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Five Advances Making It Easier to Work on Results in Development:

An Operational Perspective with South Asia Nutrition Examples

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This note broadly discusses how operational staff of a ministry or a development agency can work more effectively on what has become to be known as the Results Agenda. Focusing on the operational perspective of results in development, this note examines the issue of one particular problem–that of reducing chronic malnutrition in South Asia–and highlights how some existing and newly emerging tools might be used to generate a greater results orientation in tackling malnutrition.

Malnutrition in South Asia

As figure 1 highlights, malnutrition is more serious in South Asia than in any other part of the world. Roughly 40 percent of the malnourished children in the world are in South Asia, with by far the greatest number in India.

Besides having a high current burden, progress in reducing malnutrition in South Asia (with the possible exception of Bangladesh) has not been as good as anticipated. Figure 2 presents all observed measurements of malnutrition in the World Bank's World Development Indicators (WDI) database between 1990 and 2009 and highlights the observations of the South Asian countries. It is apparent that only Bangladesh and Pakistan have had substantial changes. Even in Bangladesh and Pakistan, the levels of malnutrition are still high (over 40 percent). In India and Nepal, there has been no notable progress and the levels are still high. In the Maldives and Sri Lanka, the two countries with the lowest levels of malnutrition, the two observations available for each country do not show marked improvement.

The World Bank is currently conducting a major effort to help countries in South Asia reduce malnutrition, which has remained at persistently high levels over the last decade. As part of this effort, the World Bank has developed a South Asia Regional Assistance Strategy for Nutrition, formed a multisectoral team with added staff to work the issue both at headquarters and in the field, and has launched the South Asia Food and Nutrition Security Initiative (SAFANSI), a Multidonor Trust Fund Initiative involving the Department for International Development (DFID, United Kingdom), AusAID, and potentially other partners to help support a systematic, results-oriented approach to generate significant improvement in nutritional outcomes. The SAFANSI initiative will finance activities that: a) generate better evidence and analysis for policy decisions; b) improve awareness of nutrition and advocacy; and c) strengthen institutional capacity to plan and implement effective policies related to food security and nutrition. The results orientation of the SAFANSI work is expected to benefit from several recent advances that make it easier to work on results in development, which are listed below and discussed in greater detail throughout this note.

Figure 1. The Burden of Malnutrition

Ranking	Country	Stunting prevalence	Number of children who are stunted (thousands, 2008)	Percentage of developing world total (195.1 million)
1	India	48	60,788	31.2
2	Ghana	15	12,685	6.5
3	Nigeria	41	10,168	5.2
4	Pakistan	42	9,868	5.1
5	Indonesia	37	7,688	3.9
6	Bangladesh	43	7,219	3.7
7	Ethiopia	51	6,768	3.5
8	Congo, Dem. Rep. of	46	5,382	2.8
9	Philippines	34	3,617	1.9
10	United Republic of Tanzania	44	3,359	1.7
11	Afghanistan	59	2,910	1.5
12	Egypt, Arab Rep. of	29	2,730	1.4
13	Vietnam	36	2,619	1.3
14	Uganda	38	2,355	1.2
15	Sudan	40	2,305	1.2
16	Kenya	35	2,269	1.2
17	Yemen, Rep. of	58	2,154	1.1
18	Myanmar	41	1,880	1.0
19	Nepal	49	1,743	<1
20	Mozambique	44	1,670	<1
21	Madagascar	53	1,622	<1
22	Mexico	16	1,594	<1
23	Niger	47	1,473	<1
24	South Africa	27	1,425	<1
			Total:	80

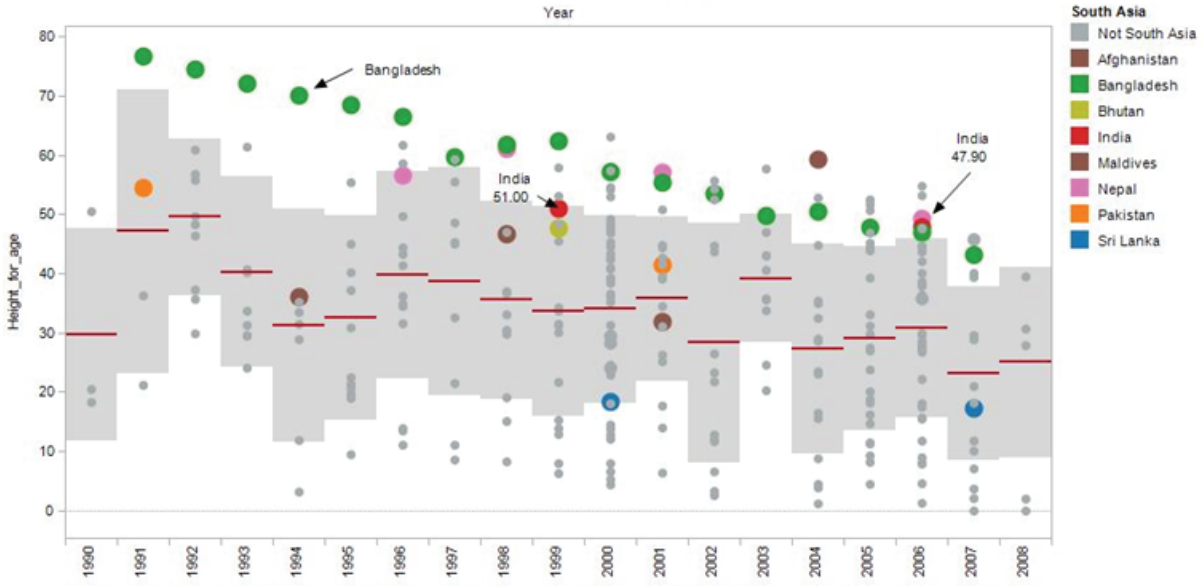
Source: UNICEF (2009).
Note: Estimates are based on the 2006 WHO Child Growth Standards, except for he following countries where estimates are available only according to the previous NCHS/WHO reference population: Kenya, Mozambique, South Africa, and Vietnam. All prevalence data based on surveys conducted in 2003 or later with the exception of Pakistan (2001–2).

