

# Diet-related non-communicable diseases in South Africa: determinants and policy responses

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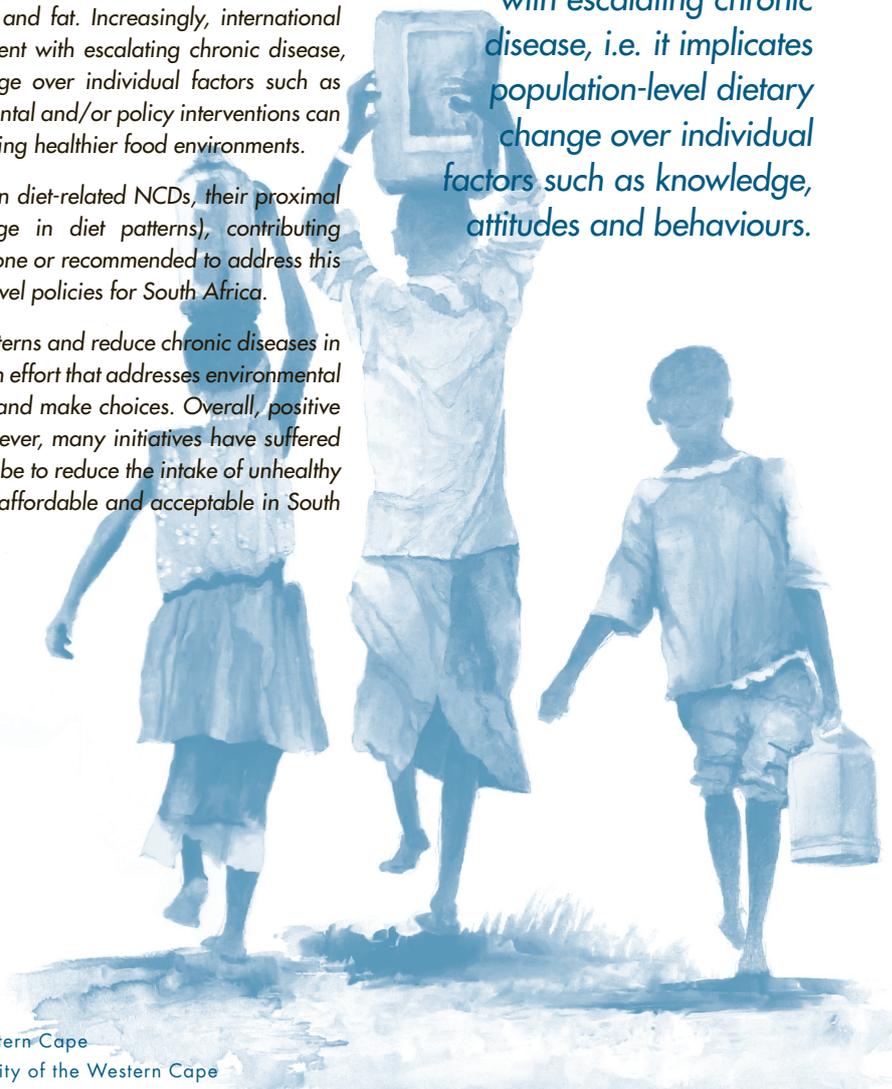
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**N**on-communicable diseases (NCDs) are the leading cause of death globally and they are on the rise both in low- and middle-income countries, with South Africa being no exception. Implicated in this upward trend in the country is an observed change in diet – a transition from traditional foods, to what has come to be known as the ‘western’ diet, i.e. more energy-dense, processed foods, more foods of animal origin, and more added sugar, salt and fat. Increasingly, international research links rapidly changing food environment with escalating chronic disease, i.e. it implicates population-level dietary change over individual factors such as knowledge, attitudes and behaviours. Environmental and/or policy interventions can be some of the most effective strategies for creating healthier food environments.

This chapter explores the link between the rise in diet-related NCDs, their proximal determinants (specifically an observed change in diet patterns), contributing environmental factors, what is currently being done or recommended to address this internationally, and the most relevant national-level policies for South Africa.

The authors conclude that to improve dietary patterns and reduce chronic diseases in South Africa will require a sustained public health effort that addresses environmental factors and the conditions in which people live and make choices. Overall, positive policies have been made at national level; however, many initiatives have suffered from a lack of concerted action. Key actions will be to reduce the intake of unhealthy foods and make healthy foods more available, affordable and acceptable in South Africa.

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## Introduction

Chronic non-communicable diseases (NCDs), mainly heart disease, stroke, cancer, diabetes and chronic respiratory disease, account for more than two-thirds of global deaths, at least half of which are caused by common, modifiable risk factors such as unhealthy diet, obesity, tobacco use and lack of physical activity.<sup>1</sup>

Currently, NCDs are the leading causes of death worldwide, resulting in 16 million premature deaths each year;<sup>2</sup> and this is projected to worsen: in 1999, NCDs were estimated to have contributed to just under 60% of worldwide deaths and around 43% of the global burden of disease.<sup>3</sup> Based on current trends forecast by the World Health Organization (WHO), these diseases are predicted to account for 73% of deaths and 60% of the disease burden by the year 2020.<sup>1</sup> Global projections indicate that the biggest increase in NCD deaths will occur in low- and middle-income countries (LMICs); currently already 80% of global NCD deaths occur in these regions.<sup>4,5</sup>

The United Nations (UN) recently recognised NCDs as an increasing threat and a major contributor to preventable disease and premature mortality. This has been a monumental step in placing NCDs on the global health and development agenda. A UN High-Level Meeting of Heads of State and Governments on the Prevention and Control of Non-communicable Diseases was held in September, 2011. This meeting classified NCDs not just as a health concern but as a major development issue. Participants adopted a political declaration to increase global focus and attention to prevent and control NCDs, especially in LMICs.

