

Urbanization and international trade and investment policies as determinants of noncommunicable diseases in sub-Saharan Africa

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Abstract

There are three dominant globalization pathways affecting noncommunicable diseases in Sub-Saharan Africa (SSA): urbanization, trade liberalization, and investment liberalization. Urbanization carries potential health benefits due to improved access to an increased variety of food imports, although for the growing number of urban poor, this has often meant increased reliance on cheap, highly processed food commodities. Reduced barriers to trade have eased the importation of such commodities, while investment liberalization has increased corporate consolidation over global and domestic food chains. Higher profit margins on processed foods have promoted the creation of ‘obesogenic’ environments, which through progressively integrated global food systems have been increasingly ‘exported’ to developing nations. This article explores globalization processes, the food environment, and dietary health outcomes in SSA through the use of trend analyses and structural equation modelling. The findings are considered in the context of global barriers and facilitators for healthy public policy.

In 2009, for the first time in history, the urban population of the world surpassed the rural population¹; proliferating the number of people living in slums: settlements marked by deplorable living conditions, overcrowding, and inadequate housing and sanitation.² The lack of timely responses to rapid growth in urban centres has created new challenges for the control of infectious disease, providing increased opportunities for contact and exposure.³ The global movement of people and goods has long served as a vector for infectious disease; escalating outbreaks such as the plague, cholera, smallpox, HIV/AIDS, severe acute respiratory syndrome and many others, to the level of global pandemics.^{4,5} While urbanization and trade routes have been recognized as critical vectors for infectious disease, their role in noncommunicable diseases (NCDs) is only beginning to be acknowledged.

General agreement has formed around the main risk factors for NCDs, including tobacco use, unhealthy diet, physical inactivity, and harmful use of alcohol.^{6,7} The United Nations political declaration of the High-Level Meeting on the

Prevention and Control of Non-communicable Diseases,⁷ introduced the trade sector and urban planning within a multisectoral approach for effective NCD control and prevention. However, limited consideration was given to these areas. These two globalization mechanisms (trade and urbanization) play a role in the increasing levels of exposure to all four risk factors, essentially serving as new vectors for the spread of NCDs.

This article will begin with an examination of the current literature supporting pathways between trade and investment, urbanization, unhealthy diet, and NCDs. This is followed by a descriptive analysis of trends in investment, trade, the food environment and NCDs in four Sub-Saharan Africa (SSA) countries: Cameroon, Kenya, Nigeria, and South Africa. The conceptual framework utilized in this paper is then explored further through the testing of a model connecting urbanization, trade and investment, overweight and obesity, and deaths attributable to NCDs, specifically cardiovascular disease (CVD), in forty-eight SSA countries, using structural equation modelling. While tobacco has been included as a control variable in the analytical sections, the focus remains on unhealthy diet, via overweight and obesity pathways, to CVD, given the rapid emergence and complexity of the global diet. The findings will be considered within the current context of global health policy discourse around healthy diets and NCDs, the potential role for practitioners and the World Trade Organization (WTO) in a health in all policies mandate, and the current World Health Organization (WHO) Global Action Plan (GAP) on NCD reduction. This paper aims to demonstrate the substantial role of globalization processes in changing the built food environment and the consequent increase in metabolic risk factors for NCDs in the developing world. It is fundamental at the outset to note that there is no one reality for SSA countries; stage of development, rural–urban divisions, and dietary habits vary widely across the region, as will be demonstrated in the trend analysis. Thus, any conclusions must be retained at the SSA regional level; extrapolating to any one SSA nation would require careful consideration of individual nuances.

Background

Globalization is best considered “a process of greater integration within the world economy through movements of goods and services capital, technology and (to a lesser extent) labour, which lead increasingly to economic decisions being influenced by global conditions⁸ (p.1)”. There are multiple pathways through which globalization affects NCDs; the key connections that will be analyzed in this article are presented in Fig 1. The three primary globalization mechanisms explored here include, trade and foreign direct investment (FDI), urbanization, and economic growth, with a focus on trade and investment. Additionally, their connection to the changing food environment and rising NCD rates will be examined.

Globalization to urbanization

Consistent with global trends, the urban population of SSA has been rising; urban population growth, at 5% per annum, now exceeds rural population growth at 2% per annum on average, although in eight of the most populous SSA countries rural population growth has dropped to 0.4% per annum.⁹ In 2010, the urban population accounted for approximately 36% of the population, a number projected to grow to 50% and 60% by 2030 and 2050, respectively.¹⁰ Three sources of increased urban population growth were identified by the World Bank¹¹:

(1) new births of existing urban residents; (2) reclassification of rural areas as urban areas; and (3) rural–urban migration, although increased life expectancy may also play a role in absolute urban population growth. The pathway between globalization and urbanization is best captured through rural–urban migration.

Tiffen⁹ provides the fullest description of the links between agriculture, globalization, and urbanization. At the beginning of a country's agricultural development, food is produced almost solely for household or family use, with high labour to output ratio. With most of the population engaged in the same task there were no markets for agricultural goods, and thus no incentives to produce a surplus. However, as non-agricultural sectors are created and cities spring up, the motivation to grow a surplus in exchange for consumer goods develops. In the case of SSA, in a highly developed and globalized era, the agricultural sector was able to access new external capital and markets, along with new production and transportation technologies. This led to a shift in agriculture, displacing rural subsistence farming with more 'corporate'-style supply production that included an emphasis on export cash crops. In addition, the acquisition of new capital to substitute machinery for labour accelerated urban drift; growing the demand for an agricultural surplus. The absolute and relative population in the agricultural sector is continuing to decline, ultimately leading to larger, more capital-intensive farming schemes. This cycle of agricultural intensification and reduced human input has contributed to rural–urban migration patterns; escalating urbanization rates. While further historical accounts of these pathways are needed, Tiffen's accounts are instructive.

Urbanization to the global food environment

Rural–urban inequality is neither a new concept, nor a uniquely African phenomenon.^{12,13} An examination of 24 SSA countries revealed that living standards for rural residents are almost universally lower than for their urban counterparts.¹⁴ That said, there are growing concerns regarding rising urban poverty in developing countries, with urbanization becoming synonymous with slum growth.^{15,16} One estimate has suggested that 65% of the SSA population reside in slums¹⁰; while UN Habitat has proposed that more than 70% of the urban population have inadequate access to housing, water supply, and sanitation.¹⁷ A 2013 World Bank report demonstrated that

the development of mega cities was associated with faster economic growth, but higher income inequality.¹⁸

The very existence of a global food industry has vastly changed what types of foods have become available. The overriding responsibility of transnational food corporations (TFCs) to their stakeholders requiring that they maximize investor returns, usually by increasing profits, gives industry only two options; push more product or improve profit margins.^{19,20}

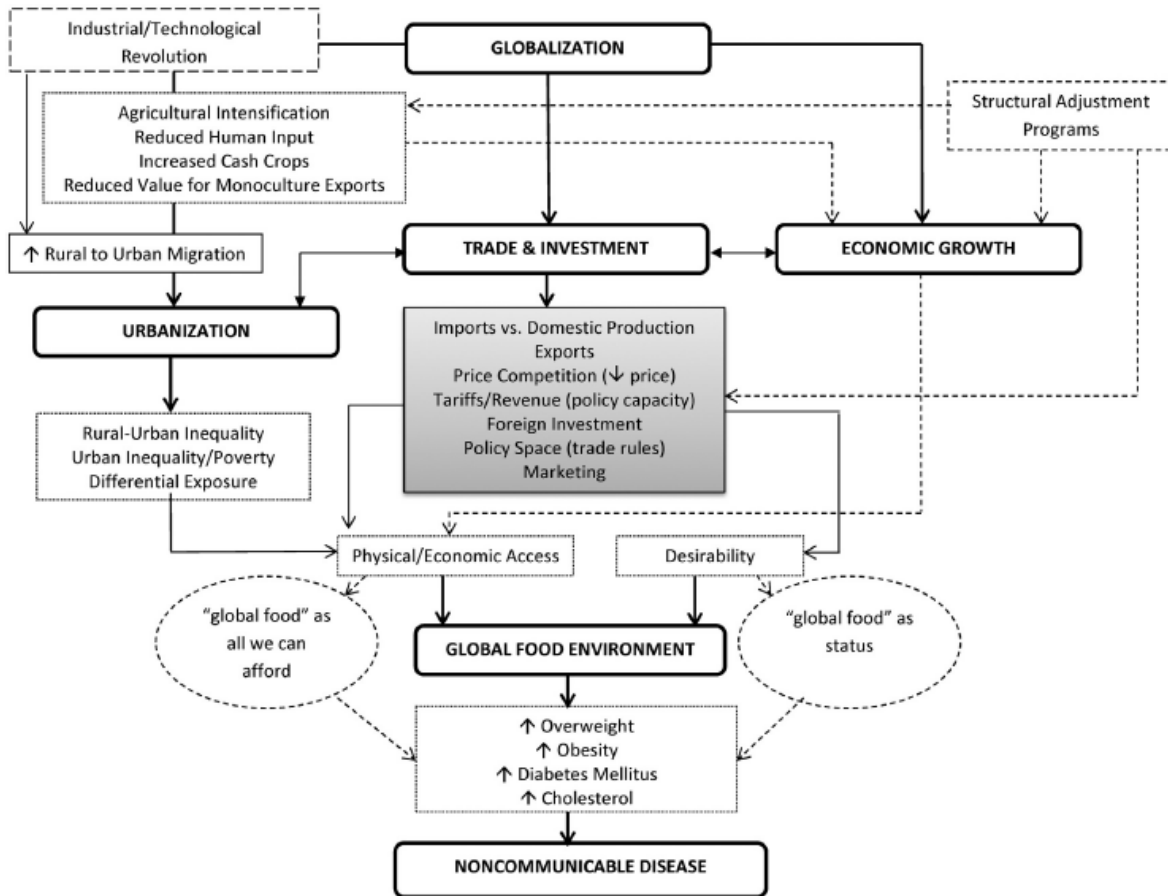


Fig 1 - Conceptual Framework.