1. Increased data availability makes it easier to benchmark.
2. A critical mass of impact evaluation studies is being reached, which has the potential to help reduce uncertainty about what is achievable.
3. Tools are available to enhance operational understanding of the causal chain linking policy actions to results.
4. Advances in visual data analysis make it easier to detect outliers, carry out analysis, and provide guided analytics.
5. New aid instruments are being developed that create greater emphasis on results.

Increased Data Availability Makes It Easier to Benchmark

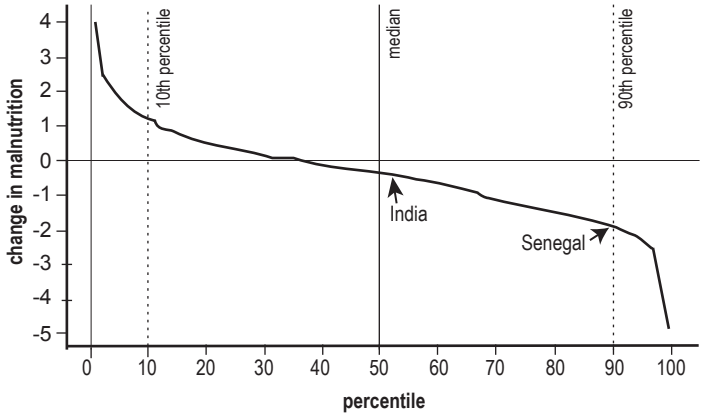
Under its Open Data, Open Knowledge and Open Solutions Initiative, the World Bank recently made its WDI database freely available.[1] This database contains information on multiple indicators for all countries over many years, including data on height for age and weight for age.[2] The availability and accessibility of data make it easy to conduct useful benchmarking exercises, as illustrated in figure 3, which plots a Pen's Parade of the distribution in average yearly changes in height for age for the most recent changes in malnutrition recorded in the World Bank's WDI database.

Figure 2. Malnutrition Across the World and in South Asian Countries (malnutrition measured as height for age)



Source: WDI, World Bank as of October 2010.
Note: All reported measures of height for age in WDI between 1990 and 2009 are reported in this table (a total of 292 observations). The red lines represent the mean of the observations recorded for that year. The shaded area represents +1, -1 standard deviation from the mean. The composition of the sample varies considerably year to year because the frequency of the measurement of malnutrition varies considerably from country to country.

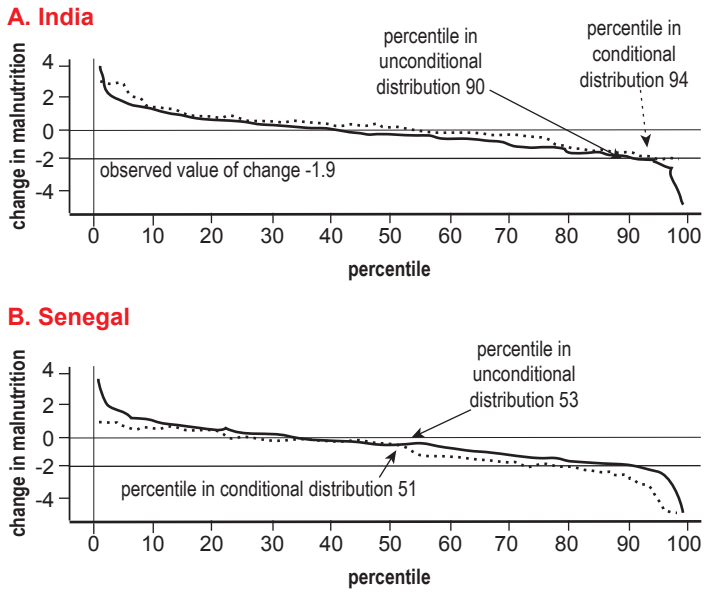
Figure 3. Distribution of Average Annual Changes in Malnutrition



Source: Author's calculations based on WDI database.
Note: Unconditional distribution of changes calculated from most recent changes in malnutrition rates (height for age) reported in WDI as of October 2010.

The changes in chronic malnutrition range from roughly an increase of 4 percentage points to a decrease of 5 percentage points; however 90 percent of the changes are between an increase of 1 point and a decrease of roughly 2 percentage points. The positions of two specific countries have been plotted for illustrative purposes. India's change is close to the median, while that of Senegal is close to the 90th percentile. For countries interested in setting a target for improvement in their nutrition indicator, information on what has been achieved empirically in the past can be useful to ensure that the set targets are reasonable. However, the empirical or unconditional distribution may not provide the best reference distribution. The initial level of malnutrition may differ, or the country could be wealthier or more rural. Indeed, there could be any number of observable factors for policy makers to address while considering a reference distribution. To account for possible dependence of the distribution on initial conditions, it is possible to estimate a series of 99 quantile regressions relating the value of the indicator of interest (in this case the change in malnutrition) to a set of variables on the right hand side of the quantile regression that reflect the initial conditions.[3] Using the set of 99 different estimated coefficients and the values of the right hand side

Figure 4. Unconditional and Conditional Distributions of Change in Malnutrition (Height for Age)



Source: Author's calculations based on WDI database.
Note: Unconditional distribution calculated from most recent changes in malnutrition rates (height for age) reported in WDI as of Oct, 2010. Conditional distributions for India and Senegal obtained by estimating 99 quantile regressions relating the change in malnutrition to the value of malnutrition at the beginning of the period, GDP per capita at beginning of period, average growth of per capita GDP over the period, percent of the population living in rural areas and a constant.

conditioning variables allows one to construct 99 estimated percentiles, thereby generating a conditional distribution (that is, a distribution of outcomes given the characteristics of that country). This makes it possible to relate the actual value of the indicator to where it falls in the estimated conditional distribution. Figure 4 illustrates how this could work for India and Senegal.