South Africa was a participant and signatory to this meeting and supported the final political declaration. NCDs impose a large and continuously growing burden on the health, economy and development of South Africa, and currently accounts for a staggering 43% of recorded deaths. Rates of overweight and obesity (together the second-leading metabolic risk factor in NCD-attributable death in South Africa<sup>6</sup>), have risen sharply over recent years,<sup>7-10</sup> in conjunction with ongoing high levels of underweight and nutritional deficiencies. In the year 2000, an estimated 7% of all nationally recorded deaths were attributed to excess body weight,<sup>11</sup> while in 2004, NCDs linked to dietary intake, together with respiratory diseases, contributed 12% to the overall disease burden.<sup>12</sup> Currently, more than 45% of men and women above the age of 35 are either overweight or obese.<sup>13</sup> While NCDs have historically affected the more affluent and mainly White population, these conditions are now affecting other population groups as well. It is believed that in the coming decades, NCDs will further exacerbate wide inequalities in longevity and quality of life in South Africa.<sup>14</sup> Additionally, the chronic nature of NCDs demands long-term care and imposes a significant burden on an overstretched health system already having to cope with the HIV and AIDS epidemic, a high burden of tuberculosis (TB), maternal and child mortality, and high levels of violence and injuries.

This chapter explores the link between the rise in diet-related NCDs, their proximal determinants (specifically an observed change in diet patterns), contributing environmental factors, what is currently being done or recommended to address this internationally, and the most relevant national-level policies for South Africa.

## Proximal determinants

The leading behavioural risk factors for NCDs are tobacco use, harmful alcohol consumption, unhealthy diets that include high sugar, salt and fat intake, physical inactivity, and overweight and obesity.<sup>15</sup> More specifically, in terms of this chapter, the continuing rise in prevalence of overweight and obesity in an increasing number of LMICs has been associated with a dramatic change in diet. Poor diet now generates more disease than physical inactivity, alcohol and smoking combined,<sup>16</sup> which is largely due to an observed change in diet at the population level. This change, dubbed the 'nutrition transition', is characterised by a shift from traditional diets based largely on staple grains or starchy roots, legumes, vegetables and fruits but minimal animal foods, towards more energy-dense, processed foods, more foods of animal origin and more added sugar, salt and fat.<sup>17-19</sup> This new diet, commonly known as the 'western' diet, is primarily made up of cheap, highly palatable, heavily promoted, energy-dense and nutrient-poor foods.<sup>18</sup>

The transition is also evident in South Africa. The change in nutrient intake among South Africans has been associated with change in population-level dietary patterns.<sup>20</sup> Although dietary differences are still evident among South Africans, increasing changes to the food environment indicate that the 'western' diet will one day be common fare across the country.<sup>21</sup>

## Environmental factors

Globally, communities that have low levels of access to affordable, healthy food options generally have poorer diets and are at a higher risk for certain diet-related diseases.<sup>22-27</sup> Local food environments, defined here as "the physical presence of food that affects a person's diet; a person's proximity to food store locations; the distribution of food stores, food service, and any physical entity by which food may be obtained; or a connected system that allows access to food",<sup>28</sup> play a key role in individual, family, and population-level health. International research increasingly implicates a rapidly changing food environment dominated by processed products high in sugar, salt and fat, and demonstrates that these environments contribute to increasing levels of chronic disease, over and above individual factors such as knowledge, attitudes, and behaviours.<sup>29-31</sup> Simply put: unhealthy food environments foster unhealthy diets. This has been especially true for communities with predominantly low-income, low socio-economic status residents.<sup>27-32</sup>

South Africa is rapidly catching up with high-income countries as the 'western' diet is becoming increasingly accessible to all segments of society. This transition has accelerated dramatically since the mid-90s when the post-apartheid government opened the borders to trade and foreign direct investment.<sup>29</sup> Since then 'Big Food' (a term used to label large commercial entities that dominate the food and beverage environment) has come to dominate the food supply by making its products more available and affordable. Although there are over 1 800 food manufacturing companies in South Africa, Big Food manufacturers account for a disproportionately large number of sales.<sup>30</sup> According to a recent publication, Big Food is becoming more widespread in South Africa and has been implicated in unhealthy eating.<sup>31</sup> Igumbor et al. report that there has been an observed increase in the sale of almost all categories of packaged

foods in the country from 2005 to 2010. For example: sales of snack bars, prepared meals and noodles all rose by more than 40%; and when compared with the worldwide average of 89 Coca-Cola products per person per year, in 2010 "South Africans consumed 254 Coca-Cola products per person per year, an increase from around 130 in 1992 and 175 in 1997".<sup>32</sup> Another study found that in 2010, up to half of all young people were reported to consume fast foods, cakes and biscuits, cold drinks and sweets on at least four days a week.<sup>13</sup> It is worth noting that of the top 10 companies that dominate food processing/manufacturing in the country, five (including the most dominant company) are South African. Igumbor et al. conclude that:

various strategies adopted by Big Food to increase the availability, affordability, and acceptability of their products have contributed to ... dietary changes in South Africa and to the increased burden of obesity and NCDs.