The most profitable items in this industry are highly processed products, including fast food, snacks, and beverages that are made up of large amounts of starch, sugars and low-quality fats.¹⁹ Furthermore, it is also reasonable to assume that brands cannot easily be built up around fruits and vegetables, thus items such as the “Big Mac”, “Whopper”, or “Blizzard”, become favourable for their capacity to be personalized and build brand loyalty in emerging markets. Healthy food as a ‘bad’ global commodity and unhealthy food as a ‘good’ global commodity (branding, long shelf life, value-added processing) have become the prevailing paradigm. Thus, the two revenue streams of TFCs, more product and more profitable products, have contributed to rising rates of overweight and obesity worldwide.²¹

The three fundamental areas of food security – availability, access, and utilisation – differ between the urban and rural context and across urban socio-economic groups.²² In the urban context, processed foods are more affordable and require less time and energy to prepare than traditional foods, shifting the diet of the urban poor towards processed and imported foods^{23,24} which contain increased amounts of fat, sugar, salt, and preservatives.²² One study in Tanzania demonstrated that while sweet potatoes, cassava, and papaya were the most commonly reported foods in the rural diet, the urban diet consisted primarily of bread, cookies, vegetable oil, beef and milk.²⁵ This finding has been corroborated in more recent studies, providing additional evidence that within urban environments traditional diets are being abandoned in favour of a more Western diet^{26,27}; however, there is evidence for an increasingly Westernized diet in some rural areas as well.²⁸

Rural–urban migration contributes to the transition from reliance on the ability to produce food, to reliance on the ability to purchase food. For example, in Mozambique, those in metropolitan areas purchased 92% of their food, while those in rural areas purchased only 29% of the food they consume, Malawi has similar statistics, with 91% in metropolitan areas and 36% in rural areas²⁹ These patterns may vary in more economically developed SSA countries, such as South Africa.²⁸ The urban poor have barriers to accessing wholesale and discount supermarkets, often placed outside the city, due to a lack of personal or public transportation.²² This requires them to purchase in small neighbourhood shops where prices are higher and there is a limited availability of meat and produce. Also due to a lack of available finances, storage capacity, and refrigeration they must purchase food in smaller quantities, prohibiting them from savings on bulk purchases.²²

With busy urban lifestyles, increased time spent commuting to work, a growing number of women engaged in the workforce, and small living spaces ill-equipped for cooking, there are less time and space available for food preparation, thus pushing more urban residents to rely on cheap, pre-prepared convenience foods.²² For example, slum-dwellers in Kenya consume more street food than those in low–middle income neighbourhoods, given the lure of low prices.³⁰ Temple and Steyn³¹ demonstrated that the most economically efficient way for the urban poor in South Africa to meet their energy needs was through energy-dense foods, including rice, beans, breads, pastas, and snack foods. Furthermore, they approximated that a healthier diet cost 69% more than an unhealthy one, rendering it unaffordable for approximately 80% of the population. Consequently, due to changes in availability, accessibility, and utilization, urban dwellers, particularly the urban poor, are consuming diets of greater variety and energy intake, but ultimately lower in micronutrient quality,²² generally leading to increased rates of overweight and obesity.

Globalization of trade and investment

Key mechanisms of the globalization process include the movement of goods and capital, in other words, trade and foreign direct investment (FDI). FDI occurs

when an entity from one country makes a substantial (greater than 10%) investment into an entity in another country, through the establishment of a subsidiary or associate company in the foreign country, acquisition of part or all of an overseas company, or through a merger or joint venture. Growth in FDI has outpaced growth in both GDP and trade in developing countries more than six-fold³²; in fact, it has become the primary source of external financing in developing countries.³³ China has been heavily pursuing investment in Africa, raising total FDI from \$20 million in the early 1990s, to \$100 million in 2000, and over \$1 billion in 2006.³⁴ While data suggest that Cameroon, Tanzania, and Uganda are the largest African recipients of FDI into the food and drink sector,³⁵ acquiring detailed breakdowns of FDI by sector and host or home economy is immensely difficult.

The liberalization of trade and FDI has introduced measures that have the capacity to help or hinder improved food security in SSA. Under the World Trade Organization (WTO), treaties such as the General Agreement on Tariffs and Trade and the Agreement on Agriculture, can improve food availability through the reduction of import barriers, which help bring international food imports into the domestic market at lower prices.^{36,37} Alternatively, increasingly affordable imports may be paralleled by the conversion of traditional domestic production to export-oriented production, or 'cash crops'. This is due in part to the legacy of colonial influences that prioritized production of coffee, copra, cotton, sesame, peanuts, and sugar, for export to Western markets.^{21,38} Integration into global food markets deepened with the imposition of structural adjustment programs (SAPs), instituted primarily by the World Bank and the International Monetary Fund, targeted privatisation and liberalization as forms of expenditure-reduction and revenue-generating policies to restore economic balance and repay international loans. SAPs contributed to the reduced availability of traditional food crops, and increased exposure to a Western diet of refined sugars, wheat, and prepared food products which have been implicated time and again in the development of NCDs in SSA.³⁸ This dietary shift is also attributed to the continued agricultural export subsidies that allow developed countries to artificially suppress food prices making it difficult for domestic markets in developed countries to compete.³⁹ Increased quantities of cheap food imports and cash-crop exports create conditions of import-dependency and threaten short- and long-term food security.⁴⁰⁻⁴² Growing national food insecurity is illustrated by the rise in the number of developing countries that are now net food importers (from 74 in the 1995–1999 to 89 in the 2005–2009 periods).⁴³ Relative to trade, FDI may be exerting larger structural changes on the food environment in SSA through TFCs. Investment liberalization has allowed TFCs to grow both horizontally, through mergers and acquisitions of local corporations, and vertically, gaining control over all levels of the food system, such as production, processing, distribution, and retail.⁴⁴ TFCs are able to capitalize on locations with the most favourable cost, regulatory, political, and social structures.⁴⁵

Under the WTO's General Agreement on Trade in Services (GATS), countries have the option to liberalize services incidental to agriculture, hunting, forestry, and fishing, and to open their wholesale trade services, retailing services, and franchising. The extent to which all SSA countries have liberalized these sectors, and/or provided limitations on market access and national treatment, is not explored in this paper. However, a brief look at South Africa is revealing. South Africa has fully liberalized the commercial presence of services related to agriculture, hunting, forestry, fishing, wholesale trade, retailing, and franchising, without stipulation regarding market access or national treatment. While direct causal relationships are difficult to demonstrate, the country's current obesity epidemic, with as much as 65.4% and 31.3% of their population reported to be overweight and obese, respectively,⁴⁶ may speak volumes to its adoption of the global food system.

As with trade, investment liberalization and TFC presence have the capacity to increase food availability through reduction in retail prices following the removal of import barriers on food, and reduced transportation costs and spoilage. As well, there may be general benefits to the economy through growth of agricultural, manufacturing, distributing, and retail sectors, if done within the country, providing wages for the purchase of food. In the case of South Africa, researchers have found that although supermarkets have increased physical access to healthier foods, they have simultaneously increased economic access to unhealthy foods, charging between 30% and 110% less for unhealthy foods relative to healthy foods when compared on a price per calorie basis.⁴⁷ Additionally, evidence of South Africa's 'sub-imperialist' actions across Africa, that is, its role as a key African nation facilitating imperialist expansion⁴⁸ can be seen in the rapid expansion of grocery retail into large parts of SSA.⁴⁹ As of 2010, four South African supermarkets held over half of the retail share of the food market in South Africa,⁵⁰ two of which (Shoprite and Pick 'n Pay) had opened a cumulative 143 supermarkets as of 2003 across Botswana, Egypt, Lesotho, Malawi, Mauritius, Madagascar, Mozambique, Namibia, Swaziland, Tanzania, Uganda, Zambia, and Zimbabwe.⁴⁹ The selective targeting of highly processed foods and the growing obesity epidemic warrant a closer look at the relationship between FDI and diet-related health outcomes.

Global marketing and advertising campaigns are inseparable from the expansion of the global food industry. TFCs must simultaneously prepare the market for their product, and adapt their product for the market. The former involves changing cultural expectations and taste preferences around food^{21,51}; while the latter involves a tactic known as glocalization: adapting products to a subset of consumer preferences.⁵² Marketing and advertising are essential to the growth of TFCs in foreign markets; in recognition of this the United States food industry spends over \$30 billion a year on advertising and promotions, more than any other industry, including tobacco. Not surprisingly, advertising dollars directed at developing countries are on the rise.²¹

A growing concern around trade, and particularly, investment agreements, involves the diminishing policy capacity at the national state level. Many developing nations, especially low-income countries (LICs), rely heavily upon tariffs for tax revenues. Pressure in trade treaty negotiations to remove and lower tariffs can result in reduced government revenues, with most LICs and some middle-income countries unable to compensate for these tariff losses due to weak tax regimes, a large informal (untaxed) employment sector,⁴⁰ and reliance on regressive VAT (consumption) taxes that, in SSA, are now as high as they can realistically be pegged.⁵³ In the end, tariff reductions can decrease funding and diminish regulatory capacity for public health and education institutions, key sectors in offsetting the negative consequences of an unhealthy food environment.

Investment agreements present additional challenges, as most, with the exception of WTO GATS, have been conducted bilaterally or regionally, without reference to the general exception in GATS that permits states to adopt necessary measures to protect public morals, maintain public order and protect human, animal or plant life or health. Of particular concern is the growing number of Bilateral Investment Promotion and Protection Agreements (BIPAs). South Africa has presently signed 22 BIPAs, all of which contain an investor–state dispute settlement clause, allowing foreign private investors to initiate arbitration if they believe their investment has been expropriated by new public legislation or regulation. While expropriation is customarily allowed for a public purpose, under BIPAs this would require compensation. Important here is that expropriation includes regulatory measures enacted by the state in the protection of public interest which may diminish the value of their investment. This raises numerous concerns regarding the regulation of the food industry and the potential for lawsuits surrounding lost profits if, for example, nations were to ban the sale of processed food items in school cafeterias. A full exploration of the BIPAs, beyond the scope of this paper, is nonetheless necessary for a more complete understanding of the potential ramifications for the food industry in SSA, and to provide guidance to those countries considering future investment agreements.

Global food environment and noncommunicable disease

It is important to gauge at this point the increased prevalence of metabolic risk factors linked to an unhealthy diet leading to overweight and obesity and then to NCDs. SSA, with some notable exceptions such as South Africa, is only beginning to enter the nutrition transition (a diet made up of progressively more energy-dense foods, high in fat, salt, and sugar). Studies of Nigeria, Kenya, and South Africa, have all consistently demonstrated higher rates of obesity in urban, relative to rural, populations, with urban women having the highest prevalence in all three countries.^{54,55}

