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NUTRITION TRENDS IN THE PAST FIFTEEN YEARS IN GUINEA: SECONDARY ANALYSIS OF CROSS-SECTIONAL DATA ON CHILDREN, ADOLESCENT GIRLS AND WOMEN

Wirth JP[1,*], Woodruff BA[1], Mamady D[2], Beauliere JM[3], Ayoya M[3], Rohner F[1] and IN Teta[3]

James P Wirth

*Corresponding author email: james@groundworkhealth.org

[1]GroundWork, Fläsch, Switzerland

[2] Ministry of Health, Conakry, Guinea

[3] United Nations Children's Fund, Conakry, Guinea

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ABSTRACT

Malnutrition is a public health problem among Guinean children and women. Despite available nutrition survey data, there have been few published studies examining trends in nutrition indicators in Guinea. The objective of this research is to investigate nutrition trends in children <5 years of age, adolescent girls 15-19 years of age, and non-pregnant women 15-49 years of age. To accomplish this, data from five nationally-representative population-based surveys was examined. These surveys include Demographic and Health Surveys (DHS) conducted in 1999, 2005, and 2012, and Standardized Monitoring and Assessment of Relief and Transitions (SMART) surveys conducted in 2011 and 2015. The analysis found that prevalence of stunting in children decreased consistently from 39% in 2005 to 25% in 2015, with the most rapid decline between 2012 and 2015 – the period when the Ebola outbreak occurred. Despite this decline, the prevalence of anemia remained elevated between 2005 and 2012, with more than 70% of children found anemic in both surveys. Among adolescent girls, the national prevalence of underweight increased from 12% in 1999 to 19% in 2012, with the largest increase among girls with no education and those residing in rural areas and households in the lowest wealth quintile. Though anemia declined in adolescent girls between 2005 and 2012, the prevalence in 2012 was above 40%, indicating a severe public health problem. Among all women, between the age of 15 and 49 years, there was a steady increase in the combined prevalence of overweight and obesity, from 12% in 1999 to 19% in 2012. Increases in prevalence were pronounced in urban areas and among women with no education, >30 years of age, and among women residing in wealthy households. Regarding anemia, the proportion of anemic women declined slightly from 2005 to 2012. However, the prevalence in women in both surveys was above 40% and indicated a severe public health problem. This trend analysis suggests that if Guinea's stunting reduction trends are maintained for the next decade, it can likely meet international stunting targets. In women, efforts to reduce underweight should be targeted at adolescent girls and research is needed to identify the determinants of overweight and obesity in Guinean women.

Key words: Guinea, nutrition, trends, stunting, wasting, anemia, overweight, children, adolescents, women

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INTRODUCTION

Globally, malnutrition in children and women contributes substantially to the global burden of disease [1]. Stunting and wasting in children can result in increased mortality and cognitive and physical impairment [2]. Despite a global decline in stunting prevalence, the number of stunted children in Africa has consistently increased since 1990 [3]. In women and adolescent girls, anemia and underweight, have been associated with poor pregnancy outcomes and increased maternal mortality [4]. Under-nutrition in adolescent girls 10-19 years of age is of particular concern as adolescence is a key period of growth and development. Particularly in developing countries where pregnancy during adolescence is high, under-nutrition may contribute to adverse birth outcomes, such as children born small for gestational age, and adverse maternal outcomes, such as early cessation of growth [5]. Over-nutrition indicators, such as overweight and obesity, have also increased globally in the past decades [6,7], and predominantly affect women rather than men in African countries [8]. Overweight and obesity have been repeatedly associated with diabetes and hypertension, which are increasingly contributing to the global burden of disease in developing countries [7].

Under-nutrition remains a major public health problem among children in Guinea. According to World Health Organization (WHO) classifications [9] and Guinea's 2012 Demographic and Health Survey (DHS) [10], anemia and stunting in children < 5 years of age are considered very severe and severe public health problems. While the 2012 DHS found only 4% of Guinean children overweight [10], under-nutrition and over-nutrition – the "double burden" of malnutrition –are both found in Guinean women. The 2012 DHS found that 12% of women were underweight and 19% were overweight or obese [10]. According to this survey, nearly 50% of women of reproductive age (15-49 years) were anemic [10], denoting a severe public health problem according to WHO classifications [11]. The interaction between maternal overweight/obesity and under-nutrition in children has also been identified in Guinea [10].

During the Ebola outbreak, there was a concern that nutrition trends would have been affected. Following the United Nations declaration in August 2014 that the Ebola outbreak was an "international public health emergency", a coordinated public health response, including nutrition actors, were mobilized to respond to nutritional needs generated by the outbreak. Three main areas of nutrition care were identified: a) nutritional care of Ebola patients, b) nutritional care of Ebola survivors, and 3) Infant and Young Child Feeding (IYCF) practices in an Ebola context. In 2014, WHO, UNICEF, and WFP developed three nutrition guidelines to be utilized in an Ebola context: 1) the interim guideline “Nutritional Care of Children and Adults with Ebola Virus Disease in Treatment Center”, 2) a joint guidance document for nutritional support to Ebola survivors, and 3) the updated guideline on "Infant Feeding in the Context of Ebola". On the basis of these guideline documents, country-level partners developed and implemented nutrition responses during the Ebola outbreak.

There is a lack of nutrition published data from Guinea. Therefore, in order to reshape on-going nutrition programs and design, implement, and evaluate future interventions in Guinea, nutrition trends in vulnerable population groups must be documented. This

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manuscript presents nutrition trends in three population groups (children <5 years of age, adolescent girls 15-19 years of age, and women of reproductive age [15-49 years of age, both pregnant and non-pregnant]) over the past 15 years. For children <5 years of age, the study examines trends in the nutrition outcomes stunting, wasting, and anemia, and multiple indicators of infant and young child feeding practices. For adolescent girls and women of reproductive age, anemia, underweight, overweight, and obesity are the nutrition outcomes of interest. For this analysis, we explored data from national surveys containing nutrition indicators in order to identify the locations and sub-groups where nutrition indicators have changed over the years.

METHODS

Data sources

Data for this analysis came from five nationally-representative population-based surveys in Guinea: three DHS conducted in 1999 [12], 2005 [13], and 2012 [10], and two Standardized Monitoring and Assessment of Relief and Transitions (SMART) surveys conducted in 2011 [14] and 2015 [15]. Data from the three DHS were obtained from the website MeasureDHS.com, and data from SMART surveys was provided by UNICEF-Guinea.

Indicators of interest

In children, the anthropometric indices height/length-for-age Z-score (HAZ) and weight-for-height/length Z-score (WHZ) were calculated using WHO Child Growth Standard [16] for all surveys. This calculation was performed by DHS for the 1999, 2005, and 2012 surveys and by the implementers of the SMART surveys in 2011 and 2015. A HAZ and WHZ less than -2.0 standard deviations below the reference median was used to define stunting and wasting, respectively. In addition, anemia in children was defined as a hemoglobin value <110 g/L [11]. Lastly, the infant and young child feeding (IYCF) indicators (early initiation of breastfeeding, exclusive breastfeeding in children <6 months of age and, in children 6-23 months of age, minimum dietary diversity, minimum meal frequency, and minimum adequate diet) were calculated according to WHO IYCF guidelines [17]; calculations were conducted for using DHS 1999, 2005, and 2012 data.

In women 15-49 years of age, height and weight measurements were used to calculate the body-mass index (BMI) for each woman. The BMI is the weight in kilograms divided by the height in meters squared. A BMI < 18.5, 25.0 – 29.9, and ≥30 were used to classify a woman as underweight, overweight, or obese, respectively. Anemia was defined as hemoglobin < 120 g/L in non-pregnant women and < 110 g/L in pregnant women [11].

The analysis utilized the eight administrative regions in Guinea to identify regional variations in indicators of interest (see Figure 1). Administrative regions were identified in all databases except the 1999 DHS, which used Guinea's *Natural Regions* rather than administrative regions. To define administrative regions for the 1999 survey, GPS points of each survey cluster were overlaid against a map of administrative regions using QGIS 2.10 (Open Source Geospatial Foundation Project, http://www.qgis.org/), and each survey cluster was assigned to one of the eight regions: 1) Boké, 2) Conakry, 3) Faranah, 4) Kankan, 5) Kindia, 6) Labé,7) Mamou, or 8) N'Zézékoré.

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Women's education status was collected by the DHS, and used in this study for sub-group analysis. The DHS questionnaires asked women if they had ever attended school, and if so, what was the highest level of school they had ever attended. This information was recoded so that women would be identified as either never having attended school, attended primary school, or attended secondary school or higher.

