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Exploring the Economic and Nutritional Drivers of Obesity and Solutions to Mitigate Future Consequences: A Literature Review

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I. Introduction

Obesity is an international pandemic that represents a significant morbidity and mortality risk to individuals all around the globe (Swinburn et al. 2011; Ball and Crawford 2006). The increasing trend of overweight and obese populations poses a momentous public health challenge. This is precipitated by the extensive and enduring reduction in physical activity and major shifts in global food chains (James 2008).
Despite a plethora of research around the drivers of obesity within the context of various global health and food systems, minimal solutions have been hatched (Roberto et al. 2015). While the obesity crisis is acknowledged as a complex and multifaceted problem, proposed solutions represent overly simplified dichotomies that fail to take a holistic approach to solving the issue (Roberto et al. 2015). This review discusses the multifactorial drivers of nutrition and food systems that underpin the ongoing obesity pandemic. In addition, this review will explore the potential for implementingsystems that accomplish a symbiotic utopia between business and health: economic profitability, sound nutrition and superior public health outcomes.

II. Epidemiology of obesity and nutritional status around the world

Obesity is reaching epidemic proportions across several large global nations (Swinburn et al. 2011). According to the World Health Organisation elevated body mass index (BMI, overweight = BMI ≥25, obese = BMI ≥30) accounts for approximately 3 million global deaths (WHO 2011). A longitudinal systematic analysis (n=1,760) conducted by Ng et al (2014) found that in 2010, increased weight and obesity were estimated to be responsible for 3.4 million deaths, representing 3.9% of life years lost and 3.8 disability adjusted life years

(DALY) around the world. The study conducted by Ng and colleagues (2014) demonstrated an upward trajectory of adults over a body mass index (BMI) of 25 (overweight), which increased 28.8% in 1980 to 36.9% in 2013 for men and 38% for women. This observation was not limited to developed nations, with developing nations depicting synonymous trends (Ng et al. 2014). While low and middle income countries appear to depict rising obesity prevalence the urban-rural differential remains unknown (Popkin, Adair and Ng 2012).However, analysis of urban and rural female populations (*n*=441,916 rural, *n*=364,267 urban) across 42 countries including Asia, the Middle East, Latin America and Africa highlights a mean annual growth of 0.7% in overweight and obesity classifications with an estimated prevalence of 19% of rural women and 37.2% of urban women being overweight or obese (Popkin, Adair and Ng 2012). This disparity indicates that food chains, nutritional status and food behaviours differ between locations, most likely due to the increased availability of poor food choices in most cities.

Similar obesity patterns are seen among the paediatric population, with 23.8% of boys and 22.6% of girls in developed countries being classified as either overweight or obese in 2013 (Ng et al. 2014). Again, this trend is observed in developing nations with overweight and obesity prevalence jumping from 8.1% to 12.9% among boys and 8.4% to 13.4% among the population of girls studied.

Nutritional status has been studied less than the very clearly defined trends seen within obesity data nonetheless the aforementioned obesity outcomes are intimately linked to the global nutritional status. Popkin, Adair and Ng (2012) explain that decades ago obesity wasa fallacy, only to lead to increasing dietary shifts to include more processed foods, take-away options and use of trans oils and sugar-sweetened beverages. Additionally, the global economy has seen a shift to improved transportation, less physical exercise and more sedentary activities (Popkin, Adair and Ng 2012). This global shift in the relationship between dietary intake and energy expenditure has been distorted by the "Western Diet", including highly refined carbohydrate sources, increased fats and animal food sources in addition to added sugar (Popkin, Adair and Ng 2012). In depth discourse of the nutritional dynamic and interplay between food sources and biological demands in different biological contexts are beyond the scope of this paper. Notwithstanding this, it is imperative to note the increase in foods with less nutritional value (high monosaccharide carbohydrates, high trans fats, oils, caloric sweeteners etc.) compared to the reduced consumptionofmore nutritionally dense dietary comparisons of vegetables, legumes andgrains (Popkin 2008; Du, Lu, Zhai and Popkin 2002; Popkin, Adair and Ng 2012).