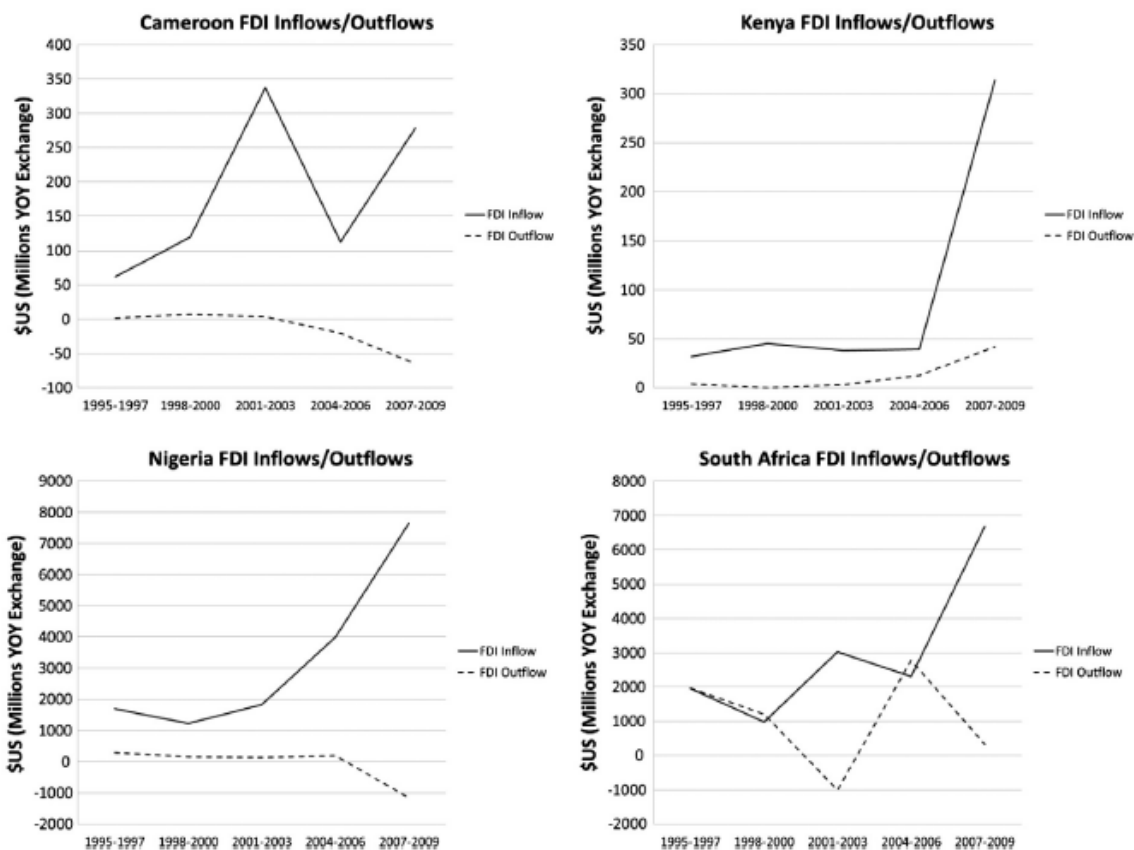


Fig 2 – Changes in FDI Inflow and Outflows between 1995 and 2009.

This finding supports the link between urbanization, an increasingly processed diet, and rising obesity rates.

Additional work in South Africa has identified a steep increase, 20%–25%, in the rate of diabetes for people between the ages of 45 and 64.⁵⁶ Obesity was the most critical risk factor identified, with over 80% of persons with diabetes having a BMI greater than 25 kg/m².⁵⁶ Additional research in Benin and Senegal has found support for a link between increased body fat and fat distribution in metabolic risk factors for cardiovascular disease.^{57,58} A recent systematic review of hypertension literature across Sub-Saharan Africa, showed that while prevalence was highly variable between countries, on average rates were rising, and were higher in urban areas,⁵⁹ a similar pattern being found for hypercholesterolemia.⁶⁰

The body of literature reviewed above (and provided in greater depth by other contributions to this special issue) suggests that there is ample evidence for connections between globalization and urbanization, diet, overweight and obesity, and NCD prevalence. The following will attempt to explicate empirically the changing trends and relationships among these factors in SSA.

Trend analysis

To gain a deeper understanding of developments in trade, foreign direct investment, the food environment, and health in SSA, a trend analysis was conducted with four SSA countries, including Cameroon, Kenya, Nigeria, and South Africa. These countries were selected based on their relatively complete

datasets available through a subscription to Euromonitor International 2013 ©; and are also representative of the four regions of SSA, i.e., Middle Africa (Cameroon); West Africa (Nigeria); East Africa (Kenya); and Southern Africa (South Africa).⁶¹ Euromonitor compiles information available from Eurostat, OECD, WHO, and national statistics, and generates complete datasets on standardized scales to improve the accuracy of cross-country comparison. Information on caloric availability was sourced from the Food and Agricultural Organization of the United Nations' food balance sheets. To avoid any large annual variations unrepresentative of overall trends, data were averaged across three year time-points. Statistics on tobacco have been included in several figures, given its historical role in NCDs, and that an examination of trends without such information would be incomplete. All monetary values reported are in USD using the year on year (YOY) exchange rate. The following is a descriptive account for each country.

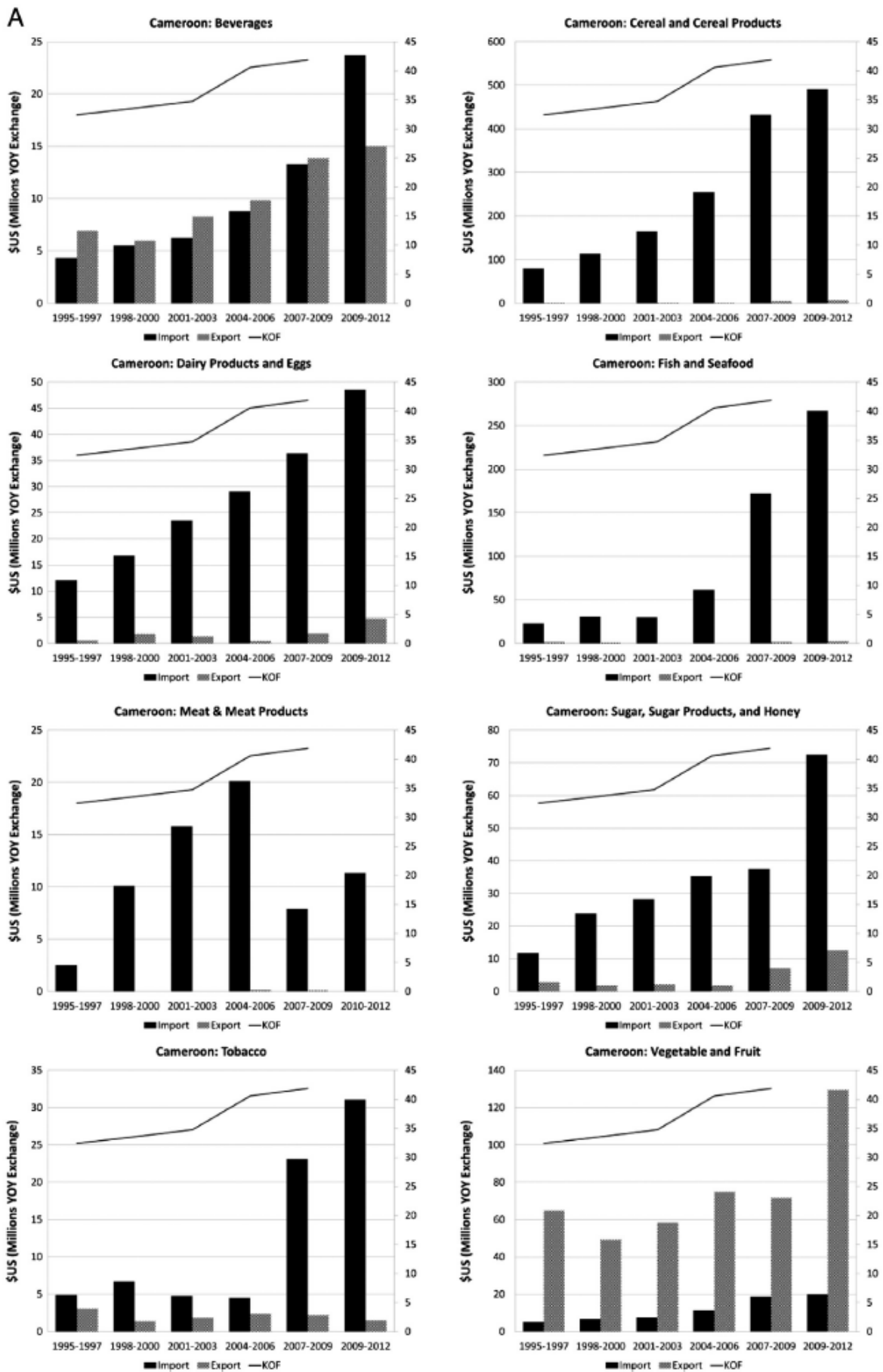


Fig 3 – A: Changes in Food Imports and Exports Between 1995 and 2012 in Cameroon. B: Changes in Food Imports and Exports Between 1995 and 2012 in Kenya. C: Changes in Food Imports and Exports Between 1995 and 2012 in Nigeria. D: Changes in Food Imports and Exports Between 1995 and 2012 in South Africa.

