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Using LiST to model potential reduction in under-five mortality in Burkina Faso

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Abstract

Background: Under-fi e mor ali remain high in B rkina Fa o i h ignifican red c ion re ired o mee Millenni m De elopmen Goal 4. The Accelera ion for Ma ernal, Ne born, and Child Heal h i being implemen ed o red ce child mor ali in he Nor h and Cen er Nor h region of B rkina Fa o.

Methods: The Li e Sa ed Tool a ed o de ermine he percen red c ion in child mor ali ha can be achie ed gi en ba eline le el of co erage for in er en ion ar ge ed b he Accelera ion. Da a e e ob ained from he Demographic and Heal h S r e 2003, he M l iple Indica or Cl er S r e 2006, and he ba eline r e for he prograam from 2010. In addi ion o he cale p, cenario e e genera ed o e amine he o come if ec lar rend in in er en ion co erage change per i ed and if in er en ion co erage le el remained con an .

Results: Scaling p all in er en ion o hei r ar ge co erage le el ho ed a po en ial red c ion in nder-fi e mor ali of 22 percen , i h di ric pecific red c ion in mor ali ranging from 14 o 25 percen . The percen red c ion in nder-fi e mor ali ha migh be a rib able o he progam a 16 percen and aried be een 14 and 19 percen b di ric . Trea men of diarrhea i h ORS and malaria i h ACT acco n ed for he majori of he red c ion in mor ali .

Conclusions: The e finding gge ha ignifican red c ion in nder-fi e mor ali ma be achie ed hro gh he cale- p of he Accelera ion. The Mini r of Heal h and i par ner in B rkina Fa o ho ld con in e hei r effor o cale p he e pro en in er en ion o achie e and e en e ceed ar ge le el for co erage.

Background

Burkina Faso remains a country with high under-five mortality. According to the Demographic and Health Survey (DHS) of 2003 the under-five mortality rate was 184 deaths per 1,000 live births, with mortality in rural areas reaching 202 deaths per 1,000 live births [1]. Results from the 2010 DHS confirm that under-five mortality has been declining [2], but significant reductions in mortality must be achieved for Burkina Faso to meet its Millennium Development Goal 4 target of 68 deaths per 1,000 live births [3].

Malaria, pneumonia, and diarrhea are important contributors to child deaths in Burkina Faso and globally, accounting for 24, 18, and 12 percent of under-five mortality in Burkina Faso and 7, 18, and 11 percent of under-five mortality globally, respectively [4]. Neonatal mortality accounts for 22 percent of deaths to children under five in Burkina Faso and 40 percent globally. Figure 1 shows the distribution of deaths in Burkina Faso by cause [4].

In 2008, the Ministry of Health (MoH) began a strategy to accelerate the scale-up of interventions with proven impact on maternal, neonatal, and child health. The program, called the Acceleration for Maternal, Neonatal and Child Health ("Acceleration"), is being implemented in nine districts in the North and Center North regions. Malaria treatment with artemisinin combination therapy (ACT) and diarrhea treatment with oral rehydration solution (ORS) and zinc are provided at the community level in all nine districts; treatment of pneumonia with oral antibiotics is provided in two districts as a pilot. By the end of 2010, all districts had trained volunteer com-

received drug kits. In addition to community case management (CCM) of childhood illness, the Acceleration targets the rapid scale-up of several other maternal, neonatal and child health interventions. Table 1 presents a list of all program interventions included in the Acceleration and their target coverage levels for 2013.

An ongoing independent evaluation of the Accelera-

Saved Tool (LiST) to model the impact of program scale-up upon under-five mortality rates using the measured baseline values and program targets. A previous analysis of the Acceleration using LiST was instrumental in establishing the intervention-specific targets for the program [5].

