

2012 Emory Global Health Case Competition

Mexico's Growing Childhood Obesity Challenge

The Emory Global Health Institute Case Writing Team



EMORY
UNIVERSITY

Emory Global Health Institute

All characters, organizations, and plots described within the case are *fictional* and bear no direct reflection to existing organizations or individuals. The case topic, however, is a true representation of circumstances in Mexico. The case scenario is complex and does not necessarily have a correct or perfect solution, and thus encourages a judicious balance of creative yet perceptive approaches.

The authors have provided informative facts and figures within the case and appendices to help teams. The data provided are derived from independent sources, may have been adapted for use in this case, and are clearly cited such that teams can verify or contest the findings within their recommendations, if it is pertinent to do so. Teams are responsible for justifying the accuracy and validity of all data and calculations that are used in their presentations, as well as defending their assertions in front of a panel of knowledgeable judges representing different stakeholders.

I. Introduction

Dr. Julio Hernandez fastened his seatbelt and awaited his plane's departure from New York's John F. Kennedy Airport back to Mexico City. He thought about the previous week and let out a sigh of frustration. Over the past week, Dr. Hernandez had served as one of Mexico's delegates to the 2011 United Nations (UN) High-Level Meeting on Non-Communicable Diseases (NCDs), joining representatives from government, civil society, and industry to discuss the growing global burdens of NCDs. The meeting was aimed at seeking genuine commitments from country delegates and their governments. Delegates from other countries had needled Dr. Hernandez at the meeting, reminding him that his country Mexico is considered one of the "fattest in the world," with obesity rates on par with the United States (US), Canada, and the United Kingdom.

Dr. Hernandez is the director of the Division of Child Health in Mexico's Ministry of Health. Over the years, he had focused his division's efforts on addressing issues with which he is familiar, such as vaccination coverage, growth monitoring, and childhood infectious diseases. Still, the numbers of underweight and stunted children remained unacceptably high in rural and indigenous communities across Mexico. Furthermore, this recent meeting had highlighted a less-recognized issue – the unprecedented rise in the numbers of overweight and obese children in Mexico. Though Mexico's President had recently announced an obesity initiative, many of the UN delegates expressed their concerns that the initiative did not go far enough and would ultimately prove ineffective.

As the plane lifted off the runway, Dr. Hernandez reviewed the Political Declaration from the UN High Level Meeting (Exhibit A). The declaration addressed governments, making them accountable to meet specific NCD prevention and control targets. Dr. Hernandez felt overwhelmed by the challenges ahead. How would these targets for child health and obesity align with his government's health and development priorities? Politically, addressing childhood obesity might be viewed unfavorably by Mexico's Cabinet members and bilateral trade partners and become an impediment to economic growth. Also, economic arguments to addressing childhood obesity would have to account for the fact that returns on investment may take several years, if not decades, to accrue. He also had reservations about the effectiveness of some of the different obesity prevention strategies and questioned how the scientific community would react to particular strategies. On the other hand, Dr. Hernandez would face enormous pressure from other UN member state representatives and the Mexican public if the government, and he particularly, were to fail to deliver on at least some of its population health targets, especially those that pertain to children. Dr. Hernandez realized that he needs innovative, justifiable, and affordable ideas to address the conundrum he faces, especially in these tough economic times. Dr. Hernandez set the report on his tray table and rubbed his temples. As he took the last sip of his coffee, he thought about the consultants that advise his staff – they would be in for a week of hard work.

II. Mexico at a Glance

- Population: 113,724,226 (July 2011 estimate)
 - Urban population: 78% of total population, with 1.2% annual urbanization rate (2010)

- Major cities: Mexico city (capital) 19.3 million, Guadalajara 4.3 million, Monterrey 3.8 million, Puebla 2.3 million, Tijuana 1.6 million (2009); refer to Exhibit B for a map of Mexico
- Mexico City is the second-largest urban agglomeration in the Western Hemisphere
- GDP: \$1.567 trillion (PPP,^a 2010 estimate): services 63.5%, industry 32.6%, agriculture 3.9%
- GDP per capita: \$13,900 (PPP, 2010 estimate)
- Governance structure: Federal republic with 31 states and a Federal District (Mexico City) [1]

Health Expenditures and Priority-Setting

Mexico currently allocates 6.8-7% of GDP to health (Exhibit C), which is approximately 170 billion pesos.^b The general budget for health is proposed by the Executive Branch of government and negotiated through the Treasury Department. The Ministry of Health decides how to allocate this money considering both national and the states' needs. The most populated states and states with the worst health indicators receive the most funds. In addition, the Chamber of Representatives provides input on funding allocation, health priorities, and policy design. The approved policies are sent to the Senate for final considerations. Lobbyist groups are concentrated around this decision-making arena. Within the Ministry of Health, the Division of Prevention and Health Promotion receives 17 billion pesos; within this Division, the obesity program receives approximately 200 million pesos per year [2].