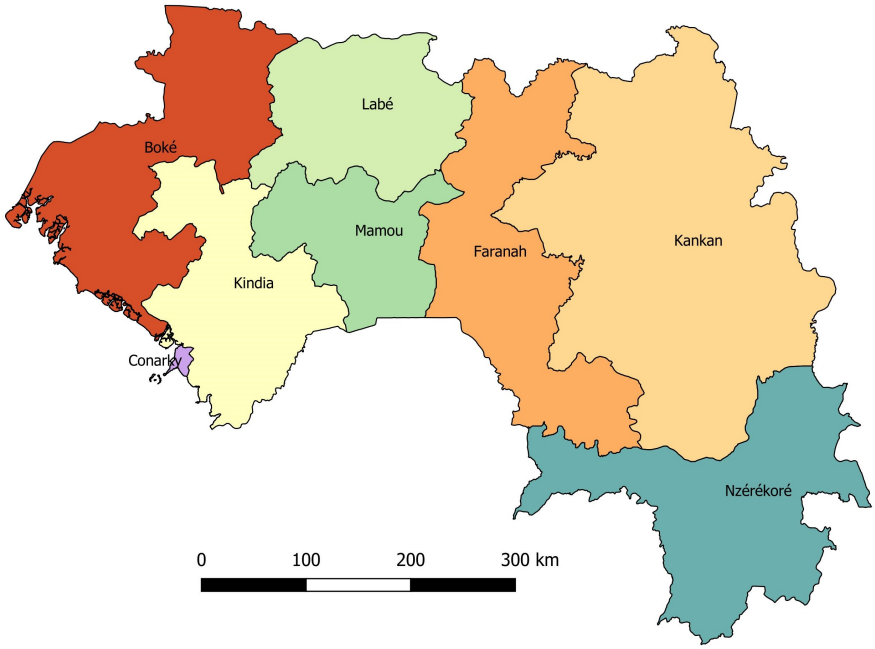

Figure 1: Map of Administrative regions of Guinea

Data management and analysis

Data analysis was conducted separately for children, adolescent girls, and women. For children, all five data sets were pooled before performing the trend analyses. For adolescent girls and women, only the three DHS data sets were pooled because the SMART surveys did not contain data on the nutritional status of women. Survey-specific estimates of proportions and means were made for each indicator to permit the analysis of trends. In addition to presenting the national-level estimates of each indicator, indicators were calculated by subgroups of age, urban/rural residence, administrative regions, education status, and household socio-economic status. Of note, neither the 2011 nor 2015 SMART surveys contained data on urban/rural residence or household socio-economic status.

For children, differences in the proportions of stunting and wasting were calculated between 1999 and 2005, 2005 and 2012, and 2012 and 2015. The 2011 SMART survey was not used to identify trends as a) it did not contain information on residence or household wealth quintile, and b) it was conducted less than one year prior to the 2012 DHS. Trends in anemia prevalence from 2005 to 2012 were also examined in children. For adolescent girls and women, differences in the proportions of underweight, overweight, and obesity were calculated between 1999 and 2005, and 2005 and

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2012.Trends in these anthropometric measures are not suitable for pregnant women [18], and were thus not calculated. Trends in anemia prevalence from 2005 to 2012 were examined for all women (both pregnant and non-pregnant).

Adjusted chi-square and ANOVA tests were used to determine if differences between survey years for various subgroups were statistically significant. Data analysis was conducted using Stata 14 (StataCorp, College Station, TX). All analyses were carried out using the statistical weights already contained in the DHS and SMART databases, and any estimates of precision, such as p values or confidence intervals, took into account the statistical weighting and the complex sampling approaches used by the DHS and SMART surveys.

RESULTS AND DISCUSSION

Table 1 shows the dates of data collection and the number of children, women of reproductive age, and adolescent girls in each survey.

Children <5 years of age

Stunting

As shown in Figure 2, there is no consistent trend in the prevalence of stunting between 1999 and 2015 in Guinea. Rather, it increased from 30.5% to 39.1% from 1999 to 2005, and then decreased to 30.9% in 2012. From 2012 to 2015, stunting prevalence has decreased further to 24.6%. Between 2005 and 2015, when stunting was at its highest and lowest levels, there has been an average annual decrease of 1.45 % in the prevalence.

No statistically significant changes were found in the prevalence of stunting in children less than 12 months of age (Table 2). In contrast, consistent and significant changes were found in older children. In these children, there was a significant increase in the stunting prevalence from 1999 to 2005, and significant reductions from 2005 to 2012 and 2012 to 2015. A similar pattern was observed in both rural and urban areas, with increases in stunting prevalence from 1999 to 2005 followed by decreases in stunting prevalence from 2005 to 2012. Among urban children, the stunting prevalence in 2012 was approximately 4 percentage points lower than in 1999. Conversely, stunting in rural children in 2012 was slightly higher than 1999 levels. Similar increases in stunting from 1999-2005 and decreases from 2005-2012 were found in household socio-economic subgroups. From a regional perspective, no significant changes in the time periods examined were found in Faranah, N'Zérékoré, and Boké. Of note, however, the stunting prevalence rates in Faranah and N'Zérékoré in 2015 were approximately 5 percentage points below those in 1999. On the contrary, the stunting prevalence in Boké increased slightly between 1999 and 2015.

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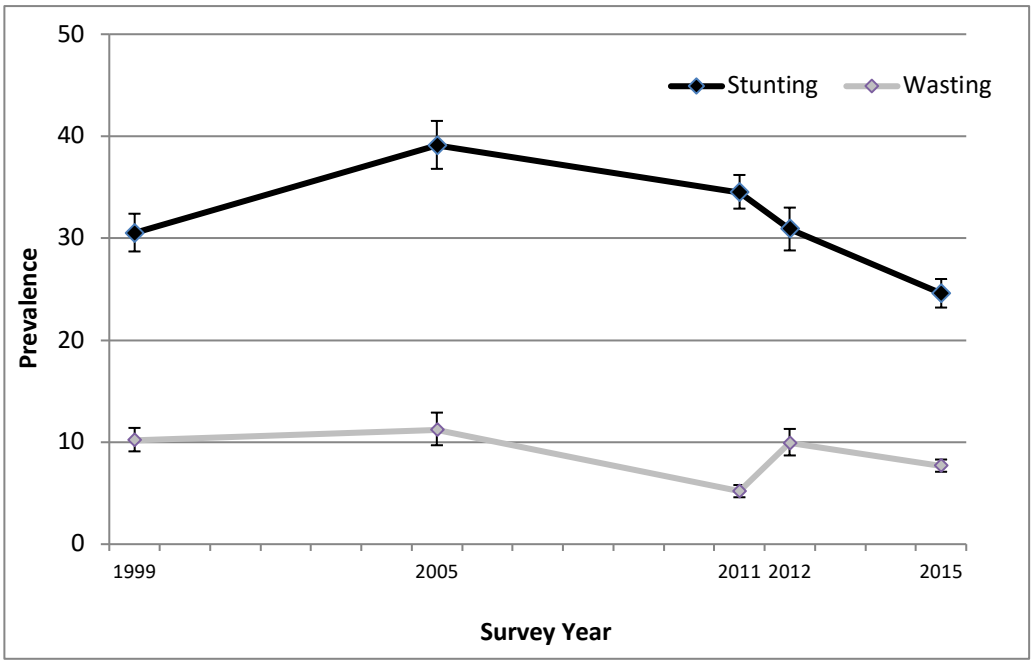

Figure 2: Prevalence of stunting and wasting in children <5 years of age, 1999-2015, Guinea

Wasting

The prevalence of wasting remained essentially unchanged between 1999 and 2005, and between 2012 and 2015 showed a small yet statistically significant, decline (Figure 2). The period between 2005 and 2012 shows the greatest variation, with markedly lower prevalence estimates in 2011 SMART (5.2%) than in the 2012 DHS (9.9%). With the exception of the results from the 2011 SMART survey, the prevalence of wasting has decreased by approximate 0.4% annually from 2005 to 2015.

There were fewer notable changes in the prevalence of wasting than in stunting (Table 3). For all children, a statistically significant decrease of 2.2 percentage points in wasting was observed from 2012 to 2015, but no significant difference observed in prior periods. From 1999 to 2005, a significant 3.9 percentage point increase in wasting was found in children 36-47 months of age. From 2012 to 2015, wasting decreased significantly from 17.8% to 10.7%, but only in children 12-23 months of age. At the regional level, Faranah displayed a significant 5.3 percentage point increase from 1999-2005 followed by a significant 5.8% decrease from 2005 to 2012. In Kankan, non-significant increases in wasting prevalence from 1999-2005 and 2005-2012 were contrasted by a significant 8.6% decrease between 2012 and 2015. Mamou region displayed a very large decrease (15.4 percentage points) from 1999 to 2005 followed by a significant 5.5 percentage point increase between 2005-2012. The changes in wasting prevalence for other regions during the three time periods were not statistically significant. Regarding residence, wasting in urban children significantly decreased by 3.3% between 2005 and 2012; no significant changes were found for rural children. Regarding wealth quintiles, a significant 7.0% increase was found between 1999 and 2005 in children residing in households in the fourth quintile (that is relatively wealthy households).

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Anemia

Hemoglobin concentrations from the 2005 and 2012 surveys showed that 74.4% and 77.9% of children were anemic, respectively (data not shown). Though small, the increase between survey years was statistically significant ($p<0.05$). Within each age group, no statistically significant changes were found between 2005 and 2012 anemia prevalence. A significant change ($p<0.01$) was observed in rural areas, where anemia prevalence increased from 74.8 (95% CI: 72.5,77.0) in 2005 to 79.9% (95% CI: 77.2, 82.3) in 2012; no such comparable change was seen in urban areas. Significant increases ($p<0.05$) in anemia prevalence from 2005 to 2012 were also observed in the following regions: Boké - 65.8 (95%CI: 60.8, 70.5) to 77.0 (95%CI: 70.5, 82.5); Kankan - 75.4 (95%CI: 69.9, 80.3) to 83.4 (95%CI: 77.5, 88.0); and Kindia- 67.7 (95%CI: 61.3,73.5) to 79.4 (95%CI: 72.2, 85.1). No statistically significant differences in anemia prevalence were observed in the lowest or highest wealth quintiles. However, for children residing in quintiles 2, 3, and 4, anemia prevalence increased from 75.9 (95%CI: 71.3, 79.9) to 83.4 (95%CI: 77.2, 88.1), 74.0 (95%CI: 70.0, 77.7) to 83.4 (95%CI: 78.9,87.1), 71.5 (95%CI: 67.3, 75.5) to 78.8 (95%CI: 74.8, 82.4), respectively.

