

Review of evidence on stunting and fertility for Burundi's context

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1. OBJECTIVE

The objective of this exercise is to review the evidence on the link between stunting and fertility in developing countries as well as determinants of stunting in Burundi to inform the preparation of a project funded by the World Bank on Investing in Early Years in Burundi. The overarching objective is to understand barriers to better health outcomes, to identify gaps in knowledge and potential entry points for the project.

2. LINKING MALNUTRITION AND FERTILITY/ ADOLESCENT HEALTH FOR BURUNDI'S CONTEXT

- **Concept of “stunted families”:** Stunting has intergenerational effects on the cycle of poverty and reduced human capital¹
 - Women who were stunted in childhood tend to have stunted offspring as well
 - Maternal height was strongly associated with stunting prevalence at 2 years was noted in several cross-sectional studies²³⁴
 - Low birthweight is more common among infants who have had mothers and grandmothers that were stunted during early childhood⁵
 - Maternal height is associated with birth size and postnatal stunting:
 - A longitudinal analysis of data from five birth cohorts in Brazil, Guatemala, India, Philippines, and South Africa (n=7630 mother-child pairs) showed there was a 0.15-0.55, p<0.001 correlation between maternal height and offspring height at all ages (conditional height measures were used to control for collinearity of multiple growth measures), after adjusting for household income, child sex, birth order and study site⁶

¹ Prendergast, A. J., & Humphrey, J. H. (2014). The stunting syndrome in developing countries. *Paediatrics and international child health*, 34(4), 250-265.

² Monden, C. W., & Smits, J. (2009). Maternal height and child mortality in 42 developing countries. *American Journal of Human Biology*, 21(3), 305-311.

³ Özaltin, E., Hill, K., & Subramanian, S. V. (2010). Association of maternal stature with offspring mortality, underweight, and stunting in low-to middle-income countries. *Jama*, 303(15), 1507-1516.

⁴ Subramanian, S. V., Ackerson, L. K., Smith, G. D., & John, N. A. (2009). Association of maternal height with child mortality, anthropometric failure, and anemia in India. *Jama*, 301(16), 1691-1701.

⁵ Victora, C. G., Adair, L., Fall, C., Hallal, P. C., Martorell, R., Richter, L., ... & Maternal and Child Undernutrition Study Group. (2008). Maternal and child undernutrition: consequences for adult health and human capital. *The lancet*, 371(9609), 340-357.

⁶ Addo, O. Y., Stein, A. D., Fall, C. H., Gigante, D. P., Guntupalli, A. M., Horta, B. L., ... & Richter, L. M. (2013). Maternal height and child growth patterns. *The Journal of pediatrics*, 163(2), 549-554.

- Maternal health and birth spacing is crucial as stunting begins *in utero*, with little recovery after the first 24 months of the child⁷
 - Analyses from previous 19 birth cohorts attributing 20% of stunting to *in utero* origins⁸⁹
 - Closely spaced births increased nutritional demands on mother
 - In Burundi, households with more than two children under 5 years old are more likely to be severely stunted (cOR=1.3, 95% CI: 1.1-1.17; p<0.03) than households with two or less¹⁰
 - Analyses using Burundi DHS2010 data similarly found that the **dependency ratio** (along with gender, age, mother's age, wealth index, and region of residence related with stunting) was associated with stunting in Burundi¹¹
 - Burundi: Living in a couple was associated with severe stunting (cOR:1.5; 95% CI: 1.2-1.8; p=0.001)¹²

3. DETERMINANTS OF STUNTING IN BURUNDI

National cross-sectional household survey conducted from 2014 baseline and follow-up surveys across 90 health centers and 6,480 households with children aged 6-23 months old. Data was collected from logbooks, in-depth interviews and focus group discussions. Response rate was 95.7% (n=6199) and stunting rates among sample population (53% stunting, 23% severe stunting among children aged 6-23 months) roughly correlates to Burundi 2010 DHS stunting rates (58%).

3.1. Child-level variables associated with stunting/ severe stunting¹³

- **Gender:** Being male was found to be more associated with stunting (cOR=1.4; 95% CI: [1.3-1.5]; p<0.001) and severe stunting (cOR=1.7; 95% CI: [1.5-1.9]; p<0.001)
- **Relative age of child stunting:** Children aged 12-17 months were two times more (95% CI: [1.8-2.3] for stunted and 95% CI:[1.7-2.4] for severely stunted, p<0.001), and children aged 18-23 months were 3 times more (95% CI:2.7-3.4 for stunted and 95% CI:2.5-3.4 for severely stunted, p<0.001) likely to be stunted than children aged 6-11 months

⁷ Rahman, M. M. (2015). Is Unwanted birth associated with child malnutrition in Bangladesh?. *International perspectives on sexual and reproductive health*, 41(2), 80-88.

