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SCALING UP NUTRITION (SUN) 2.0 / FIRST 1000 MOST CRITICAL DAYS PROGRAMME (MCDP II)

MATERNAL NUTRITION

HOW DOES MATERNAL NUTRITION INFLUENCE CHILD NUTRITION?

Women's nutritional status affects their own short- and long-term health, as well as the health, growth, and development of their children. Inadequate maternal nutrition contributes to intrauterine growth restriction,[1] increases the risk of new-born death and stunting in childhood and increases children's risk of obesity and non-communicable diseases in adulthood. The earlier children experience stunting, the more likely they are to be severely stunted,[2] emphasising the importance of pre-pregnancy and antenatal maternal factors that may contribute to stunting during infancy. Despite recent improvements in child undernutrition in Zambia, rates of stunting, wasting, and underweight in children under 5 years remain high (35%, 4%, 12 %, respectively).[3]

The intergenerational impact of stunting can be seen at every stage of life. Women with short stature face increased risk for preterm birth, small-for-gestational age, and a child who is stunted at 12 months of age.[1,4,5] Iron and calcium deficiencies in pregnancy substantially contribute to maternal death. Maternal iron deficiency is associated with low birthweight.[6] Anaemia and iron deficiency cause fatigue and impair physical capacity and work performance. Anaemia during pregnancy is associated with mortality and morbidity in the mother and child, including risk for miscarriage, stillbirth, premature delivery, and low birthweight. Postpartum anaemia is negatively associated with maternal caregiving practices and child development outcomes.[7] Although low body mass index (BMI), an indication of maternal undernutrition, has declined over the past two decades, it continues to persist. At the same time, the prevalence of maternal overweight has steadily increased since 1980 and exceeds that of underweight. Maternal overweight and obesity result in increased maternal morbidity, preterm birth, pregnancy loss, gestational diabetes, preeclampsia and other hypertensive disorders, and infant mortality.[5]

Maternal diets are closely linked with children's diets. Studies from several countries have established the links between maternal diet diversity and child diet diversity.[8] Children whose mothers consumed 5 or more food groups (out of 10 possible groups) were 5 to 9 times more likely to meet minimum diet diversity recommendations, decreasing their risk of chronic undernutrition and stunting, compared to children whose mothers ate fewer than 3 food groups.[7] Maternal food insecurity and inadequate diet are linked to sub-optimal breastfeeding practices.[9] Food insecurity contributes to perceived breastmilk insufficiency, concerns about infant hunger, and a perception that access to adequate food is needed for successful breastfeeding.[8] Sub-optimal breastfeeding practices increase the risk of undernutrition and stunting in children.

Given the direct influence of maternal nutrition on child nutrition, nutrition interventions need to address the immediate and underlying causes of malnutrition in girls and women, starting before pregnancy. Immediate causes include lack of knowledge about adequate nutrition, inadequate or excessive consumption of nutrients, and chronic and frequent infections that increase energy and micronutrient requirements and decrease nutrient absorption. Underlying causes of malnutrition include

a lack of access to nutritious foods, quality health services, and a clean environment; early, frequent, too many, and short spacing of pregnancies; limited infrastructure; food insecurity; the absence of markets to purchase food; gender and other inequities; heavy workloads for women; and poverty. For girls, lack of access to services, education, and nutritious foods due to inequality in household food distribution are particularly important underlying causes of malnutrition. Mitigating the underlying causes of malnutrition can improve the nutrition situation of girls and women, ultimately decreasing the risk of stunting in future generations. **A multisectoral approach is critical to improving maternal nutrition.**

2019 BASELINE SURVEY FINDINGS

The First 1000 Most Critical Days Programme Phase II (MCDP II) Baseline Survey was a cross-sectional survey carried out in 30 priority Scaling Up Nutrition 2.0 districts in Zambia in 2019. The survey collected data from 7,500 households with a child under 2 years of age and included key informant interviews with 51 district or provincial ministry officials or nongovernmental organisation representatives. Of these households, 7,191 included the biological mother as the primary caregiver. Table 1 presents maternal characteristics associated with child stunting and underweight.