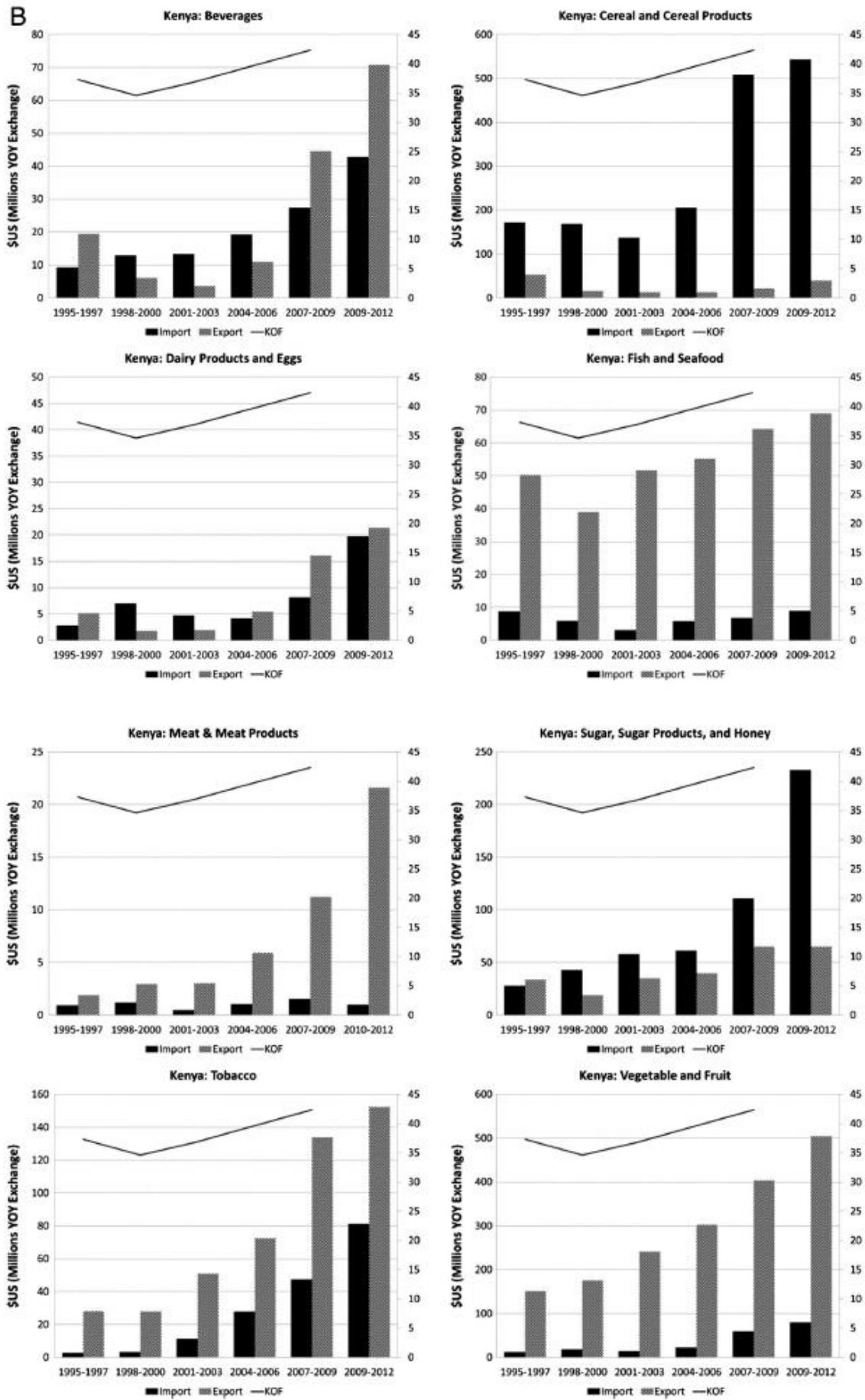


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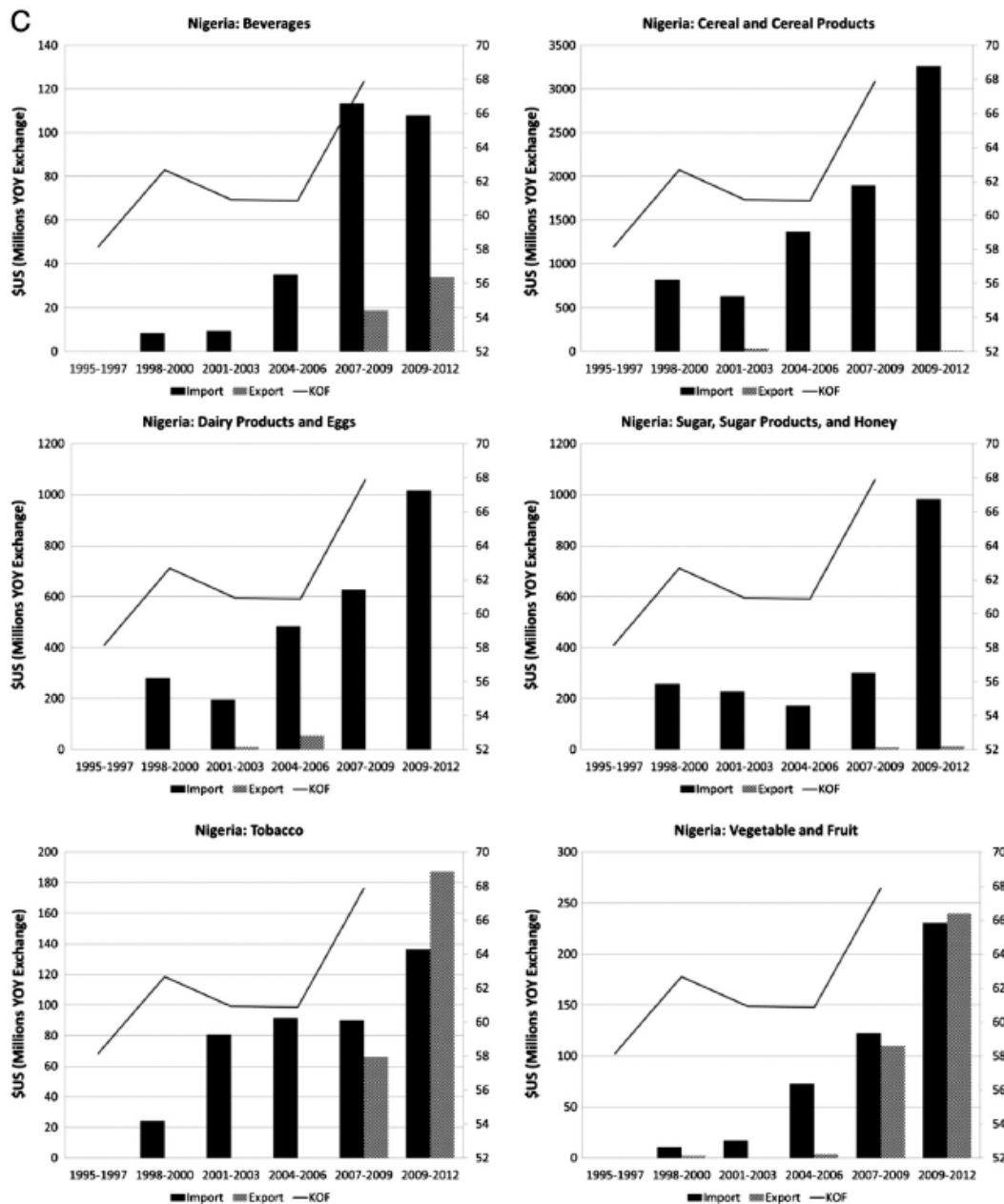


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Cameroon

Despite some fluctuations, between 1995 and 2009 Cameroon has experienced rising levels of inward FDI, although its FDI outflows appear to be on a downward trend since the early 2000s (see Fig 2). An examination of its food imports and exports provides a clear picture of Cameroon as a net food importing country, with import levels rising rapidly in all categories between 1995 and 2012, with the exception of meats, and vegetables and fruit (see Fig 3A). In regard to vegetables and fruit, Cameroon is a net exporter, with export levels on the rise. Where people are purchasing their food is changing; grocery retailers' sales have climbed from approximately \$2.98 billion in 2001–03 to \$5.49 billion in 2010–12 (see Fig 4). Cameroon has seen an increase in total calories available daily per capita, up from 2064 in 1995–97 to 2451 in 2007–09 (see Fig 5). The majority of their dietary calories are still available from cereals

and roots, with animal and vegetable oils generally increasing; suggesting they are only beginning to enter the nutrition transition.

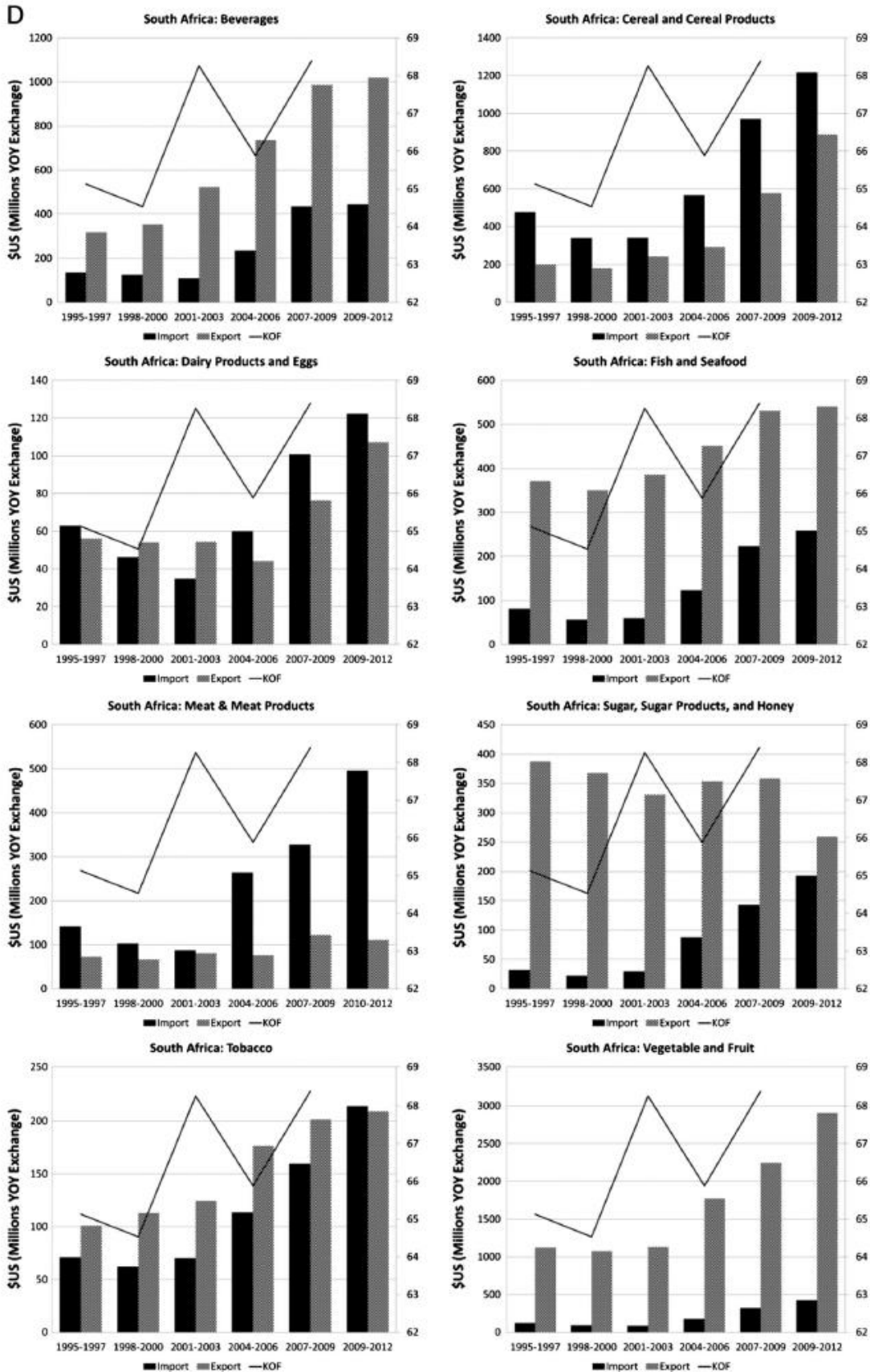


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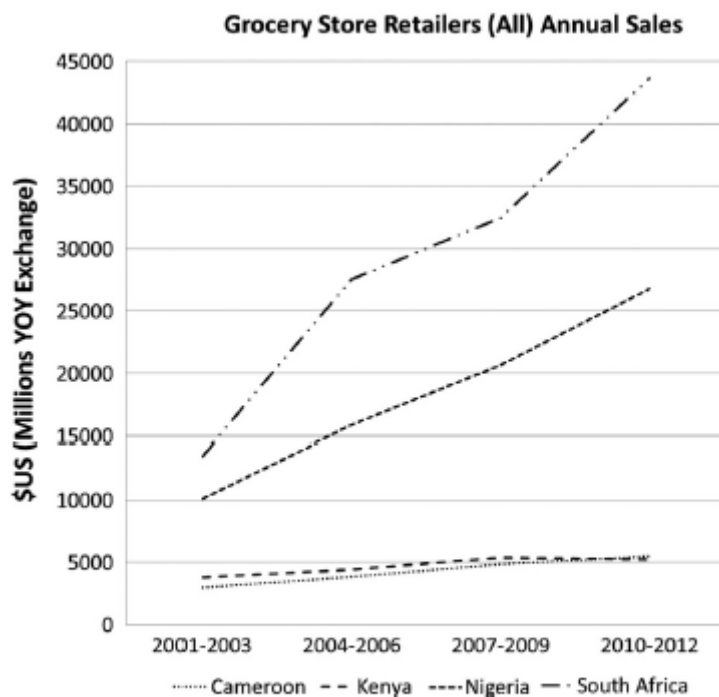


Fig 4 – Changes in Grocery Retail Sales Between 2001 and 2012.