As shown in Figure 3, the prevalence of exclusive breastfeeding and early initiation of breastfeeding increased from 1999 to 2005, but then decreased between 2005 and 2012. Complementary feeding measurements were only available for the 2005 and 2012 surveys, and showed that the proportion of children 6-23 months of age with minimum dietary diversity and minimum acceptable diet decreased substantially from 2005 to 2012, whereas the proportion with minimum meal frequency remained nearly the same. While infant and young child feeding practices were clearly suboptimal in all surveys, there was a consistent decline in optimal feeding practices between 2005 and 2012.

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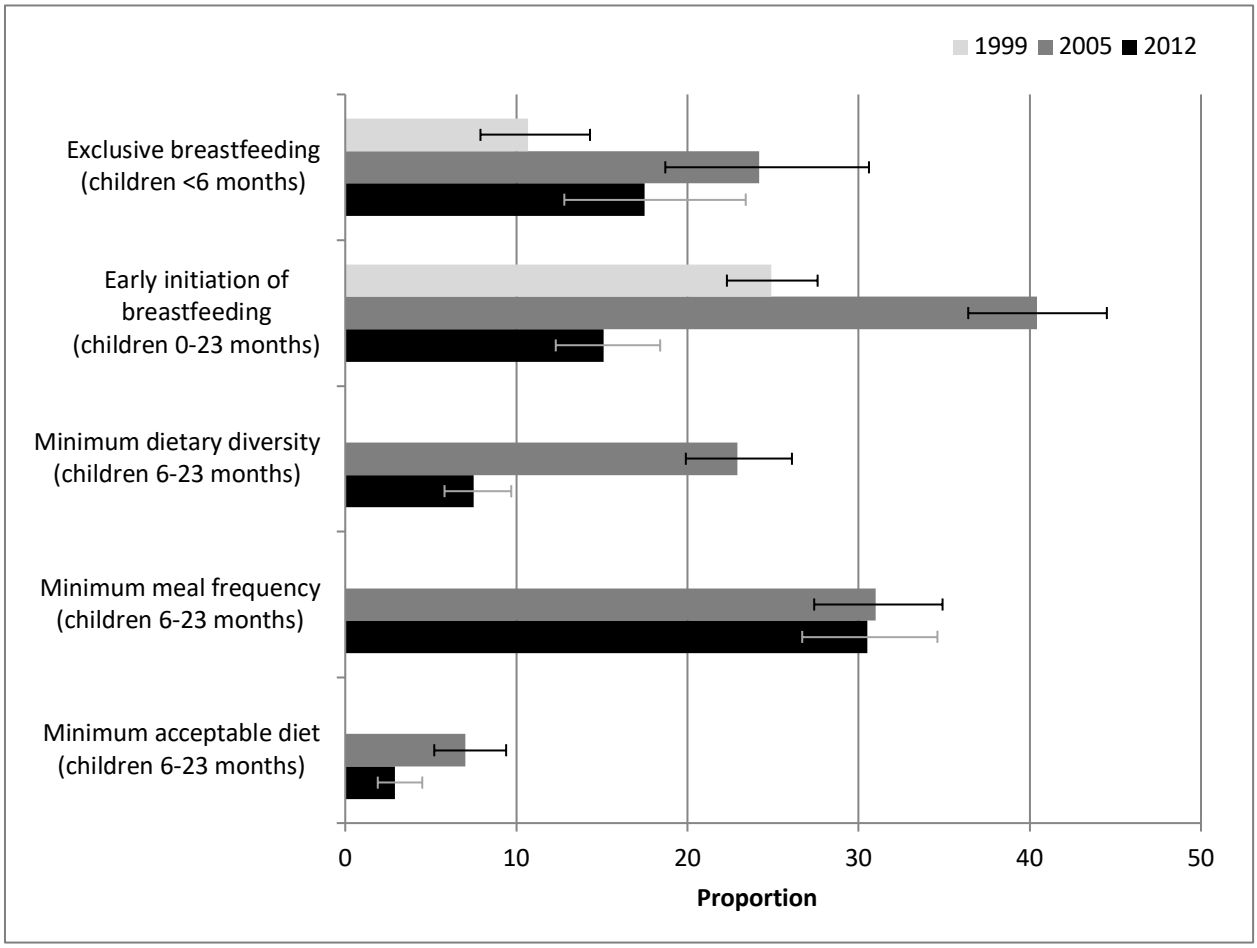

Figure 3: Infant and young child feeding indicator in children 0-23 months of age, 1999-2012, Guinea
(|———| denotes 95% confidence intervals)

Figure 4 presents the vitamin A supplementation coverage in children 6-59 months of age, deworming coverage in children 12-59 months of age, and the post-partum (i.e. within 2-months after delivery) vitamin A supplement coverage in mothers of children 0-59 months of age. Data is presented for all surveys where it was collected. For vitamin A supplementation of children, the national coverage decreased from 69.7% in 2005 to 38.5% in 2012, but rebounded in 2015 to almost the 2005 levels (68.0%). In nearly all regions, the coverage dropped considerably from 2005 to 2012, and showed a converse increase from 2012 to 2015 (see panel A). At the national level, the coverage of deworming medication (see panel B) increased from 28.1% in 2012 to 67.1% in 2015; a similar pattern was observed in all regions. Similar to vitamin A supplement coverage in children, the proportion of mothers that received post-partum vitamin A supplements (see panel C) decreased from 33.9% in 2005 to 26.9% in 2012. A similar decline in prevalence was observed in nearly all regions except N'Zérékoré where the prevalence was constant between years.

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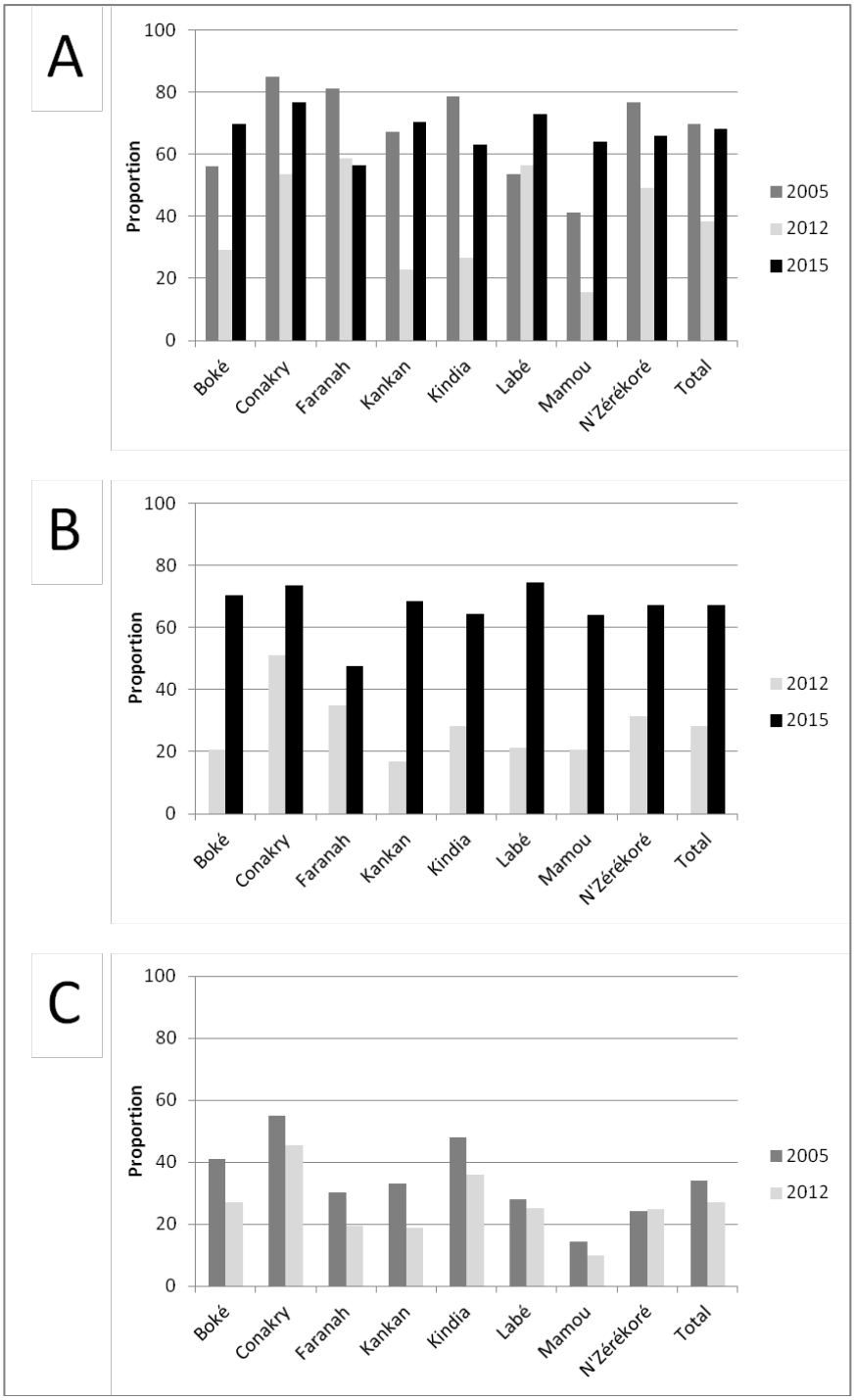

Figure 4: The coverage of vitamin A supplements among children 6-59 months of age in the previous six months [A], deworming medication among children 12-59 months of age in the previous six months [B], and post-partum vitamin A supplements among mothers during their last pregnancy, by region by year, Guinea

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Adolescent girls (15-19 years of age)

Underweight

As shown in Table 4, the prevalence of underweight in adolescent girls increased significantly from 1999 to 2012, with the largest increase occurring from 1999 to 2005. Statistically significant increases in the underweight prevalence were found in adolescent girls with no education, and among girls who had a secondary education or higher. In the latter group, however, there was only a very small number of adolescent girls (n=16) enrolled in secondary or higher in 1999. Statistically significant increases were also observed in girls in rural areas or households with the lowest wealth quintile. From 1999 to 2012, the underweight prevalence increased in all provinces except Mamou, with the largest (and only significant) increases observed in Labé.