Table 1: Maternal characteristics associated with child stunting and underweight

Maternal characteristics	Total % (n)	Stunted[a] % (n)	P-value	Underweight[b] % (n)	P-value
Educational attainment					
Primary or less	57.7 (4,143)	34.6 (1,417)	0.00	11.4 (471)	0.00
Secondary or higher	42.3 (3,033)	23.9 (717)		7.5 (227)	
Head of household					
Male	81.5 (6,101)	30.0 (1,812)	0.43	9.9 (604)	0.64
Female	18.5 (1,385)	31.2 (423)		9.5 (131)	
Adolescence					
≤19 years of age	12.8 (919)	32.6 (293)	0.08	11.0 (101)	0.16
>19 years of age	87.2 (6,247)	29.7 (1,837)		9.5 (594)	
BMI category					
Underweight (<18.5)	7.2 (506)	36.4 (183)	0.00	17.0 (86)	0.00
Normal (18.5–24.9)	71.7 (5,023)	30.9 (1,533)		9.9 (496)	
Overweight (25–29.9)	15.2 (1,063)	24.2 (253)		5.6 (61)	
Obese (≥30)	6.0 (417)	21.1 (87)		6.7 (28)	
Stature					
≤150 cm	15.2 (1,068)	45.2 (477)	0.00	15.2 (161)	0.00
>150 cm	84.8 (5,966)	26.9 (1,583)		8.6 (513)	
Household hunger					
Moderate or severe	75.6 (5,453)	32.5 (1,819)	0.00	10.8 (607)	0.00
None or mild	24.4 (1,723)	23.0 (415)		7.0 (127)	
Maternal dietary diversity					
<5 food groups	46.3 (3,319)	32.2 (1,055)	0.00	10.7 (355)	0.01
≥5 food groups	53.7 (3,847)	28.3 (1,075)		8.9 (340)	
Consumed NRVCC[c]					
≥1 from each group	34.3 (2,460)	28.9 (701)	0.12	9.4 (230)	0.47
<1 from each group	65.7 (4,706)	30.7 (1,429)		9.9 (465)	
Eating during pregnancy					
More	39.3 (2,799)	29.1 (804)		8.2 (227)	
No change	13.4 (952)	31.4 (295)	0.37	10.8 (102)	0.00
Less	47.3 (3,370)	30.6 (1,017)		10.9 (366)	
Eating during breastfeeding					
More	74.1 (5,265)	30.4 (1,580)		9.8 (511)	
No change	16.5 (1,169)	29.3 (337)	0.72	10.6 (124)	0.41
Less	9.4 (670)	29.4 (194)		8.6 (57)	

[a] Refers to children who fall -2 standard deviations from the length-for-age/height-for-age World Health Organization Child Growth Standards median

[b] Refers to children who fall -2 standard deviations from the weight-for-age World Health Organization Child Growth Standards median

[c] NRVCC=nutrient-rich value chain commodity. Groups include the following: (1) legumes (pulses, nuts, and seeds); (2) animal products (milk and milk products, organ meat, fish, eggs, insects, and other small animal proteins); and (3) fruits and vegetables (dark green leafy vegetables, vitamin A-rich vegetables, other vegetables and fruits, and palm oil).

In Figures 1 and 2, districts depicted in darker red have a higher percentage of mothers who are underweight or have short stature. Figure 1 shows the geographic distribution of underweight among mothers in Zambia. Districts with the highest percentages of underweight women are Kalabo (21.7%), Kaoma (15.0%), and Mwinilunga (11.5%). Western province has the highest percentage of underweight mothers (13.9%). Figure 2 highlights the geographic distribution of women with short stature. Districts with the highest percentages of women with short stature are Kaputa (29.3%), Nchelenge (27.2%), and Luwingu (27.1%). Northern province has the highest percentage of women with short stature (25.8%).