While the 99 estimated coefficients are the same, the values of the conditioning variables differ for India and Senegal. For India, the conditional distribution lies mostly to the left of the unconditional distribution, whereas for Senegal, the conditional distribution lies mostly to the right of the unconditional distribution. This suggests that, relative to all countries, it is easier to reduce chronic malnutrition under the prevailing conditions in India than in Senegal.[4]

A critical mass of impact evaluation studies is being reached

Information from existing impact evaluations could be helpful in guiding policy makers on the right mix of interventions to accelerate improvement in nutrition. As a result of the recent interest in impact evaluation, there are an increasing number of impact evaluations being conducted across many disciplines and, at least in some cases, there is now a critical mass to allow for a meta analysis. For nutrition, table 1 illustrates a meta analysis by the World Bank's Independent Evaluation Group (IEG) of 49 different impact evaluations conducted between 2000 and 2009, which found that a wide range of interventions has positively impacted indicators related to height, weight, wasting, and low birth weight (IEG 2010).

While many different interventions had impacts on nutritional outcomes, there was no clear pattern of impacts across interventions. Because of this, the IEG (2010) report stressed the importance of taking note of the context in which the intervention took place and understanding why a particular outcome was achieved. IEG (2010) recommends that when an evaluation finds no significant impact for an intervention that should have had an effect, the team should identify where in the causal chain the program broke down. An example of detecting a breakdown in the causal chain for a nutrition intervention in Bangladesh is shown in figure 5.

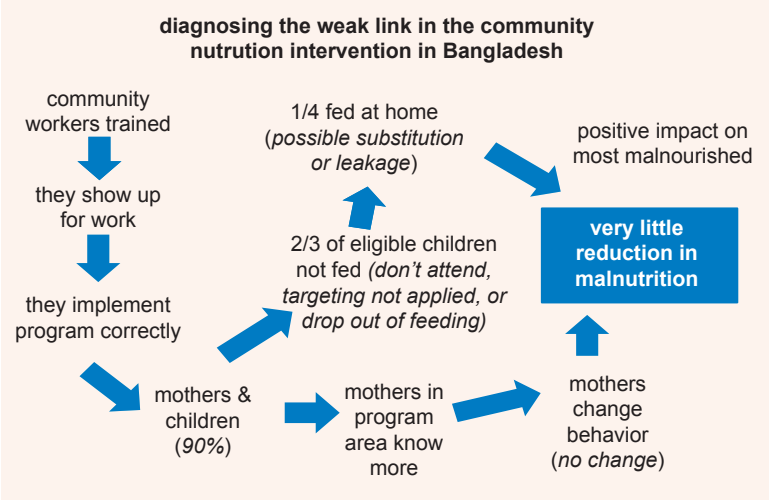
However, it is important to note that the IEG (2010) study has not exhausted the information

Table 1. Interventions with Positive Impact on Malnutrition in WB IEG Nutrition Impact Evaluation Study (number with positive impact/number that measured given indicator)

Intervention	Total number of interventions	Height, HAZ or stunting	Weight, WAZ or underweight	WHZ or Wasting	Birth weight or low birth weight
Conditional cash transfers	9	6/8	2/4	1/2	2/3
Unconditional cash transfers	3	2/3	0/1		
Community-based nutrition	8	3/5	6/8	1/4	
Micronutrient supplements	7	0/1	1/1		5/7
Child feeding or food transfers	5	2/5	2/2	2/2	
Early child development	4	1/3	1/3	1/1	
Integrated health	3	1/3	2/3	1/2	
Deworming	3	1/2	2/3		
Other	4	2/3	1/3	0/2	1/1

Source: IEG (2010).
Note: HAZ = height for age z-score; WAZ =weight for age z-score; WHZ = weight for height z-score.

Figure 5. Breakdown in a Causal Chain



Source: From White and Masset (2007) as reported in Ainsworth (2010).

that can be gleaned from an analysis of the existing studies. Each case could and should be examined separately to see how relevant and informative the experience is for the decisions facing policy makers. As long as the studies help reduce uncertainty in decision making, they support better decisions.

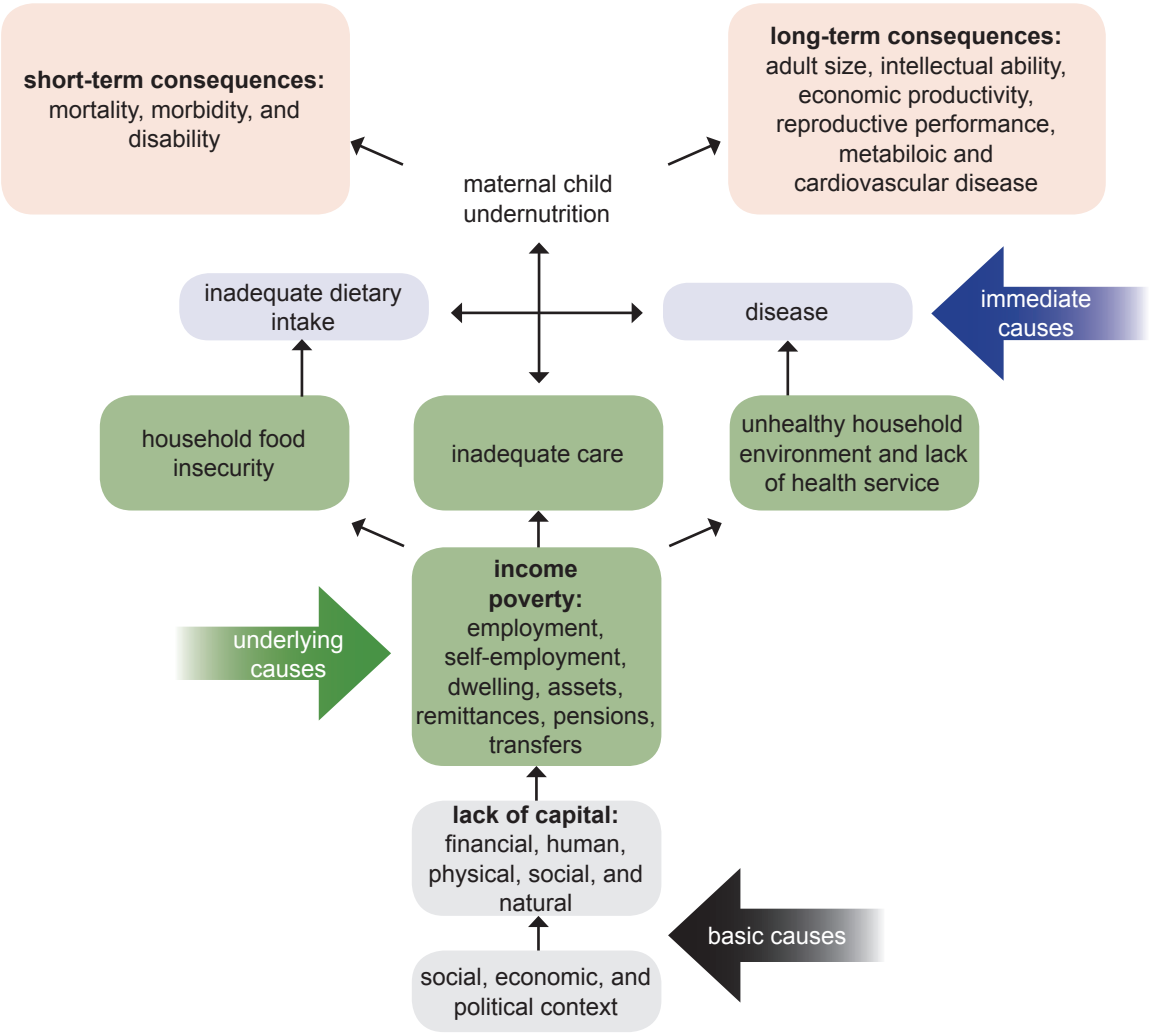
As the number of impact evaluations rises, the marginal value of the additional information would be expected to decline. The marginal value is likely to decline faster if the impact evaluation is designed solely to measure an average treatment effect and only adds one more observation to the distribution of estimated average treatment effects that already exist. A greater value of future impact evaluations is likely to be realized if, as recommended by IEG (2010), an effort is made