Also accelerating the spread of the 'western' diet in South Africa has been the rapid expansion of supermarkets, with chain outlets now owning more than 50% of the retail food market,<sup>33</sup> making supermarkets the primary place South Africans purchase their foods.<sup>34</sup> In general, supermarkets have made both staple and packaged foods more affordable;<sup>35</sup> however, healthier food options typically cost between 10% and 60% more when compared with unhealthier options in these retail outlets.<sup>36</sup> Availability of these healthier options has also been observed as an issue, particularly for those living in low-income areas. One study noted that "supermarkets in low-income areas typically stock less healthy foods than those in wealthier areas and, as a result, the supermarkets do not increase access to healthy foods and may, in fact, accelerate the nutrition transition".<sup>37</sup>

These environmental factors are decreasing the diversity of food stuffs consumed by South Africans. Dietary diversity plays a crucial part in preventing undernutrition and overweight/obesity. With healthier options usually being more expensive than their unhealthy alternatives,<sup>38-40</sup> and as a result out of reach for many South African families, dietary diversity has become less and less of a reality in this country.<sup>41-44</sup>

## Policy approaches

International research has shown that "environmental and policy interventions may be among the most effective strategies for creating population-wide improvements in eating".<sup>45</sup> Based on research and practice, consensus now exists regarding core policy actions that can be taken to promote healthy diets.<sup>46,47</sup> The policy actions have been grouped into three domains in the NOURISHING framework,<sup>48</sup> including the food environment (e.g. nutrition labelling, food taxation, restriction of food advertising); the food system (e.g. supply-chain incentives); and behaviour-change communication (e.g. mass-media campaigns, nutritional advice and education). Evidence exists to support the benefits of focused mass-media campaigns, food-pricing strategies, school-procurement policies and worksite wellness programmes, but there is less conclusive evidence for food and menu labelling and changes in the local built environment.<sup>49</sup> In addition, there is a dearth of research into how nutrition labels are being received in the global South, especially among the urban and rural poor, in order to assess the effectiveness of labelling policies.<sup>50</sup>

In the United States of America studies have shown greater effects of food policies related to bans/restrictions on unhealthy foods, mandates offering healthier foods, and altering purchase/payment rules on foods purchased using low-income food vouchers compared with other interventions such as menu labelling or the introduction of new supermarkets.<sup>51</sup> There is also consistent evidence that taxation and subsidy intervention influence dietary behaviour.<sup>52</sup> Mexico, for example, implemented taxation of sugar-sweetened beverages and other so-called junk foods, and many other countries have or are actively pursuing taxes on sugar-sweetened beverages to combat both obesity and dental disease.<sup>46</sup> Early results from the sugar taxation in Mexico indicate that in 2014 the purchase of soda and other taxed drinks had dropped by 10% compared with the previous year, whereas the purchase of bottled water rose by 13%, showing that people were indeed changing to a healthier alternative.<sup>53</sup>

Sugar taxes have been implemented in Denmark, Finland, France, Hungary, Ireland and Norway, based on substantial scientific evidence showing that decreased sugar-sweetened beverage consumption reduces the prevalence of obesity and obesity-related diseases and that a tax on sugar-sweetened beverages reduces the obesity rate.<sup>54,55</sup> However, in order for full health benefits to be achieved, a tax on sugar-sweetened beverages would need to be part of a wider approach to obesity that includes for example, food labelling, advertising regulations, reformulation of foods and drinks by industry and consumer-awareness programmes as well as possible subsidies on healthy foods.

In order to monitor factors influencing the food environment associated with obesity, the International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support (INFORMAS) has developed a set of modules. It includes a framework to monitor, assess and provide input on improving food environment-related policies. Known as the Government Healthy Food Environment Policy Index (Food-EPI), this approach puts forward seven policy domain areas, which "address the key aspects of food environments that can be influenced by governments to create readily accessible, available and affordable healthy food choices".<sup>56</sup> These domains are food composition, food labelling, food promotion, food provision, food retail, food prices, and food trade and investment. 'Good practice statements' have been developed for each of these domains and are used as benchmarks when assessing or rating existing policies in a given jurisdiction. Currently, this rating process is taking place in South Africa and results should be available soon.

