FIRST DRAFT

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Is the Child Nutrition target of MDG consistent with other MDG targets? A Cross-national

Analysis of Nutrition, Poverty, Economic Growth and Literacy

By

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INTRODUCTION

In September 2000, 189 nations committed themselves to work towards a number of developmental achievements as part of the United Nations Millennium Declaration (1). To help track progress, the United Nations as well as representatives of International Monetary Fund (IMF), the World Bank (WB), and Organization for Economic Co-operation and Development (OECD) defined the Millennium Development Goals (MDG). International experts selected relevant indicators to be used to assess progress over the period 1990-2015, when targets are expected to be met. A framework of 8 goals, 18 targets and 48 indicators to measure progress towards the Millennium Development goals were adopted by a consensus of experts from the United Nations Secretariat, IMF, OECD and the World Bank (2).

The MDGs are time-bound and quantifiable targets serving as yardsticks to measure progress of nations for the overall development. Achieving these goals is far more important for regions and countries with low economic and social progress. For this reason, halving hunger by 2015 from the 1990 levels is given high priority (3). The MDGs are not discrete goals or outcomes but rather an integrated set of indicators to ensure "balanced" development of societies by eradicating poverty and hunger, achieving universal primary education, promoting gender equality, reducing child mortality, improving maternal health, combating HIV/AIDS, ensuring environmental sustainability, and developing a global partnership for development. Since all the MDG indicators are considered equally important, it is important to examine how consistent are the targets with each other.

In a recent article in the Economist (4), the eight Millennium Development Goals (MDGs) were termed as the "Eight Commandments", probably as a light-hearted way of attracting attention to the content of the article in the magazine rather than implying any sort of

"MDG fundamentalism" on the part of global policy makers. Although, counting numbers, reporting ratios and rates are important in monitoring progress and ensuring constant focus on most important developmental and human wellbeing issues, too much emphasis on simple ratios and rates could be misleading, if not totally counter-productive. According to some researchers, increasing international assistance has created significant disruptions within the health systems of poor developing countries, exactly opposite of what was intended (see review by Garrett, 5).

The world seems to be on track in achieving the "poverty" goal of MDGs (6) despite the fact that the picture completely changes if we exclude China from the calculations. To what extend was China's success in poverty alleviation was due to targeted interventions triggered by the MDGs? China reduced its head-count ratio of poverty from 64% in 1981 to 33% in 1990 and 17% in 1996, and obviously MDG activities did not play any role in this rapid decline. Similarly, Middle-east and North African poverty rate declined from 5% in 1981 to less than 2% by 1993, again without MDGs playing any role in these improvements. Attributing the decline in extreme poverty in the world since mid-1990s to MDG activities will clearly be a gross overstatement.

From the poverty indicators, the conclusion one should reach is that tracking the indicators at the global level is not very useful; one should focus on smaller geographic regions or disadvantaged areas within a country where the progress in the developmental indicators are expected to be slow without targeted interventions. Focus on the disadvantaged groups or geographic areas will ensure that interventions will be designed for targeting the most needy rather than allowing the natural "trickle-down" approach to reach them at a later stage (see 7). In this sense, the impacts of MDG activities should be evaluated by examining the progress of various MDG indicators for the "lowest ranking" regions of the world and within each region, the lowest ranking countries of the region. Since Africa was the "lowest ranking" region in 1990,

success and failure of the MDG strategy can be evaluated by looking at Africa in general and a number of poor performing countries in Africa.

In this analysis, we start from the assumption that MDGs are reasonable development indicators and all countries should try to achieve the goals. However, the quantitative targets set by the MDG may not be fully consistent with the achievement of all the goals or indicators in the MDG list. To see the potential inter-relationships among various MDG indicators, we will focus on country level measures to analyze if MDG targets are consistent with each other. It is possible that to achieve the target on hunger will require much faster improvements in poverty situation than the target set by the MDGs.

To focus the discussion narrowly, we will examine the improvements in child malnutrition status in Africa. Child malnutrition remains a serious problem in most developing countries of the world. The prevalence of underweight, stunting and wasting among under-fives in the developing world were 27%, 31% and 8% respectively (8). More than half (53%) of all under five deaths are related to under nutrition (9). Although the relative number of hungry people has fallen globally, around 852 million people are still chronically or acutely malnourished (10).