Figure 1: Percentage of underweight mothers, by district

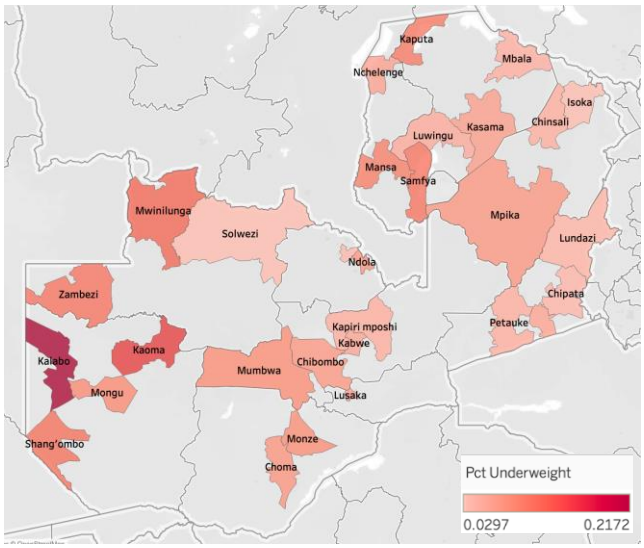
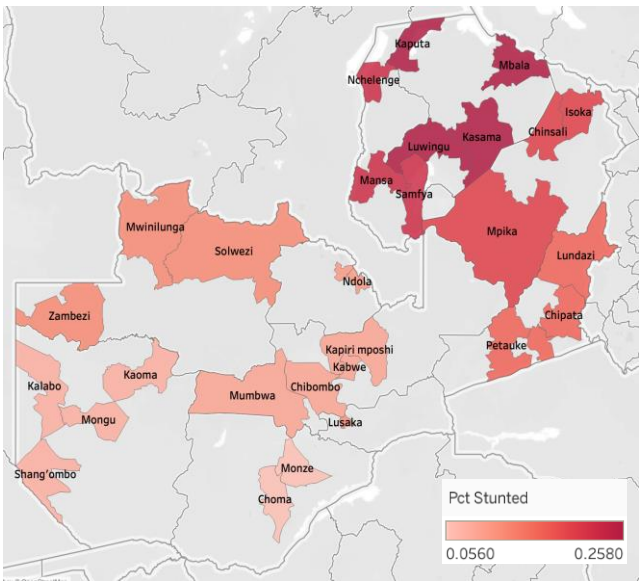


Figure 2: Percentage of mothers with short stature, by district



Maternal Nutrition and Child Outcomes

Maternal nutrition status was associated with child stunting and underweight outcomes.

Mother's BMI

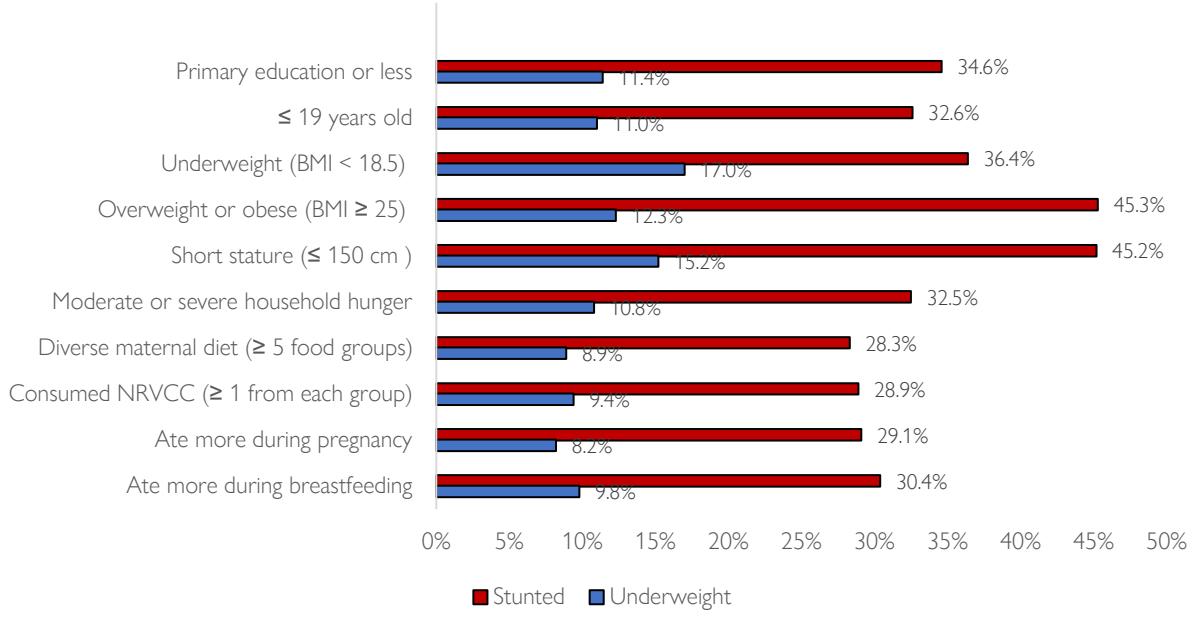
Mothers with a higher BMI (≥18.5 kg/m2) had children with a decreased likelihood of being stunted or underweight, compared to mothers with a low BMI (<18.5 kg/m2) (Table 2).