Fig 6 demonstrates that Cameroon’s overweight and obesity prevalence is also rising, with recent rates as high as 33.2% and 12.6%, respectively. This trend, coupled with the knowledge that 22% of Cameroon’s population is classified as under- nourished,⁶² suggests that the food supply reaching the population may be of poor nutritional quality, and/or diminished in caloric value. Cameroon struggles with food affordability, such that the average household spends 52.3% of their total household expenditures on food, well above the global average of 38.8%.⁶² While mortality rates due to diabetes mellitus, ischaemic heart disease, and cardiovascular disease appear to be declining over time (see Fig 7), in 2008 NCDs accounted for approximately 31% of all mortality.⁴⁶

Kenya

Kenya has experienced rising levels of both FDI inflow and outflow between 1995 and 2009, although FDI into the country soared starting in the 2007–09 (see Fig 2), largely due to privatization sales in the telecommunications and railway industries.⁶³ In the categories of beverages, fish and seafood, meats, and vegetables and fruit, Kenya exports considerably more product than they import, while the opposite is true for cereals and sugar products (see Fig 3B). Kenya has seen similar increases in grocery retailers’ sales as Cameroon, up from \$3.8 billion in 2001–03 to \$5.2 billion in 2010–12 (see Fig 4). Their total calories available daily per capita have fluctuated, although with little change overall between 1995–97 and 2007–09 (see Fig 5). The Kenyan diet consists primarily of cereals with low dietary diversity.⁶² Fig 6 demonstrates that Kenya has seen small increases in their overweight and obesity prevalence, with recent rates at only 14.5% and 1.2%, respectively. Kenya has had a continued struggle with food security, such that 33% of their population remains classified as

undernourished,⁶² questioning the logic of exporting fish and meat products from a country with low availability of quality protein and an insufficient supply of food to feed their people.⁶² Mortality rates due to ischaemic heart disease and cardiovascular disease are declining, while mortality rates attributable to diabetes are increasing rapidly (see Fig 7); in 2008 NCDs accounted for approximately 28% of all mortality.⁴⁶

Nigeria

Nigeria has experienced consistently rising levels of inward FDI, while outflows have been negligible; the value of funds repatriated since the 2004–06 period has been less than their investments abroad (see Fig 2). Nigeria is primarily a food importer, with food exports relegated to vegetables and fruit which are approximately on par with imports (see Fig 3C). Nigeria has had immense growth in grocery retailers' sales, increasing from \$10.1 billion in 2001–03 to \$26.8 billion in 2010–12 (see Fig 4). Furthermore they have considerably higher total calories available daily per capita than Cameroon or Kenya, growing from 2545 in 1995–97 to 2758 in 2007–09 (see Fig 5). The Nigerian diet is dominated by cereals and roots with oils playing a growing role and, like Cameroon, the country is entering the nutrition transition. Fig 6 exhibits a growing overweight and obesity problem, with 2010–12 rates at 26.4% and 5.9%, respectively, up from 17.1% and 2.3% in 1995–97. Nigeria has a relatively small population classified as undernourished (6%), although with food consumption already at 64.7% of total household expenditure, one of the highest rates globally, and no food safety net programs in place, a large percentage of their population will be vulnerable to spikes in food prices.⁶² NCD mortality rates attributable to diabetes, ischemic heart disease, and cardiovascular disease appear to be declining in Nigeria (see Fig 7); although they still accounted for approximately 27% of all mortality in 2008.⁴⁶

South Africa

South Africa has had considerable variation in both inflows and outflows of FDI, although in general inflows are increasing (see Fig 2). Over the 1995–97 to 2009–12 period South Africa continued to increase its exports in beverages and fish and seafood, with small declines in sugar exports (see Fig 3D). At the same time they increased cereal, dairy, and in particular, meat product imports. Of our four countries, South Africa has the highest annual grocery store retail sales, rising from \$13.5 billion in 2001–03 to \$43.6 billion in 2010–12 (see Fig 4). Additionally, Fig 8 demonstrates that consumer food service sales are primarily accounted for through independent grocery retailers, followed by fast food chains, grocery store chains, restaurants (not falling into another category), cafes and bars, street stalls, and take-out/delivery food, all of which have been increasing to varying degrees. South Africa has the highest total caloric availability daily per capita, up from 2809 in 1995–97 to 3002 in 2007–09 (see Fig 5). While their diet is still primarily cereals and roots, the larger role of oils, meats and fats, and sugars, demonstrates their advanced standing in the nutrition transition in SSA. Parallel to these findings, South Africa has some of the highest rates of

overweight and obesity in the region; Euromonitor approximates that in 2010–12 32.7% and 22.7% of the population were overweight or obese, respectively.

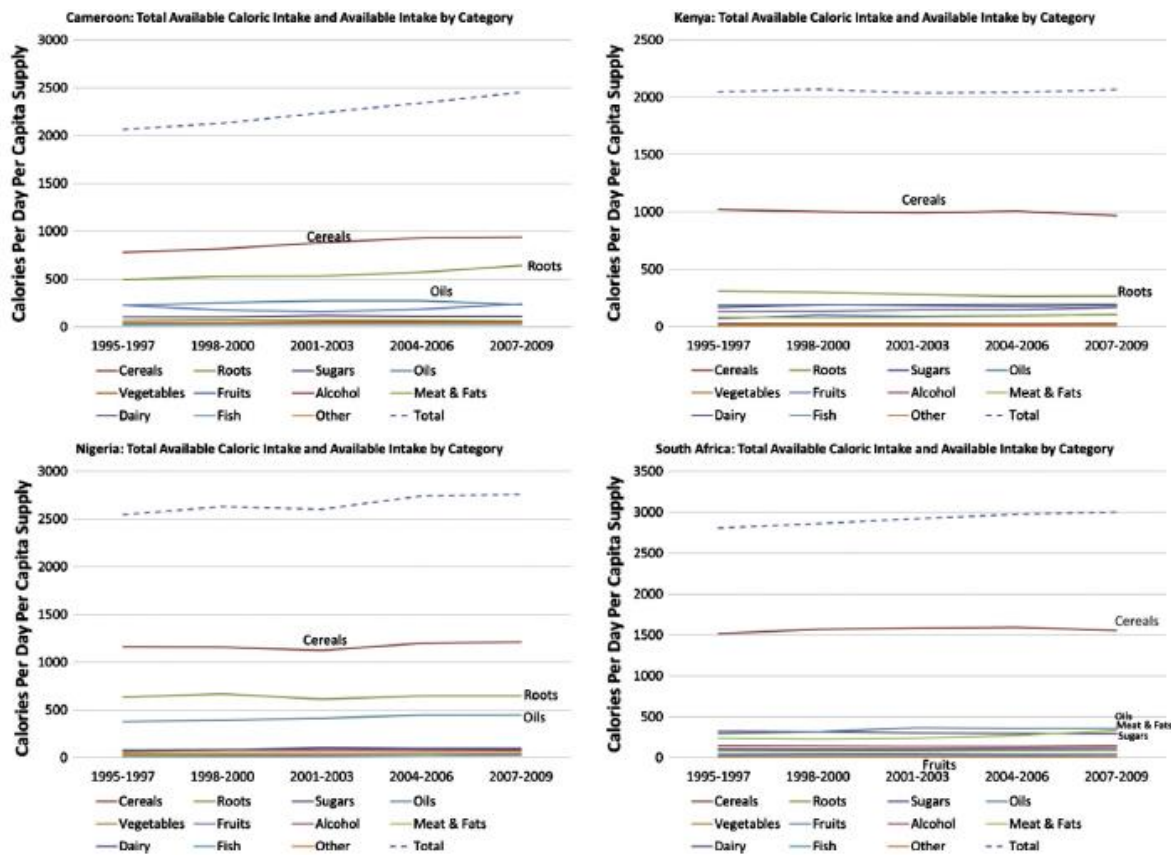


Fig 5 – Changes in Caloric Intake Between 1995 and 2009.

These estimates are considerably more conservative than the previously reported WHO estimates (65.4% and 31.3%), highlighting some of the data issues in the SSA region; however the Euromonitor estimates were kept for consistency within the trend analysis. That said, South Africa is a country of vast inequalities, with a Gini income coefficient of 0.631, where 1.0 represents maximal inequality and most OECD countries are around 0.3 or less.⁶⁴ South Africa’s income inequality is the second highest worldwide just behind Lesotho at 0.632.⁶⁵ Not surprisingly, 27% of their population is classified as undernourished and, despite food affordability and availability being generally good on average, there are huge inequities in access.⁶² Mortality rates due to NCDs appear to be stagnant or, in the case of diabetes mellitus, increasing (see Fig 7); NCDs accounted for approximately 29% of all mortality in 2008,⁴⁶ similar to three other country profiles.

Structural equation model

In an effort to begin quantifying pathways between globalization and NCDs in SSA we developed two hypothesized models based on our conceptual model (see Figs 9 and 10). In this model we hypothesized that increased trade and investment and urbanization would increase the proportion of individuals in the population categorized as overweight or obese, which would then be related to an increased proportion of deaths due to NCDs, specifically, CVD. We ran two models, one with overweight and one with obesity, based on a large body of

evidence supporting increased CVD mortality with increasing BMI categorization.^{66–69} Additionally, we incorporated two potential confounding factors; the first is a measure of overall economic growth in the country, to establish that any changes in CVD due to globalization processes would exist while accounting for economic growth (whether or not such growth was itself also related to globalization processes). The second is the prevalence of tobacco smoking in the population, similarly to establish that the connection between the predictive factors in our model and CVD would exist while accounting for the impact of tobacco.

Measurement of variables

Urbanization was measured using national estimates of the percentage of the population living in an urban area as of the first of January. Economic growth was estimated using gross domestic product (GDP) measured at purchasing power parity. Data for both measures were retrieved from the Euromonitor International database for all 48 SSA countries for the 2008 year.