Overweight and obesity

Nationally, the prevalence of overweight and obesity in adolescent girls increased only slightly over time: 5.0% in 1999 to 8.1% in 2012 (Table 4). Because the change over time and the number of adolescent girls included in these surveys was small, only few changes within subgroups were statistically significant.

Anemia

From 2005 to 2012, the anemia prevalence in adolescent girls declined slightly (Table 4). This decline was not statistically significant; anemia remains a severe public health problem. No significant change was observed by education, residence, pregnancy status, or household wealth quintile. A statistically significant reduction in anemia was only observed in girls residing in Conakry.

Women of reproductive age 15-49 years of age

Underweight

At the national level, the prevalence of underweight among all women 15-49 years has been largely constant from 1999 to 2012 (Table 5). Among women 15-19 years old, the prevalence increased significantly from 1999 to 2012. Dissimilarly, underweight decreased by 4.2 percentage points between 1999 and 2012 in women 30-39 years old. No subgroup by education, urban/rural residence, region, or household wealth had a substantial change during the period 1999-2012.

Overweight and obesity

The prevalence of overweight and obesity showed a statistically significant increase in all women and in all age groups (Figure 5). From 1999 to 2012, the combined overweight and obesity prevalence increased significantly among women with no education, women in both urban and rural areas, and women residing in households in the medium and fourth wealth quintiles. In this same time period, the prevalence increased in all regions, with significant differences in Boké, Conakry, Kankan, Kindia, and N'Zérékoré.

Anemia

From 2005 and 2012, anemia prevalence in all women showed a small, albeit statistically significant decrease from 52.5% to 49.1% (Table 4). Though small, this decline was statistically significant. With a few exceptions, similar declines were found in subgroups of age, pregnancy status, under- and over-nutrition status, region, and wealth quintile. In

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spite of this decline, anemia prevalence in 2012 exceeded 40% overall and in nearly all sub-groups, demonstrating a severe public health problem.

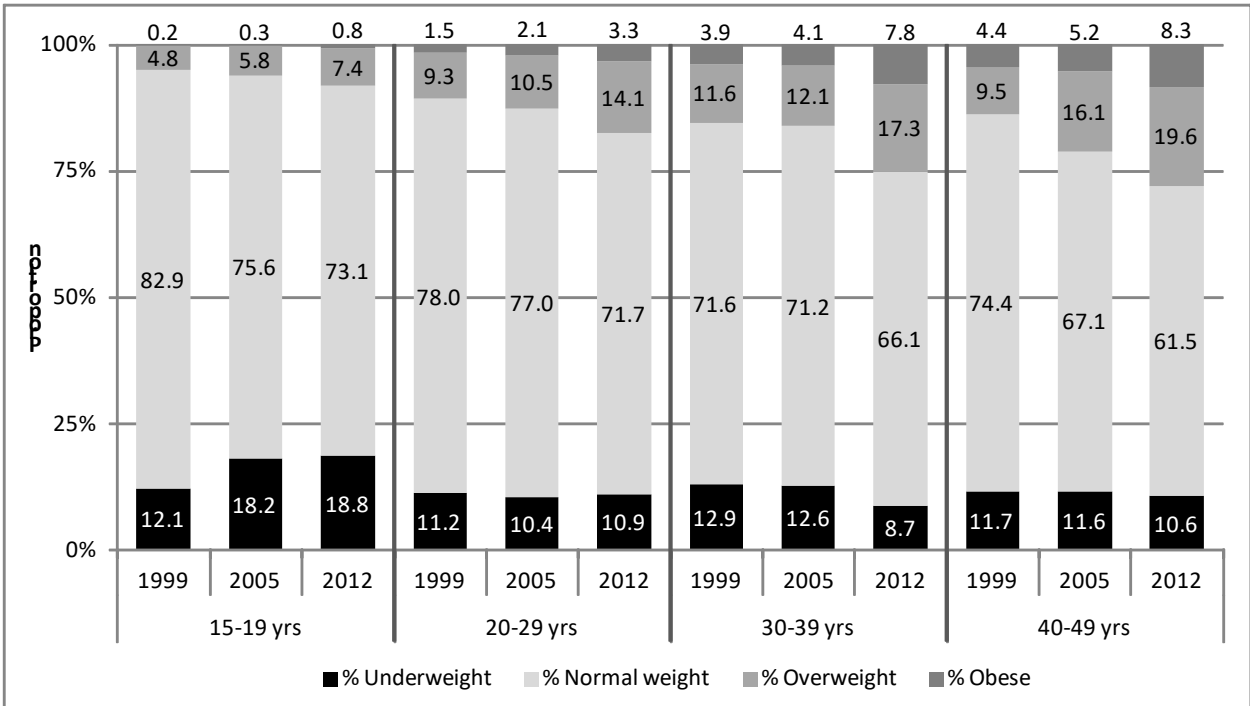

Figure 5: The prevalence of underweight, normal weight, overweight, and obesity in women of reproductive age, by age group and year, Guinea

Child nutrition and WHA targets

According to the targets established by the World Health Assembly (WHA), countries should aim to reduce the number of stunted children < 5 years of age by 40% by 2025 [19]. This analysis found that, from 2005 to 2015, the prevalence of stunting has decreased by an average of 1.45 percentage points annually. This annual reduction is notably larger than the ~0.3% annual reduction in stunting prevalence that occurred in Africa between 1990 and 2011 [3].Using the number of Guinean children < 5 years of age and population growth rate from the United Nation's Population Division [20],and assuming a consistent 1.45% decrease in the annual stunting prevalence until 2025, the number of stunted children in Guinea would decline by 57% by that year (see Table 6), and would thus surpass the WHA targets. More modest simulations that assume an average annual decline of 1% or 0.5% (starting in 2016) in the prevalence of stunting would result in a 37% or 16% decline in the number of stunted children by 2025. Under these scenarios, Guinea would not meet the WHA targets.

The wasting prevalence has also declined since 2005, but as wasting is an acute condition for which the prevalence can change quickly, a simulation of future trends in the prevalence of wasting is much less likely to be accurate. Nonetheless, if the trend from 2012 to 2015 continues, Guinea will meet the WHA target of reducing wasting prevalence to below 5% by 2025.

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To meet the WHA stunting and wasting targets, Guinea must sustain its investment in nutrition and health programs targeting children < 5 years of age. As stunting in Guinea is associated with numerous maternal factors [21], investments in the health and nutrition status of women of reproductive age may also help sustain a reduction in stunting.

Changes in child nutrition during Ebola outbreak

The most substantial reduction in the stunting prevalence occurred between 2012 and 2015, and were driven by significant reductions in most regions. This decline is notable considering the Ebola outbreak occurring during this time period. In fact, the decline in stunting prevalence was still substantial in those regions reporting the greatest cumulative prevalence of Ebola infection; these regions include N'Zérékoré and Kankan, on the Liberian border; Kindia and Boké in the west, and Faranah on the Sierra Leone border.

The modest reduction in wasting prevalence at the national level from 2005 and 2015 was driven by larger reductions in Conakry, Faranah, Labé, and N'Zérékoré. However, most of these reductions occurred between 2005 and 2012, before the Ebola outbreak. Only Kankan experienced a significant drop in wasting prevalence from 2012 to 2015 when the Ebola outbreak occurred. Attributing this reduction to the humanitarian response is difficult as similar reductions were not found in other regions.

The reductions in stunting and wasting from 2012 to 2015 occurred at the same time as increases in the coverage of vitamin A supplementation and deworming. While no causal relationship can be made between these programs and the reduction in malnutrition, in particular stunting, it is notable that the coverage of these programs increased during the Ebola outbreak. As these programs could serve as a proxy for health services, they may reflect the expansion of the health system during a period of crisis.

Underweight in adolescent girls

The prevalence of underweight has significantly increased in adolescent girls, which poses many public health concerns for girls, particularly those who become pregnant. According to Casanueva *et al.* [22], pregnancy in adolescence can lead to a cessation of maternal growth due to increased energy requirements. The increased prevalence of underweight and relatively constant proportion of pregnant adolescent girls suggests that more pregnant adolescent girls in Guinea are at risk of not growing to their full potential. Moreover, underweight women at any age who become pregnant are at greater risk of giving birth to low birthweight children [23]. In a pooled analysis of DHS data from Guinea, Woodruff *et al.* [21] found that maternal age at birth and severe underweight were both independent predictors of childhood stunting and wasting.

Overweight and obesity in women

In Guinea, the prevalence of overweight and obesity has increased substantially in women over ≥ 30 years of age. Similar increases in the prevalence of overweight and obesity have been observed globally since 2000 [7].