PROGRESS OF MDGs IN AFRICA

MDGs were designed and implemented to serve as a tracking tool to monitor progress for important indicators necessary for the overall development. Implementation of MDGs may have played a significant role in accelerating development across regions/countries. If all regions/countries happen to achieve all the major MDGs by 2015 – it is estimated that it will help save 500 million people from poverty and hunger, 350 million will have access to safe

water and good sanitation conditions and this will ultimately result in saving around 30 million children from dying before the age of five years.

Compared to other regions, Africa fares the worst with respect to its progress for attaining the MDGs (11). Table 1 presents progress of Africa for some of the important indicators of MDGs for the time period 1990 – 2004/2005. Note from the table, Africa as a whole is performing very poorly in terms of all the major MDG indicators. If the trend observed over 1990-2004/5 continues in the future, Africa will miss the MDG targets by a wide margin. For example, head-count poverty should have declined to 23.4% by 2015 but the current trend implies that the rate will be about 37%, more than 58% above the target. Percent of children underweight in 2015 will remain more than 26%, again 60% higher than the MDG target. Clearly, if Africa fails to accelerate its progress towards the MDG targets, it will remain so far off the mark that human development will elude Africa once again.

Table 1 – Tracking Africa's progress towards major MDGs

Goals/targets	1990	2004/2005	Projected 2015*
People living on less than $ 1 (PPP) a day (% of population)	46.8	41	37.3
Poverty gap ratio	19.5	17.5	16.2
Share of poorest quintile in national consumption, 1990-2004 (%)	3.4	3.4	3.4
Proportion of children under age five who are underweight (percentage)	33	29	26.4
Total net enrolment ratio in primary education (percentage)	54	70	84
Promoting gender equality: Ratio of girls to boys in primary and secondary school (%)	82	86	91
Under-five mortality rate (per 1000 live births)	185	166	154
Maternal mortality rate (per 100,000 births)	920	917	915
Access to improved water source (% of population)	49	56	61
Access to improved sanitation services (% of population)	32	37	53

- using exponential decline/growth function

NUTRITION AND MILLENNIUM DEVELOPMENT GOALS

An estimated 852 million people around the world do not have access to food to be able to lead a healthy life (12). Unable to meet the minimum requirements of daily food intake impacts the physical state and increase the prevalence of diseases and mortality rate. Malnutrition also affects neurological development in children adversely and labor productivity suffers significantly due to malnutrition and hunger. All these factors combined have a strong and lasting effect even for the future generations.

By understanding the severity and the long term impact it has, reducing hunger was included as one of the development goals under the MDGs. The goal is to reduce hunger by half over the period 1990-2015. The proponents of MDG targets were fully aware of the fact that the challenge of halving hunger is closely linked with the achievement of other MDGs. Even though the MDG indicators are related, target setting did not explicitly take into account the time trend of progress required in other indicators to successfully achieve the "hunger" indicators of MDGs by the target date.

Hunger and malnutrition creates significant costs in terms of economic productivity (12). Loss in labor productivity due to malnutrition and hunger is probably around 6 to 10 percent of the Gross Domestic Product (GDP) of a country (13). Improvement in nutritional status will not only help attain the MDG directly related to nutrition and hunger but also help attain the other MDGs thus accelerating the improvements in non-nutrition development objectives.

The inter-relationship of nutrition in achieving other MDGs has been described by the Standing Committee on Nutrition (SCN) (14). Table 2 below has been taken from the fifth report of the SCN.

Table 2 - Nutrition's contributions to the attainment of the MDGs

Goal 1 Eradicate extreme poverty and hunger	Malnutrition erodes human capital, reduces resilience to shocks and reduces productivity (impaired physical and mental capacity).
Goal 2 Achieve universal primary education	Malnutrition reduces mental capacity. Malnourished children are less likely to enroll in school, or more likely to enroll later. Current hunger and malnutrition reduces school performance.
Goal 3 Promote gender equality and empower women	Better-nourished girls are more likely to stay in school and to have more control of future choices.
Goal 4 Reduce child mortality	Malnutrition is directly or indirectly associated with more than 50% of all child mortality. Malnutrition is the main contributor to the burden of disease in the developing world.
Goal 5 Improve maternal health	Maternal health is compromised by an anti-female bias in allocations of food, health and care. Malnutrition is associated with most major risk factors for maternal mortality.
Goal 6 Combat HIV/AIDS, malaria and other diseases	Malnutrition hastens onset of AIDS among HIV-positive. Malnutrition weakens resistance to infections and reduces malarial survival rates.