Methods

Lives Saved Tool (LiST)

LiST is a state-of-the-art modeling software package that uses available demographic and epidemiologic data to predict the effect that changes in coverage of health interventions will have on neonatal, under-five and maternal mortality [6]. It allows the user to model counterfactual scenarios to calculate not only the impact of a projected scale up of a health program, but also the impact relative to any number of alternate scenarios. LiST draws upon the technical expertise of the Child Health Epidemiology Reference Group (CHERG) [7] for estimation of key inputs, such as cause-specific mortality by country and intervention effectiveness. A description

concerned that the higher coverage value in 2003 or 2006 compared with 2010 might not reflect a real decrease in coverage over time. Instead, the higher value in 2003 or 2006 might have resulted from the use of national rural data from these surveys, rather than region- or district- level rural data. Where this conflict occurred, the coverage values from the LiST survey were considered more representative of the population of interest, and the 2010 values were used in place of the 2003 or 2006 survey values. Under this approach, for these interventions and districts we assumed there was no change in coverage in the projection prior to 2010, resulting in a flat secular trend for these interventions.

Three scenarios were considered for the period 2010 to 2013 (Figure 2). First, the fixed-coverage scenario held coverage of all interventions constant at their 2010 level through 2013. Secondly, the scale-up scenario held coverage of all non-program interventions constant at their 2010 level and scaled up all program interventions to meet the MoH targets in 2013. In instances where the coverage target had been achieved by baseline, we assumed that coverage continued to increase to 2013, using the same annual rate of change observed prior to 2010. See Table 2 for baseline and endline coverage levels for program interventions used in the scale -up scenario by district. A final projection predicted the decrease in under-five mortality if the observed changes in intervention coverage during the reference period (2003 or 2006 through 2010) continued through 2013. These trends were calculated by applying the annual rate of change in coverage of an intervention prior to 2010 to the period 2010-2013. This projection assumed that once a secular trend caused coverage to reach 90%, then coverage of that intervention would cease to increase. Chloroquine for treatment of malaria was phased out of Burkina Faso beginning in 2005-2006, and use of ACTs was extremely limited at the time the 2006 MICi.9.7634-8(ed)-352(at)-346(th)-8(e)-343(t123[(ent)4(a)1(ti)5(

reductions in mortality under the scale-up scenario, as shown in Barsalogho and Kongoussi districts (25% and 22% reductions, respectively). Districts where baseline coverage of the treatment interventions was higher, such as Titao and Séguénéga, experienced relatively smaller reductions in mortality.

The difference between the reduction in under-five mortality as a result of scaling up the program interventions and the reduction in under-five mortality due to secular trends in coverage change provides an approximation of the percentage reduction in mortality attributable to the program. There was large variation in program-attributable mortality reductions in mortality by district, with the largest reductions in Boulsa, Barsalogho, Kongoussi and Titao districts. Scaling up the program interventions in these districts accounted for reductions in under-five mortality that were 14 to 19 percentage points greater than the anticipated reductions in under-five mortality due to secular trends.

Table 3 shows the results for the intervention-specific reductions in mortality in all 16 districts if the program targets are met. The three interventions responsible for the largest reduction in mortality were case management of malaria, diarrhea, and pneumonia. The reductions in mortality that would be achieved by scaling up the interventions individually are very similar to the intervention-specific contributions to reduced mortality from scaling up all interventions simultaneously.

Each of the scale up projections was also examined to

mortality in some districts but none in others. Reasons for these findings are explored in the following section.

Discussion

The results of the scale up scenario predict a reduction in mortality in each of the program districts, although the magnitude of the reduction varies greatly between districts. The Ouahigouya and Séguénéga districts of the North region show lower reductions in mortality than the other districts. The reduced program impact in these districts is consistent with the higher baseline coverage levels of the treatment interventions in these districts. Similarly, the lower baseline coverage level of the treatment interventions in Barsalogho, Boulsa and Yako districts explains the increased program impact in these districts.

Case management of malaria with ACTs, diarrhea with ORS and pneumonia with oral antibiotics were the program interventions with the most impact wherever they were implemented. This is due in part to the close relationship between these interventions and the cause of death distribution in Burkina Faso, where malaria, diarrhea, and pneumonia account for 49% of under-five mortality. Interventions targeting maternal and neonatal mortality, such as antenatal care and intermittent pre-

survey data, and intervention effectiveness data are estimated from study results. Country-specific cause of death structures are also modeled estimates. An uncertainty analysis tool for LiST is in development and will be included in the software in the future.

Conclusions

This analysis sought to assess the potential mortality reduction resulting from the Acceleration program in two regions of Burkina Faso. The results suggest that a reduction in under-five mortality ranging from 14% to