III. Childhood Obesity in Mexico

Distribution and Trends

In countries undergoing rapid economic growth (such as Mexico, Brazil, Chile, and Egypt), the prevalence of overweight among school-aged children has reached levels comparable to those in established market economy countries [3]. Between 1999 and 2006, the proportion of Mexican schoolchildren classified as obese increased from 18.6% to 26.0% [4], with the highest prevalence observed among adolescents (30.9%) [5]. In particular, the prevalence of obesity increased dramatically among female adolescents (a near-fourfold increase between 1988 and 2006) [5]. In stark contrast, many regions of Mexico still experience unacceptably high rates of stunting, underweight, and wasting, especially in the rural Southern and Central states, which have large indigenous populations and many low-income families. In 2006, children under 5 living in rural areas had double the risk of being stunted (24.1%) compared to their urban counterparts (12.5%). Wasting was as high as 4.9% in infants under 6 months old overall [6]. This feeds a paradoxical cycle where low maternal weight during pregnancy and low-weight-for-age at birth are associated with higher risk of later obesity and cardiovascular disease in the individual [7].

The prevalence of overweight and obesity is higher in urban areas than in rural areas (Exhibit D). Data show that there are higher proportions of overweight and obese children and adolescents in Mexico City and Northern states close to the US border compared to their rural or southern counterparts [5]. Across socioeconomic strata, middle- and high-income families in Mexico generally exhibit higher likelihood of childhood overweight or obesity. In particular, the fast-growing middle-class has

^a PPP or Purchasing power parity is an adjusted estimate of gross domestic product (GDP) that accounts for the fact that a common basket of goods and services will have different costs across different countries.

^b Exchange rate (as of 01/30/2012): 1 Mexican peso = 0.0775 US dollars

experienced dramatic increases in overweight and obesity prevalence, postulated to be related to rapidly changing consumption patterns. However, in large metropolitan areas, a large proportion of low-income family children are overweight or obese – a pattern that mirrors the US and Western Europe. It is estimated that overweight and obesity affect 17.4% of low-income schoolchildren, 26.5% of low-income female adolescents, and 19.0% of indigenous children (considered the “poorest of the poor”) [5].

Health Consequences of Childhood Obesity

Childhood obesity has both immediate and lifelong health consequences. A major concern regarding childhood obesity is the high risk of persistence into adulthood. Once a person is obese, it is difficult and costly to lose and maintain lower body weight. Adult obesity increases the risk of a number of chronic diseases, including type 2 diabetes and cardiovascular diseases, and is a major cause of preventable morbidity and mortality [8]. In addition, obesity during early life (childhood and adolescence) is known to increase the risk of childhood diseases including asthma, sleep apnea, hypertension, abnormal glucose intolerance, and type 2 diabetes, a condition that was previously thought to affect adults exclusively. Childhood obesity also impacts psychosocial development as children may experience depression, low self-esteem, and/or discrimination from peers [8].

Costs of Childhood Obesity

The full cost of obesity and related chronic diseases such as diabetes involves direct medical expenditures and indirect costs to society. Indirect costs are accrued by society through lower returns on education; decreased household incomes and saving; decreased productivity; increased premature retirement and unemployment; and higher dependence on welfare [9, 10]. The direct medical costs and indirect costs (lost earnings due to morbidity and premature death) associated with chronic diseases (that are highly correlated with obesity) have grown at a rate of 8.5% annually since 2000. According to the Economic Analysis Unit at Mexico’s Ministry of Health, the direct and indirect costs of obesity exceeded US \$4 billion in 2008 [11]. Studies elsewhere also illustrate how cost burdens of childhood obesity are contributing to rising healthcare expenditures [12, 13].

