Stunting has adverse long-term consequences for children's immune function and survival, risk of nutrition-related chronic diseases, cognitive and behavioral development, and human capital.

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Africa in Transition: Growth Trends in Children and Implications for Nutrition

by Shane A. Norris et al.

Key insights

Stunting in under-5-year-old children still plagues Africa and has not decreased as rapidly as the concomitant increase in economic growth. The persistence of disease and socioeconomic inequality ensures that not all segments of the population, in particular the most vulnerable, benefit equally from economic growth. Further compounding the problem is the association between economic progress and obesity, especially amongst females. More and more African countries are now being afflicted with the double burden of malnutrition.

Current knowledge

There have been successes in reducing stunting in other low- or middle-income countries. For example, Brazil's dramatic reduction of the national stunting prevalence from 37.1 to 7.1% over a 33-year period was largely attributed to economic advancement and policies that combated inequality. Similarly, Mexico's conditional cash transfer and increased health-care access initiatives managed to decrease stunting by over 10%. Transitioning country environments that are unable to reduce early-life undernutrition but foster later-life overnutrition may accelerate the risk of metabolic diseases, such as type 2 diabetes.

Practical implications

A multisectorial response is needed to alleviate poverty, support gender equality, and improve access to health care and education. An important target population is females, where the goal is to improve maternal nutrition during pregnancy and

Factors that contribute to stunting in some African countries, negating the effects of economic progress.

infant nutrition through the promotion and support of breastfeeding. For children, growth monitoring and immunization campaigns can boost efforts to reduce child stunting. The complex challenge for many transitioning African countries will be to simultaneously address childhood stunting on one hand and the emergence of later adolescent/adult obesity on the other.

Recommended reading

de Onis M, Blössner M, Borghi E: Prevalence and trends of stunting among pre-schoolchildren, 1990–2020. *Public Health Nutr* 2012;15:142–148.

Africa in Transition: Growth Trends in Children and Implications for Nutrition

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Key Messages

- Despite economic growth in Africa, stunting in under-5-year-old children is persistently high.
- Several African countries now face a double burden of malnutrition.
- To combat stunting in Africa, both policy and multisectoral interventions need to target the economically vulnerable.

Key Words

Africa · Stunting · Adult obesity · Nutrition · Economic development

Abstract

The aims of this paper were to: (1) review the literature and examine contemporary child growth in terms of stunting prevalence across Africa; (2) discuss child stunting within the context of economic growth and adult obesity, and (3) elucidate the implications for child nutrition. It is evident that stunting in under-5-year-old children still plagues Africa and has not decreased as expected in line with the concomitant improvement in economic development over the past de-

cade. Persisting and possibly widening inequality ensures that not all segments of the population, in particular the most vulnerable, benefit equally from economic growth. Of concern is the association between the increasing economic progress across Africa and the rising adult obesity, especially amongst females. More and more African countries are now afflicted with a double burden of malnutrition. The implication for child nutrition is that African countries need not only apply a multisectoral approach to accelerate the reduction in stunting levels, but also to arrest and prevent obesity.

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Introduction

Africa is undergoing significant demographic, economic, and nutrition transitions. By 2010, the population of Africa had hit the one billion mark, and in 2013, it was estimated that Africa had a population of 1.033 billion people [1]. Furthermore, sub-Saharan Africa is the only continent globally in which the adolescent and youth populations are increasing [2]. This ‘youth bulge’ is often quoted as the population change that could lead to a demographic dividend of accelerated economic growth as youth are drivers for economic advancement through participation in labour markets and also as consumers [3].

The United Nations Development Programme's Regional Bureau for Africa reported that between 1990 and 2010 the gross domestic product (GDP) per capita of sub-Saharan African countries increased on average by 4%, which was greater than the global average for that period [4]. One would anticipate that increases in macroeconomic growth in sub-Saharan Africa would intensify food productivity and availability, infrastructure and public health services, employment, and living standards, all of which could have a positive impact on child nutrition.