to understand not only whether the outcome is different between a treatment and comparison or control group, but also why. This involves conducting process evaluations and collecting data to document the causal chain in parallel.

Tools to Enhance Operational Understanding of the Causal Chain Linking Policy Actions to Results

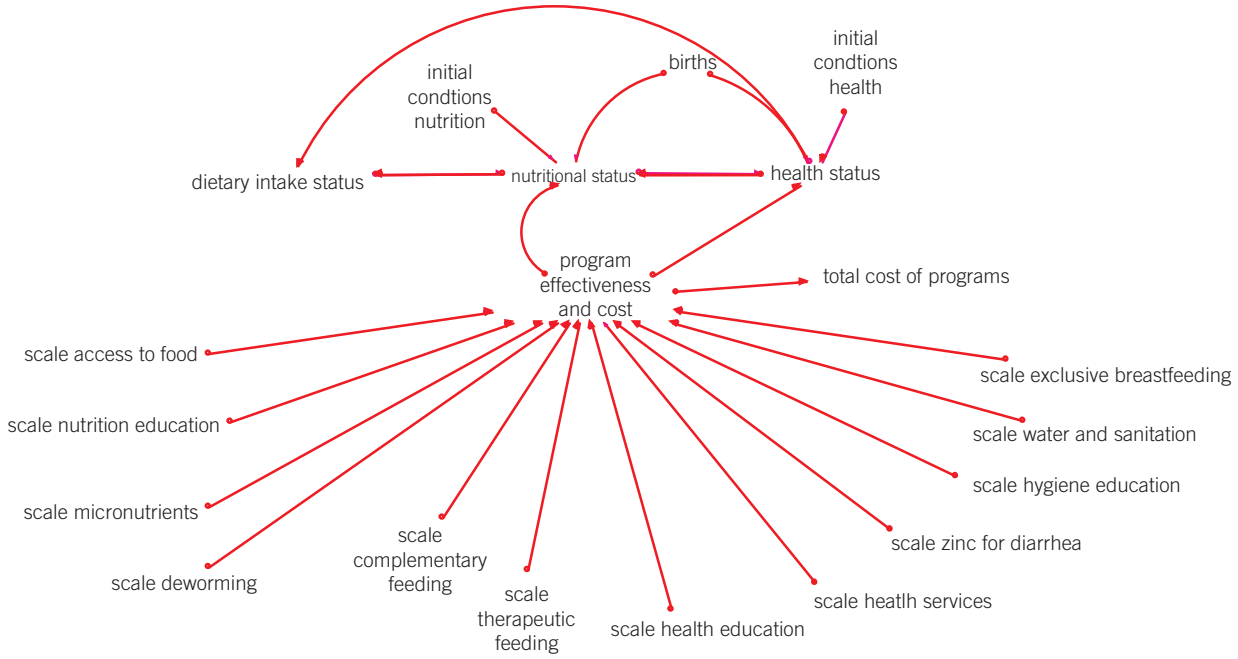
IEG (2010) stressed that understanding what works in large-scale nutrition programs requires information from the entire causal chain. In nutrition, the causal chain involves multiple sectors and can be complex. Fortunately, there are tools available that have been developed in other fields (notably system dynamics) that show promise for building operational understanding of the causal chain. A multisectoral simulation tool is being developed under the South Asia Food and Nutrition Security Initiative to help increase operational understanding of what might be driving nutritional outcomes in Bangladesh and India and what might be required to scale up nutrition interventions to reach desired targets. This tool is being developed to support the Scaling Up Nutrition (SUN) Initiative, a larger worldwide effort. The starting point is the United Nations Children's Fund (UNICEF) framework, which was introduced in 1990 and has long emphasized the importance

Figure 6. A Recent Representation of the UNICEF Framework for Nutrition



Source: Lancet series on Maternal and Child Undernutrition2008. **[[Q: add to Refs list?]]**

Figure 7. High-Level Map from Multisectoral Simluation Tool for SUN



Source: Author's production from Draft Multisectoral Simulation Tool for Scaling Up Nutrition.

of taking a multisectoral approach. Figure 6 is a recent representation of the UNICEF framework for nutrition.

This framework clearly illustrates the multisectoral nature of nutrition, but does not really help countries come up with quantitative estimates of what a district or country may need to do. For that, one needs a more operational version of the UNICEF framework that makes clear links between some of the activities and the outcomes and accounts explicitly for a district or country's initial conditions.