Table 2: Odds of child stunting or underweight by mother's BMI

Mother's BMI	Odds of child stunting (95% CI)	P-value	Odds of child underweight (95% CI)	P-value
Underweight (<18.5)	1.28 (1.05–1.55)	0.01	1.86 (1.45–2.39)	0.00
Normal (18.5–24.9)	Reference group	0.00	Reference group	0.00
Overweight (25–29.9)	0.71 (0.61–0.83)	0.00	0.56 (0.42–0.73)	0.00
Obese (≥30)	0.60 (0.47–0.76)	0.00	0.66 (0.44–0.97)	0.04

Figure 3 highlights the maternal and household characteristics from Table 1 that were significant or near significant. Child stunting was associated with low maternal education attainment, low maternal BMI, short maternal stature, moderate/severe household hunger, and insufficient maternal dietary diversity ($p<0.05$). Adolescent maternal age was near significant ($p=0.08$). Child underweight was associated with low maternal education attainment, low maternal BMI, short maternal stature, moderate/severe household hunger, insufficient maternal dietary diversity, and eating less during pregnancy ($p<0.05$).

Figure 3: Percentage of children who are stunted or underweight by select maternal and household characteristics



NRVCC=nutrient-rich value chain commodity

Women's Dietary Diversity

Dietary diversity among women of reproductive age is important to consider because women with micronutrient inadequacy are more likely to have stunted or underweight children.[10] Due to the shared environment between mother and child, it is important to consider factors inhibiting mothers from achieving dietary diversity, because these are likely to be household-level factors that influence the child's ability to achieve dietary diversity as well. Minimum dietary diversity (consumption of 5 or more food

groups out of 10 food groups in the preceding 24 hours) for women is a proxy for micronutrient adequacy among women of reproductive age.[11] Women of reproductive age who consume five or more food groups are also more likely to consume at least one animal-source food, either nuts or pulses, and two or more fruit and vegetable food groups.[12] This section describes the factors associated with dietary diversity for women.

Overall, women in the sample reported consuming a mean of 4.6 food groups (less than the five required to achieve minimum dietary diversity), and 54.0% of women consumed five or more food groups. Dietary diversity was similar among women regardless of age. Women 15–19 years of age did not report a difference in the mean number of food groups consumed (4.64), compared to women 20–49 years of age (4.55). Adolescent mothers (15–19 years of age) consumed significantly less milk and sugar-sweetened beverages than adult mothers, but significantly more leafy greens and grains ($p<0.05$). There was no difference in the consumption of beans, eggs, meat and poultry, fish, vitamin A-rich fruits and vegetables, sweet foods, or fried snacks.