Poor linear growth, or stunting (<2 SD length/height for age), is a suitable proxy for children's general health and nutritional well-being. Stunting is a result of a complex combination of proximal and distal biological and environmental factors [see framework for actions to achieve optimum foetal and child nutrition and development; 5]. It has been demonstrated that stunting has adverse long-term consequences for children's immune function and survival, risk of nutrition-related chronic diseases, cognitive and behavioural development, and human capital (educational attainment and economic productivity) [5, 6]. De Onis et al. [7] determined that

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over a period of 20 years (1990–2010), the prevalence of under-5-year-old stunting decreased by 15.1% (44.4–29.2%) in low- or middle-income countries (LMICs), but only diminished by 2% (40.3–38.2%) in Africa. In Asia, it decreased by an astounding 21% (48.6–27.6%), and in 2010, Latin America had the lowest stunting levels (13.5%) of LMICs. A stunting prevalence of approximately 6% persisted in high-income countries over that period. These trends represent a striking paradox in Africa in terms of economic progress and child linear growth faltering. This paradox would suggest that the economic growth in Africa has not been fully translated into: (1) improved access to good-quality food; (2) access to clean water and sanitation; (3) access to immunisation initiatives and maternal and child health services; (4) maternal education, and (5) poverty reduction [8].

While the stunting prevalence across African countries has not decreased as expected with concomitant increases in economic growth, adult obesity levels have risen. A study by Ziraba et al. [9] in 2009 reported a 35% increase in the prevalence of obesity between 1992 and

2005 in several African countries. The aims of this paper are to: (1) review the literature and examine contemporary child growth in terms of stunting prevalence across Africa; (2) set child stunting within the context of economic growth and adult obesity, and (3) discuss the implications for child nutrition.

Methods

Information Sources and Search Strategy

PRISMA guidelines for the reporting of systematic reviews informed the process [10]. Three authors (S.W., L.K.M., and R.S.M.) independently performed a literature search using three electronic databases (PubMed, Science Direct databases, and Cochrane Library) using National Library of Medicine Medical Subject Heading (MeSH) search terms to cover two key domains: (1) child (<5-year-old) stunting and (2) adult obesity. The words 'prevalence' and 'Africa' or 'sub-Saharan Africa' were used in combination with 'stunting', 'stunted', 'undernutrition', 'height', 'length', 'malnutrition', or adult 'overweight' or 'obesity'. In addition, the search terms together with the names of each of the 54 African countries were used. Additional searches including 'rural' and 'urban' were conducted to report prevalence in both rural and urban contexts. We selected the limit function to restrict search results to published papers in English or French and human studies. The search was finalised in March 2014 and included all articles published between 2000 and 2013, but where limited data existed for an African country, the time period was expanded to include data before 2000.

Grey literature including the World Health Organisation (WHO) and United Nations Children's Fund websites were searched for statistics and publications on child stunting and adult obesity in Africa. All African countries were individually searched for Demographic Health Surveillance data, and where data were available, the most recent data were included. African countries' GDP per capita (an indicator of economic growth) and Gini index (an indicator of inequality) data were accessed from the World Bank (www.worldbank.org).

Data Extraction

Once duplicate references were removed, the titles and abstracts of the references were screened. Full-text articles were obtained and reviewed. Data were then extracted regarding country, setting (rural/urban), national or regional representation, age, gender, the year of the study, growth reference/standard used to determine stunting, and the prevalence of stunting or obesity. For the purpose of this paper, national studies were prioritised. Linear regressions were fitted to the data to explore associations.

