

Stunting prevalence and correlates among children in Indonesia



Child stunting, or low height-for-age, is a global health challenge affecting more than 150 million children under age 5, particularly in developing countries (UNICEF, WHO, and World Bank 2017). Despite decades of reductions in poverty, child mortality, and rates of underweight children in Indonesia, an estimated 37 percent of children under age 5 were stunted in 2013 (World Bank 2017).

Stunting in early childhood is associated with impaired cognitive ability and higher morbidity and mortality, which can result in lifelong effects of lower wages and lost productivity (Sudfeld et al. 2015; Prendergast and Humphrey 2014; Victora et al. 2008; Hoddinott et al. 2013a, 2013b; Alderman et al. 2006). Stunted mothers are also more likely to have children who are stunted, so the negative socioeconomic and health impacts of stunting may persist across generations (Onis and Branca 2016).

Despite recognizing the magnitude of the problem, researchers are still attempting to understand the causes of stunting. Recent work by Danaei et al. (2016) suggests that high global stunting rates are associated with a number of risk factors, including short maternal stature, restricted fetal growth, child diarrhea and nutrition, and poor sanitation. In this brief we explore the prevalence of stunting and possible nutrition, sanitation, and health factors associated with growth faltering among children 0-35 months old in rural areas of Central Kalimantan, West Kalimantan, and South Sumatra in Indonesia.

Thirty-two percent of children were stunted. (Eight percent were severely stunted.) Figure 1 shows the share of children who were stunted among each age group, sex, and province. The stunting rate increased with age (19 percent for children 0-11 months, 36 percent for children 12-23 months, 44 percent for children 24-35 months), in large part because many children who become stunted do not experience the catch-up growth that would bring them back to the normal range for their age. There was no statistically significant difference in stunting rates between boys and girls, although the rate of severe stunting was 58 percent higher among boys than among girls, which is a statistically significant difference. The provinces of Central and West Kalimantan had similar rates of stunting (34 and 36 percent, respectively) that were significantly higher than the stunting rate in South Sumatra (26 percent).

Figure 2 presents a summary of the associations between stunting rates for children aged 0-35 months and a range of household and community conditions we explore in our analysis and describe below. The figure includes the estimated difference in the stunting rate associated with each characteristic, as well as the 95 percent confidence intervals for each estimated difference. If the confidence interval does not cross zero, the estimated difference is statistically significant.

Using caregiver's education as an example, the confidence interval from approximately 10 percent to 45 percent does not cross zero, so the estimated relationship between