III. Drivers of shifting food and nutrition trends towards promoting obesity

A multiplicity of factors has shaped the food supply of countries around the world. Indeed, each country has a unique food chain scenario that has invariably changed over time, however the general trend towards obesity is unanimous. These factors include the shift in food systems subsequent to globalisation and increased accessibility to poor food choices, shifting work and life behaviours, less physical activity and more sedentary behaviours and mass marketing and distribution technique utilised by to capture market share of vulnerable middle to low income countries, among others.

3.1 Less physical activity and changing work demands

A shift in physical activity towards more sedentary lifestyle and decreased energy utilisation evidently aids the progression of obesity alongside excess energy consumption (James 2008; Ball and Crawford 2006). Combined with diet-related risk factors, such as high fat and sodium intake with low vegetable and fruit intake, physical inactivity accounts for greater than 10% of disability adjusted life years (DALY) internationally (Lim et al. 2010). One example of the decreased positive implications of physical activity is China's reduction in daily energy expenditure by up to 400 kcal/day (James 2008). As explained in more depth below, the commercial success of passive products that promote less physical activity underpins the rapid decrease in physical exertion. Matthews et al (2008) state that 55% of Americans spend their daytime in sedentary activities. Examples include spending more time watching television, playing game consoles or using smartphones or tablets for various applications (Chahal, Fung,Kuhle and Veugelers 2013; Gortmaker et al. 1996; Moodie,

Swinburn, Richarson and Somaini 2006). The sedentary lifestyle compounded by little to no physical exercise causes significant decline in muscle integrity and leads to acceleration of age-related musculoskeletal changes (Short, Vittone, Bigelow, Proctor and Nair 2004; Short et al. 2003). Moreover, these behaviours are associated with metabolic syndrome, cardiovascular disease, and psychosocial issues (Hamburg et al. 2007; Bauman and Spungen 2008; Yanagibori et al. 1998; Ekeland, Heian, Hagen, Abbott andNordheim 2004).