Women in households that reported hunger were less likely to meet minimum dietary diversity (47.8%) than women in households that did not report hunger (73.3%). The opposite is also true—in households that did not report hunger, fewer women (26.8%) ate less than five food groups, compared to women in households that reported hunger (52.3%) ($p<0.001$). This confirms that in households experiencing hunger, women consume a less-varied diet and are at greater risk of inadequate micronutrient intake. This is especially relevant to child stunting and underweight status, because child diet is positively correlated with maternal diet (Figure 4). If a mother is experiencing hunger and subsequently eating a less-varied diet, it is likely that her child is not consuming a diverse diet.

Children whose mothers did not meet the minimum dietary diversity (i.e., consumed fewer than five food groups in the previous 24 hours) were significantly more likely to be stunted (OR=1.20, p=0.00) or underweight (OR=1.24, p=0.01), compared to children whose mothers ate food from five or more food groups. Children whose mothers did not meet the minimum dietary diversity were significantly less likely to meet minimum dietary diversity in the previous 24 hours, compared to those whose mothers met minimum dietary diversity (OR=0.12, p=0.00).

Figure 4: Maternal and child dietary diversity scores by child stunting status

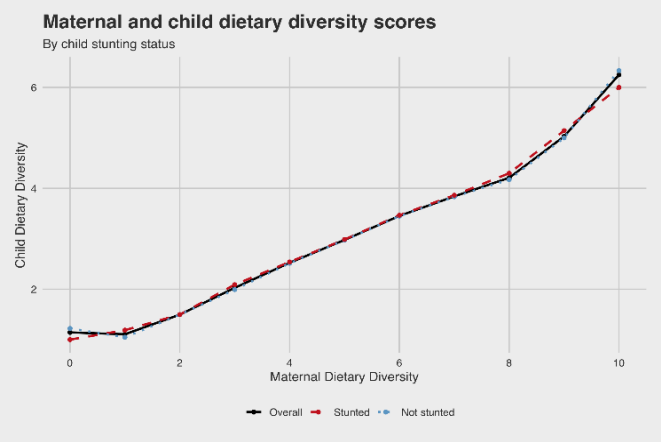
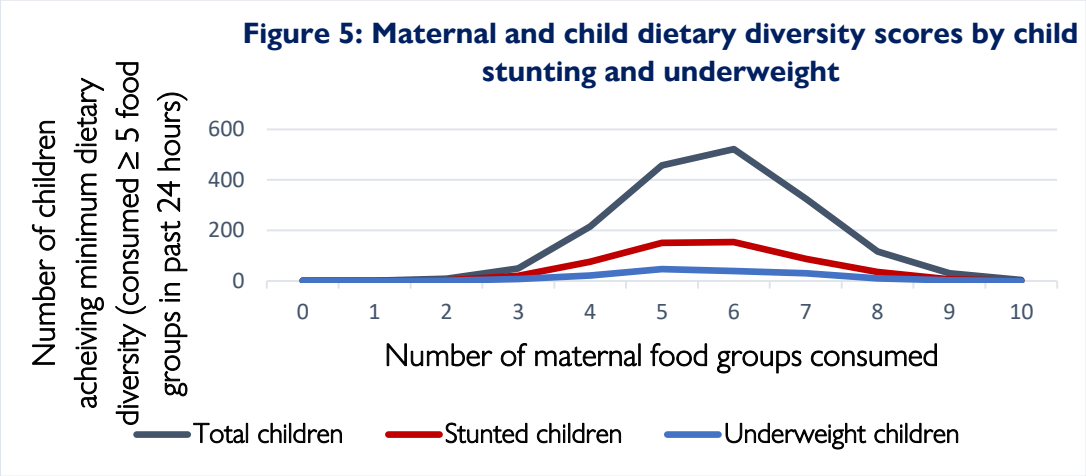


Figure 4 highlights the relationship between maternal and child dietary diversity. Maternal dietary diversity is positively correlated with child dietary diversity.