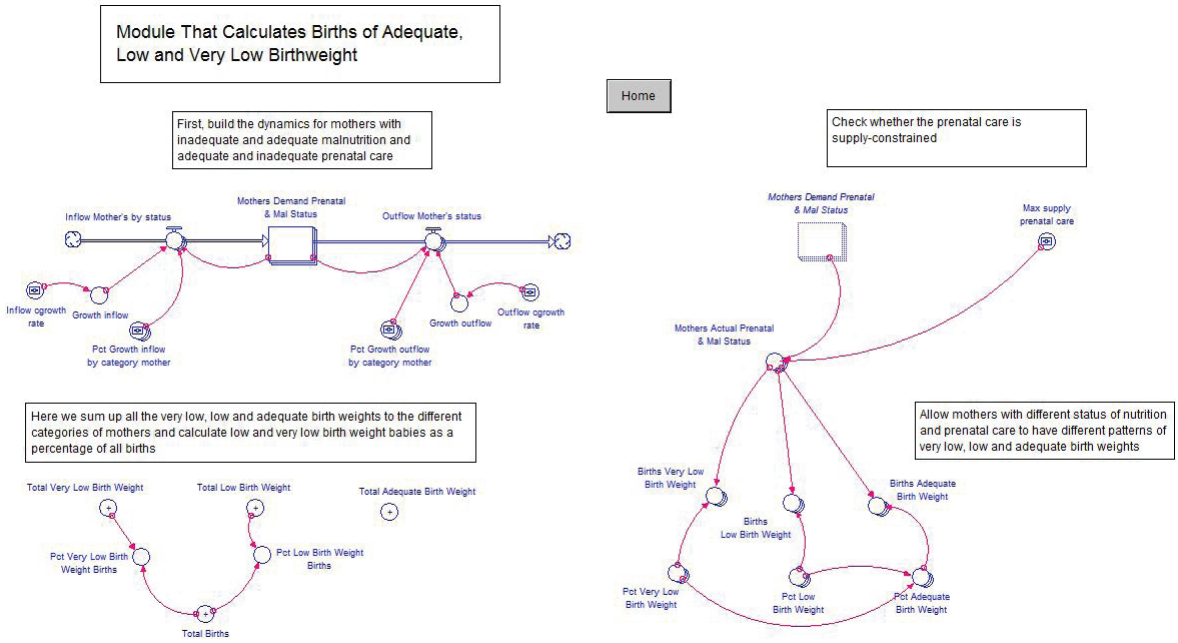
Figure 7 illustrates an initial high-level map from the multisectoral simulation tool that shows there is a relationship between health status and nutritional status and that the effect goes in both directions. It also shows that this interaction depends upon the outcome of births and on the initial conditions associated with the drivers of nutritional and health status. Finally, the high-level map identifies some specific interventions that, depending on their program effectiveness and scale, would be expected to affect nutritional status directly or indirectly via health status.

What goes on in one box affects what happens in another, and the feedback can go in both directions. For example, children who are malnourished are more vulnerable to illness, but children who are sick are also more likely to lose nutrients and go from being adequately nourished to being malnourished. This is a negative feedback loop that is difficult to handle in many models, but not in system dynamics models. Indeed, system dynamics was developed precisely to deal with feedback loops.

Individual interventions are taken from SUN's list of interventions. Within each box, one would have to go into some detail describing what the initial conditions are and what resources would be necessary to scale up. The box on effectiveness is a placeholder where one would define explicitly what is known about the effectiveness of the different interventions. If the effectiveness is not known or is known only with a high degree of uncertainty, one can work with ranges of estimates and see how, in the simulation, the outcomes vary according to the estimates of the effectiveness. An example of what is done when one clicks on a box is shown in figure 8, which is a stock flow diagram that is typical of a system dynamics model.

Figure 8 illustrates how one particular part of the problem—that of having low or very low birthweight babies—is captured in the module of births. At any given time in a particular district or

Figure 8. Stock Flow Diagram of Births



Source:Author's production from Draft Multisectoral Simulation Tool for Scaling Up Nutrition.
Note: bw = birthweight.

country, there are a distribution of women who differ in their own nutritional status and in the prenatal care that they received. Those women who have adequate nutrition and who receive adequate prenatal care tend to have a greater proportion of babies born with adequate birth weight (2500 grams and above) than those women who either had poor nutrition themselves or who did not receive prenatal care. The proportion of very low, low, and adequate birth weight babies born to different types of mothers can be estimated from survey data. Given these proportions and given the number of women in each category, this will generate a flow of births with very low, low, and adequate birth weights for the population as a whole. At the same time, there can be policies and programs that affect the birth outcomes by, for example, changing the number of women who receive adequate prenatal care. The complexity of the problem is evident from the fact that this module looks only at one part of the problem—what is driving the birthweight. Once the babies are born, there are other dimensions that affect whether a baby will be malnourished and other policies that need to be put in to place to block a child from becoming malnourished. Each part of the problem needs to be considered. By working with the high level map, the detailed map relating the causal model of malnutrition and the model of the interventions needed to block children from becoming malnourished, one can gain an operational understanding of what is needed to improve malnutrition and, most importantly, get some idea of the scale of the effort that will be needed to match the scale of the problem.

To conduct the simulations, it is necessary to assign some quantitative values to the variables in the model. Some of the necessary parameter values will come from impact evaluation studies. In practice, it is often possible to generate useful ranges of estimates through a process of calibrating expert responses. However, there will likely be some variables or relations with rather larger uncertainty. Simulations can help determine which uncertain variables

Box 1. Clarification Chain

1. If it matters at all, it is detectable/observable.
2. If it is detectable, it can be detected as an amount (or range of possible amounts).
3. If it can be detected as a range of possible amounts, it can be measured.

Source: Hubbard 2010.

have the most influence on the outcomes. It may be worthwhile to spend real resources to carry out some measurement to reduce uncertainty. Hubbard (2010) provides some useful advice on measurement that is summarized in what he calls a "clarification chain" (box 1).