Results

From the search on child stunting, 458 references were identified and reviewed, of which 131 references were included. The prevalence of stunting was determined for 50 of the 54 African countries and ranged from 10.1% in Tunisia to 50.7% in Ethiopia. It was noted that national assessments of stunting are not regular in all African coun-

Fig. 1. Prevalence of (under-5-year-old) child stunting across Africa (data source: online suppl. table A).

tries, limiting the effective monitoring of nutritional indices over time at a country level. In countries that had multiple national assessments of stunting, the use of several growth references to define stunting, or different sampling methods to assess the prevalence of stunting in the population over time, complicated the interpretation. Considering the most recent assessments of the prevalence of stunting, 66% of African countries (33 of the 50 countries that had data) exhibit a high to very high prevalence of stunting ($\geq 30\%$) according to the WHO classification for the assessment of the severity of malnutrition among children under 5 years of age (fig. 1). These figures would suggest that linear growth faltering in African children under 5 years of age is still a major public health concern for the majority of the countries in Africa. Within countries, the prevalence of stunting is generally higher in rural than urban areas. Finally, for the majority of African countries that assessed the prevalence of stunting by sex, male children had a higher prevalence than female children (online suppl. table A; for all online suppl. material, see www.karger.com/doi/10.1159/000365122). Economic development was measured by a change in GDP between 2000 and 2012 and tends to be inversely associated with child stunting. In some countries, such as Tunisia, stunting prevalence was relatively low despite only marginal economic growth, while in other countries, such as Nigeria, despite marked economic development, stunting prevalence was still high (fig. 2).

Fig. 2. Prevalence of (under-5-year-old) child stunting with change in GDP between 2000 and 2012 in African countries with a linear regression plot indicated by the solid line (data source: online suppl. table A and World Bank).

From the search on adult obesity, 1,038 references were identified and reviewed, and 153 were included. Clearly, obesity is increasing in Africa, particularly in women, and more specifically women residing in urban areas, with the highest obesity prevalence of 56% being reported in a regional study of urban Gambian women. The prevalence of female obesity ranges from as low as 1% in Ethiopia to 40% in Libya and Egypt (fig. 3). The highest prevalence of obesity appears to be in countries north of the Sahara desert as well as southern Africa, with the prevalence in most central African countries being $<4\%$. South Africa, which has recently reported a female obesity prevalence of 39.2%, has the third highest obesity prevalence in Africa, with countries like the Seychelles, Tunisia, Algeria, and Sudan all reporting an obesity prevalence of $>30\%$. Approximately one third of all African countries report a female obesity prevalence of $>10\%$. In all countries in Africa, the obesity prevalence for females is significantly higher than that for males, with some countries reporting a 6- to 7-fold greater obesity prevalence in females compared to their male counterparts (online suppl. table B).

Economic development as measured by a change in GDP between 2000 and 2012 seems to be strongly associated with an increased adult female obesity prevalence (fig. 4). For several African countries, the prevalence of adult female obesity closely mirrors their respective economic growth, with South Africa standing out. Concomitantly, as African countries transition, adult obesity increas-

Fig. 3. Prevalence of adult female obesity across Africa (data source: online suppl. table B).

Fig. 4. Prevalence of adult female obesity with change in GDP (economic growth) between 2000 and 2012 in African countries with a linear regression plot indicated by the solid line (data source: online suppl. table B and World Bank).

Fig. 5. Two-way scatter plot of prevalence of (under-5-year-old) child stunting and prevalence of adult female obesity in African countries with a linear regression plot indicated by the solid line (data source: online suppl. tables A and B).

Fig. 6. Two-way scatter plot of prevalence of adult diabetes against the prevalence of adult female obesity in African countries with a linear regression plot indicated by the solid line (data source: International Diabetes Federation Diabetes Atlas and online suppl. table B).

es and child stunting decreases but still remains notably high, thus creating a scenario of a double burden of malnutrition in many African countries (fig. 5). Furthermore, with rising obesity, metabolic diseases such as type 2 diabetes become more prevalent (fig. 6; diabetes prevalence data from the International Diabetes Federation Diabetes Atlas).

Discussion

Floud et al. [11] documented that since the beginning of the 17th century and over a 300-year period, the average male in the UK had become taller by 10 cm and heavier, and that life expectancy had increased from 33 to 70 years. These changes over a long period of time were

largely attributed to economic development [11]. This overall improvement in nutrition and health is reflected in the very low current levels of stunting in high-income countries, like the UK (<6% stunting in children under 5 years of age) [7]. From this review, stunting in under-5-year-old children in contemporary Africa is on average six times greater than that in the UK. However, there is marked variation in stunting prevalence across the African continent. Furthermore, stunting is not as low as one would have expected in line with the concurrent improvement in economic growth over the past period. Floud et al.'s [11] work suggests that the enduring hold of undernutrition across generations only unravels over a long time, and that a few decades of economic development in Africa may be too short a period.