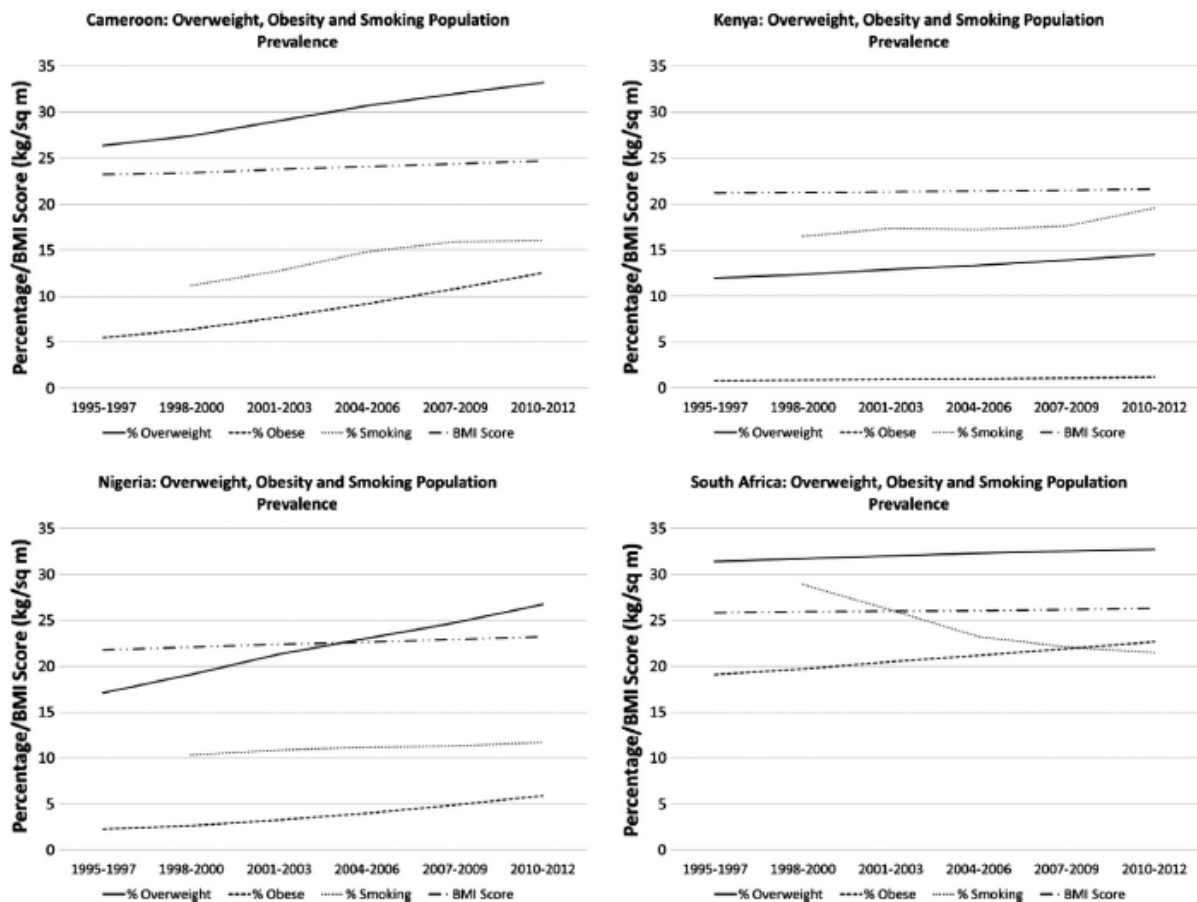


Fig 6 – Changes in Overweight, Obesity, and Smoking Prevalence in the Population.

Estimates of trade and FDI were measured using the Economic Globalization subscale of the KOF Index of Globalization.⁷⁰ This subscale provides an aggregate score for countries based on their sum of exports and imports of goods and services, foreign direct investment inflows and outflows, investment assets stocks and liabilities stocks, and income payments to foreign nationals, all as a percent of GDP; as well as the presence of trade restrictions, such as

hidden import barriers, mean tariff rates, taxes on international trade, and capital account restrictions. Data were retrieved from <http://globalization.kof.ethz.ch/> for 39 of the 48 countries for 2008 (missing cases: Comoros, Djibouti, Equatorial Guinea, Eritrea, Gambia, Liberia, Sao Tome and Principe, Seychelles, and Somalia, accounting for 2.7% of the total population).

Changes in dietary behaviour were measured using the summed total of the population prevalence of overweight and obesity. The prevalence of CVD was measured as the proportion of all deaths attributable to CVD, as morbidity data are challenging to acquire for the SSA region. Data for both variables were retrieved from the *Noncommunicable Diseases Country Profiles 2011* report from the WHO, using population estimates from 2008. Data for CVD were available for all 48 countries, while overweight and obesity data were available for 41 of the 48 countries (missing cases: Angola, Burundi, Djibouti, Equatorial Guinea, Guinea-Bissau, Somalia, and Sudan, accounting for 9.0% of the total population).

The prevalence of tobacco smoking was defined as the annual per capita consumption of tobacco cigarettes as reported by the Tobacco Atlas, an initiative from the World Lung Foundation and the American Cancer Society (http://www.tobaccoatlas.org/products/cigarette_consumption/annual_cigarette_consumption/). Data for 2009 were available for 47 of the 48 countries (missing case: Congo-Brazzaville, accounting for 0.5% of the population).

Structural equation modelling

The hypothesized models in this study were analysed using path analysis within structural equation modelling (SEM) procedures using the Analysis of Moment Structures (AMOS) statistical software program (version 21.0). SEM is generally a large data technique requiring sample sizes of anywhere between 100 to 200 cases.⁷¹ However, as pointed out by Kenny,⁷² upper limit exists on N, such as when the unit of analysis is a country. With the exception of three countries (Réunion and Western Sahara due to insufficient data, and South Sudan due to its independence only occurring in 2011), all SSA countries were included in this model, almost achieving population saturation.

Missing data were estimated using AMOS's full information maximum likelihood (FIML) estimation, which has been established to outperform common methods for handling missing data.⁷³ Numerous indices exist for assessing the model fit; based on the recommendation from Schreiber et al.⁷⁴ for single models without modifications, the Tucker–Lewis Index (TLI), the Comparative Fit Index (CFI) and the root mean square error of approximation (RMSEA) will be reported. Hu and Bentler⁷⁵ have recommended the TLI and the CFI to exceed .95, and the RMSEA be below .06 to determine an acceptable fit.

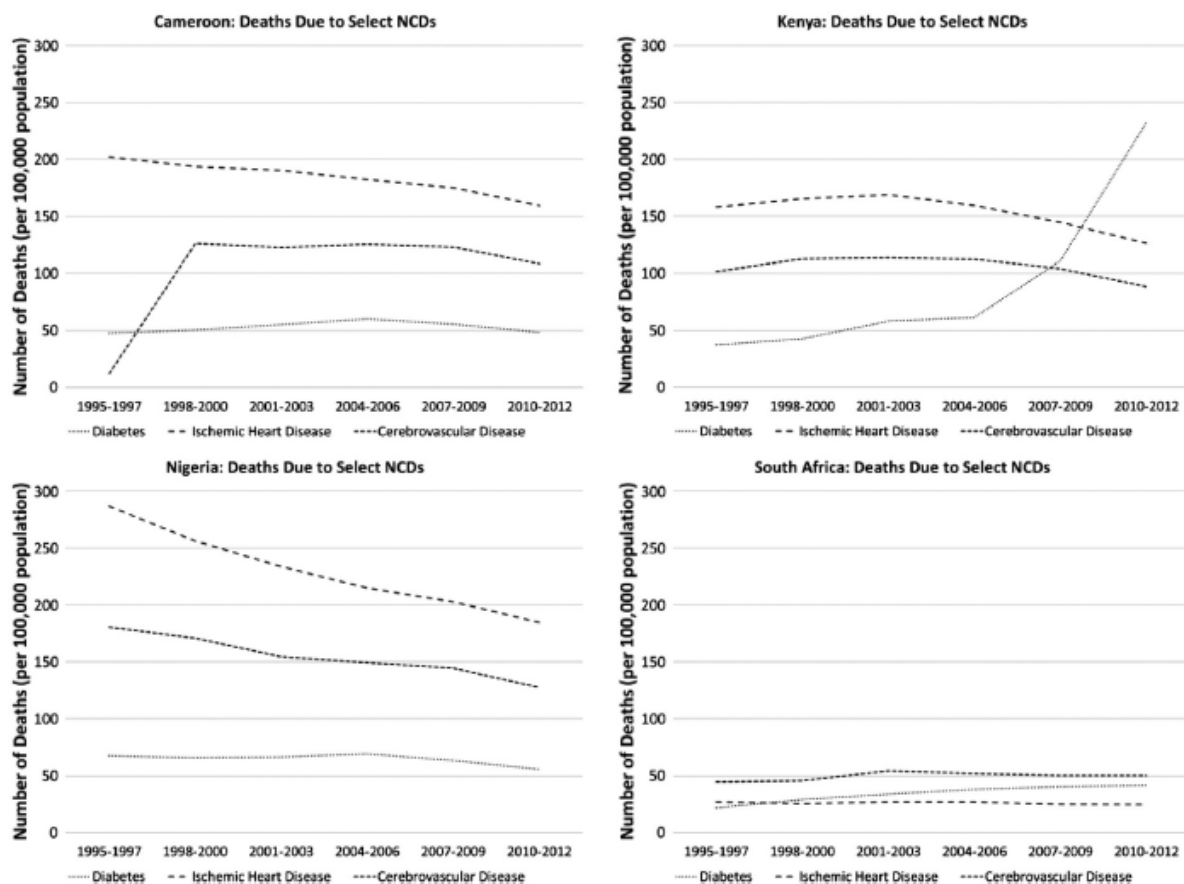


Fig 7 – Changes in NCD Deaths Between 1995 and 2012.

As is convention, we will also report the chi-square test (χ^2) which measures the difference between the expected and the observed model; low χ^2 values are desired with a probability level greater than 0.05 to indicate that the hypothesized model is not statistically significantly different from the observed data. AMOS does not produce standard errors when there are missing data, prohibiting the calculation of confidence intervals; although where the p-value is less than .05 (one-tailed), it can be inferred that zero would not be contained in the 95% confidence interval. The standardized regression weights (β), also known as path coefficients, are a form of effect size allowing direct comparison of the influence of independent variables on the dependent variable.

Test of the hypothesized models

The fit statistics for the overweight model indicated an acceptable fit of the model to the data ($\chi^2 = 2.79$, $p = .42$, TLI = 1.02, CFI = 1.00, RMSEA = .00; see Fig 10). As predicted, economic growth as represented by GDP had a significant direct effect on overweight prevalence ($\beta = .59$, $p < .05$) and tobacco consumption ($\beta = .45$, $p < .05$). Both GDP and tobacco, in turn, had a direct effect on the proportion of deaths attributable to CVD ($\beta = .16$, $p > .05$ and $\beta = .39$, $p < .05$ respectively). Economic globalization had a significant direct

effect on both tobacco consumption ($\beta = .34, p < .05$) and overweight ($\beta = .25, p < .05$) as well as having an effect on CVD deaths ($\beta = .17, p > .05$).

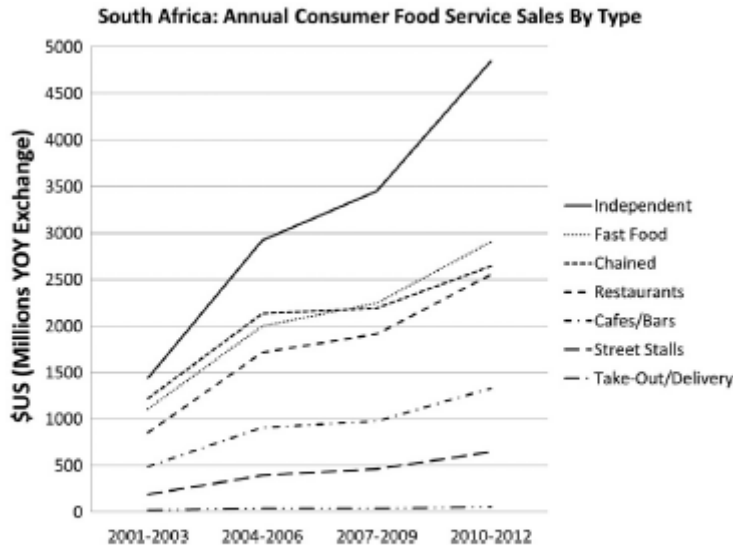


Fig 8 – Changes in Consumer Food Service Between 2001 and 2012 in South Africa.