One of the advantages of this multisectoral simulation tool over others is that the simulation is not a black box. What is put front and center are the relations among key stocks and flows, and the problems can be broken down into manageable chunks. These models can be worked on collaboratively in person or over the Internet using Skype or other Internet-conferencing software. Moreover, the simulations can also be run interactively over the Internet,[5] allowing a local official in a district, representatives of ministries of public works, health and planning in a capital city, and experts from Seoul and Geneva to all meet virtually, run simulations, and use the simulations to increase operational understanding.

It is important to recognize the need for an iterative process. After initial work creating explicit mental models that different actors have and trying to come up with a shared vision of what is driving the system, the interventions will take place and the initial results will become known. If the results are not what as expected, the first thing to check is whether the planned actions were actually carried out. If they were, then it could be that the parameter values were incorrect. If the interventions were carried out as planned and the parameter values were largely as expected, then it is possible that the system driving the results was not working as anticipated. In that case, it would be necessary to revisit the explicit models of the system's design.

The hypothesis behind this approach is that a more systematic approach[6] may allow a country or district to reach a goal in 5 years instead of 10. In the case of malnutrition in South Asia, this would translate into millions more children growing up with an enhanced ability to learn and a reduced risk of dying.

Visual Data Analysis Advances Help Detect Outliers, Conduct Analysis, and Provide Guided Analytics

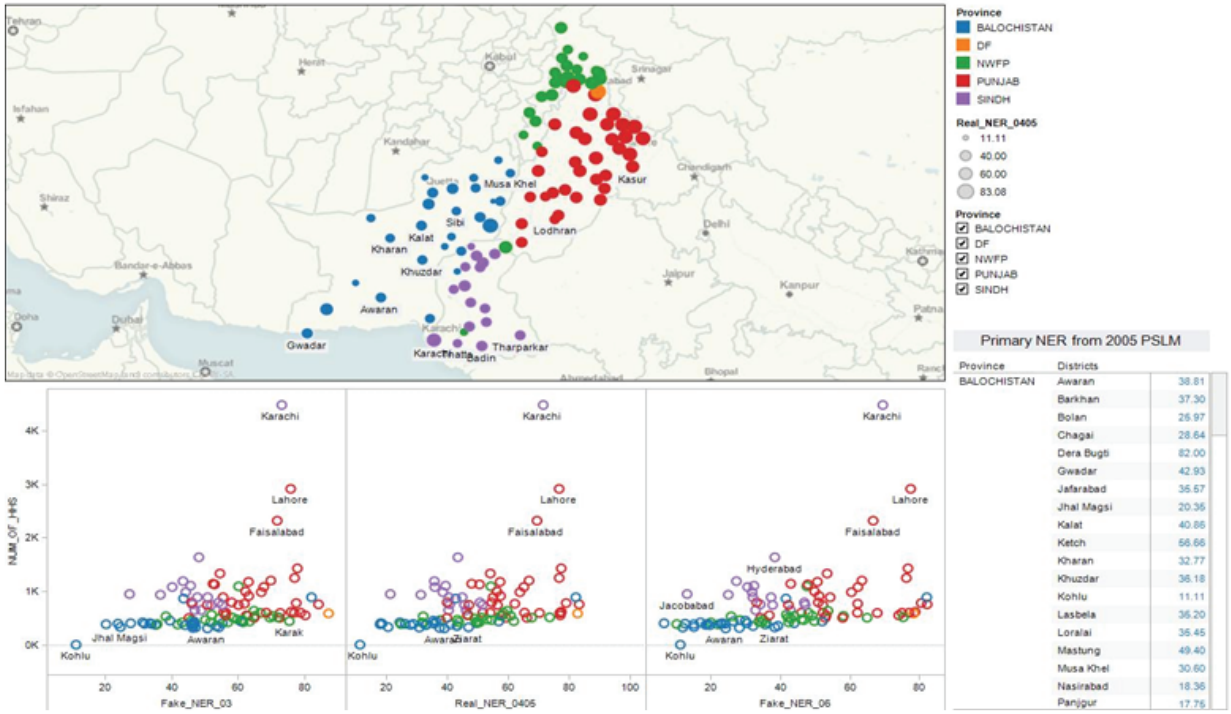
Another significant technological advance that makes it easier to work on results in development is the advancement of extremely powerful and easy-to-use software to carry out visual data analysis.[7] One important contribution of visual data analysis is the improvement in the quality of data collected using mobile platforms. By combining mobile phone data collection and visual data analysis, one can compare recorded data with the entire distribution of recorded data in real time—not just the data that are collected from a narrow geographic area. Data visualization software can be used to quickly highlight suspicious data and the supervisor can then send additional questions down to the interviewer's phone to ascertain whether the unusual result is real or some artifact of the data.

An example of how data visualization software can be helpful in detecting outliers is provided in figure 9, which presents two dashboards showing data on net enrollment rates in Pakistan. The two dashboards are identical, except for the highlighted areas. The first dashboard shows all of the data, including for all of the provinces. The second dashboard includes only the data related to the Balochistan province, revealing that one of the data points appears to be considerably different.

Data visualization software is useful not just to help improve data quality, but also for analysts to see patterns and to communicate those patterns to policy makers. Figure 10 provides an example of visual data analysis that is quite rapid and easy to perform. It uses data from the 2007 Demographic Health Survey (DHS) from Bangladesh and compares side by side the observations that are considered to have inadequate environmental health and care with those that are considered to have adequate environmental health and care. By clicking on the boxes in the upper right hand corner, one can easily change what is displayed. There is a slider on the age in months (which is not visible), but can be moved to show the results for different ranges of ages. As the ages change, the predicted trend lines also change. The observations in orange in both cases correspond to those children who are considered malnourished, with a z-score 2 or above. This figure clearly shows that the criteria of adequate environmental health and care does seem to make a difference (as expected, given the UNICEF framework), but that there are many more children with inadequate environmental health and care than there are with adequate health and care.