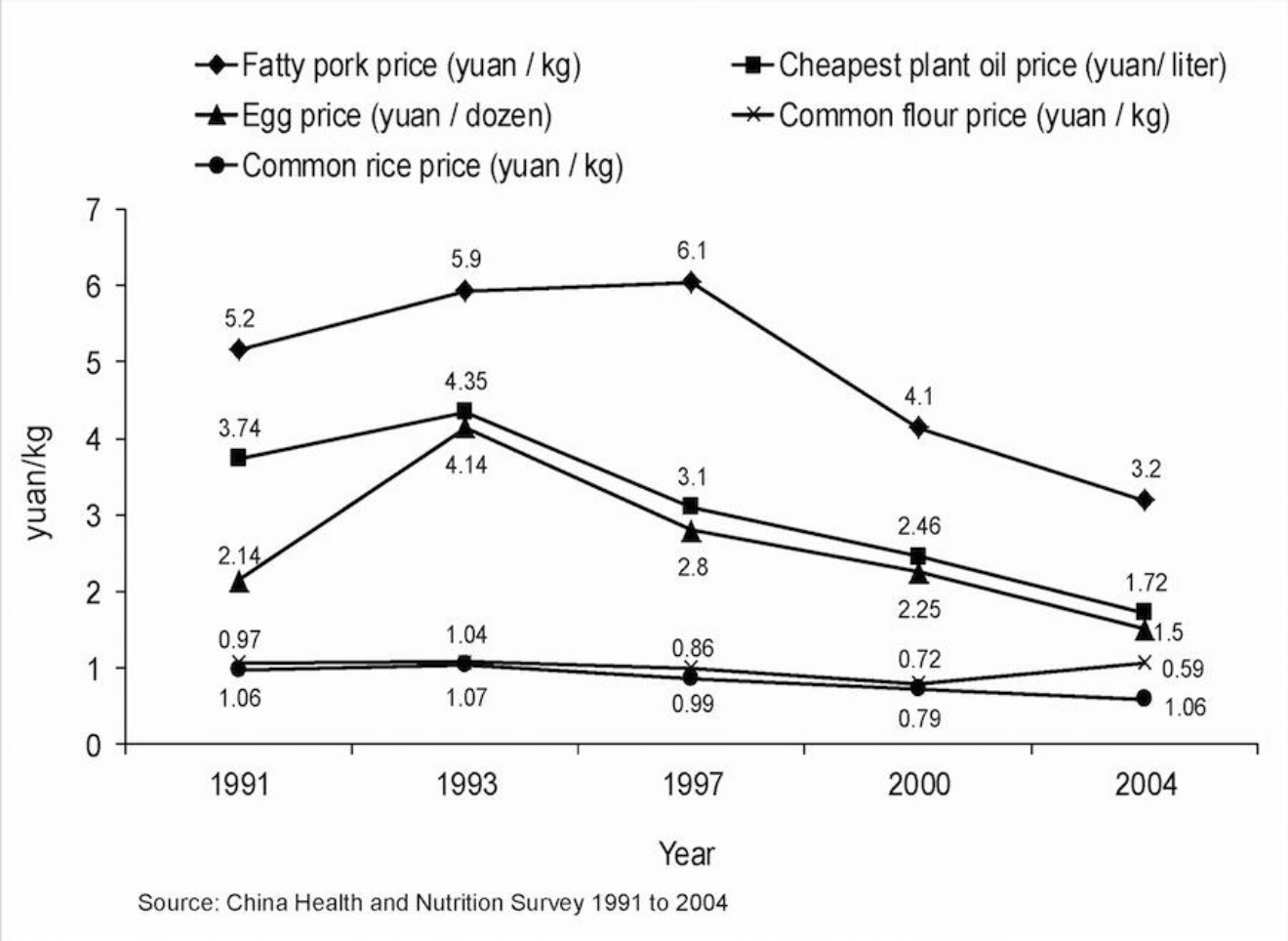
3.2 Accessibility and economic drivers of energy dense and low nutrition foods

It is indisputable that most communities around the world facing obesity crisis are powerfully influenced by the access and economic attractions of unhealthy, energy dense and nutrition deficient food. Globalisation manifesting from enhancements in technology and improved distribution relating to food production, marketing and accessibility has drastically altered the food system in most countries (Popkin, Adair and Ng 2012). Moreover, contemporary food distribution has facilitated penetrating access to new markets for commercial giants (Reardon, Timmer, Barrett and Berdegue 2002).Moreover, the enhancements in large supermarket chain procurement and logistics systems have facilitated competition on cost with smaller domestic stores and local markets across most, if not all, products (Popkin, Adair and Ng 2012). Furthermore, a shifting trade dynamic, mostly due to the world trade organisation and the changes leading to the less arduous trade barriers, has influenced the global food economy and local food decision-making. For instance, in china hurdles to import edible oils has been reduced, therefore the production of vegetable oil has been centralised to significantly bolster local producers competitive edge against importers (Popkin, Adair and Ng 2012).

The developing world is shifting from local production of food sources to global economy wherein large multinational supermarkets are significant traction (Popkin, Adair and Ng 2012).It is undeniable that the market forces brought about by mega-chains such as Carrefour and Walmart place downward pressure on the prices of processed, high sugar, high salt and high fat foods making these more attractive and accessible in low and middle income populations. Asfaw (2011) states that this shift in the food environment will influence people to intake processed, lower quality and less nutritious foods.

A substantial increase in global investment in agriculture, as has been seen throughout Australia, has forced down prices for various global food commodities such as animal-food sources, sugar and oils (Popkin 2011). As seen in Figure 1, China is a gold standard example to illustrate the downward trend in prices for these commodities driven largely by investment.

Figure 1. The relative price shift in select food groups in China from 1991 to 2004 based on 330 communities' food markets (Popkin, Du, Zhai and Zhang 2010).