* Source: (Standing committee on nutrition - 5th Report on the World Nutrition Situation)

Among all the regions of the world, Africa fares the worst with respect to its progress for attaining the first MDG (15). In SSA, prevalence of children born with low birth weight ranges from 11-52 percent, 25 percent of under-fives are moderately to severely underweight, 7-9 percent are moderately to severely wasted and 35-37 percent are moderately to severely stunted (15, 16).

Based on data availability for the SSA countries, 18 countries in SSA still have very high proportion of undernourished population, around 16 countries seem to be on track and 19 countries are nowhere close to achieving the nutrition related MDGs (15). Some countries (Benin, Botswana, Congo, Cote d'Ivoire, Gambia, and Mauritania, Ghana, Niger, Mali, Malawi, Sao Tome & Principe, Sierra Leone) in SSA show positive trend towards reduction of under

nutrition. Over the period 1990-2004, prevalence of malnutrition however has increased in Cameroon, Comoros, Burkina Faso, Burundi, Ethiopia, Kenya, Madagascar, Tanzania, Somalia, and Zimbabwe. In Ethiopia, 50 percent of children are underweight, 57 percent of children are stunted in Burundi and 17 percent are wasted in Somalia. About 29 percent of children in Nigeria are underweight making it one of the highest prevalence of underweight in the SSA (see 15 for details).

CHILD NUTRITION IN AFRICA – THE INTER-LINKAGES

It is important to examine the causes for the reverse trend in the Sub-Saharan Africa of the nutritional status indicators. Sachs (17) has identified a number of factors affecting Africa's achievement of MDGs. Some of the factors affecting or slowing the progress in SSA are declines in agricultural productivity, food crisis due to drought and communal/regional conflict, increasing level of poverty, prevalence of low birth weight, women's status in society, women's education, low economic development, and increasing rate of HIV/AIDS.

In the last decade, according to Sachs (2005), SSA has experienced average growth rate of only 2.1 percent. In per capita terms, economic growth from 1960 to mid-1990 was less than 0.4% (see Sawada and Yotopoulos 18). There exist high levels of inequality with respect to economic growth at the regional and the country level. Around twenty countries in SSA experienced a negative economic growth and are poorer today than their income levels in 1990. Political turmoil and civil unrest in countries such as Angola, Burundi, Central African Republic, the Democratic Republic of Congo, Rwanda, and Sierra Leone have affected economic growth and nutritional status of children. Prevalence of poverty has also remained relatively high in SSA with little or no change over the years.

A number of studies demonstrate that economic growth is an essential factor in reducing the head-count rate of poverty. To improve the situation of the poor, economic growth must be relatively high (19, 20). Sawada and Yotopoulos (18) calculated the required growth rate over 1990-2015 for achieving the poverty target of MDGs. The per capita average growth rate varies from 1% for Ghana to 5% for Sierra Leone. Most of the African countries are not growing fast enough to achieve the poverty targets by 2015. Since the purpose of this analysis is to examine the progress of African countries in terms of the child nutritional status indicator, we need to go beyond income-poverty linkages and examine the effect of poverty on child nutrition. Even if we assume that poverty target can be achieved through significant targeted investments in productive activities, how likely is it that nutritional targets will also be achieved? Most of the empirical analyses indicate that poverty and literacy are two most important determinants of nutritional status of children and so it is unlikely that child nutritional status will improve significantly without rapid decline in poverty and improvements in other social indicators of MDGs.

In this paper, we will examine the correlations among nutrition and other MDG indicators in Africa to understand the potential inter-linkages among the indicators. We will also examine the income elasticity of poverty and poverty elasticity of child nutritional status. The elasticity estimates will indicate what impact economic progress might have on poverty and how poverty changes will affect child nutritional status, with or without changes in related MDG indicators. Effect of literacy and other factors on nutritional status will also be examined.

CORRELATIONS BETWEEN NUTRITION AND OTHER SOCIAL INDICATORS

Using most recent cross-country data from Africa, correlation coefficients were obtained

between child nutrition status (prevalence of underweight) and other developmental indicators.