Figure 5 presents the relationship between maternal-child diet and child growth. As maternal dietary diversity increases, so does child dietary diversity. However, even as maternal dietary diversity increases, stunted and underweight children are still less likely to have a diverse diet, compared to non-stunted, non-underweight children, highlighting the importance of targeted messages to increase dietary diversity among children 6–23-months of age.



Dietary Diversity and Resilience

Women in households with stronger resilience during lean periods and environmental shocks, defined using the Food and Agriculture Organization's Coping Strategy Index referencing the previous 12 months, were more likely to achieve minimum dietary diversity (consumed five or more food groups) (65.2%) than those living in households with lower resilience (39.8%). This suggests that stronger resilience during lean periods is associated with a more diversified diet for women. Household production of nutritious food is positively associated with women's dietary diversity. Among households that produced nutritious food for consumption, 56.5% of women met their minimum dietary diversity, compared to 45.5% of women in households that did not produce nutritious food for consumption. This is also true when households sell or barter the nutritious food they produce. In households that sold or bartered their nutritious food, more women (54.8%) met minimum dietary diversity requirements than those living in households that did not sell or barter their nutritious food (47.0%) ($p<0.001$). This is in line with other findings in the Baseline Study, which found that 74.3% of the households that produced nutritious crops sold less than half of their produce, meaning that most of the crops were retained or were too low to allow for any selling or bartering. Further analysis of women's dietary diversity with food processing and cooking (including preparation) showed that in households that practiced better food processing (i.e., steps required before cooking or eating food and fruits, such as washing fruits, dealing with mouldy food, and washing hands and kitchen utensils before cooking), more women (61.5%) met minimum dietary diversity (five or more food groups), compared to 34.8% of women in households that did not practice better food processing ($p=0.04$). These data suggest that household production of nutritious foods (whether for consumption only or also for sale/barter), as well as practicing good food processing, enables women to eat a more-varied diet.

Regarding maternal-related actions, diet during pregnancy appears to be the most problematic—only 39% of pregnant women reported increased intake of foods during pregnancy. Diet during breastfeeding was better, with more women reporting eating more food during lactation (73.8%), but still requires improvement.

Women's Consumption of Nutrient-rich Value Chain Commodities

Consumption of nutrient-rich value chain foods among women is significantly associated with household production and consumption of nutritious crops and livestock. About 40.0% of women from nutritious crop producing households also consumed nutrient-rich value chain commodities, compared to 28.2% of women from households that did not produce nutritious crops ($p<0.001$), suggesting that they were able to eat the nutritious foods produced. More women in households that produced and sold nutritious

crops (40.0%) consumed nutrient-rich value chain commodities than women in households that did not (24.5%) ($p<0.001$). This suggests that women in households that sell nutritious crops and livestock might have been able to consume what was produced and also might have been able to purchase other nutrient-rich value chain commodities for consumption. However, significant differences were found between women who consumed nutrient-rich value chain commodities and a household's practice of essential nutrition actions. More women who consumed nutrient-rich value chain commodities (21.0%) lived in households that practiced essential nutrition actions than in households that did not practice essential nutrition actions (17.0%) ($p<0.001$). This suggests that household nutrition practices might have a positive influence on women's consumption of nutrient-rich value chain commodities.

There is also a significant relationship between women who consumed nutrient-rich value chain commodities and their nutritional status. Few underweight women consumed nutrient-rich value chain commodities (28.5%), compared to women with normal or higher BMI (71.5%) ($p=0.004$). There is also a significant relationship between consumption of nutrient-rich value chain commodities and household hunger. Few women in households that reported hunger (18.2%) ate nutrient-rich value chain commodities, compared to those in households that did not report hunger (40.0%) ($p<0.001$). This implies that household hunger reduced the availability of nutrient-rich value chain commodities in the household, and thus affected a woman's diet.

Finally, women who ate nutrient-rich value chain commodities had higher dietary diversity than those who did not. Almost all women (94.8%) who ate foods from eight food groups consumed nutrient-rich value chain commodities, compared to 20.4% of women who ate foods from four food groups ($p<0.001$).