It is also important to recognise the positive impacts that supermarkets have made, especially in low and middle-income regions, such as the provision of ultra-heat treatment (UHT) milk that does not require refrigeration and thus increases the safety among all income groups; and the implementation of food safety standards, which govern modern food chains to provide at the most fundamental level, safe consumables (Balsevich, Berdegue, Flores, Mainville and Reardon 2003; Popkin, Adair and Ng 2012).

3.3. Food security and the continuum between malnutrition and obesity

Food security underpins much of the discourse around the reason why food systems have become the way they are today, however it is concept that also defines the lives of those living in low-income regions of the world. Food security is defined as the physical, social and economic accessibility to food that is safe, nutritious and capable of meeting the body's dietary needs in order to live a health and active life (Food and Agriculture Organisation of the United Nations 2006). As incomes in developed nations grow and the demand for animal food sources increases, so too does the demand for the agricultural supplies such as grains to feed live cattle. Paradoxically, while the global food economy shifts to support the demands of high and middle income groups,

the system denies poorer countries sufficient access to one of their most valuable food source. Therefore, while some groups are predisposed to obesity due to the gross overconsumption of animal sources of food among other things, a large proportion of global members suffer the plight of malnutrition. As observed in the aforementioned obesity figures, this food threat of the urban poor intersects the accessibility of empty high calorie foods that are financially viable options to avoid hunger and emerges as a dichotomy of malnutrition and hunger versus frank obesity, even within a single household (Popkin, Adair and Ng 2012).

3.4. Increasingly vulnerable populations and exposure to unhealthy food options

Decades of literature support the premise that individuals that belong to lower socioeconomic groups are at increased risk of poor health choices (Ball and Crawford 2006). Interestingly, this concept is not universally distributed when it comes to the end outcome of obesity. Groups of lower socioeconomic status living in developed countries are increasingly more predisposed to obesity, while those of higher socioeconomic status in developed countries are proportionately more overweight or obese (Ball and Crawford 2006). A study conducted by Stuckler and Nestle (2012) exploring the relationships between economics and food choices demonstrated that lower income countries have a substantially higher annual growth rate in the consumption per person (1999 to 2009) for packaged foods, soft drinks, processed food, oils and fats, and snacks and snack bars. Moreover, the prevalence of ultra-processed foods and drinks are rising most sharply in low and middle income countries (Stuckler and Nestle 2012; Moodie et al. 2013).

3.5. The balance of responsibility surrounding obesity and nutrition

Environmental factors are powerful drivers of individual action. Accordingly, the presence of negative environmentally reinforced messages can, and do, support and undermine the aptitude of individuals to act in self-interest (Roberto et al. 2015). Indeed, the balance of responsibility lies somewhere on a continuum between the individual and the collective and so individual responsibility cannot be relinquished in the search for an appropriate solution. The contemporary food environment exploits individual susceptibilities, including psychological, biological, social and economic positioning (Roberto et al. 2015). This continuing exploitation facilitates ongoing reinforcement the demand of unhealthy food preferences, which in turn manifest as a broader scale and largely influential unhealthy nutritional environment. Therefore, in this respect the obesity crisis represents at once both an individual and systems problem. Newell, Proust, Dyball and McManus (2008) advocate for the latter stating that solutions must be created taking into account the full gamut of human and environmental factors. James (2008) supports this notion highlighting the failure to address the problem with the individualised approach to obesity prevention.

IV. Exploring the profitability of food and nutrition systems based on fundamental nutritional requirements

4.1. The food economy and its underlying imbalances

Commercial drivers of the obesity pandemic are so profound that an overweight consumer audience is representative of commercial success (Swinburn 2008). In the face of increasing consumer culture it is improbable that corporate or individual consumer desires such as moral or social responsibility and the desire to eat less or healthy foods, respectively, will prevail. Indeed, the food economy is only one component of a broader but equally detrimental system of drivers that have facilitated obesity including transport (cars), labour saving apparatus and passive entertainment options (Moodie, Swinburn, Richarson and Somaini2006; Swinburn 2008). This paints a picture in which the global food economy is slanted to support poor food choices, and in which structural change is imperative to quell the consequences such as obesity. This supports the notion of deficient individual self-determination when it comes to food choices. Further supporting this underlying systematic food system imbalance is depicted by the statistics on unhealthy food and drink sales and the increasing endeavour for commercial oligopoly. For instance, ten large food companies United States market control over 50% of all food sales (Lyson and Raymer 2000). Across the globe this statistic is much lower at