Statistically significant correlations are reported below in table 3.

Table 3 – Correlation coefficients between percent of under-five children underweight and other developmental indicators (Statistical significance of coefficients at 0.01 or better)

Indicators	Correlation coefficient	Indicator	Correlation coefficient.
Literacy rate	-0.545	% with improved sanitation	-0.490
Primary school enrollment	-0.460	% with safe water access	-0.549
Ratio of girls and boys in school	-0.482	Human Development Index	-0.625
Female to male literacy rate	-0.455	Prevalence diarrhea (under-5)	0.515
Female to male non-agricultural work	-0.381	% diarrhea cases using ORS	-0.506
Infant Mortality Rate	0.336	Prevalence of Low Birth Wt	0.361
Under-5 Mortality Rate	0.402	Coverage of BCG	-0.323
% birth attended by skilled personnel	-0.614	Coverage of Tetanus vaccination	-0.439
Contraceptive Prevalence rate	-0.629	GDP per capita	-0.519
Case identified by DOTS	-0.330	Health Expenditure per capita	-0.587
Population growth rate	0.464	Physicians per 1000 pop	-0.516

* Pair-wise correlation coefficients are based on 36 to 48 observations. For 19 pairs (out of 22), number of observations were 45 or more. Observations for prevalence of diarrhea, ORS used and Low birth weight were 36, 39 and 42 respectively.

From the table, it is clear that nutritional status of children is quite closely correlated with a number of other indicators. The indicators showing more than 0.5 correlation coefficients in absolute terms are: literacy rate, percent of birth attended by skilled personnel, contraceptive prevalence rate, percent of households with access to safe water, Human Development Index, prevalence of diarrhea, GDP per capita, health expenditure per capita and number of physicians per 1000 population. A number of indicators in the table show high inter-correlations among them. For example, literacy rate and female to male literacy ratio is highly correlated with correlation coefficient being 0.88. Similarly, the correlation coefficients between GDP per capita and health expenditure per capita or physicians per 1000 population is found to be 0.8 and 0.75 respectively. Physicians per 1000 population, CPR, percent of births attended by skilled personnel, health expenditure per capita, GDP per capita are also show relatively high correlations. So, we are probably better-off choosing a representative indicator for the set of highly correlated indicators in the table. Although correlation coefficients can not indicate causality, we can still say that higher literacy rate will probably reduce the prevalence of underweight among children. Reduced prevalence of diarrhea will improve nutritional status of children and income will have significant impact in lowering malnutrition rate. Unfortunately, it was not possible to test the hypothesis that prevalence of poverty (below $1 a day per capita) has significant positive impact on malnutrition rates in Africa due to lack of data. For this reason, we will use data from all developing countries of the world to find the poverty-malnutrition relationship and then apply that in the context of Africa to conclude the potential effects of income growth on poverty and the effect of poverty on child malnutrition.

INCOME-POVERTY RELATIONSHIP

Three different approaches have been used by researchers to estimate the effect of income on poverty. The first approach uses cross-country data to find the elasticity of income on poverty reduction, measured either as percent of income received by the poorest quintile or percent of individuals under the poverty line. The second approach uses cross-section of households to determine the effect of income on poverty reduction. Since we are examining the poverty-income relationship at the macro level, household data based parameters will probably overestimate the elasticity as the approach automatically takes into account the income distribution in the country. The third approach, again using cross-country data, estimates the economic growth rate required for countries to reach the MDG poverty target by 2015.

For our analysis, we need information on the effect of income on the prevalence of poverty (head-count ratio of poverty). The study by Besley and Burgess (21) will be most appropriate for us. In the Besley-Burgess study, the authors calculated the elasticity with respect to per capita income changes. The model they have estimated can be written as:

$$\log P_{it} = \theta_i + \eta \log \mu_{it} + \varepsilon_{it}$$

where P_{it} is the head count poverty rate for a country i in year t based on $1 a day poverty line, θ is the country fixed effect, μ is the real per capita income and ε is the error term. η is the elasticity of poverty. The elasticity value estimated by Besley and Burgess varied from -1.0 for East Asia and Pacific to -0.49 for Sun-Saharan Africa. For the whole sample (all countries of the world), the elasticity value was found to be -0.73.