INTERVENTIONS TARGETING MATERNAL NUTRITION

Several interventions have been shown to improve maternal nutrition before and during pregnancy to promote optimal nutrition for women and children.[5] Interventions targeting maternal nutrition include iron and folic acid (IFA) supplementation and social and behaviour change communication on women's diets during pregnancy and lactation. Baseline Survey findings showed that the coverage of IFA supplementation was very high, with 97.9% of pregnant women reporting having received iron supplementation and 98.2% receiving folic acid during their last pregnancy. Although the number of women who reported receiving IFA during pregnancy is high, it does not reflect continued adherence to IFA supplementation throughout pregnancy. During the key informant interviews with provincial and district-level government officials and nongovernmental organisation staff that were conducted alongside the Baseline Survey, participants typically described IFA supplementation programmes working well in their districts, with most participants rating IFA programmes as good or excellent, although some participants noted challenges with traditional beliefs being a barrier to women's adherence and stockouts of IFA supplements that limited programme effectiveness.

Higher proportions of women in the Baseline Survey received social and behaviour change communication on diet during pregnancy (90.7%) than on breastfeeding (67.3%). Of women who reported that they received information on diet during pregnancy, the information received was from health care clinics (94.9%), friends and family (16.5%), and the radio (3.2%). Of women who reported that they received information on diet during breastfeeding, the information received was from health care clinics (88.6%), friends and family (23.3%), and the radio (2.5%). Key informants' perceptions of the promotion of diverse diets and nutrient-rich crops were less favourable than IFA. They identified lack of awareness among families, changes in climate, and lack of seeds as barriers to promoting nutrient-rich foods.

WHAT DOES THIS MEAN FOR IMPROVING MATERNAL NUTRITION?

For their own health and the health and development of their children, it is essential for women to be well nourished before, during, and after pregnancy. This requires reaching girls and women with interventions **before their first pregnancy** and between subsequent pregnancies.

Data from the Baseline Survey show that women are not meeting recommendations for dietary diversity. Further, similar to global trends, overweight is much higher in women of reproductive age than underweight, even as child stunting remains high. This double burden of malnutrition, which is the co-existence of undernutrition and overweight and obesity at the individual, household, or population levels, requires double-duty actions to address all forms of malnutrition.

Recommendations

Interventions should address the immediate and underlying causes of malnutrition in girls and women. **A multisectoral approach to improving maternal nutrition is critical.** When interventions are integrated into a package of services and through different sectors, they can address the multiple, underlying causes of all forms of maternal malnutrition (both undernutrition and overweight and obesity), either before (e.g., in adolescent girls, engaged women, and newly married women), during, or after pregnancy and lactation. There are multiple ways for different sectors to act to improve the nutrition of girls and women.[13]

- The **health sector** can address maternal nutrition through the following:
    - Antenatal care services should provide adequate quantities of daily IFA supplements or multiple micronutrient supplements, along with counselling on why and how to take supplements and manage side effects; add calcium supplementation to decrease the risk of preeclampsia; and counsel women about which foods, in what quantities, are required for optimal intake. This can both prevent micronutrient deficiencies and ensure appropriate gestational weight gain.
    - Maternal nutrition during breastfeeding should be integrated into child health services and growth monitoring and promotion services by including counselling about maternal diet, the provision of weekly IFA supplements, and the promotion of physical activity.
    - The scope of community health workers should be expanded to include promoting adequate diets and weekly IFA supplementation for adolescent girls in addition to the focus on the first 1,000 days.
    - Family planning services should provide commodities and counselling to women to delay pregnancy, increase birth spacing, and reduce pregnancies. Family planning is a nutrition-sensitive intervention that can improve the nutritional status of women, extend breastfeeding, and prevent child stunting.[12]
- The **education sector** should provide healthy foods through school-based nutrition programmes that address micronutrient deficiencies and consider energy needs, as well as conduct nutrition screening and referrals for nutrition services for adolescent girls. Schools should provide health; water, sanitation, and hygiene; and nutrition interventions to benefit girls. This includes micronutrient supplements, deworming, treatment for malaria, and toilet facilities for girls. The education sector should also promote girls' school attendance. Longer schooling and greater education can delay marriage, protects girls' nutritional status, and improve their status in society.[12]