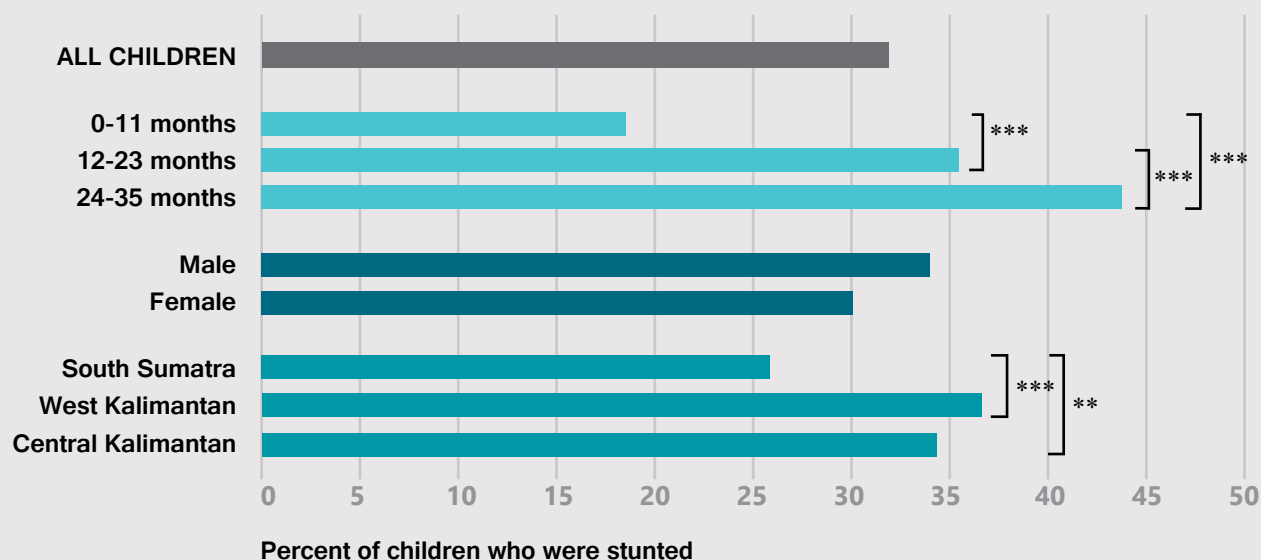
DEFINING STUNTING

Stunting is defined as having a height-for-age Z-score (a method of standardizing height measurements across age groups and sex) more than two standard deviations below the median of the World Health Organization (WHO) Child Growth Standards based on a healthy reference population; severe stunting is defined as being three or more standard deviations below the median (WHO 2006).

education and stunting is statistically significant, and we are reasonably confident that children whose caregivers did not complete junior high are more likely to be stunted.

NOTE: All comparisons of stunting rates across groups were estimated using multivariate Poisson regressions with controls for each respondent's age, gender, socioeconomic background, and province, with standard errors clustered by kecamatan. We also estimated differences in linear growth (the continuous Z-score), an alternative outcome, using multivariate OLS regressions and found results that were broadly consistent with those for the binary stunting outcomes.

FIGURE 1: OLDER CHILDREN AND CHILDREN IN CENTRAL AND WEST KALIMANTAN WERE MORE LIKELY TO BE STUNTED



/ Difference between bracketed categories is statistically significant at the 0.05/0.01 level.

Stunting disproportionately affected disadvantaged children.

We found that children whose caregivers had not completed at least junior high school were 28 percent more likely to be stunted than children whose caregivers who had completed junior high. Children from households with fewer assets were also more likely to be stunted but this difference was not statistically significant after controlling for other factors, like mother’s education.

Most aspects of a child’s health status and access to healthcare were not associated with stunting, except for vaccines.

We found no statistically significant relationship between a number of measures of healthcare utilization by caregivers and children and child stunting, including whether children had attended posyandu (integrated maternal and child health service post) in the last six months, whether caregivers had attended early childhood counseling sessions (kelas balita) at the posyandu, four prenatal care visits, or two postnatal care visits (the number of pre- and postnatal care visits recommended by WHO at the time the data were collected).

In addition, children who experienced specific health conditions that could inhibit growth, like worm infections, diarrhea in the last four weeks, or blood or mucus in the child’s stool, were not significantly more or less likely to be stunted.

Children who received the full suite of age-appropriate vaccines were significantly less likely to be stunted than children who had not, by 17 percent on average. (They were 38 percent less likely to be severely stunted.) It is possible that vaccinated children are less likely to become sick and thus less likely to experience growth faltering, and these findings are consistent with previous studies, which have found positive correlations between the availability of vaccines and child height (Thomas et al. 1996; Anekwe and Kumar 2012). It is also possible that children who are vaccinated are also more likely to access better healthcare in general and that receiving better healthcare improves growth outcomes.