## Current national policy context

Poverty and food insecurity in South Africa have a unique and long history that has been traced back and linked to colonialism and the legacy of apartheid: "The former [colonialism] disrupted the African production and indigenous knowledge on food security. The latter [apartheid] designed a system that generally created unfavourable conditions for black people in all aspects of livelihood".<sup>57</sup> Currently, under a rights-based system such as South Africa's, the government "must provide an enabling environment in which people can adequately produce or procure food for themselves and their families".<sup>58</sup> Section 27 of the South African Constitution states that "everyone has the right to have access to sufficient food and water",<sup>59</sup> and points out that "the state must take reasonable

legislative and other measures, within its available resources, to achieve the progressive realisation of each of these rights". As a result, the South African Government as 'duty bearers' is obliged to respect peoples' rights, protect these rights, and do all they can to realise these rights, which means that decision-makers must generate conditions in which everyone can be as healthy as possible, without discrimination.<sup>60</sup>

Rapidly changing local food environments in South Africa have led to the call for labelling and fiscal policy measures to address the availability, acceptability and affordability of healthy versus less-healthy foods, and for improved implementation of regulations for the marketing of foods and beverages to children.<sup>31</sup> Since 1994, South Africa has taken some positive policy steps at national level to address issues related to NCD prevention and/or healthy food access. In September 2011, the South African Minister and Deputy-Minister of Health convened a summit on the Prevention and Control of Non-Communicable Diseases.<sup>61</sup> The summit included various governmental departments, researchers, private sector and civil society stakeholders, and resulted in a declaration that endorsed action aimed at various risk factors (behavioural, environmental and structural). Subsequently, the national government has released its Strategic Plan for Non-Communicable Diseases, 2013–2017,<sup>62</sup> which provides a short-term framework to reduce the burden of NCDs, including actions related to specific targets identified and agreed upon at the 2011 Summit. The plan outlines cost-effective interventions/actions that address unhealthy diet, specifically reduced salt intake in line with the WHO's supported interventions on salt intake reduction in the sub-Saharan Africa region.<sup>66</sup> It goes on to point out that dietary changes are needed in South Africa if NCDs are to be combatted effectively, and that food environments play a key role in this. The plan advocates for a legislative approach to improve food environments, including legislation/regulations to reduce trans-fatty acids; regulations to reduce salt in processed food; consideration to be given to the ban of junk food advertisements directed at children during key television programmes; the taxation of undesirable processed foods and the exemption of healthier choices from taxation; and better control of food and nutrient supplements. A recent review of actions taken in South Africa to combat NCDs reveals that increased attention is being paid to NCDs in South Africa, but that "this heightened focus has to be strengthened and sustained over the next decades to combat the current trend and achieve a real reduction in the NCD-related burden",<sup>14</sup> and that additional rigorous measures are required to continue to address the common risk factors NCDs for South Africa.

With regard to reduced salt intake, voluntary measures have been discussed with the appropriate consumer and industry groups and a comprehensive salt-reduction plan, including legislative measures, has been implemented.<sup>64</sup> The Department of Health has approved regulations which will come into effect in 2016.<sup>65</sup> In addition, a new advocacy group has been established, along with an educational campaign launched by the Heart and Stroke Foundation to communicate about the harms of high salt consumption. Similarly, Regulations relating to trans-fats in food already exist as of 2010,<sup>66</sup> while new food labelling and advertising legislation came into being in March 2012. It is encouraging that the current (February 2016) South African Minister of Health, Dr Aaron Motsoaledi, stated that:

"Africans are eating more and more junk processed foods instead of their traditional diet," and [he] affirmed his desire to regulate junk food starting with reducing salt in bread and eliminating trans-fats.<sup>67</sup>

In his 2016 Budget speech, South African Finance Minister Pravin Gordhan revealed plans to introduce a tax on sugar-sweetened beverages, similar to the sin taxes on alcohol and tobacco.<sup>68</sup> The sugar tax will be implemented from 1 April 2017 and will be levied on soft drinks, fruit juices, energy drinks and vitamin water. This decision was informed by research indicating that a 20% tax on sugary drinks could bring in an estimated R7-billion in additional revenues each year and reduce obesity among 220 000 adults.<sup>69,70</sup>

Other relevant national level-policies, programmes and strategies that shape provincial and community-level actions impacting food environments are the Integrated Food Security Strategy,<sup>71</sup> the Integrated Nutrition Programme,<sup>72</sup> the National School Nutrition Programme,<sup>73</sup> the National Policy on Food and Nutrition Security,<sup>74</sup> and the National Development Plan.<sup>75</sup> However, collectively, these policies frame food insecurity as primarily a rural and food-production issue; few resources have been allocated to municipalities to address urban concerns around this issue, which some argue is where the focus is currently needed.<sup>76</sup> On the whole, these policies do not take environmental issues into account or spatial contexts around access; rather, they focus on household-level issues such as income-generation, government safety nets, nutritional programmes, and on increasing production.<sup>77</sup>

### Policy coherence

All government departments and their respective policies have the potential to affect the health of the population/s they serve. While health may not be the main aim of all these policies, their implementation has the potential to have either a positive or a negative effect on population health. Consequently, the World Health Organization has said that policy coherence is vital across different government sectors, and that when it comes to the promotion of health, various government department policies should complement rather than contradict each other.<sup>78</sup>

In South Africa, a lack of policy coherence is apparent. One such example is the contradiction between our national trade and investment policy and our national health policy, with trade and foreign direct investment promoting the influx of large amounts of processed foods and sugary beverages, giving free rein to fast food companies like McDonalds and Burger King. In more recent documents, there has been an increasing call for an inter-sectoral approach, which has yet to be realised in the South Africa Declaration on the Prevention and Control of Non-Communicable Diseases,<sup>62</sup> the National Strategy for Prevention and Control of Obesity<sup>79</sup> and the South Africa Strategic Plan for Non-Communicable Diseases, 2013–2017.<sup>62</sup> These types of approaches have been successfully used in initiatives such as the Health Promoting Schools Programme, which was developed in response to a shared policy concern across the health and education sector. The approach is obviously more problematic when dealing with sectors with conflicting interests, e.g. between health policy and trade and investment. As pointed out in the Report of the Commission on Social Determinants of Health, "trade policy that actively encourages unfettered production, trade,

and consumption of foods high in fats and sugars to the detriment of fruit and vegetable production is contradictory to health policy".<sup>80</sup>

