	1,372,640	2,022,846	2,612,126	
Recurrent Spending (2001–2015) (millions)		$27.5	$43.0	$76.5	$130.7	$1,014.3
Capital Spending (2001–2015) (millions)		$28.5	$28.5	$28.5	$11.1	$409.8
Total Spending (2001–2015) (millions)		$56.0	$71.5	$105.0	$141.9	$1,424.2
Recurrent cost per student		$29.0	$31.4	$37.8	$50.0	$36.6
Capital cost per student		$30.0	$20.7	$14.1	$4.3	$17.4
Total cost per student		$59.0	$52.1	$51.9	$54.3	$54.0
Niger	1998					
Cost per Student (Recurrent Only)	$60.4					
# pupils in public primary education		868,716	1,455,800	2,396,711	3,191,055	
Recurrent Spending (2001–2015) (millions)		$39.0	$54.8	$82.5	$110.2	$1,078.0
Capital Spending (2001–2015) (millions)		$26.9	$26.9	$26.9	$16.5	$392.6
Total Spending (2001–2015) (millions)		$65.9	$81.7	$109.3	$126.7	$1,470.6
Recurrent cost per student		$44.9	$37.6	$34.4	$34.5	$36.9
Capital cost per student		$30.9	$18.5	$11.2	$5.2	$15.5
Total cost per student		$75.9	$56.1	$45.6	$39.7	$52.4
Nigeria	2000					
Cost per Student (Recurrent Only)	$44.8					
# pupils in public primary education		17,417,153	20,414,021	24,762,082	29,582,042	
Recurrent Spending (2001–2015) (millions)		$809.9	$1,068.1	$1,506.0	$2,099.5	$20,502.4
Capital Spending (2001–2015) (millions)		$122.1	$122.1	$122.1	$66.4	$1,775.2
Total Spending (2001–2015) (millions)		$931.9	$1,190.1	$1,628.0	$2,165.9	$22,277.6
Recurrent cost per student		$46.5	$52.3	$60.8	$71.0	$57.8
Capital cost per student		$7.0	$6.0	$4.9	$2.2	$5.3
Total cost per student		$53.5	$58.3	$65.7	$73.2	$63.1
Rwanda	2000					
Cost per Student (Recurrent Only)	$19.1					
# pupils in public primary education		1,340,828	1,551,699	2,067,086	2,671,868	
Recurrent Spending (2001–2015) (millions)		$27.1	$35.2	$54.2	$90.3	$756.3
Capital Spending (2001–2015) (millions)		$11.1	$11.1	$11.1	$2.9	$157.7
Total Spending (2001–2015) (millions)		$38.1	$46.3	$65.3	$93.2	$914.0
Recurrent cost per student		$20.2	$22.7	$26.2	$33.8	$25.7
Capital cost per student		$8.2	$7.1	$5.3	$1.1	$5.9
Total cost per student		$28.4	$29.8	$31.6	$34.9	$31.6
Senegal	2000					
Cost per Student (Recurrent Only)	$65.3					
# pupils in public primary education		1,025,739	1,341,326	1,803,576	2,224,283	
Recurrent Spending (2001–2015) (millions)		$61.8	$87.9	$137.0	$206.4	$1,830.4

Capital Spending (2001–2015) (millions)		$18.8	$18.8	$18.8	$5.0	$267.9
Total Spending (2001–2015) (millions)		$80.6	$106.7	$155.8	$211.5	$2,098.3
Recurrent cost per student		$60.2	$65.5	$76.0	$92.8	$73.3
Capital cost per student		$18.3	$14.0	$10.4	$2.3	$11.9
Total cost per student		$78.5	$79.5	$86.4	$95.1	$85.2
Tanzania	1999					
Cost per Student (Recurrent Only)	$24.0					
# pupils in public primary education		4,468,625	5,237,692	6,301,522	7,210,478	
Recurrent Spending (2001–2015) (millions)		$117.5	$163.7	$242.6	$338.8	$3,233.6
Capital Spending (2001–2015) (millions)		$27.5	$27.5	$27.5	$12.6	$397.7
Total Spending (2001–2015) (millions)		$145.0	$191.2	$270.1	$351.3	$3,631.3
Recurrent cost per student		$26.3	$31.3	$38.5	$47.0	$35.9
Capital cost per student		$6.2	$5.3	$4.4	$1.7	$4.7
Total cost per student		$32.5	$36.5	$42.9	$48.7	$40.6
Uganda	2000					
Cost per Student (Recurrent Only)	$27.5					
# pupils in public primary education		3,971,324	4,338,404	4,839,331	5,438,942	
Recurrent Spending (2001–2015) (millions)		$135.9	$165.2	$210.2	$269.0	$2,929.8
Capital Spending (2001–2015) (millions)		$14.0	$14.0	$14.0	$15.8	$211.7
Total Spending (2001–2015) (millions)		$149.9	$179.2	$224.2	$284.8	$3,141.5
Recurrent cost per student		$34.2	$38.1	$43.4	$49.5	$41.5
Capital cost per student		$3.5	$3.2	$2.9	$2.9	$3.1
Total cost per student		$37.7	$41.3	$46.3	$52.4	$44.5
Zambia	1998					
Cost per Student (Recurrent Only)	$13.8					
# pupils in public primary education		1,507,409	1,668,640	1,885,121	2,068,989	
Recurrent Spending (2001–2015) (millions)		$31.9	$43.7	$64.3	$92.1	$865.8
Capital Spending (2001–2015) (millions)		$8.7	$8.7	$8.7	$2.4	$124.3
Total Spending (2001–2015) (millions)		$40.6	$52.4	$73.0	$94.4	$990.1
Recurrent cost per student		$21.2	$26.2	$34.1	$44.5	$31.5
Capital cost per student		$5.8	$5.2	$4.6	$1.1	$4.7
Total cost per student		$26.9	$31.4	$38.7	$45.6	$36.2

Source: Data and Education for All Financing Simulation Models, World Bank EdStats website, http://devdata.worldbank.org/edstats/em3.asp.
For education service delivery only. The World Bank models also provide AIDS-related costs but these are not included.

Appendix 3. Cumulative Cost Estimates for Family Planning, Two Methods

	Family Planning Costs (US$ millions)*	Family Planning Costs (US$ millions)**
Burkina Faso	$27.5	$87.5
Cameroon	$14.7	$28.2
Chad	$4.7	$6.2
Ethiopia	$102.8	$130.6
Ghana	$54.0	$123.6
Guinea	$20.8	$109.5
Kenya	$71.4	$107.9
Madagascar	$25.5	$24.4
Mali	$35.8	$267.2
Niger	$28.6	$248.8
Nigeria	$139.5	$250.4
Rwanda	$6.1	$46.2
Senegal	$42.7	$255.5
Tanzania	$71.6	$138.4
Uganda	$97.4	$383.7
Zambia	$27.2	$36.3

* Based on cost per CYP of $11.20.

**Based on cost per FP user, see Table II.8.

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