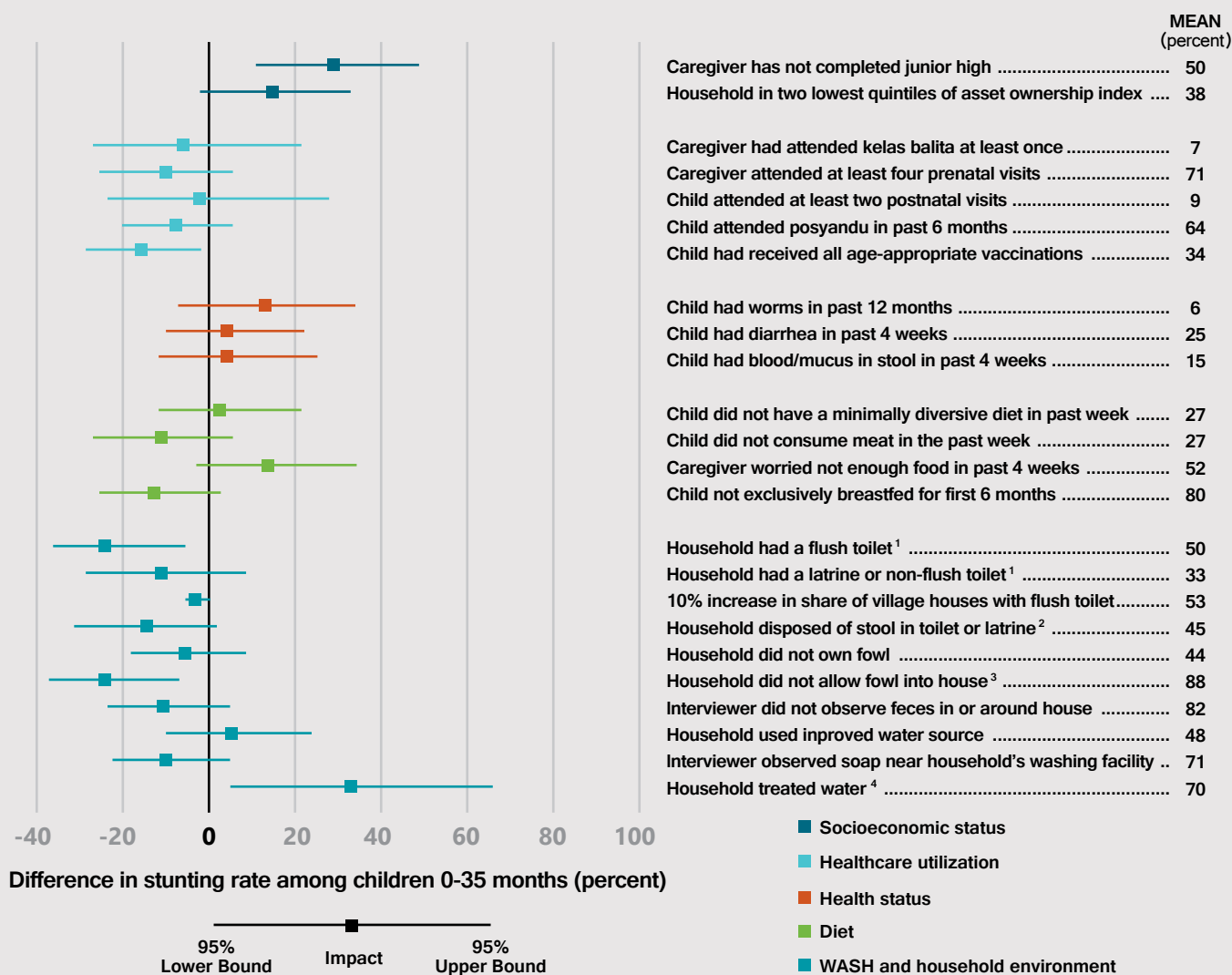
ABOUT THE DATASET

Data used in this analysis are from a baseline survey for a cluster-randomized controlled trial of a nutrition program implemented by the Government of Indonesia and Millennium Challenge Account-Indonesia, funded by the Millennium Challenge Corporation.



The survey was conducted in late 2014 and early 2015 in the provinces of South Sumatra, Central Kalimantan, and West Kalimantan. The survey is representative of children ages 0-35 months in 190 kecamatan (subdistricts) that are the trial clusters. The household survey included modules about household characteristics, home environment, health service access and utilization, knowledge of recommended health behaviors, nutrition practices, and children’s height and weight measurement. The survey did not include measures of maternal nutrition or birth weight, which studies suggest are associated with early childhood stunting (Bhutta et al. 2013; Prentice et al. 2013; Danaei et al. 2016; Aryastami et al. 2017). A total of 2,979 children were weighed and measured (for length or height).

FIGURE 2: A RANGE OF CHILD, HOUSEHOLD, AND COMMUNITY CONDITIONS WERE ASSOCIATED WITH STUNTING, SUCH AS POVERTY AND SANITATION CONDITIONS



¹ Compared to households without any toilet or latrine.
² Sample includes only households with a toilet or latrine.
³ Sample includes only households with fowl.
⁴ Sample includes only households without improved water.

Our measures of dietary diversity and household food insecurity were not associated with stunting. Previous research shows a strong association between child nutrition, especially sufficient consumption of protein, energy, and micronutrients (for example, zinc or vitamin A), and linear growth (Martorell 1995; Imdad and Bhutta 2011; Hadi et al. 2000). However, we found no statistically significant association between stunting and measures of consuming meat in last seven days or minimal dietary diversity, defined as consuming food from four or more of a range of food groups in the last week (WHO 2010). The lack of association between stunting and dietary diversity in our data could reflect the fact that our measures only identify whether particular types of food were consumed, not the quantity or nutrient content of food.

We also considered food security — whether a caregiver reported that she was worried that the household didn't have enough food in the past four weeks — and this was not related to stunting.