15%, however is ominously rising (Lyson and Raymer 2000). Furthermore, Coca-Cola and PepsiCo control more than half of the global soft drink market (Moodie et al. 2013); while 75% of the world food sales are processed foods of which the largest producers control over one third of the market share (Alexander, Yach and Mensah 2011; Lysonand Raymer 2000). As discussed above, the easy access and affordability of these products when faced with rising prices for alternative and more healthy options is fundamentally obesogenic.

Supply and demand are implicated in the propagation of unhealthy food products and entry of large multinational fast food giants into more vulnerable regions (Moodie et al. 2013; Roberto et al. 2015). Globalisation and fewer barriers to trade and export, in addition to enhanced technological logistics and fulfilment have allowed commercial access to vulnerable markets. Demand for food is high as prices rise and therefore the pressure to adjust food selections are extremely high (Popkin, Adair and Ng 2012). Collectively, the group of people in this position will probably opt to purchase the cheapest but highest calorie option available, further precipitating obesity. Indeed, if the supply of animal sources, high fat, high calorie and high sugar foods is greater than the more healthy alternative such as vegetables, legumes and fruit, which are comparativelyin much higher demand, the demand (consumers) follow supply and the lower, more affordable, price point becomes the norm.

4.2. Viability of healthy food options in the marketplace

Local and global markets are fundamentally unique. Global success in the food business requires access to, and influence in, lower and middle income regions of the world. Healthy foods are available around the world, nonetheless to many they are not cost accessible. A longitudinal cross-sectional survey conducted in Queensland, Australia, assessing the change in cost and availability of standard healthy food items found that over six years, the standard healthy food examined rose approximately 50%, much more than the less healthy alternatives (Harrison et al 2010). A systematic review of global food prices conducted by (Rao, Afshin, Singh and Mozaffarian 2013) determined that healthier food-based diets were more expensive based on actual per day and per 200 kcal serving. The study determined that the price difference of approximately $1.50/day was the difference in financial capacity in order to support a healthier overall diet such as Mediterranean diet (fruits, vegetables, fish, nuts) versus a much less nutritious and more obesogenic diet of processed foods, meats and refined grains (Rao, Afshin, Singh and Mozaffarian 2013). Despite the evidence supporting a higher cost for healthier choices, the underlying reasons for this difference are complicated and vague. Perhaps the many decades of policies developed to facilitate low-cost and high volume food commodities have shaped the various checkpoints (i.e. agriculture, storage, logistics and transports, food processing, manufacturing and the provision of mass marketing capabilities) in addition to the underlying shift in globalisation, and continue to favour processed food sales for maximum industry profit (Mozaffarian et al. 2012).

V. Conclusion

Obesity is a global pandemic and there are few, if any, global food structures in place to attenuate this trend. Global citizens are eating higher calories with fewer nutrients, exercising less and working in increasingly sedentary jobs. Transport mitigates the need to walk and entertainment is becoming progressively more stagnant in nature. The food system is made up of many drivers that, in many instances, force economic food inequity onto low and middle income groups. The current reality is that while healthy food is available, it is more expensive and financially out of reach for many. This structural food inequality is driven predominately by globalisation and the improvements in retailer logistics combined with less trade barriers in order to gain easy access to more vulnerable markets. Market pressures act as a gridlock in preventing augmentation of food systems for public health benefit. The result is obesity dancing around malnutrition in vulnerable regions and a frank transition to vast amounts of overweight and obese groups around the globe. The paradox of a system that was once derived to support the ease of access to food and ultimately, food security, is that it now supports poor nutrition choices, obesity and the remarkable chronic health consequences that this entails.