Recently, Vollmer et al. [12] analysed data from 121 Demographic and Health Surveys from 36 LMICs, including several African countries, and unearthed weak evidence to support that economic development reduces undernutrition in early childhood. In a 7-country case study, the United Nations Development Programme found that the reduction in child undernutrition was not proportionate to economic growth as measured by GDP. Indeed, the fastest growing economies did not perform better in reducing child undernutrition, as inequality was still pervasive. Thus, the most vulnerable within the population did not benefit in the same way [4]. South Africa is an illustrative example of this. South Africa has had the second greatest increase in GDP over the past decade, but also has the second highest Gini index (measure of inequality) in Africa (online suppl. fig. 1) and a stunting prevalence (19.5%) that is almost triple that of Brazil. The ubiquitous inequality in South Africa has likely obstructed the benefit of the past economic advances. However, other factors such as HIV are also likely to have had an impact.

In addition, this review highlights the association between increasing economic progress across Africa and rising adult obesity, particularly amongst females. This increase in adult obesity is likely accelerating the non-communicable disease burden, such as diabetes (fig. 6). More and more African communities are now afflicted with a double burden of malnutrition. In South Africa, alongside a stubborn stunting prevalence in children, staggering adult female obesity prevalence (39.2%), and

The complex challenge for many transitioning African countries will be to simultaneously address childhood stunting, on the one hand, and the emergence of later child/adult obesity, on the other.

rising diabetes burden (10%), overweight and obesity are increasing in children and adolescents [13]. The recent South African National Health and Nutrition Examination Survey found that 25% of young children (2–4 years of age) were either overweight or obese [13].

In other LMICs, there have been successes in reducing stunting. For example, Brazil's dramatic reduction in the national stunting prevalence from 37.1 to 7.1% over a 33-year period was largely attributed to economic advancement coupled with policies that combated inequality and were able to increase the socioeconomic status of poor families. The Brazilian example illustrates the positive impact that interventions which promote income redistribution and universal access to basic services can have on child undernutrition [14]. Similarly, Mexico's conditional cash transfer initiative (Oportunidades), where families received cash in exchange for complying with 'conditionalities', such as nutrition supplementation and growth and health monitoring, resulted in a lower prevalence of stunting and a host of other physical and cognitive benefits [15].

Headey [8] argues that if economic growth can be turned into 'nutrition-sensitive' economic growth, then it can significantly reduce child undernutrition and improve linear growth. Vollmer et al. [12] suggest that targeted health and nutrition interventions will be more effective in improving child nutrition as they lessen the reliance of a 'trickle-down approach'. These arguments would suggest that a multisectoral response is warranted: (1) macro-level economic growth coupled with sustained agricultural supply; (2) social sector development that addresses household poverty alleviation, education, and gender equality, and (3) community 'first 1,000 days' initiatives to improve maternal and child nutrition through the promotion of regular attendance of ante- and post-natal health services, breastfeeding support, child linear growth monitoring, and immunisation campaigns can boost efforts to reduce child stunting and undernutrition.

The complex challenge for many transitioning African countries will be to simultaneously address childhood stunting, on the one hand, and the emergence of later child/adult obesity, on the other. Possibly, a multisectoral approach that also incorporates ways to (1) improve the quality and diversity of food, (2) support healthier food

choice and practice, and (3) enable more physical activity and less sedentary behaviour may combat obesity.

In conclusion, to address the gap in Africa to ensure that all children reach their potential to become healthy and productive adults may seem overwhelming, but the potential gains with success are considerable. More research and national monitoring of malnutrition including both under- and overnutrition is needed in Africa to assist in understanding growth trends and responses to multisectoral interventions and policy changes.

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