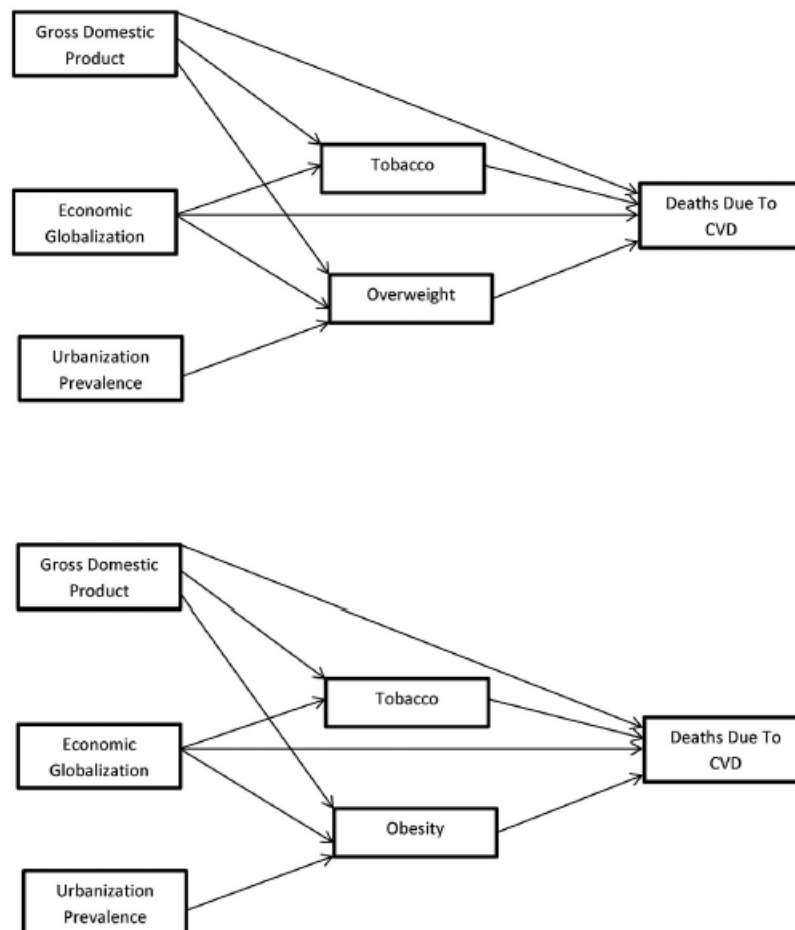


Fig 9 – Hypothesized Models.

While the influence of urbanization did not reach significance, it had an effect on the prevalence of overweight ($\beta = .16, p > .05$). The prevalence of overweight

in the population produced a negligible effect on CVD deaths ($\beta = -.06$, $p > .05$). Overall the model was able to explain 45% of the variability in CVD mortalities, while the globalization processes (urbanization, economic globalization, and GDP) explained 56.9% of the variability in overweight prevalence, and together, economic globalization and GDP explained 61.2% of the variability in tobacco consumption.

The fit statistics for the obesity model indicated an acceptable fit of the model to the data ($\chi^2 = 2.58$, $p = .46$, $TLI = 1.03$, $CFI = 1.00$, $RMSEA = .00$; see Fig 11). Again, economic growth as represented by GDP had a significant direct effect on obesity prevalence ($\beta = .68$, $p < .05$) and tobacco consumption ($\beta = .46$, $p < .05$). Both GDP and tobacco, in turn, had a direct effect on the proportion of deaths attributable to CVD ($\beta = .34$, $p > .05$ and $\beta = .38$, $p < .05$ respectively). Economic globalization had a significant direct effect on both tobacco consumption ($\beta = .33$, $p < .05$) and obesity ($\beta = .23$, $p < .05$) as well as having an effect on CVD deaths ($\beta = .24$, $p > .05$). Contrary to the previous model, urbanization had a negligible effect on obesity rates ($\beta = .03$, $p > .05$), while the prevalence of obesity in the population has a considerable effect on CVD deaths ($\beta = -.31$, $p > .05$). Overall the model was able to explain 47% of the variability in CVD mortalities, while the globalization processes (urbanization, economic globalization, and GDP) explained 53.3% of the variability in overweight prevalence, and again economic globalization and GDP explained 61.2% of the variability in tobacco consumption.

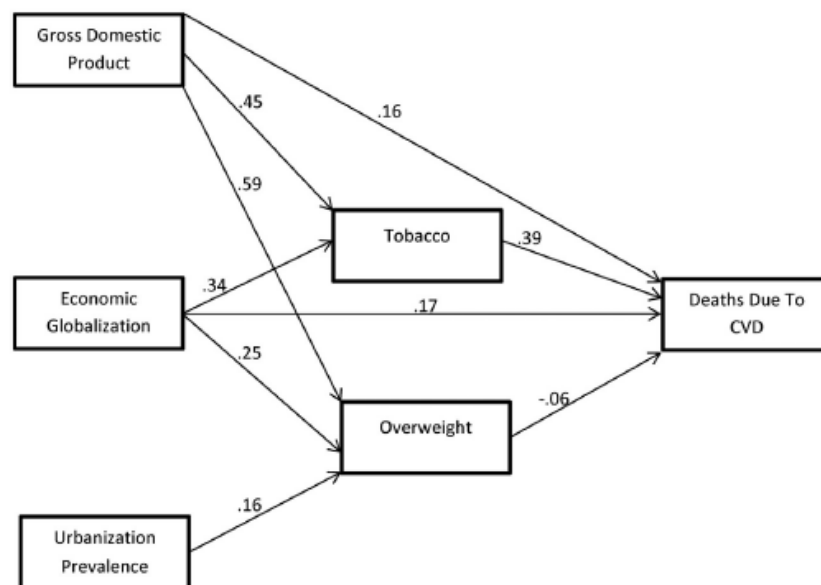


Fig 10 – Test of the Overweight Model.

To better understand the negative pathway coefficient from both overweight and obesity prevalence to CVD deaths, a bivariate correlation matrix was run for all model variables (see Table 1). All correlations were significant at the $p < .01$ level, and the bivariate correlations between overweight and obesity and proportion of CVD deaths were $r = .49$ and $r = .43$, respectively, indicating a positive correlation, as would be expected. This suggests the presence of a net

suppression effect, wherein a predictor variable (overweight and obesity) has a regression weight with an opposite sign to its correlation with the criterion variable (CVD). This can occur when a predictor variable shares considerable variance with one or more additional predictor variables, the predictor variable with the weakest relationship with the criterion variable will be the automatic recipient of the ‘sign flip.’⁷⁶ In this case both overweight and obesity are correlated with tobacco, and exude the smallest effect on the proportion of CVD deaths. The direct effect of the KOF on CVD deaths may be smaller, but because it also acts indirectly through overweight, obesity, and tobacco, it does not get the ‘sign flip’.

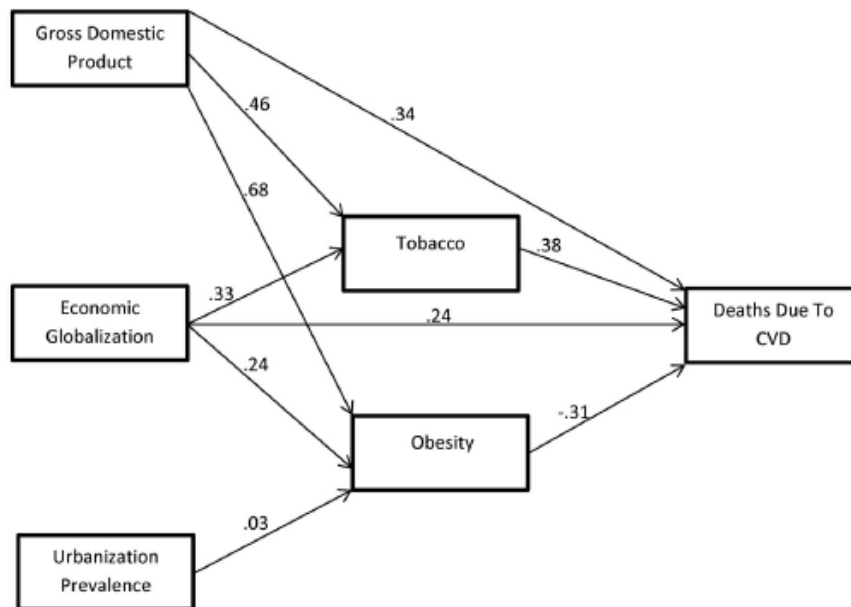


Fig 11 – Modification of the Obesity Model.

Table 1 – Bivariate correlation matrix between model variables.							
	1	2	3	4	5	6	7
1. Gross Domestic Product	–						
2. Economic Globalization	.58	–					
3. Urbanization Prevalence	.37	.49	–				
4. Tobacco Consumption	.62	.57	.39	–			
5. Overweight Prevalence	.74	.60	.55	.59	–		
6. Obesity Prevalence	.75	.58	.46	.58	.98	–	
7. Proportion of Deaths due to CVD ⁺	.44	.39	.40	.55	.49	.43	–

*All correlations significant at the $p < .01$ level (1-tailed).
⁺ = cardiovascular disease.

Discussion

To our knowledge this is the first study empirically modelling the relationship between globalization processes, economic growth, metabolic risk factors, and deaths attributable to CVD within the SSA context. While rising GDP and increased prevalence of tobacco consumption have long been presumed to impact health outcomes, this analysis lends support to what will inevitably be a

growing body of literature on the relative influence of globalization and urbanization on the food environment and population health outcomes. The first important finding is that global economic integration (trade and investment), beyond the pure generation of wealth (GDP), is linked to intermediate (overweight and obesity) and distal (CVD death) health outcomes.

Interestingly, the influence of urbanization was considerably stronger on national overweight prevalence relative to national obesity prevalence, suggesting that while city life increases one's probability of being overweight, the shift to obesity is relatively unaffected by the urban environment. Almost half of all national variability in CVD deaths could be accounted for by the variables in our model, and the effect sizes of economic globalization, GDP, obesity, and tobacco in the second model were all quite similar. Consistent with previous findings,^{66–69} overweight and obesity had variable effects on CVD deaths, such that the direct effect of obesity on CVD death approached significance, while the effect from overweight was negligible. Although urban environments appear to increase rates of overweight, and overweight is the logical first progression towards obesity, there likely are additional elements unexplored in this paper that cause the transition from overweight to obesity and CVD deaths.