References

[1.] Alexander, Eleanore, Derek Yach, and George A. Mensah. "Major multinational food and beverage companies and informal sector contributions to global food consumption: implications for nutrition policy." *Globalization and health* 7, no. 1 (2011): 1.

[2.] Asfaw, Abay. "Does consumption of processed foods explain disparities in the body weight of individuals? The case of Guatemala." *Health economics* 20, no. 2 (2011): 184-195.

[3.] Ball, Kylie, and David Crawford. "Socio-economic factors in obesity: a case of slim chance in a fat world?".*Asia Pacific journal of clinical nutrition* 15 (2006): 15.

[4.] Balsevich, F., Berdegué, J. A., Flores, L., Mainville, D., & Reardon, T. (2003). "Supermarkets and produce quality and safety standards in Latin America."*American journal of agricultural economics*, *85*(5), 1147-1154.

[5.] Bauman, W. A., and A. M. Spungen. "Coronary heart disease in individuals with spinal cord injury: assessment of risk factors." *Spinal Cord* 46, no. 7 (2008): 466-476.

[6.] Chahal, H., C. Fung, S. Kuhle, and P. J. Veugelers. "Availability and night-time use of electronic entertainment and communication devices are associated with short sleep duration and obesity among Canadian children." *Pediatric obesity* 8, no. 1 (2013): 42-51.

[7.] Du, Shufa, Bing Lu, FengyingZhai, and Barry M. Popkin. "A new stage of the nutrition transition in China." *Public health nutrition* 5, no. 1a (2002): 169-174.

[8.] Ekeland, E., Heian, F., Hagen, K. B., Abbott, J. M., &Nordheim, L. (2004). Exercise to improve self-esteem in children and young people. *The Cochrane Library*.

[9.] Food and Agriculture Organisation of the United Nations. 2006. "Food Security." Retrieved from http://www.fao.org/forestry/13128-0e6f36f27e0091055bec28ebe830f46b3.pdf

[10.] Gortmaker, Steven L., Aviva Must, Arthur M. Sobol, Karen Peterson, Graham A. Colditz, and William H. Dietz. "Television viewing as a cause of increasing obesity among children in the United States, 1986-1990." *Archives of pediatrics & adolescent medicine* 150, no. 4 (1996): 356-362.

[11.] Hamburg, Naomi M., Craig J. McMackin, Alex L. Huang, Sherene M. Shenouda, Michael E. Widlansky, Eberhard Schulz, Noyan Gokce, Neil B. Ruderman, John F. Keaney, and Joseph A. Vita. "Physical inactivity rapidly induces insulin resistance and microvascular dysfunction in healthy volunteers." *Arteriosclerosis, thrombosis, and vascular biology* 27, no. 12 (2007): 2650-2656.

[12.] Harrison, Michelle, Amanda Lee, Michael Findlay, Ralph Nicholls, Dympna Leonard, and Caroline Martin. "The increasing cost of healthy food." *Australian and New Zealand Journal of Public Health* 34, no. 2 (2010): 179-186.

[13.] James, W. P. T. "The fundamental drivers of the obesity epidemic." *Obesity reviews* 9, no. s1 (2008): 6-13.

[14.] Lim, Stephen S., Theo Vos, Abraham D. Flaxman, GoodarzDanaei, Kenji Shibuya, Heather Adair-Rohani, Mohammad A. AlMazroa et al. "A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010." *The lancet* 380, no. 9859 (2013): 2224-2260.

[15.] Lyson, Thomas A., and Annalisa Lewis Raymer. "Stalking the wily multinational: Power and control in the US food system." *Agriculture and Human Values* 17, no. 2 (2000): 199-208.

[16.] Matthews, Charles E., Kong Y. Chen, Patty S. Freedson, Maciej S. Buchowski, Bettina M. Beech, Russell R. Pate, and Richard P. Troiano. "Amount of time spent in sedentary behaviors in the United States, 2003–2004." *American journal of epidemiology* 167, no. 7 (2008): 875-881.