This analysis also found that overweight and obesity increased more in women with no education, urban women, and women residing in wealthier households. These findings

are similar to an analysis by Neupane *et al*. [24], who analyzed data from 32 countries in sub-Saharan African (including Guinea) and found that more educated women, urban women, and wealthier women are more likely to be overweight or obese than less educated, rural, and poor women. While the study shows that the prevalence of overweight and obesity was higher in more educated women, it also revealed that the greatest prevalence in overweight and obesity was among women with no education. This finding could suggest that dietary patterns or activity habits of non-educated women in Guinea varies from those with at least a primary education. Additional research is needed to identify the main determinants of overweight and obesity in Guinea. However, researchers have already proposed that physical activity should be promoted, and that in urban areas, the installation of designated pedestrian and cycling lanes could increase physical activity [24].

Limitations

This analysis has some notable limitations. First, DHS and SMART surveys do not collect the same types of information. Most notably, SMART surveys do not collect information on the nutritional status of women of reproductive age or on anemia in children. In addition, the SMART survey does not classify its primary sampling units as urban or rural, which prevented the cross-tabulations of various indicators by residence. Second, this analysis did not account for issues of data quality, which may have affected the accuracy of some calculations. For example, the 2011 SMART survey report [14] presented the results from standardization tests of height and weight measurements, which found that enumerators' measurements had acceptable *precision* but "poor" accuracy. Thus, anthropometric measurements in this survey may have results in under- or over-estimation of Z scores, which would subsequently impact the stunting and wasting prevalence presented.

CONCLUSIONS

Among children less than 5 years of age in Guinea, the prevalence rates of stunting and wasting have decreased since 2005. If a similar trend continues for the next decade, Guinea can meet stunting and wasting targets established by the World Health Assembly. Among adolescent girls, the prevalence of underweight has steadily increased, and anemia has declined only slightly. Among all women of reproductive age, the prevalence of underweight has remained relatively constant, and anemia has declined only slightly. There has been a steady increase in the prevalence of overweight and obesity in all women, particularly in women >30 years of age.

Author contributions

JPW, FR, and BAW designed the data analysis plan. DM, JMB, MA, and INT provided scientific oversight. JPW and BAW analyzed the data and JPW drafted the first version of the manuscript. All authors provided inputs to the manuscript and JPW had primary responsibility for final content. All authors read and approved the final manuscript.

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Table 1: Survey information and descriptive statistics, by survey, 1999-2015, Guinea

	1999 DHS (May-Jul 1999)	2005 DHS (Feb-Jun 2005)	2011 SMART[1] (Dec 2011-Feb 2012)	2012 DHS (Jun-Oct 2012)	2015 SMART[1] (July 2015)
Children <5 years old					
N	2,958	2,758	8,174	3,512	12,145
Age in months, mean (SD)	24.2 (± 0.3)	27.3 (± 0.4)	26.5 (± 0.2)	27.8 (± 0.3)	27.8 (± 0.3)
HAZ, mean (SD)	-1.15 (± 0.04)	-1.45 (± 0.04)	-1.53 (± 0.03)	-1.09 (± 0.05)	-1.01 (± 0.03)
WHZ, mean (SD)	-0.32 (± 0.03)	-0.29 (± 0.04)	-0.13 (± 0.02)	-0.33 (± 0.03)	-0.33 (± 0.02)
Urban, %	30.2	21.9	n/a	24.8	n/a
Adolescent girls 15-19 years[2]					
N	407	813	n/a	1,094	n/a
Age in years, mean (SD)	17.8 (± 1.1)	16.8 (±1.4)	n/a	16.9 (±1.4)	n/a
Pregnant, %	9.5	9.6	n/a	9.6	n/a
Urban, %	29.0	38.6	n/a	40.6	n/a
Women 15-49 years[2]					
N	3,806	3,962	n/a	4,717	n/a
Age in years, mean (± SD)	28.8 (± 7.5)	29.4 (± 9.8)	n/a	28.4 (± 9.7)	n/a
Pregnant, %	11.9	9.9	n/a	10.4	n/a
Urban, %	26.1	30.2	n/a	35.0	n/a

[1] SMART surveys did not conduct a separate sample of women of reproductive age, but collected selected information from mothers of selected children

[2]Descriptive statistics provided for women and adolescent girls with complete age, height, and weight information

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Table 2: Trends in stunting prevalence of children < 5 years of age, Guinea, 1999 – 2015

	Prevalence					Trends			
	1999	2005	2011	2012	2015	1999-2005	2005-2012	2012-2015	2005-2015
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	Δ sig	Δ sig	Δ sig	Δ sig
Total	30.5 (28.7, 32.4)	39.1 (36.8, 41.5)	34.5 (32.9, 36.2)	30.9 (28.8, 33.0)	24.6 (23.2, 26.0)	+8.6**	-8.2**	-6.3**	-14.5**
Age (months)									
0-5	14.4 (11.3, 18.1)	12.0 (8.4, 16.8)	17.7 (15.1, 20.5)	10.2 (7.3, 14.3)	13.5 (11.1, 16.2)	-2.4	-1.8	+3.3	+1.5
6-11	16.9 (13.5, 21.1)	18.0 (14.2, 22.7)	20.4 (17.7, 23.3)	13.1 (8.9, 18.8)	18.4 (15.4, 21.8)	+1.1	-4.9	+5.3	+0.4
12-23	33.5 (30.2, 37.0)	39.8 (35.2, 44.5)	37.5 (34.4, 40.7)	27.6 (23.7, 31.9)	25.9 (23.7, 28.3)	+6.3*	-12.2**	-1.7	-13.9**
24-35	41.6 (37.1, 46.1)	55.0 (50.4, 59.5)	41.4 (38.7, 44.2)	40.9 (36.1, 45.9)	29.4 (27.0, 31.9)	+13.4**	-14.1**	-11.5**	-25.6**
36-47	38.9 (34.0, 43.9)	48.2 (43.2, 53.3)	42.3 (38.9, 45.8)	40.5 (35.6, 45.7)	29.5 (27.0, 32.1)	+9.3**	-7.7*	-11.0**	-18.7**
48-59	33.2 (28.3, 38.5)	46.6 (41.6, 51.6)	35.9 (32.6, 39.5)	38.4 (34.0, 43.1)	23.0 (20.7, 25.4)	+13.4**	-8.2*	-15.4**	-23.6**
Residence									
Rural	34.2 (32.0, 36.5)	42.2 (39.5, 45.1)	--	35.2 (32.7, 37.7)	--	+8.0**	-7.0**	--	--
Urban	22.0 (19.1, 25.1)	28.1 (24.5, 32.1)	--	17.9 (14.9, 21.3)	--	+6.1*	-10.2**	--	--
Region									
Boké	25.0 (19.3, 31.6)	30.5 (24.7, 36.9)	29.6 (25.8, 33.7)	27.4 (21.4, 34.4)	28.3 (25.3, 31.4)	+5.5	-3.1	+0.9	-2.2
Conakry	19.3 (16.0, 23.0)	26.1 (20.4, 32.8)	20.7 (18.0, 23.7)	15.4 (11.0, 21.2)	15.4 (12.5, 18.8)	+6.8	-10.7*	0.0	-10.7**
Faranah	31.1 (26.4, 36.2)	34.9 (30.7, 39.3)	39.6 (33.6, 45.9)	30.5 (25.6, 35.9)	26.0 (23.0, 29.1)	+3.8	-4.4	-4.5	-8.9**
Kankan	30.7 (25.6, 36.4)	46.0 (40.9, 51.2)	38.8 (34.6, 43.2)	32.2 (27.7, 37.2)	28.6 (26.3, 31.0)	+15.3**	-13.8**	-3.6	-17.4**
Kindia	32.2 (28.1, 36.6)	39.5 (33.9, 45.3)	33.0 (28.0, 38.5)	29.9 (24.7, 35.5)	20.4 (17.0, 24.3)	+7.3*	-9.6*	-9.5**	-19.1**
Labé	35.5 (28.7, 43.0)	39.4 (33.0, 46.1)	40.5 (36.0, 45.0)	35.0 (28.1, 42.7)	25.1 (22.2, 28.2)	+3.9	-4.4	-9.9*	-14.3**
Mamou	25.8 (18.4, 34.9)	38.5 (32.1, 45.4)	38.2 (34.4, 42.3)	42.3 (35.5, 49.4)	23.6 (20.4, 27.1)	+12.7*	+3.8	-18.7**	-14.9**
N'Zérékoré	37.7 (34.0, 41.4)	44.3 (37.7, 51.1)	39.7 (34.1, 45.6)	36.9 (31.8, 42.2)	31.6 (26.6, 37.0)	+6.6	-7.4	-5.3	-12.7**
Wealth quintile									
Lowest	36.0 (32.6, 39.6)	44.2 (37.9, 50.6)	--	37.6 (28.6, 47.6)	--	+8.2*	-6.6	--	--
Second	33.4 (29.6, 37.4)	42.8 (38.1, 47.7)	--	42.3 (36.0, 48.8)	--	+9.4**	-0.5	--	--
Medium	35.0 (30.5, 39.8)	43.9 (40.1, 47.8)	--	37.9 (33.5, 42.5)	--	+8.9**	-6.0*	--	--
Fourth	26.0 (21.6, 30.9)	31.9 (27.0, 37.2)	--	30.9 (27.4, 34.6)	--	+5.9	-1.0	--	--
Highest	16.7 (13.5, 20.6)	28.5 (24.0, 33.5)	--	20.8 (17.9, 24.0)	--	+11.8**	-7.7*	--	--

* = p<0.05; ** = p<0.01

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Table 3: Trends in wasting prevalence of children < 5 years of age, Guinea, 1999 – 2015