POVERTY AND NUTRITIONAL STATUS

Using the similar empirical approach used by Besley and Burgess, we have estimated the prevalence of malnutrition elasticity with respect to poverty rate. Rather than using the African sample alone (due to lack of data on poverty), we have used all countries of the world as our sample. In our sample, we had complete data for 68 developing countries of the world. For these 68 countries, log of child underweight rate was found to be influenced by adult literacy rate, percent of population urban and log of poverty rate. The regression model was highly significant with F-statistics of 51 and R-square of 0.70.

The results indicate that for one percent increase in illiteracy rate log of under-weight prevalence increase by .011. Increase in urbanization by one percent also reduces log of malnutrition by -0.02. Elasticity of underweight rate with respect to poverty rate is 0.241 (one percent increase in poverty rate increases the underweight rate by 0.241%).

SIMULATION EXERCISES

For the simulation exercise, let us use optimistic assumption that GDP per capita in Africa will grow at a rate of 4% per year from 2004/5 to 2015. Over the 10 year period, total growth in GDP per capita would be about 48%. Given the elasticity of poverty with respect to income (-0.49), poverty rate should decline by 23.5% from the 2004/5 level. In 2004/5, the poverty rate in Africa was 41% and so even with 4% rate of economic growth, poverty rate will decline to 31.4%, only 5.9 percentage points lower than the expected poverty rate if the current rate of decline in poverty continues in the future. In other words, even a very rapid economic growth in Africa will not help achieve the first MDG target of poverty reduction. Clearly, other social, behavioral,

institutional and infrastructural changes must happen with economic progress to allow Africa achieve the poverty goal of MDG.

It would be interesting to see what would be the impact of poverty reduction on nutritional status of children in Africa if the poverty rate actually declines by about 23.5% to 31.4%. Elasticity of child malnutrition with respect to poverty is +0.241 and so 23.5% decline in poverty should reduce child malnutrition rate by 5.66 percent. In 2004/5, prevalence of malnutrition among children in Africa was 29% and so over the next 10 years, reduction in poverty by 23.5% will reduce malnutrition rate to 27.36%, only marginally lower than the 2004/5 rates. Even if Africa could reach its poverty target of head-count ratio of poverty at 24% (reduction by 58.5%), poverty reduction alone would have reduced the malnutrition rate by 14.1% to 24.9%, much higher than the target of 16.5% of malnutrition prevalence rate in 2015.

Let us now examine the interrelationships among various indicators for Africa alone (excluding the head-count ratio of poverty). For this analysis, we have used cross-country data set for Africa. The data set, as mentioned earlier has information on 48 African countries. For these countries, three variables turned out to be significant in the natural logarithm of child underweight model: log of GDP per capita, log of percent of households with improved sanitation and log of percent coverage of BCG. The coverage of BCG in Africa has already reached a level of 82% and it is unlikely that coverage can increase by more than 16% by 2015 (reaching a coverage rate of 95% by 2015). Even with optimistic growth scenario, per capita GDP growth rate should not be more than 2% per capita per year (increase by 22% by 2015). Assuming 50% improvements in sanitation, we can estimate the effects of all these changes on child malnutrition. The elasticity of child malnutrition rate with respect to GDP per capita was found to be -0.2, with respect to sanitation rate was -0.299 and with respect to BCG coverage

rate was -0.396 (all these coefficients are significant at 1% level or better). Using these elasticity numbers and assuming the improvements for the years 2004 to 2015 mentioned above, total effect on child nutritional status indicator will be to reduce the prevalence of under-weight prevalence by 25%. In other words, child underweight prevalence rate will become 21.75% in 2015 if all the improvements mentioned above arte assumed. This final rate is still much higher than the MDG target for Africa.

Note that this is the most optimistic scenario of the analysis. Even with this very optimistic scenario and using higher than expected elasticity numbers, Africa fails to achieve the child nutrition goal. Achieving the most important MDG goals will not be enough to achieve the nutrition goal. In fact, poverty reduction goal needs to be significantly higher than 50% to achieve 50% decline in child malnutrition.

Even in countries where poverty has shown rapid decline, improvements in nutritional status of children has lagged behind. Changing the nutritional status of children appears much more difficult than reducing the head-count rate of poverty or improving literacy rates. The persistence of high malnutrition rate in developing countries is not at all surprising; nutritional status of children depends not only on income and education but also on child rearing practices of caregivers and overall improvements in infrastructure.

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