[17.] Moodie, Rob, David Stuckler, Carlos Monteiro, Nick Sheron, Bruce Neal, ThaksaphonThamarangsi, Paul Lincoln, Sally Casswell, and Lancet NCD Action Group. "Profits and pandemics: prevention of harmful effects of tobacco, alcohol, and ultra-processed food and drink industries." *The Lancet* 381, no. 9867 (2013): 670-679.

[18.] Moodie, Rob, Boyd Swinburn, Jeff Richardson, and BertinoSomaini. "Childhood obesity–a sign of commercial success, but a market failure." *International Journal of Pediatric Obesity* 1, no. 3 (2006): 133-138.

[19.] Mozaffarian, Dariush, Ashkan Afshin, Neal L. Benowitz, Vera Bittner, Stephen R. Daniels, Harold A. Franch, David R. Jacobs et al. "Population approaches to improve diet, physical activity, and smoking habits a scientific statement from the American Heart Association." *Circulation* 126, no. 12 (2012): 1514-1563.

[20.] Newell, Barry, Katrina Proust, Robert Dyball, and Phil McManus. "Seeing obesity as a systems problem." *New South Wales public health bulletin* 18, no. 12 (2008): 214-218.

[21.] Popkin, Barry M., Linda S. Adair, and Shu Wen Ng. "Global nutrition transition and the pandemic of obesity in developing countries." *Nutrition reviews* 70, no. 1 (2012): 3-21.

[22.] Popkin, Barry M. "Agricultural policies, food and public health." *EMBO reports* 12, no. 1 (2011): 11-18.

[23.] Popkin, Barry M. *The world is fat: the fads, trends, policies, and products that are fattening the human race*. Penguin, 2009.

[24.] Popkin, Barry M., Shufa Du, FengyingZhai, and Bing Zhang. "Cohort Profile: The China Health and Nutrition Survey—monitoring and understanding socio-economic and health change in China, 1989–2011." *International journal of epidemiology* 39, no. 6 (2010): 1435-1440.

[25.] Reardon, Thomas, C. Peter Timmer, Christopher B. Barrett, and Julio Berdegué. "The rise of supermarkets in Africa, Asia, and Latin America." *American journal of agricultural economics* 85, no. 5 (2003): 1140-1146.

[26.] Roberto, Christina A., Boyd Swinburn, Corinna Hawkes, Terry TK Huang, Sergio A. Costa, Marice Ashe, Lindsey Zwicker, John H. Cawley, and Kelly D. Brownell. "Patchy progress on obesity prevention: emerging examples, entrenched barriers, and new thinking." *The Lancet* 385, no. 9985 (2015): 2400-2409.

[27.] Short, Kevin R., Janet L. Vittone, Maureen L. Bigelow, David N. Proctor, Robert A. Rizza, Jill M. Coenen-Schimke, and K. Sreekumaran Nair. "Impact of aerobic exercise training on age-related changes in insulin sensitivity and muscle oxidative capacity." *Diabetes* 52, no. 8 (2003): 1888-1896.

[28.] Stuckler, David, and Marion Nestle. "Big food, food systems, and global health." *PLoS Med* 9, no. 6 (2012): 1001242.

[29.] Swinburn, Boyd A., Gary Sacks, Kevin D. Hall, Klim McPherson, Diane T. Finegood, Marjory L. Moodie, and Steven L. Gortmaker. "The global obesity pandemic: shaped by global drivers and local environments." *The Lancet* 378, no. 9793 (2011): 804-814.

[30.] World Health Organization. 2011. "Global status report on non-communicable diseases 2010". Retrieved from http://whqlibdoc.who.int/publications/2011/9789240686458_eng.pdf?ua=1

[31.] Yanagibori, Ryoko, Kazuo Kondo, Yoji Suzuki, Kiyoshi Kawakubo, Tamami Iwamoto, and Hiroshige Itakura. "Effect of 20 days' bed rest on the reverse cholesterol transport system in healthy young subjects." *Journal of internal medicine* 243, no. 4 (1998): 307-312.