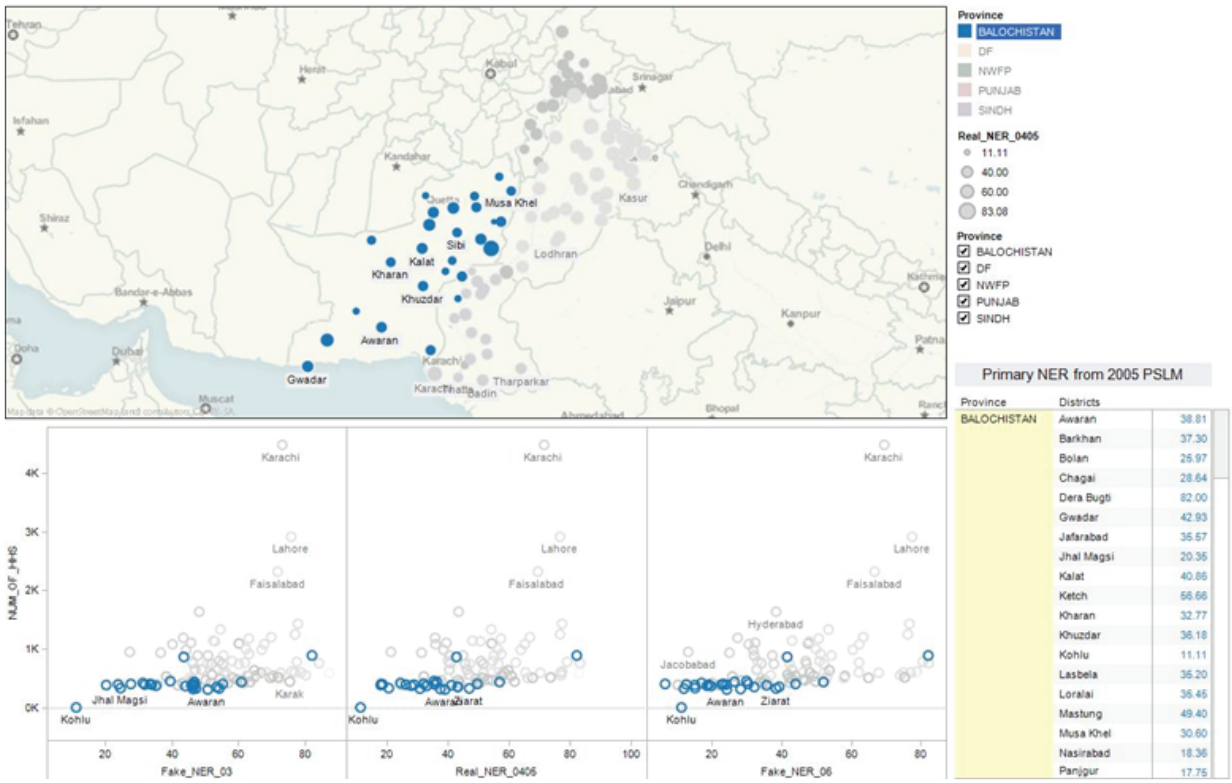
Figure 9. District Primary Net Enrollment Rates in Pakistan

Panel A



Province	Districts	
BALOCHISTAN	Awaran	38.81
	Barkhan	37.30
	Bolan	25.97
	Chagai	28.64
	Dera Bugti	82.00
	Gwadar	42.93
	Jafarabad	35.57
	Jhal Magsi	20.35
	Kalat	40.86
	Ketch	56.66
	Kharan	32.77
	Khuzdar	36.18
	Kohlu	11.11
	Lasbela	36.20
	Loralai	35.45
	Mastung	49.40
	Musa Khel	30.60
	Nasirabad	18.36
	Panjgur	17.75

Panel B



Province	Districts	
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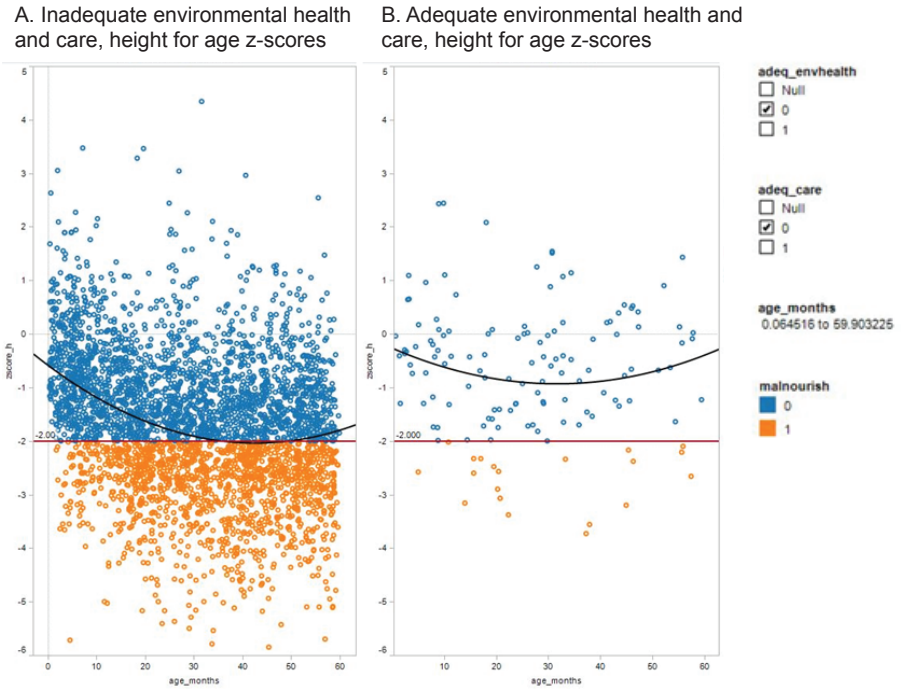
	Chagai	28.64
	Dera Bugti	82.00
	Gwadar	42.93
	Jafarabad	35.57
	Jhal Magsi	20.35
	Kalat	40.86
	Ketch	56.66
	Kharan	32.77
	Khuzdar	36.18
	Kohlu	11.11
	Lasbela	36.20
	Loralai	35.45
	Mastung	49.40
	Musa Khel	30.60
	Nasirabad	18.36
	Panjgur	17.75

Source: Author's calculation.