	Prevalence					Trends			
	1999	2005	2011	2012	2015	1999-2005	2005-2012	2012-2015	2005-2015
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	Δ sig	Δ sig	Δ sig	Δ sig
Total	10.2 (9.1, 11.4)	11.2 (9.7, 12.9)	5.2 (4.6, 5.8)	9.9 (8.7, 11.3)	7.7 (7.1, 8.3)	+1.0	-1.3	-2.2**	-3.5**
Age (months)									
0-5	13.4 (10.6, 16.9)	14.7 (11.3, 18.9)	6.2 (4.6, 8.3)	12.3 (8.9, 16.7)	9.0 (7.3, 11.1)	+1.3	-2.4	-3.3	-5.7**
6-11	19.8 (15.7, 24.6)	21.2 (16.0, 27.7)	8.3 (6.4, 10.6)	14.0 (10.0, 19.3)	9.9 (8.1, 12.1)	+1.4	-7.2	-4.1	-11.3**
12-23	15.5 (13.0, 18.5)	15.0 (11.8, 19.0)	7.5 (6.3, 9.0)	17.8 (14.4, 21.8)	10.7 (9.3, 12.2)	-0.5	+2.8	-7.1**	-4.3*
24-35	6.4 (4.6, 8.8)	9.5 (6.9, 12.9)	3.5 (2.7, 4.5)	8.0 (5.3, 11.9)	7.8 (6.6, 9.2)	+3.1	-1.5	-0.2	-1.7
36-47	3.0 (1.8, 5.1)	6.9 (4.7, 10.0)	3.1 (2.2, 4.2)	4.9 (3.2, 7.6)	5.0 (4.0, 6.1)	+3.9**	-2.0	+0.1	-1.9
48-59	2.4 (1.3, 4.4)	4.1 (2.6, 6.4)	3.4 (2.4, 4.9)	4.3 (2.9, 6.4)	5.3 (4.1, 6.8)	+1.7	+0.2	+1.0	+1.2
Residence									
Rural	10.7 (9.3, 12.2)	11.5 (9.6, 13.6)	--	11.0 (9.5, 12.6)	--	+0.8	-0.5	--	--
Urban	9.1 (7.3, 11.3)	10.2 (8.1, 12.8)	--	6.9 (5.3, 8.9)	--	+1.1	-3.3*	--	--
Region									
Boké	9.2 (6.0, 13.9)	6.6 (4.5, 9.7)	4.9 (3.5, 6.9)	8.9 (6.2, 12.4)	8.5 (6.7, 10.8)	-2.6	+2.3	-0.4	+1.9
Conakry	10.3 (7.8, 13.7)	11.1 (7.4, 16.4)	7.2 (5.5, 9.2)	7.4 (4.9, 11.0)	5.8 (4.6, 7.3)	+0.8	-3.7	-1.6	-5.3**
Faranah	10.0 (6.9, 14.2)	15.3 (12.2, 19.0)	2.4 (1.6, 3.6)	9.5 (6.2, 14.2)	8.7 (7.3, 10.4)	+5.3*	-5.8*	-0.8	-6.6**
Kankan	11.0 (7.7, 15.5)	15.8 (10.5, 23.0)	5.3 (3.9, 7.0)	18.9 (15.8, 22.4)	10.3 (9.1, 11.7)	+4.8	+3.1	-8.6**	-5.5
Kindia	9.6 (7.1, 12.9)	8.1 (5.4, 11.9)	6.3 (4.4, 8.7)	6.3 (4.2, 9.3)	8.0 (6.2, 10.1)	-1.5	-1.8	+1.7	-0.1
Labé	12.3 (8.0, 18.6)	13.9 (9.6, 19.6)	7.1 (5.4, 9.1)	8.9 (6.1, 12.9)	7.4 (6.3, 8.6)	+1.6	-5.0	-1.5	-6.5**
Mamou	19.8 (13.3, 28.5)	4.4 (2.6, 7.4)	5.0 (3.8, 6.6)	9.9 (6.7, 14.4)	7.2 (5.7, 9.0)	-15.4**	+5.5*	-2.7	+2.8
N'Zérékoré	8.1 (6.4, 10.2)	11.3 (8.3, 15.2)	2.6 (1.7, 4.2)	6.8 (4.2, 11.0)	6.6 (4.7, 9.1)	+3.2	-4.5	-0.2	-4.7*
Wealth quintile									
Lowest	13.0 (10.6, 15.7)	11.1 (8.7, 14.2)	--	10.7 (6.6, 16.8)	--	-1.9	-0.4	--	--
Second	10.0 (7.8, 12.7)	13.0 (10.1, 16.6)	--	10.6 (7.4, 15.1)	--	+3.0	-2.4	--	--
Medium	9.1 (6.8, 12.1)	9.3 (7.4, 11.6)	--	9.7 (7.4, 12.6)	--	+0.2	+0.4	--	--
Fourth	6.9 (5.1, 9.4)	13.9 (10.1, 19.0)	--	12.1 (9.5, 15.4)	--	+7.0**	-1.8	--	--
Highest	9.2 (6.7, 12.5)	9.2 (6.4, 13.0)	--	7.7 (6.2, 9.6)	--	0.0	-1.5	--	--

* = p<0.05; ** = p<0.01

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Table 4: Trends in nutrition status of non-pregnant adolescent girls, Guinea, 1999 – 2012

	Adolescent girls (15-19 years)			Trends		
	1999	2005	2012	1999-2005	2005-2012	1999-2012
	% (CI)	% (CI)	% (CI)	Δ sig	Δ sig	Δ sig
Underweight						
N	368	737	997			
Total	12.1 (8.8, 16.5)	18.2 (15.4, 21.4)	18.8 (16.2, 21.6)	+6.1*	+0.6	+6.7*
Education						
No education	12.0 (8.3, 17.1)	18.1 (14.1, 23.0)	18.3 (14.5, 22.8)	+6.1	+0.2	+6.3*
Primary	15.8 (9.0, 26.3)	15.5 (10.9, 21.5)	17.1 (12.6, 22.6)	-0.3	+1.6	+1.3
Sec. or higher	0.0 (--,--)	21.8 (15.6, 29.6)	20.4 (15.4, 26.7)	+21.8**	-1.4	+20.4**
Anemic						
No	n/a	20.5 (16.5, 25.1)	22.0 (18.3, 26.3)	n/a	+1.5	n/a
Yes	n/a	15.8 (12.4, 19.8)	14.8 (11.5, 18.8)	n/a	-1.0	n/a
Residence						
Urban	14.1 (9.3, 20.9)	17.2 (13.0, 22.5)	19.2 (15.2, 23.9)	+3.1	+2.0	+5.1
Rural	11.2 (7.2, 17.1)	18.9 (15.3, 23.1)	18.5 (15.3, 22.1)	+7.7*	-0.4	+7.3*
Region						
Boké	14.2 (4.5, 36.5)	17.8 (11.4, 26.9)	17.1 (10.8, 26.0)	+3.6	-0.7	+2.9
Conakry	12.1 (5.7, 23.9)	17.6 (10.7, 27.7)	21.4 (15.7, 28.5)	+5.5	+3.8	+9.3
Faranah	12.8 (5.7, 26.3)	21.7 (13.8, 32.5)	19.5 (11.8, 30.3)	+8.9	-2.2	+6.7
Kankan	16.7 (8.9, 29.2)	20.2 (13.6, 28.9)	22.2 (16.0, 30.1)	+3.5	+2.0	+5.5
Kindia	9.6 (4.9, 18.1)	18.7 (11.8, 28.4)	13.5 (8.5, 20.8)	+9.1	-5.2	3.9
Labé	0.0 (--,--)	36.9 (24.5, 51.2)	27.5 (19.8, 36.8)	+36.9**	-9.4	27.5**
Mamou	26.7 (5.4, 69.7)	21.7 (11.6, 36.8)	25.4 (16.0, 37.9)	-5.0	+3.7	-1.3
N'Zérékoré	11.0 (5.1, 22.1)	7.8 (4.1, 14.4)	12.5 (8.2, 18.5)	-3.2	+4.7	+1.5
Wealth quintile						
Lowest	10.6 (5.1, 20.7)	15.9 (10.4, 23.4)	24.9 (18.7, 32.2)	+5.3	+9.0	+14.3*
Second	13.1 (6.1, 26.2)	20.7 (14.1, 29.2)	19.3 (13.8, 26.3)	+7.6	-1.4	+6.2
Medium	13.2 (7.0, 23.4)	15.6 (9.1, 25.6)	15.1 (10.6, 20.9)	+2.4	-0.5	+1.9
Fourth	11.0 (6.3, 18.5)	20.6 (15.8, 26.4)	14.4 (10.8, 18.9)	+9.6*	-6.2	+3.4
Highest	12.6 (6.1, 24.2)	18.6 (12.8, 26.3)	22.1 (16.6, 28.8)	+6.0	+3.5	+2.1
Overweight and Obesity						
N	368	737	997			
Total	5.0 (3.4, 7.4)	6.1 (4.5, 8.3)	8.1 (6.3, 10.4)	+1.1	+2.0	3.1*
Education						
No education	4.8 (3.0, 7.5)	5.6 (3.5, 8.9)	5.3 (3.1, 8.8)	+0.8	-0.3	+0.5
Primary	5.6 (1.8, 16.1)	7.0 (4.1, 11.8)	4.4 (2.4, 8.1)	+1.4	-2.6	-1.2
Sec. or higher	11.0 (1.3, 53.7)	5.8 (3.0, 10.9)	14.4 (10.2, 20.0)	-5.2	+8.6*	+3.4
Anemic						
No	n/a	5.8 (3.6, 9.1)	7.7 (5.5, 10.7)	n/a	+1.9	n/a