The reduction of obesity and promotion of health, including the promotion of healthy food choices, will benefit directly from a systems approach, including 'upstream' policy actions beyond the traditional health sector.<sup>81</sup> Health-in-All Policies (HiAP) is one such approach. It has been described as a way that considers the impact of policies on health outcomes, determinants and health systems, with special emphasis on the distribution of these impacts.<sup>82</sup> The HiAP approach was adopted in South Australia, where the regional government mapped the core business and policy directions of local State departments against research showing what works in combatting obesity. "Negotiations then developed high-level policy commitments to address factors promoting healthy weight which predominantly changed ways of working rather than requiring new expenditure and also assisted departments in meeting their own goals."<sup>81</sup> This initiative achieved buy-in from traditionally non-health departments and an increased level of commitment to a broader range of policy actions. In the South African context, HiAP could be advocated and monitored through the establishment of an independent-of-government Health Promotion Foundation (HPF).<sup>83</sup> HPFs work across sectors to support government and contribute to the development of evidence-based policy in collaboration with government, academia and civil society. HPFs have successfully influenced population health in countries such as Thailand and Australia, and in South Africa the Health Promotion and Development Foundation Network has lobbied for the establishment of an HPF, which has not materialised so far. Another approach to promote NCD prevention in South Africa would be guided by the establishment of a multi-stakeholder national health commission that actively engages other sectors including trade and industry, agriculture, education, sports, and arts and culture.<sup>84</sup> Whilst there is strong national commitment and civil society support for this initiative, provinces have been slow to prioritise and implement action plans in this area over the last few years.<sup>85</sup>

## Conclusion

To improve dietary patterns and reduce chronic diseases will require a sustained public health effort. This must include consideration of environmental factors and the conditions in which people live and make choices. Overall, positive policy steps have been made at the national level; however, most initiatives have been critiqued for lack of action. Existing efforts that address initiatives NCD prevention, their proximal determinants and contributing environmental factors have to be strengthened and sustained in order to combat the current trend and achieve a real reduction in the NCD-related burden. Additional rigorous measures are also required to continue to address the common risk factors for NCDs in South Africa. The South African government should develop a co-ordinated, specific plan to make healthy foods more available, affordable and acceptable, and existing related policies should be implemented more effectively.