- The **agriculture sector** can implement policies and programmes to increase the production, preservation, processing, and use of nutritious foods. This includes increasing the availability of nutrient-rich foods through horticulture and livestock programmes for girls and women[12] and including gender equity and women's empowerment in community agriculture programmes.
- The **water, sanitation, and hygiene sector** should improve water and sanitation infrastructure and promote handwashing with soap and the hygienic preparation of food.[12]
- The Ministry of Community Development and Social Services provides **social protection** through the Social Cash Transfer programme. To increase the impact of the Social Cash Transfer programme, it should be linked to other health social programmes that complement the cash transfer (referred to as "cash plus") and include nutrition interventions for adolescent girls and women to address all forms of malnutrition.
- There are opportunities for consumer groups, religious organisations, and **civil society** organisations to become nutrition champions, and they can also monitor nutrition at the community level.[12]
- Public policies and government regulation and monitoring can ensure that the **private food industry** produces affordable, healthy, fortified foods to address micronutrient deficiencies among women of reproductive age,[12] as well as limit the amount of sugar and salt and ultra-processed foods.

Supplementary Table 1: Maternal underweight and short stature, by province/district

Province/district	Underweight mothers (BMI<18.5)	Short stature (<150 cm)
Central	**6.2%**	**9.1%**
Chibombo	6.9%	10.2%
Kabwe	5.4%	10.8%
Kapiri-Mposhi	4.6%	7.6%
Mumbwa	8.0%	7.5%
Copperbelt	**5.3%**	**10.3%**
Kitwe	3.4%	13.1%
Ndola	7.1%	7.5%
Eastern	**4.5%**	**16.4%**
Chipata	3.8%	13.8%
Katete	5.7%	14.0%
Lundazi	4.1%	23.3%
Petauke	4.5%	14.85%
Luapula	**8.4%**	**22.6%**
Mansa	9.2%	21.8%
Nchelenge	5.9%	27.2%
Samfya	10.2%	18.7%
Lusaka	**6.0%**	**11.5%**
Lusaka	6.0%	11.5%
Muchinga	**4.9%**	**19.9%**
Chinsali	4.5%	21.2%
Isoka	3.0%	19.9%
Mpika	7.0%	18.6%
Northern	**6.4%**	**25.8%**
Kaputa	9.8%	29.3%
Kasama	6.3%	22.5%
Luwingu	4.9%	27.1%
Mbala	4.5%	24.4%

Province/district	Underweight mothers (BMI<18.5)	Short stature (<150 cm)
Northwestern	**8.3%**	**12.4%**
Mwinilunga	11.5%	23.1%
Solwezi	3.0%	3.9%
Zambezi	10.3%	9.8%
Southern	**7.5%**	**5.6%**
Choma	7.1%	5.8%
Monze	7.9%	5.4%
Western	**13.9%**	**7.9%**
Kalabo	21.7%	7.8%
Koama	15.0%	6.3%
Mongu	8.2%	9.1%
Shang'ombo	10.5%	8.5%

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ABOUT SCALING UP NUTRITION ZAMBIA

The Government of the Republic of Zambia (GRZ) is a member of Scaling Up Nutrition (SUN)—a global movement uniting governments, civil society, businesses, and citizens in a worldwide effort to end undernutrition. Phase 1 of the Zambia SUN programme began in 2013 with the goal to reduce stunting among children less than 24 months old in 15 districts.

Currently in its second phase, SUN has increased from 15 to 30 districts, coordinated by the National Food and Nutrition Commission of Zambia, and supported by a variety of partners and donors, including USAID/Zambia who supports the SUN programme through the SUN Learning and Evaluation (SUN LE) project.

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