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Yes	n/a	6.6 (4.4, 9.9)	8.8 (6.1, 12.4)	n/a	+2.2	n/a
Residence						
Urban	8.3 (5.0, 13.5)	10.3 (7.1, 14.7)	12.8 (9.5, 17.0)	+2.0	+2.5	+4.5
Rural	3.6 (2.0, 6.5)	3.3 (1.9, 5.8)	4.6 (2.9, 7.4)	-0.3	+1.3	+1.0
Region						
Boké	0.0	4.3 (1.7, 10.1)	6.6 (3.4, 12.6)	+4.3	+2.3	+6.6
Conakry	17.2 (10.6, 26.8)	13.1 (8.0, 20.7)	16.3 (11.2, 23.2)	-4.1	+3.2	-0.9
Faranah	2.3 (0.3, 16.2)	3.3 (1.1, 9.7)	3.9 (1.6, 9.2)	+1.0	+0.6	+1.6
Kankan	0.0	3.4 (0.7, 14.5)	3.9 (1.5, 9.9)	+3.4	+0.5	+3.9
Kindia	9.6 (4.8, 18.4)	4.6 (1.6, 12.4)	4.1 (1.7, 9.4)	-5.0	-0.5	-5.5
Labé	0.0	1.7 (0.5, 5.8)	2.7 (0.8, 8.5)	+1.7	+1.0	+2.7
Mamou	0.0	10.8 (3.9, 26.7)	4.0 (1.2, 12.9)	+10.8	-6.8	+4.0
N'Zérékoré	2.0 (0.5, 7.5)	5.2 (2.6, 10.3)	8.7 (4.7, 15.7)	+3.2	+3.5	+6.7*
Wealth quintile						
Lowest	1.2 (0.2, 7.5)	2.2 (0.6, 8.4)	3.2 (1.1, 8.6)	+1.0	+1.0	+2.0
Second	1.6 (0.2, 10.6)	3.4 (1.0, 10.5)	3.1 (1.2, 8.1)	+1.8	-0.3	+1.5
Medium	2.7 (0.7, 10.8)	3.4 (1.3, 8.7)	4.4 (1.7, 10.7)	+0.7	+1.0	+1.7
Fourth	7.8 (3.8, 15.6)	5.5 (3.0, 10.0)	10.8 (7.1, 16.2)	-2.3	+5.3	+3.0
Highest	12.6 (7.3, 20.9)	12.5 (8.3, 18.5)	13.1 (8.5, 19.6)	-0.1	+0.6	+0.5
Anemia						
N	--	799	1,087	--	--	--
Total	--	50.2 (46.2, 54.2)	47.1 (43.6, 50.6)	--	-3.1	--
Education						
No education	--	54.6 (49.4, 59.7)	50.9 (45.1, 56.6)	--	-3.7	--
Primary	--	48.7 (41.1, 56.3)	48.6 (42.2, 55.0)	--	-0.1	--
Sec. or higher	--	41.0 (33.2, 49.3)	41.0 (35.0, 47.2)	--	0.0	--
Pregnant						
No	--	48.5 (44.3, 52.7)	44.7 (41.0, 48.4)	--	-3.8	--
Yes	--	67.5 (54.8, 78.1)	69.4 (60.3, 77.2)	--	+1.9	--
Underweight						
No	--	52.0 (47.6, 49.1)	49.1 (45.1, 53.1)	--	-2.9	--
Yes	--	42.1 (34.9,49.7)	37.6 (30.3, 45.5)	--	-4.5	--
Overweight or Obese						
No	--	49.6 (45.5, 53.7)	46.7 (43.2, 50.2)	--	-2.9	--
Yes	--	58.4 (42.3, 72.9)	51.0 (39.0, 63.0)	--	-7.4	--
Residence						
Urban	--	43.8 (37.3, 50.5)	40.9 (35.6, 46.5)	--	-2.9	--
Rural	--	54.3 (49.4, 59.1)	51.3 (46.8, 55.8)	--	-3.0	--
Region						
Boké	--	46.5 (37.2, 56.0)	49.6 (40.6, 58.7)	--	+3.1	--
Conakry	--	54.4 (44.9, 63.6)	40.7 (32.6, 49.3)	--	-13.7*	--
Faranah	--	47.3 (35.5, 59.5)	59.1 (50.1, 67.5)	--	+11.8	--
Kankan	--	60.7 (49.2, 71.1)	53.5 (41.6, 65.0)	--	-7.2	--
Kindia	--	36.5 (28.5, 45.2)	42.9 (32.9, 53.6)	--	+6.4	--

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Labé	--	39.3 (29.5, 50.1)	31.3 (24.3, 39.3)	--	-8.0	--
Mamou	--	53.0 (39.7, 65.9)	45.7 (36.2, 55.6)	--	-7.3	--
N'Zérékoré	--	56.5 (45.6, 66.9)	51.3 (43.9, 58.8)	--	-5.2	--
Wealth quintile						
Lowest	--	56.0 (45.1, 66.3)	49.5 (40.9, 58.1)	--	-6.5	--
Second	--	61.3 (52.9, 69.2)	56.1 (46.7, 65.1)	--	-5.2	--
Medium	--	51.6 (42.4, 60.7)	48.2 (40.4, 56.1)	--	-3.4	--
Fourth	--	38.9 (29.9, 48.7)	44.9 (37.7, 52.3)	--	+6.0	--
Highest	--	48.3 (41.1, 55.5)	39.4 (33.0, 46.2)	--	-8.9	--

* = $p<0.05$; ** = $p<0.01$

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Table 5: Trends in nutrition status of women of reproductive age, Guinea, 1999 – 2012

	Women of reproductive age (15-49 years)			Trends		
	1999	2005	2012	1999-2005	2005-2012	1999-2012
	% (CI)	% (CI)	% (CI)	Δ sig	Δ sig	Δ sig
Underweight						
N	3348	3578	4229			
Total	11.9 (10.7, 13.3)	12.9 (11.6, 14.3)	12.2 (10.9, 13.6)	+1.0	-0.7	0.3
Age (years)						
15-19	12.1 (8.8, 16.5)	18.2 (15.4, 21.4)	18.8 (16.2, 21.6)	+6.1*	+0.6	+6.7*
20-29	11.2 (9.5, 13.2)	10.4 (8.6, 12.5)	10.9 (8.8, 13.4)	-0.8	0.5	-0.3
30-39	12.9 (11.0, 15.0)	12.6 (10.4, 15.0)	8.7 (6.9, 10.9)	-0.3	-3.9	-4.2**
40-49	11.7 (8.9, 15.3)	11.6 (9.3, 14.2)	10.6 (8.4, 13.3)	-0.1	-1.0	-1.1
Education						
No education	12.3 (11.0, 13.8)	13.0 (11.4, 14.7)	12.4 (10.9, 14.0)	+0.7	-0.6	+0.1
Primary	11.6 (8.2, 16.1)	11.9 (8.8, 16.1)	12.1 (9.4, 15.5)	+0.3	+0.2	+0.5
Sec. or higher	8.3 (5.1, 13.1)	13.1 (9.5, 17.8)	11.4 (9.0, 14.5)	+4.8	-1.7	+3.1
Anemic						
No	n/a	13.8 (11.9, 16.0)	12.9 (11.2, 14.7)	n/a	-0.9	n/a
Yes	n/a	12.2 (10.7, 13.9)	11.5 (9.9, 13.2)	n/a	-0.7	n/a
Residence						
Urban	9.5 (7.6, 11.9)	11.3 (9.4, 13.6)	9.8 (8.1, 11.8)	+1.8	-1.5	+0.3
Rural	12.8 (11.3, 14.4)	13.6 (12.0, 15.4)	13.5 (11.8, 15.5)	+0.8	-0.1	+0.7
Region						
Boké	10.8 (8.2, 14.2)	11.7 (8.7, 15.5)	12.2 (9.0, 16.3)	+0.9	+0.5	+1.4
Conakry	9.1 (6.7, 12.2)	12.1 (9.1, 16.1)	10.1 (7.7, 13.2)	+3.0	-2.0	+1.0
Faranah	11.0 (7.2, 16.5)	15.3 (11.4, 20.1)	13.1 (9.5, 17.9)	+4.3	-2.2	+2.1
Kankan	11.6 (8.6, 15.6)	14.3 (11.0, 18.3)	14.6 (11.0, 19.2)	+2.7	+0.3	+3.0
Kindia	13.0 (9.8, 17.0)	12.1 (9.1, 15.8)	10.0 (7.1, 13.8)	-0.9	-2.1	-3.0
Labé	14.2 (10.8, 18.4)	26.1 (19.8, 33.6)	17.3 (14.1, 21.1)	+11.9**	-8.8*	+3.1
Mamou	18.4 (13.1, 25.1)	16.4 (12.3, 21.5)	20.5 (15.8, 26.2)	-2.0	+4.1	+2.1
N'Zérékoré	11.0 (8.3, 14.3)	6.1 (4.3, 8.5)	8.5 (5.7, 12.4)	-4.9**	+2.4	-2.5
Wealth quintile						
Lowest	16.6 (14.0, 19.5)	12.2 (9.8, 15.1)	18.1 (15.1, 21.5)	-4.4*	5.9**	+1.5
Second	11.3 (9.0, 14.2)	14.2 (11.3, 17.6)	14.3 (11.7, 17.3)	+2.9	+0.1	+3.0
Medium	11.3 (9.1, 14.1)	13.6 (10.7, 17.2)	10.2 (8.1, 12.8)	+2.3	-3.4	-1.1
Fourth	9.9 (7.6, 12.8)	13.3 (10.9, 16.0)	9.5 (7.7, 11.8)	+3.4	-3.8*	-0.4
Highest	9.1 (7.0, 11.8)	11.6 (9.2, 14.5)	10.3 (8.3, 12.7)	+2.5	-1.3	+1.2
Overweight and Obesity						
N	3348	3578	4229			
Total	12.1 (10.9, 13.5)	14.1 (12.6, 15.7)	19.0 (17.3, 20.8)	+2.0	+4.9**	+6.9**
Age (years)						
15-19	5.0 (3.4, 7.4)	6.1 (4.5, 8.3)	8.1 (6.3, 10.4)	+1.1	+2.0	+3.1*