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## References

- 1 Beaglehole R, Bonita R, Alleyne G, Horton R, Li L, Lincoln P, et al. UN High-Level Meeting on Non-Communicable Diseases: addressing four questions. *Lancet*. 2011;378(9789):449–55.
- 2 World Health Organization. Non-communicable Diseases Progress Monitor Report, 2015. Geneva: World Health Organization; 2015.
- 3 World Health Organization. WHO NCD Surveillance Strategy 2016. [Internet]. [cited 11 Feb 2016]. URL: [http://www.who.int/ncd\\_surveillance/strategy/en/](http://www.who.int/ncd_surveillance/strategy/en/)
- 4 World Health Organization. Global Burden of Disease. 2016. [Internet]. [cited 11 Feb 2016]. URL: [http://www.who.int/healthinfo/global\\_burden\\_disease/](http://www.who.int/healthinfo/global_burden_disease/)
- 5 World Health Organization. Global status report on non-communicable diseases 2010. Geneva: World Health Organization; 2011.
- 6 World Health Organization. Non-communicable Disease Fact Sheet 2015. [Internet]. [cited 11 Feb 2016]. URL: <http://www.who.int/mediacentre/factsheets/fs355/en/>
- 7 Armstrong ME, Lambert MI, Lambert EV. Secular trends in the prevalence of stunting, overweight and obesity among South African children (1994–2004). *Eur J Clin Nutr*. 2011;65(7):835–40.
- 8 South African National Department of Health, Medical Research Council and OrcMacro. South Africa Demographic and Health Survey 2003. Pretoria: National Department of Health; 2007.
- 9 Reddy SP, James S, Sewpaul R, Koopman F, Funani NI, et al. Umthente Uhlaba Usamila – The South African Youth Risk Behaviour Survey 2008. Cape Town: South African Medical Research Council; 2010.
- 10 Kruger HS, Steyn NP, Swart EC, Maunder EMW, Nel JH, et al. Overweight among children decreased, but obesity prevalence remained high among women in South Africa, 1999–2005. *Public Health Nutr*. 2011;18:1–6.
- 11 Joubert J, Norman R, Lambert EV, Groenewald P, Schneider M, et al. Estimating the burden of disease attributable to physical inactivity in South Africa in 2000. *S Afr Med J*. 2007;97:725–31.
- 12 Mayosi BM, Flisher AJ, Lalloo UG, Sitas F, Tollman SM, Bradshaw D. The burden of non-communicable diseases in South Africa. *Lancet*. 2009;374:934–47.
- 13 Bradshaw D, Steyn K, Levitt N, Nojilana B. Non-communicable Diseases – A race against time. Parow: Medical Research Council; 2010.
- 14 Puoane TR, Tsolekile LP, Caldbick S, Igumbor EU, Meghnath K, Sanders D. Chronic non-communicable diseases in South Africa: Progress and challenges: Social and environmental determinants of health. In: Padarath A, English R, editors. *South African Health Review 2012–13*. Durban: Health Systems Trust; 2013; p.115–26.
- 15 World Health Organization. Global Health Risks. Mortality and Burden of Disease Attributable to Selected Major Risks. Geneva: World Health Organization; 2009.
- 16 Malhotra A, Noakes T, Phinney S. It is time to bust the myth of physical inactivity and obesity: you cannot outrun a bad diet. *Br J Sports Med*. 2015; 49(15):967–8.
- 17 Popkin BM. The nutrition transition in low-income countries: an emerging crisis. *Nutr. Rev*. 1994;52(9):285–98.
- 18 Swinburn BA, Sacks G, Hall KD, et al. The global obesity pandemic: shaped by global drivers and local environments. *Lancet*. 2011;378:804–14.
- 19 Kennedy G, Nantel G, Shetty P; Food and Agriculture Organization of the United Nations. Globalization of food systems in developing countries: impact on food security and nutrition. *FAO Food Nutr Pap*. 2004;83:1–300.
- 20 MacIntyre UE, Kruger HS, Venter CS, Vorster HH. Dietary intakes of an African population in different stages of transition in the North West Province, South Africa: the THUSA study. *Nutrition Research*. 2002;22:239–56.
- 21 Temple NJ, Steyn NP. Food prices and energy density as barriers to healthy food patterns in Cape Town, South Africa. *J Hunger Environ Nutr*. 2009;(4):203–13.
- 22 Moore LV, Diez Roux AV, Nettleton JA, Jacobs DR. Associations of the local food environment with diet quality – a comparison of assessments based on surveys and geographic information systems. *Am J Epidemiol*. 2008;167(8):917–24.
- 23 Goldstein H, Harvey S, Banthia R, et al. Designed for Disease: The Link Between Local Food Environments and Obesity and Diabetes. California: Center for Public Health Advocacy, PolicyLink, and the UCLA Center for Health Policy Research; 2008.
- 24 Franco M, Diez Roux AV, Glass TA, Caballero B, Brancati FL. Neighborhood characteristics and availability of healthy foods in Baltimore. *Am J Prev Med*. 2008;35(6):561–7.
- 25 Morland K, Wing S, Diez Roux A. The contextual effect of the local food environment on residents' diets: the atherosclerosis risk in communities study. *Am J Public Health*. 2002;92(11):1761–7.
- 26 Morland K, Diez Roux AV, Wing S. Supermarkets, other food stores, and obesity: the atherosclerosis risk in communities study. *Am J Prev Med*. 2006;30(4):333–9.
- 27 Morland KB, Evenson KR. Obesity prevalence and the local food environment. *Health Place*. 2009;15(2):491–5.
- 28 Centers for Disease Control and Prevention. General Food Environment Resources. [updated 6 Mar 2014]. [Internet]. [cited 11 February 2016]. URL: <http://www.cdc.gov/healthyplaces/healthtopics/healthyfood/general.htm>
- 29 Thow A, Sanders D, Drury E, Puoane T, Chowdhury S, Tsolekile L, Negin J. Importing obesity: Implications of regional trade and investment for diet-related NCD prevention policy in Southern Africa. *Glob Health Action*. 2015;(8):28338. doi:10.3402/gha.v8.28338
- 30 USDA Foreign Agricultural Services. GAIN report South Africa's food processing sector offers opportunities for U.S. exports. [Internet]. [cited 11 Feb 2016]. URL: <http://static.globaltrade.net/files/pdf/20120123003839246.pdf>. 2011
- 31 Igumbor EU, Sanders D, Puoane TR, Tsolekile L, Schwarz C, Purdy C, et al. "Big Food," the Consumer Food Environment, Health, and the Policy Response in South Africa. *PLoS Med*. 2012;9(7):e1001253.
- 32 Hawkes C. Marketing Activities of Global Soft Drink and Fast Food Companies in Emerging Markets: A Review. Globalization, diets, and non-communicable diseases. Geneva: World Health Organization; 2002.
- 33 Greenberg S. Contesting the food system in South Africa: Issues and Opportunities. Institute of Poverty, Land and Agrarian Studies research report 42. Cape Town: University of the Western Cape; 2010.