⁸ Onis, M., & Branca, F. (2016). Childhood stunting: a global perspective. *Maternal & child nutrition*, 12(S1), 12-26.

⁹ Christian, P., Lee, S. E., Donahue Angel, M., Adair, L. S., Arifeen, S. E., Ashorn, P., ... & Hu, G. (2013). Risk of childhood undernutrition related to small-for-gestational age and preterm birth in low-and middle-income countries. *International journal of epidemiology*, 42(5), 1340-1355.

¹⁰ Nkurunziza, S., Meessen, B., & Korachais, C. (2017). Determinants of stunting and severe stunting among Burundian children aged 6-23 months: evidence from a national cross-sectional household survey, 2014. *BMC pediatrics*, 17(1), 176.

¹¹ UNICEF . Analyse de la malnutrition des enfants au Burundi. Bujumbura: UNICEF; 2013.

¹² Nkurunziza, S., Meessen, B., & Korachais, C. (2017). Determinants of stunting and severe stunting among Burundian children aged 6-23 months: evidence from a national cross-sectional household survey, 2014. *BMC pediatrics*, 17(1), 176.

¹³ Nkurunziza, S., Meessen, B., & Korachais, C. (2017). Determinants of stunting and severe stunting among Burundian children aged 6-23 months: evidence from a national cross-sectional household survey, 2014. *BMC pediatrics*, 17(1), 176.

- **Location of birth:** Children born at home were more likely to be stunted (cOR=1.4; 95% CI: 1.2-1.6; $p<0.001$) and severely stunted (cOR=1.3; 95% CI: 1.1-1.5; $p=0.001$) than those born in health facilities

3.2. Parental-level variables associated with stunting/ severe stunting¹⁴

- **Education of parents:** Children whose mothers had no education are more likely to be stunted (cOR=2.3; 95% CI: 1.7-3; $p<0.001$) and severely stunted (cOR= 2.0; 95% CI: 1.3-2.9; $p<0.001$) than those whose mothers reached secondary school and above
 - Multivariate regression analyses estimated that universal primary schooling would reduce stunting by 2.5%, middle school would reduce by 6%, and upper secondary completion would reduce by 10.3%¹⁵
- **Ability of mother to discern nutritional status:** Children whose mother was not able to assess correctly the nutritional status were more likely to be stunted (cOR=3.4; 95% CI: 3.1-3.8; $p<0.001$) and severely stunted (cOR=1.2; 95% CI: 1.1-1.14; $p<0.001$) than mothers who were aware
- **Marital status of mother:** Living in a couple was associated with severe stunting (cOR:1.5; 95% CI: 1.2-1.8; $p=0.001$)

3.3. Household-level variables associated with stunting¹⁶

- **Household head does not have a secondary education or above:** Children from a non-educated household head were more likely to be stunted (cOR=1.9; 95% CI: 1.4-2.4; $p<0.001$) and severely stunted (cOR=2.1; 95% CI: 1.4-3.0; $p<0.001$)
- **Walking distance from health center:** Children who lived more than one hour walking from a health center were more likely to be stunted (cOR=1.9; 95% CI: 1.4-2.4; $p<0.001$) and severely stunted ((cOR=2.1; 95% CI: 1.4-3.0; $p<0.001$) than those living less than 30 minute walking
- **Severe food insecurity at the household level (HFIAS scale):** Children from households experiencing severe food insecurity were more likely to be stunted and severely stunted relative to those living in food security households
- **Number of children under 5 in the household (birth spacing):** Households with more than two children under 5 years old are more likely to be severely stunted (cOR=1.3, 95% CI: 1.1-1.17; $p<0.03$) than households with two or less. Similar results found from DHS 2010 analyses.¹⁷

4. GAPS IN THE EXISTING RESEARCH

- In general, there is little understanding of the pathogenesis of stunting and the most effective interventions to promote health growth, especially with children in developing countries

¹⁴ Nkurunziza, S., Meessen, B., & Korachais, C. (2017). Determinants of stunting and severe stunting among Burundian children aged 6-23 months: evidence from a national cross-sectional household survey, 2014. *BMC pediatrics*, 17(1), 176.