Exclusive breastfeeding for the first six months was not protective against stunting. Children who are exclusively breastfed may be less likely to contract illnesses and become stunted because they are not exposed to potentially contaminated water or food during feeding. While previous studies have found impacts of exclusive breastfeeding on mortality, they have largely found no impact on stunting (Bhutta et al. 2008). We also find no statistically significant association between stunting and whether a child six months or older was exclusively breastfed for the first six months of life.

Sanitation conditions and stunting were strongly related.

Children living in households with flush toilets were significantly less likely to be stunted, by 24 percent on average (and 55 percent less likely to be severely stunted), than children in households without a toilet or latrine. However the difference in stunting rates between children living in households with latrines or non-flush toilets and children living in households without a toilet or latrine was not statistically significant.

In addition, the share of households in the village with a flush or pour flush toilet affected stunting. Previous studies show that the sanitation conditions of other households in the same village, which may affect children's exposure to illnesses or other household waste, are associated with child growth in a number of developing countries (Spears et al. 2013; Harris et al. 2017). We found that a 10 percent increase in the share of households in the village with a flush or pour flush toilet was associated with a 3 percent lower stunting rate for children in the village. Said another way, villages with 100 percent households with flush or pour flush toilets have 14 percent lower stunting rates than villages with the average share of households with flush or pour flush toilets (53 percent).

Stunting was marginally affected by hygienic disposal of children's stools. Children in households with a toilet or latrine that disposed of a child's stool in the toilet or latrine instead of in the open had lower stunting rates (17 percent), but the difference was just outside of statistical significance.

In addition to human feces, animal feces around the home could lead to greater exposure to disease. Headey et al. (2017) found that the presence of animal feces was not statistically

associated with standardized height-for-age for children ages 6-23 months in Vietnam, another Southeast Asian country, but was associated with decreases in child growth in other contexts (Ethiopia and Bangladesh). We found that whether the household owned fowl (chickens, ducks, and geese) and whether human or animal feces were visible in the house or living area were not significantly associated with stunting. However, among households that owned fowl, stunting rates were 25 percent lower in households that did not allow fowl into their homes.

Improvements in water quality and hand washing were not related to lower stunting rates. In contrast to a meta-analysis of water, sanitation, and hygiene (WASH) interventions conducted by Dangour et al. (2011), which found WASH improvements such as handwashing and water treatment were positively associated with child height, we found that using improved water sources (defined as piped water, public tap, tube well/borehole, protected spring, or rainwater) and whether the data collection teams observed soap near the household's washing facility were not associated with stunting.

Counter-intuitively, we found that among households without an improved water source, who were at greater risk of having low quality water, the rate of stunting was 34 percent higher for children in households that reported treating their water (by boiling, adding bleach or chlorine, straining through cloth, or using a water filter) than children in households that reported not treating their water. It is possible that worse water quality led households to treat their water; if the treatment was not effective enough, then they might still have had worse water quality on average than households that did not treat their water.

DISCUSSION AND RECOMMENDATIONS

We explored the associations between child stunting and several measures of child nutrition and health, and household sanitation, hygiene, and water quality. Most of these measures were not predictive of stunting, but we found some meaningful associations.

- Stunting is a problem that disproportionately affects the poor, indicating that targeting efforts should clearly focus on this population. We find strong associations between stunting and mother's education and household assets.
- The association between vaccines and stunting indicates that vaccines as well as general health checkups and awareness may be helpful in reducing stunting. The posyandu program is an important component of early childhood health care, especially because it provides vaccines. Sixty-four percent of children had visited the posyandu in the last six months. Although we find no relationship between attendance in posyandu and stunting, it remains a critical mechanism for vaccines and health education, and programs that strengthen the posyandu may be supportive of vaccination and in turn mitigating stunting.
- Our findings complement other studies showing that household and community sanitation is important to child growth (Spears et al. 2013, Harris et al. 2017). Having a flush toilet in the household was related to lower stunting rates, and much lower rates of severe stunting. Higher concentrations of households with flush toilets in the community were also related to lower rates of stunting.
- Disposing of children's stools in a toilet or latrine, which reduces the likelihood of children being directly or indirectly exposed to infectious diseases from the stools, is marginally associated with lower rates of stunting.
- Preventing fowl from entering the home, and therefore reducing the likelihood of children coming into contact with fowl or their feces, was associated with lower rates of stunting.
- Access to an improved water source or soap near the hand washing facility (an indication of the ability to wash hands) were not associated with differences in stunting rates.

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