Figure 10. Bangladesh Demographic and Health Survey 2007

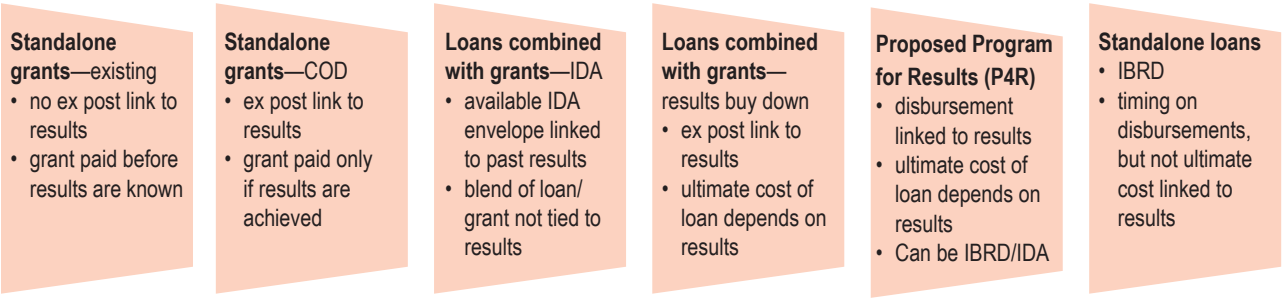


Source: Author's calculation based on 2007 Bangladesh DHS.

New Aid Instruments Are Creating Greater Emphasis on Results

Largely because of the increased focus on results in development, there is currently an active discussion around new aid instruments that are more directly related to results. One innovation is the cash on delivery instrument suggested by the Center for Global Development (Birdsall and Savedoff 2011). In this model, aid is provided per unit of measurable outcome and the country is free to develop the solutions that it considers most appropriate. There would be no financial link to the inputs that might be needed to achieve the outcome. A second innovation is a results buy-down, which has been used for polio eradication.[8] Under this arrangement, a country takes out a loan with a development agency such as the World Bank, and, if performance targets are met, grant money is used to buy down the cost of the loan. The buy-down could be structured to cover some, part, or all of the interest and principal. A third innovation is the proposed Program for Results (P4R) lending instrument that would link disbursements to the achievement of results. Figure 11 illustrates how these three instruments fit within the existing spectrum of aid instruments.

Figure 11. An Expanded Spectrum of Aid Instruments



Source: Author's compila ion.

These lending instruments have not yet been considered for use with nutrition, but there have been some initial discussions on considering a cash-on-delivery model for nutrition. Even if these instruments might not be used for international aid for nutrition, the mechanisms could be used for intergovernmental transfers within a country.

Over and above the results incentive contained in the aid instrument, there is the issue of how financial resources can be provided to support multisectoral investments when the initial conditions differ so much across different districts or regions. A traditional loan or project to implement just one type of intervention does not seem to be a good fit for reducing malnutrition. In that respect, experiences with Social Investment Fund projects, which have been implemented widely in Latin America and Africa, offer an intriguing model for nutrition. In these projects, there is a menu of eligible interventions and the local agency picks from the menu. Since there is now close to a consensus on what the menu of interventions should be, this would be easy to define for nutrition. There is typically a matching fund requirement, but local groups would get to pick the interventions that they think would have the biggest impact on nutrition. This lending instrument could be complemented by support for the decision-making process, helping local authorities decide what to select. Each selection constitutes a piece of information that could be analyzed to see under what circumstances local districts chose what interventions and what happened to the outcomes over time. The tools described in this note could help guide the choices: there could be a useful marriage of the lending instrument that allows local groups to customize what they receive (within a given structure defined by the menu) and the tools used to help guide the decisions.

Conclusions

This note describes recent advances that make it easier to work on results in development. One of the advances utilizes the growing number of impact evaluations, but that is only one of the areas where advances have been made to further progress on the Results Agenda. A common thread going through this note was variation and the need to better understand why outcomes are different. This was an important conclusion of the IEG (2010) study, but the importance of variation surfaced in the discussion of many of the advances; increased data availability and benchmarking draw attention to the variability of outcomes. The multisectoral simulation tool helps determine how some of the factors operate in the system to generate variability. The visual data analysis makes it easier to detect and drill down to see additional detail on the variability. A lending instrument for nutrition based on the Social Investment Fund model provides a means of creating a large-scale program that is still able to customize the intervention to the particular circumstances prevailing in a particular location.

A second important thread going through this note was data: the approaches to improving performance in nutrition are data intensive. Fortunately, the costs and ease of using data have dramatically improved in recent years. Making better use of data has helped many sectors improve performance and there is scope to improve performance in nutrition and, more generally, in development. There is reason to be optimistic that countries in South Asia will be successful in accelerating their pace of improvement in nutrition, particularly with the use of the advances described in this note to help them achieve their targets.

About the Author

John Newman is the *Lead Economist* for the *Economic Policy and Poverty Sector* in the *South Asia Region* of the *World Bank*.

Acknowledgments

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Notes

1. For further information, visit: http://data.worldbank.org/.

2. More detailed and extensive information on nutrition indicators has been available for some time from the Demographic and Health Surveys (DHS) conducted worldwide by ICF Macro with funding from the United States Agency for International Development (see http://www.measuredhs.com). The raw data can be downloaded and it is also possible to interactively select indicators of interest.

3. This approach is described in Newman and others (2010).

4. Additional information is in Newman (2010).

5. The simulations could be run using NetSim (www.iseesystems.com) or using Forio, an interesting hosting service that allows one to upload simulation models to the Internet and run them interactively with multiple users from different locations (see www.forio.com).

6. This approach follows essentially the Plan, Do, Study, Act cycle also known as the Deming cycle or Shewart cycle (see http://en.wikipedia.org/wiki/PDCA). It also follows the logic of the World Bank's own project cycle. The difference is that this approach attempts to make more explicit the mental model of what is often only held implicitly.

7. One powerful package is Tableau Software (www.tableausoftware.com). If a country or district is prepared to make its data publically available, it can use Tableau Public for free to publish data to the Internet.

8. See http://www.fininnov.org/img/pdf/19%20-IDA%20buydowns%20Nigeria.pdf for a presentation on an experience in Nigeria.

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