- 34 D'Haese M, Huylenbroeck GV. The rise of supermarkets and changing expenditure patterns of poor rural households: case study in the Transkei area, South Africa. *Food Policy*. 2005;30:97–113.
- 35 Weatherspoon D, Reardon T. The Rise of Supermarkets in Africa: Implications for Agrifood Systems and the Rural Poor. *Dev Policy Rev*. 2003;21:333–55.
- 36 Temple NJ, Steyn NP, Fourie J, De Villiers A. Price and availability of healthy food: A study in rural South Africa. *Nutrition*. 2011;27:55–8.
- 37 Battersby J, Peyton S. The Geography of Supermarkets in Cape Town: Supermarket Expansion and Food Access. *Urban Forum*. 2014;25(2):153–64.
- 38 Temple NJ, Steyn NP. Food prices and energy density as barriers to healthy food patterns in Cape Town, South Africa. *J Hunger Environ Nutr*. 2009;4:203–13.
- 39 Muzigaba M, Puoane T. Perceived and actual cost of healthier foods versus their less healthy alternatives: A case study in a predominantly black urban township in South Africa. *East Afr J Public Health*. 2014;8(4):283–90.
- 40 Steyn NP, Mchiza Z, Abrahams Z, Temple N. Television advertising to children: Ethical considerations with regard to advertising of unhealthy foods and drinks. Cape Town: Human Sciences Research Council; 2014. [Internet] [cited 11 Feb 2016].  
URL: <http://www.hsrc.ac.za/uploads/pageContent/4577/2014%20Television%20Advertising.pdf>
- 41 Labadarios D, Steyn NP, Nel J. How diverse is the diet of adult South Africans? *Nutr J*. 2011;17:10:33. doi: 10.1186/1475–2891–10–33.
- 42 Puoane TR, Tsolekile L, Sanders D. A Case Study of Community-Level Intervention for Non-Communicable Diseases in Khayelitsha, Cape Town. Brighton Institute of Development Studies (IDS); 2013.
- 43 Tsolekile L, Lerebo W, Muzigaba M, Puoane T. Challenges in combating childhood obesity in black township schools of South Africa. *Afr J Phys Health Educ Recreat Dance*. Supplement 2. 2014; p.442–56.
- 44 Stern R, Puoane T, Tsolekile L. An Exploration into the Determinants of Noncommunicable Diseases Among Rural-to-Urban Migrants in Periurban South Africa. *Prev Chronic Dis*. 2010;7(6):1–7.
- 45 Morland KB, Evenson KR. Obesity prevalence and the local food environment. *Health Place*. 2009;15(2):491–5.
- 46 Roberto CA, Swinburn B, Hawkes C, Huang TTK, Costa SA, Ashe M, et al. Patchy progress on obesity prevention: emerging examples, entrenched barriers, and new thinking. *Lancet*. 2015;385(9985):2400–9.
- 47 Roberto CA, Pomeranz JL. Public Health and Legal Arguments in Favor of a Policy to Cap the Portion Sizes of Sugar-Sweetened Beverages. *Am J Public Health*. 2015;105(11):2183–90.
- 48 Hawkes C, Smith TG, Jewell J, Wardle J, Hammond RA, Friel S, et al. Smart food policies for obesity prevention. *Lancet*. 2015;385(9985):2410–21.
- 49 Afshin A, Penalvo J, Del Gobbo L, Kashaf M, Micha R, Morrish K, et al. CVD Prevention Through Policy: a Review of Mass Media, Food/Menu Labeling, Taxation/Subsidies, Built Environment, School Procurement, Worksite Wellness, and Marketing Standards to Improve Diet. *Curr Cardiol Rep*. 2015;17(11):1–12.
- 50 Mandle J, Tugendhaft A, Michalow J, Hofman K. Nutrition labelling: a review of research on consumer and industry response in the global South. *Glob Health Action*. 2015;8.
- 51 Mayne SL, Auchincloss AH, Michael YL. Impact of policy and built environment changes on obesity-related outcomes: a systematic review of naturally occurring experiments. *Obes Rev*. 2015;16(5):362–75.
- 52 Niebylski ML, Redburn KA, Duhane T, Campbell NR. Healthy food subsidies and unhealthy food taxation: A systematic review of the evidence. *Nutrition*. 2015;31(6):787–95.
- 53 Colchero MA, Popkin BM, Rivera JA, Ng SW. Beverage purchases from stores in Mexico under the excise tax on sugar sweetened beverages: observational study. 2016;352:h6704.
- 54 Hu FB. Resolved: there is sufficient scientific evidence that decreasing sugar-sweetened beverage consumption will reduce the prevalence of obesity and obesity-related diseases. *Obes Rev*. 2013;14(8):606–19.
- 55 Cabrera Escobar MA, Veerman JL, Tollman SM, Bertram MY, Hofman KJ. Evidence that a tax on sugar sweetened beverages reduces the obesity rate: a meta-analysis. *BMC Public Health*. 2013;13(1):1–10.
- 56 Swinburn B, Vandevijvere S, Kraak V, Sacks G, Snowdon W, Hawkes C, et al. Monitoring and benchmarking government policies and actions to improve the healthiness of food environments: a proposed Government Healthy Food Environment Policy Index. *Obes Rev*. 2013;14(Suppl 1):24–37.
- 57 Empowerment for Food Security Programme. VVOB vzw Formulation Report; 6 September 2015. Pretoria: Direct Aid Project; 2015.  
URL: <http://www.kzndae.gov.za/Portals/0/Rural%20Development/Food%20Security/FINAL%20formulation%20report%20Food%20Security%20-%20206%20sept.pdf>
- 58 South African Human Rights Commission. The Right to Food Campaign. 2014 [Internet]. [cited 8 August 2014].  
URL: <http://www.sahrc.org.za/home/index.php?ipkContentID=112&ipkMenuID=94>
- 59 Republic of South Africa. The Constitution of the Republic of South Africa, Act 108 of 1996. Pretoria: Government Printer; 1996.
- 60 World Health Organization. Fact Sheet No.323: The Right to Health. 2015 [Internet] [cited 8 August 2014].  
URL: <http://www.who.int/mediacentre/factsheets/fs323/en/>
- 61 South African National Department of Health. Summit on Prevention and Control of Non-Communicable Diseases. 2011 [Internet]. [cited 1 November 2012].  
URL: <http://www.doh.gov.za/eventlist.php?eid=5>
- 62 South African National Department of Health. Strategic Plan for the Prevention and Control of Non-Communicable Diseases, 2013–2017. Pretoria: National Department of Health; 2012.
- 63 Sookram C, Munodawafa D, Phori PM, Varenne B, Alisalad A. WHO's supported interventions on salt intake reduction in the sub-Saharan Africa region. *Cardiovasc Diagn Ther*. 2015;5(3):186–90.
- 64 Delobelle P, Sanders D, Puoane T, Freudenberg N. Reducing the Role of the Food, Tobacco, and Alcohol Industries in Noncommunicable Disease Risk in South Africa. *Health Educ Behav*. 2016 (in press).
- 65 South African Government. Foodstuffs, Cosmetics and Disinfectants Act 1972 (No. R. 214): Regulations relating to the reduction of sodium in certain foodstuffs and related matters, No. R. 214 (2013).