The very similar magnitudes of the effect sizes between tobacco and CVD death ($\beta = .38$) and obesity and CVD death ($\beta = .31$), suggest that efforts to reduce NCDs, such as CVD, through decreased tobacco consumption may be thwarted by the rising obesity epidemic. In Canada for example, 25% of the population aged 15 years and over were smokers in 1999, and by 2011 this number was down to 17%.⁷⁷ However, between 1995 and 2011, 36.3% of Canadians increased their BMI,⁷⁸ reaching a national overweight and obesity prevalence rate of 52.1% in 2011.⁷⁹ In a similar vein, researchers in the United States reported that between the years of 1980 and 2000 there was a 43% reduction in deaths due to coronary heart disease (CHD), half of which could be attributed to medical therapies and the other half to a reduction in risk factors. However, they also estimated that the number of deaths due to CHD could have been reduced an additional 18% had it not been for the rising rates of obesity and diabetes.⁸⁰

Results from the trend analysis show that the levels of FDI inflows and grocery retail sales are increasing for all countries. The per capita access to daily caloric intake is rising, with the exception of Kenya, where it has largely remained stagnant. Data from all four countries examined revealed that they were rapidly increasing their imports in cereal/cereal products and sugar/sugar products/honey; major contributors to energy-dense, processed foods. While Cameroon, Kenya, and Nigeria appear to only be entering the nutrition transition, South Africa's caloric consumption patterns and obesity epidemic presage a bleak future for SSA countries following in its footsteps. The trend towards rising prevalence of overweight and obesity coupled with declining death rates attributable to NCDs, with the exception of diabetes mellitus, was surprising at first. Upon further reflection it seems highly probable that this

finding could be accounted for by SSA's rapid population growth (2.7% annually⁸¹). Data represented over the population, such as those presented here, i.e., the number of NCD deaths per 100,000 inhabitants, mean that growth in the numerator (total NCD deaths) must outpace growth in the denominator (total population), in order for such statistics to reveal change. Utilizing mortality as an endpoint, rather than morbidity, means that it will take some time for NCDs to cause death. Even assuming an aging population, the overall population growth (which still remains substantial in SSA) would have the effect of lowering mortality rates, unless the portion of people dying from NCDs outpaced the proportional rise in overall population. Importantly, this does not mean that the proportion of overall deaths due to NCDs is declining. Thus, future analyses may benefit from examining the change in percentage of deaths attributable to NCDs rather than the absolute numbers averaged over a growing population.

The continued undernourishment prevalence rates of over twenty and thirty percent in Cameroon, Kenya, and South Africa, alongside a growing obesity epidemic are disconcerting. Large segments of these populations remain food insecure, both the more traditional view of malnourishment as underweight (inadequate or low quality caloric intake), but also the growing malnourishment as overweight (excessive low quality caloric intake). This is a particularly concerning phenomenon in developing regions, such as SSA, entering a rapid nutrition transition, wherein fetal adaptations to an early nutrient-limited environment increases later life susceptibility to noncommunicable disease.⁸² Future food security strategies must address equitable access to healthy caloric availability in SSA; an increased volume of calories alone is no longer sufficient for realizing global food security goals.

With increased global economic integration inevitably comes increased integration into the global food system, currently dominated by powerful transnational food corporations. From years of structural adjustment, economic and food aid dependency, and relatively limited national capacity for policy and administration, developing nations may become more vulnerable to the negative externalities of a global food system driven by highly profitable energy-dense processed foods. International responses to NCDs, consistently recognizing the impact of an unhealthy diet, are increasingly acknowledging the important role of the 'built' food environment and those responsible for its formation and maintenance.

In July 2012 the World Health Organization released its *Global Action Plan on Noncommunicable Diseases 2013–2020* (GAP-NCDs),⁷ which has been officially endorsed by the 66th World Health Assembly in May 2013. The GAP-NCDs contains nine voluntary global targets, including broad goals such as, a 25% relative reduction in risk of premature mortality from cardiovascular diseases, cancer, diabetes, or chronic respiratory diseases; and goals pertaining to the reduction of known risk factors, such as a 30% relative reduction in mean population intake of salt/sodium. The action plan recognizes the unequal

distribution of NCDs between and within populations, and the underlying need to create equitable access to the social determinants of health essential to an economically productive and healthy society. It calls for increased multisectoral action, including a whole-of- government and whole-of-society approach, but cautions that all policies, strategies and actions directed at NCD reduction “must be protected from undue influence by any form of vested interest.”

The GAP-NCDs makes a series of recommendations around the four pathways for NCD reduction; tobacco control, healthy diet, physical activity, and a reduction in the harmful use of alcohol. With respect to healthy diet, it recommends that member nations work with relevant sectors, including food producers, processors and commercial operators to develop guidelines and regulations that will reduce levels of salt/sodium, trans-fatty and saturated fatty acids, added sugar, and portion sizes and energy density of pre-packaged or prepared food and beverages. It recommends the creation of policies to improve the availability, affordability and acceptability of healthier food products, particularly within public institutions, such as schools, other educational institutions and the workplace. Finally, it recommends that member nations consider, the introduction of taxes and subsidies to encourage consumption of healthier food products and discourage the consumption of less healthy options. While the trade sector is suggested as a potential partner within multisectoral action on NCDs, rarely has the role of urbanization and of trade and investment been given a full exploration for potential impacts on NCD prevalence rates. Additionally, global strategies such as the GAP-NCD have seemingly yet to acknowledge the potential for diminished capacity to act through regulatory strategies, such as those directed at the food industry, due to the protection provided to investors through international investment treaties. As has been suggested here, the growing number of bilateral and regional investment promotion and protection agreements raises serious concerns regarding the autonomy of the nation state to protect public health without facing retribution for expropriation of investment due to regulatory measures. Those committed to health-based public policy have thus had new challenges emerge; they now need to enhance their understanding of and participation in trade and investment treaties to ensure that sufficient capacity and space for effective public health regulation are protected. As WHO Director-General, Dr. Margaret Chan, challenged delegates at the 8th World Conference on Health Promotion in Helsinki, Finland, in June 2013:

The globalization of unhealthy lifestyles is by no means just a technical issue for public health. It is a political issue. It is a trade issue. And it is an issue for foreign affairs... [I]t is not just Big Tobacco anymore. Public health must also contend with Big Food, Big Soda, and Big Alcohol. All of these industries fear regulation, and protect themselves by using the same tactics... Not one single country has managed to turn around its obesity epidemic in all age groups. This is not a failure of individual will-power. This is a failure of political will to take on big business. I am deeply concerned by two recent trends. The first relates to trade agreements. Governments introducing measures to protect the health of

their citizens are being taken to court, and challenged in litigation. This is dangerous. The second is efforts by industry to shape the public health policies and strategies that affect their products. When industry is involved in policy-making, rest assured that the most effective control measures will be downplayed or left out entirely.

Limitations

The current findings should be viewed in light of the limitations presented by the data. While there may exist a theoretical foundation for the proposed pathways, cross-sectional, ecological data preclude definitive assertions of causality. It is also possible that there were potentially important confounding variables omitted from the model that may better explain changing proportions of CVD deaths. That being said, we believe that there is a strong literature base supporting the inclusion of our selected variables. Additionally, there is a concern regarding the ability to access high-quality, comprehensive datasets on African nations. For example, the current data were limited to CVD mortality rates, an outcome that may take an excessive period of time to demonstrate change. Future work would benefit from examining non-fatal outcomes and morbidity statistics, such as diabetes prevalence, hypertension, or non-fatal cardiac events, if the data were to become available. Lack of transparency from TFCs and retailers, and inadequate monitoring of population consumption patterns make it difficult to directly assess changes in the food environment. A global effort to monitor changes in product-specific retail sales, marketing and advertising, FDI into the food manufacturing and processing industry, and other indicators of dietary change and nutrition transition will be imperative to policy efforts targeting unhealthy food environments. Improved longitudinal monitoring of NCD risk factors and outcomes in SSA, such as the work being conducted by the WHO's Global Burden of Disease group will permit development of more advanced models in future research.

Conclusion

This article provides an in-depth look at specific globalization pathways and the changing food environment in SSA, and builds on the growing body of work attempting to empirically measure the relative impacts of the globalization channels and their connection to changing NCD risk factors and epidemiological profiles. The context of investment liberalization in SSA and its implications for the food environment requires further understanding. Future research should review the GATS commitments and terms of the BIPAs currently ratified by SSA governments, and explore the potential outcomes for NCDs and health equity.

One of the important contributions of this work includes addressing the relative impacts of obesity and tobacco on CVD deaths. Our results suggest quite similar effect sizes for tobacco (.38) and obesity (-.31) on the proportion of deaths due to CVD in SSA; however, future research is required to confirm these relationships. As demonstrated by the work in Canada and the United States, two countries that have been actively targeting the tobacco epidemic, the reductions they are

achieving in CVD and NCD deaths through tobacco regulation are being offset or diminished by rising overweight and obesity epidemics. Global strategies for reducing tobacco consumption, such as the ground-breaking international treaty led by the WHO, the Framework Convention on Tobacco Control, should be looked to for potential strategies to address the global obesity epidemic.

Notwithstanding our study limitations and the need for further research, our study concludes that economic growth (GDP) is positively related to both intermediate and distal CVD outcomes. This is not a new finding, as economic growth is known to change both food consumption patterns and exposure to new food products. What is compelling is the finding that global economic integration via trade and investment liberalization is also positively related to these outcomes, over and above economic growth. National and regional policy discussions, while informed by the WHO's GAP for NCDs, must also attend to the impact of trade and investment liberalization policies on intermediate risk factors, as well as the potential of such treaties to limit policy space for public health regulation.^{83,40,84,85} This requires careful analyses (health impact assessments) of present trade and investment treaties to ensure that governments in their NCD control programs fully utilize existing policy flexibilities within these treaties. These include using compulsory licensing or parallel importing for access to generic drug treatments, restricting in non-discriminatory ways imports of unhealthy food products while reducing tariffs on imports of healthy foods, reviewing investment treaties to ensure that intellectual property rights are not considered in the definition of 'investment' and considering, as is the case in South Africa, not renewing such investment treaties that may be expiring. It also means ensuring that any new trade or investment treaty is carefully drafted to protect policy space for future public health regulation. These are not activities that most physicians, and certainly cardiovascular specialists, are familiar with. However, most countries have active academic and civil society organizations attempting to move forward this agenda, which could benefit in their work from the support of the medical community. This support could extend to health professional participation in trade, policy and health policy forums convened by such governments or civil society groups and, in the latter case, consideration to some direct financial assistance for their work. At a minimum, physicians and specialists need to recognize that managing CVD risk requires far more than managing individual behaviour choices.

In his look at urban life in Africa AbdouMaliq Simone stated that, "perhaps the clearest demonstration of African popular will, of a coherent urban culture, and urban citizenship has been the persistence of people to survive in the city. To survive has meant to revise and improvise upon informal activities and to put together a vast domain of providing foodstuffs, services, shelter, consumables, transportation, health care, and education outside of the institutions, frameworks, practices, and policies sanctioned by the state⁸⁶ (p.14)." While Simone was applauding the ability of the African people to persevere outside of government infrastructure, the growing number of urban dwellers and urban poor in SSA is entitled to the support of the global health

community, particularly given the larger role globalization has played in their current circumstances. A commitment to healthy policies, healthy cities, healthy development, and health for all, must recognize the changing environments in which the majority of the world's population lives, and ensure systems are in place that support equitable access to a healthy diet within the new global food architecture.

Statement of Conflict of Interest

The authors have no conflicts of interest to report.

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