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20-29	10.8 (9.3, 12.5)	12.6 (9.6, 16.4)	17.4 (14.7, 20.4)	+1.8	+4.8*	+6.6**
30-39	15.5 (13.5, 17.7)	16.2 (14.0, 18.7)	25.1 (22.4, 28.2)	+0.7	+8.9**	+9.6**
40-49	13.9 (10.7, 17.8)	21.3 (18.5, 24.4)	27.9 (24.2, 32.0)	+7.4**	+6.6**	+14.0**
Education						
No education	10.1 (8.9, 11.5)	12.7 (10.9, 14.7)	16.7 (15.0, 18.5)	+2.6*	+4.0**	+6.6**
Primary	20.0 (16.1, 24.6)	18.4 (14.8, 22.6)	18.5 (15.3, 22.2)	-1.6	+0.1	-1.5
Sec. or higher	27.8 (22.4, 34.0)	18.6 (15.0, 22.9)	26.6 (22.2, 31.6)	-9.2**	+8.0*	-1.2
Anemic						
No	n/a	15.0 (13.0, 17.2)	21.7 (19.2, 24.4)	n/a	+6.7**	n/a
Yes	n/a	13.3 (11.5, 15.4)	16.0 (14.1, 18.1)	n/a	+2.7	n/a
Residence						
Urban	24.0 (21.3, 27.0)	26.6 (23.3, 30.2)	31.8 (28.5, 35.4)	+2.6	+5.2*	+7.8**
Rural	7.8 (6.6, 9.2)	8.4 (7.2, 9.8)	11.7 (10.2, 13.5)	+0.6	+3.3**	+3.9**
Region						
Boké	13.9 (10.9, 17.6)	14.7 (11.7, 18.4)	22.0 (17.6, 27.0)	+0.8	+7.3*	+8.1**
Conakry	26.3 (22.2, 30.9)	30.7 (25.8, 36.1)	35.6 (30.3, 41.2)	+4.4	+4.9	+9.3**
Faranah	8.2 (4.3, 15.1)	8.9 (6.3, 12.5)	11.4 (8.3, 15.3)	+0.7	+2.5	+3.2
Kankan	7.2 (5.1, 10.0)	8.8 (5.9, 12.8)	13.9 (10.0, 19.0)	+1.6	+5.1	+6.7**
Kindia	11.0 (8.2, 14.5)	12.8 (9.8, 16.4)	16.6 (12.7, 21.3)	+1.8	+3.8	+5.6*
Labé	8.5 (5.9, 12.3)	5.5 (3.7, 8.1)	9.6 (6.9, 13.2)	-3.0	+4.1*	+1.1
Mamou	8.9 (4.5, 16.8)	10.8 (7.2, 15.8)	10.6 (8.0, 14.0)	+1.9	-0.2	+1.7
N'Zérékoré	10.6 (8.4, 13.4)	13.4 (9.5, 18.4)	15.4 (12.6, 18.6)	+2.8	+2.0	+4.8*
Wealth quintile						
Lowest	4.5 (3.2, 6.4)	7.1 (5.5, 9.3)	6.2 (4.2, 9.0)	+2.6*	-0.9	+1.7
Second	8.0 (5.9, 10.7)	7.7 (5.6, 10.7)	8.5 (6.7, 10.8)	-0.3	+0.8	+0.5
Medium	8.5 (6.7, 10.8)	8.4 (6.4, 10.8)	16.8 (13.7, 20.3)	-0.1	+8.4**	+8.3**
Fourth	14.3 (11.7, 17.2)	16.3 (13.6, 19.4)	23.9 (20.8, 27.3)	+2.0	+7.6**	+9.6**
Highest	29.5 (25.8, 33.5)	29.5 (25.6, 33.8)	34.2 (30.1, 38.6)	0.0	+4.7	+4.7
Anemia						
N	--	3,879	4,691			
Total	--	52.5 (50.4, 54.6)	49.1 (47.1, 51.2)	--	-3.4*	--
Age (years)						
15-19	--	50.2 (46.2, 54.2)	47.1 (43.6, 50.6)	--	-3.1	--
20-29	--	54.9 (51.5, 58.3)	49.1 (46.2, 52.1)	--	-5.8*	--
30-39	--	53.0 (49.7, 56.3)	51.6 (47.7, 55.5)	--	-1.4	--
40-49	--	50.5 (46.3, 54.8)	48.3 (43.4, 53.2)	--	-2.2	--
Education						
No education	--	53.3 (51.0, 55.6)	51.9 (49.4, 54.3)	--	-1.4	--
Primary	--	51.2 (45.0, 57.3)	47.7 (43.5, 51.9)	--	-3.5	--
Sec. or higher	--	47.4 (41.0, 53.8)	40.7 (37.2, 44.3)	--	-6.7	--
Pregnant						
No	--	51.4 (49.0, 53.7)	47.3 (45.1, 49.5)	--	-4.1*	--
Yes	--	62.8 (57.1, 68.2)	64.9 (60.3, 69.3)	--	+2.1	--
Underweight						
No	--	53.2 (50.9, 55.4)	49.5 (47.4, 51.7)	--	-3.7*	--

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Yes	--	48.5 (43.7, 53.3)	46.6 (41.9, 51.3)	--	-1.9	--
Overweight or Obese						
No		52.9 (50.8, 55.0)	50.8 (48.6, 53.0)	--	-2.1	--
Yes		50.9 (45.9, 55.9)	42.7 (38.3, 47.1)	--	-8.2*	--
Residence						
Urban	--	48.7 (44.2, 53.2)	43.5 (40.2, 46.8)	--	-5.2	--
Rural	--	54.2 (51.9, 56.5)	52.2 (49.5, 54.8)	--	-2.0	--
Region						
Boké	--	48.1 (43.1, 53.2)	53.4 (47.9, 58.9)	--	+5.3	--
Conakry	--	54.4 (47.7, 61.0)	42.6 (37.3, 48.0)	--	-11.8**	--
Faranah	--	56.2 (50.7, 61.5)	60.7 (56.3, 64.9)	--	+4.5	--
Kankan	--	62.6 (59.1, 66.1)	55.3 (49.9, 60.6)	--	-7.3*	--
Kindia	--	45.1 (40.5, 49.9)	50.9 (45.0, 56.7)	--	+5.8	--
Labé	--	40.5 (34.5, 46.7)	36.9 (31.2, 42.9)	--	-3.6	--
Mamou	--	51.1 (44.1, 58.2)	44.5 (38.4, 50.8)	--	-6.6	--
N'Zérékoré	--	57.3 (51.2, 63.2)	49.4 (43.6, 55.2)	--	-7.9	--
Wealth quintile						
Lowest	--	56.1 (51.3, 60.8)	55.3 (50.8, 59.7)	--	-0.8	--
Second	--	54.9 (51.2, 58.5)	56.5 (52.0, 61.0)	--	+1.6	--
Medium	--	54.3 (49.9, 58.7)	48.8 (44.8, 52.9)	--	-5.5	--
Fourth	--	47.2 (41.9, 52.6)	44.3 (40.6, 48.0)	--	-2.9	--
Highest	--	50.4 (45.8, 55.1)	42.8 (38.6, 47.3)	--	-7.6*	--

* = $p<0.05$; ** = $p<0.01$

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Table 6: Estimated stunting prevalence and number of stunted children <5 years of age, Guinea, 2005-2025

Year	Stunting prevalence from national survey	Average annual reduction in stunting prevalence	Estimated stunting prevalence based on reduction from 2005 to 2015	Population of children <5 years of age †	Estimated number of stunted children	% Reduction from 2012 to 2025
2005	39.1	--	39.1	1,658,000	648,278	--
2006		1.45	37.65	1,692,000	637,038	--
2007		1.45	36.2	1,723,000	623,726	--
2008		1.45	34.75	1,755,000	609,863	--
2009		1.45	33.3	1,790,000	596,070	--
2010		1.45	31.85	1,830,000	582,855	--
2011	34.5	1.45	30.4	1,875,000	570,000	--
2012	30.9	1.45	28.95	1,919,000	555,551	--
2013		1.45	27.5	1,962,000	539,550	--
2014		1.45	26.05	2,005,000	522,303	--
2015	24.6	1.45	24.6	2,046,000	503,316	--
2016		1.45	23.15	2,091,000	484,067	--
2017		1.45	21.7	2,127,000	461,559	--
2018		1.45	20.25	2,157,000	436,793	--
2019		1.45	18.8	2,185,000	410,780	--
2020		1.45	17.35	2,216,000	384,476	--
2021		1.45	15.9	2,248,000	357,432	--
2022		1.45	14.45	2,281,000	329,605	--
2023		1.45	13	2,316,000	301,080	--
2024		1.45	11.55	2,350,000	271,425	--
2025		1.45	10.1	2,385,000	240,885	57%

† United Nations - Department of Economic and Social Affairs - Population Division. World Population Prospects: The 2015 Revision. [accessed 30 Aug 2015]. Available: https://esa.un.org/unpd/wpp/

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