- 66 South African Government. Foodstuffs, Cosmetics and Disinfectants Act 1972 (No. R. 249): Regulations Relating to Trans-Fat in Foodstuffs, No. R. 249 (2010).
- 67 The Guardian, Lawrence F. Alarm as corporate giants target developing countries [Internet]. [updated 23 Nov 2011; cited 1 May 2012].  
URL: <http://www.guardian.co.uk/global-development/2011/nov/23/corporate-giants-target-developing-countries>.
- 68 Mail and Guardian, Donnelly L. Gordhan announces sugar tax [Internet]. [updated 24 Feb 2016].  
URL: <http://mg.co.za/article/2016-02-24-budget-speech-2016-gordhan-introduces-sugar-tax>
- 69 Tugendhaft A, Manyema M, Veerman LJ, Chola L, Labadarios D, Hofman KJ. Cost of inaction on sugar-sweetened beverage consumption: implications for obesity in South Africa. *Public Health Nutr.* 2015;1–9.
- 70 Manyema M, Veerman LJ, Chola L, Tugendhaft A, Sartorius B, Labadarios D, et al. The potential impact of a 20% tax on sugar-sweetened beverages on obesity in South African adults: a mathematical model. *PLoS One.* 2014;9(8):e105287.
- 71 South African National Department of Agriculture. The integrated food security strategy for South Africa. Pretoria: Department of Agriculture; 2012.
- 72 South African National Department of Health. Integrated Nutrition Programme Pretoria: Department of Health; 2002.
- 73 South African National Department of Education. National School Nutrition Programme. Pretoria: Department of Education; 1994.
- 74 Department of Social Development; Department of Agriculture, Forestry and Fisheries. National Policy on Food and Nutrition Security. Pretoria: Department of Social Development, Department of Agriculture, Forestry and Fisheries; 2014.
- 75 National Planning Commission. National Development Plan 2030: Our future – make it work. Pretoria: The Presidency, Republic of South Africa; 2012.
- 76 The African Urban Food Security Network. Publications – Urban Food Security Series 2016. [Internet]. [cited 3 Feb 2016].  
URL: <http://www.afsun.org/publications/>
- 77 Battersby J, Haysom G, Marshak M, Kroll F, Tawodzera G. South African Cities Network Programme: A study on current and future realities for urban food security in South Africa (draft 3); 2015; doi: 10.13140/RG.2.1.4224.6487
- 78 World Health Organization. Social determinants of health – Key Concepts 2016. [cited 3 Feb 2016].  
URL: [http://www.who.int/social\\_determinants/thecommission/finalreport/key\\_concepts/en/](http://www.who.int/social_determinants/thecommission/finalreport/key_concepts/en/)
- 79 South African National Department of Health. Strategy for the Prevention and Control of Obesity in South Africa 2015–2020. Pretoria: National Department of Health; 2015.
- 80 Marmot M, Friel S, Bell R, Houweling TAJ, Taylor S. Closing the gap in a generation: health equity through action on the social determinants of health. *Lancet.* 2008;372(9650):1661–9.
- 81 Newman L, Ludford I, Williams C, Herriot M. Applying Health in All Policies to obesity in South Australia. *Health Promot Int.* 2016;31(1):44–58.
- 82 Ollila E. Health in All Policies: from rhetoric to action. *Scand J Public Health.* 2011;39(6):11–8.
- 83 Perez AM, Ayo-Yusuf OA, Hofman K, Kalideen S, Maker A, Mokonoto D, et al. Establishing a health promotion and development foundation in South Africa. *S Afr Med J.* 2013;103(3):147–9.
- 84 Hofman K. Non-communicable diseases in South Africa: A challenge to economic development. *S Afr Med J.* 2014;104(10):647.
- 85 Pinkney-Atkinson V. Civil Society Status Report 2010–2015: Mapping South Africa’s Reponse to the Epidemic of Non-Communicable Diseases. South African NCDs Alliance; 2015.