¹⁵ Alderman, H., & Headey, D. D. (2017). How Important is Parental Education for Child Nutrition?. *World Development*, 94, 448-464.

¹⁶ Nkurunziza, S., Meessen, B., & Korachais, C. (2017). Determinants of stunting and severe stunting among Burundian children aged 6-23 months: evidence from a national cross-sectional household survey, 2014. *BMC pediatrics*, 17(1), 176.

¹⁷ UNICEF . Analyse de la malnutrition des enfants au Burundi. Bujumbura: UNICEF; 2013.

- It is unknown if:
 - Is a window of opportunity to catch-up from stunting after the child older than 2 years?¹⁸
 - What is the scale of impact of prenatal interventions on postnatal growth? In Bangladesh, the MINIMAT trial found early food supplementation during pregnancy reduced postnatal stunting in boys only, but other interventions have had variable effects.¹⁹
- Intergenerational effects of stunting on health are unknown: “It has been argued that these intergenerational influences on health have been ignored in setting the Millennium Development Goals, which are unlikely to be attained if maternal health is not addressed.”²⁰

5. ADVOCACY, COMMUNICATION, CAPACITY BUILDING AROUND STUNTING AND FERTILITY ISSUES

- **Dissemination of Maternal and Child Health handbook in Burundi (Burundi MoH, JICA):** Integrated home-based record with records for the continuum of care for mothers and children. Study aimed to assess effectiveness on improving notification of birth ownership and PNC uptake in 23 health facilities in Gitega District, Burundi. Mothers had infants aged less than 6 weeks were included in the study, and selected from maternal registers. Significant improvement was observed in the proportion of mothers receiving notification of birth at health facilities, from 4.6% to 61.0% (95% confidence interval [CI]: 55.9%–66.2%), and the proportion of mothers receiving guidance on PNC, from 35.9% to 64.2% (95% CI: 59.2%–69.3%). The annual PNC coverage (43.9% to 54.2%; $p < 0.05$) in the Gitega District significantly increased from 2013 to 2014).²¹
- **Care Groups:** Community-based implementation strategy for the delivery of social and behaviour change interventions. A total of 45 MoH-led Care Groups with 478 Care Group Volunteers (CGV) were established within the intervention area of Burundi, with another 50 NGO-led Care Groups and 509 CGV set up in another area to conduct home visits to households, provide health promotion messages, screened for acute malnutrition and collect vital events data. Data was collected from 593 and 700 mothers of children 0-23 months at baseline and endline. Both models performed similarly, and lead to increased child and maternal health indicators.²²

¹⁸ Rahman, M. M. (2015). Is Unwanted birth associated with child malnutrition in Bangladesh?. *International perspectives on sexual and reproductive health*, 41(2), 80-88.

¹⁹ Khan, A. I., Kabir, I., Ekström, E. C., Åsling-Monemi, K., Alam, D. S., Frongillo, E. A., ... & Persson, L. Å. (2011). Effects of prenatal food and micronutrient supplementation on child growth from birth to 54 months of age: a randomized trial in Bangladesh. *Nutrition journal*, 10(1), 134.

²⁰ Rahman, M. M. (2015). Is Unwanted birth associated with child malnutrition in Bangladesh?. *International perspectives on sexual and reproductive health*, 41(2), 80-88.

²¹ Kaneko, K., Niyonkuru, J., Juma, N., Mbonabu, T., Osaki, K., & Aoyama, A. (2017). Effectiveness of the Maternal and Child Health handbook in Burundi for increasing notification of birth at health facilities and postnatal care uptake. *Global Health Action*, 10(1), 1297604.

²² Weiss, J., Makonnen, R., & Sula, D. (2015). Shifting management of a community volunteer system for improved child health outcomes: results from an operations research study in Burundi. *BMC health services research*, 15(1), S2.

- **Comprehensive review of community-based interventions for nutrition-related initiatives in LMICs:²³**

- Studies of community-based interventions addressing protein energy undernutrition: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5491948/table/T5/>
- Community-based projects that promoted breastfeeding and complementary feeding in children: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5491948/table/T6/>
- Studies of micronutrient supplementation at the community level: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5491948/table/T7/>



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²³ Freeman, P. A., Schleiff, M., Sacks, E., Rassekh, B. M., Gupta, S., & Perry, H. B. (2017). Comprehensive review of the evidence regarding the effectiveness of community-based primary health care in improving maternal, neonatal and child health: 4. child health findings. *Journal of global health*, 7(1).