Biology of Obesity

Obesity traditionally is described as thermodynamic imbalance in the “energy in = energy out” equation. Put simply, energy consumption is in excess of energy expenditure; the unexpended energy is then stored as fat or adipose tissue. However, the biology of obesity is a multifactorial phenomenon that involves a series of homeostatic mechanisms regulating fat storage and release, resting metabolic rate and energy expenditure, which may be determined by genetic factors [8]. This is further complicated by the fact that despite the discovery of growing numbers of gene variants that predispose one to obesity, the majority of cases cannot be explained by a monogenic phenomenon [14]. In the case of metabolic syndromes, a term referring to a cluster of clinical outcomes related to obesity and other chronic conditions, evidence suggest that the pathophysiology of obesity can be viewed in light of the many interactions between biological and environmental factors including predisposing genetic profile, individual age-related hormonal profile, nutritional insults during fetal and infant development, and individual diet and physical activity patterns.

IV. Social Trends in Mexico

Economic and Nutrition Transitions

A number of fast-developing countries, including Mexico, are experiencing concurrent demographic, socioeconomic, and nutrition transitions. The nutrition transition is characterized by a shift in dietary consumption and activity patterns such that high burdens of under-nutrition are being replaced by an emergence and dominance of lifestyle-related chronic NCDs. These transitions are cumulatively characterized by: 1) increased consumption of energy-dense foods with high fat, sugar, and salt content; 2) less time to prepare home-cooked meals, more frequent eating outside of the home, and higher consumption of “fast foods;” 3) greater exposure to innovations that decrease physical activity (*i.e.* cars, labor-saving devices, TV, electronics, etc.); and 4) increased purchasing power [11].

Dietary Patterns

The changing consumption patterns of the Mexican population over the recent years are evident from nutrition surveys and food sales data. Between 1995 and 2003, sales of processed foods^c in Mexico increased 5-10% annually. During the same period, the Mexican diet shifted from its staple of beans, tortillas, chicken, fruits, and vegetables prepared in homes (or small restaurants called *fondas*) to a diet predominantly composed of items with low nutritional value [15]. Since 2002, sales of fresh fruits and vegetables, dairy, and meat have all fallen (Exhibit E). In contrast, the purchases of refined sugars and carbonated beverages have increased by 6.3% and 37.2%, respectively [16].

At the national level, changes in food sales have been accompanied by changes in dietary patterns. The national average total energy intake from fat in Mexican diets increased from 23.5% to 30.3 % between 1988 and 1999 [17] with the increase higher in Mexico City than in rural areas [18]. Between 1992 and 2000, calories from carbonated soft drinks increased by almost 40%. By 2002, the average Mexican was drinking more cola servings per year (487 eight-ounce servings) than US residents (436 eight-ounce servings) [17]. In 2006, Mexican adolescents consumed 22.3% of their daily kcal from energy-containing beverages (e.g., whole milk, juice, and sugar sweetened beverages) [19]. A representative survey of 100 children aged 1-4 years of age reported that 48% of total energy, 44% of carbohydrates, 39% of protein, and 56% of fat calories come from the consumption of processed foods [11]. While some argue that these consumption patterns are driving the obesity epidemic, it should be noted that population-level trends cannot be directly attributed as causal for individuals, a concept known as ecological fallacy.^d To add to this, there has been no robust evidence to date that targeting individual food products is an effective means of addressing complex behavioral and metabolic conditions like obesity.

^c Although definitions vary widely (and from author to author), the term processed/industrialized foods refers to manufactured foods that are routinely characterized as high calorie, high in sodium, and of low nutritional value.

^d Ecologic fallacy is a limitation on the epidemiologist's ability to infer a causal explanation from a correlation study. Observed variables (*i.e.* suspected risk factor and disease occurrence) may be associated on a population level but not necessarily at the individual level [Greenberg R., Daniels S., Flanders W., et al: Medical Epidemiology, 4th Ed. New York, McGraw-Hill. Accessed 01/30/2012. Available from: McGraw-Hill's AccessSurgery: <http://www.accessmedicine.com.proxy.library.emory.edu/content.aspx?aID=545295&searchStr=ecological+fallacy#545295>].

Childhood Environments

Dietary patterns among Mexican children are influenced by both their school and home environments. Although the public school system^e does not have a formal meal program, it provides a school snack that typically consists of food and beverage. Until recently, the school snack provision was largely unregulated by the Mexican government and heavily influenced by vendors who provide school snack items. A study conducted in 2007 in Mexico City found that energy-dense items of low nutritional quality dominated school snack options [20].

According to the 2006 Survey of Health and Nutrition, fewer than 40% of children and adolescents (10-19 years old) participate in recommended amounts of physical activity in Mexico [21]. Though the government mandates that physical education (PE) should occur twice a week for 50 minutes per class, enforcement is weak. In Mexico City's public primary schools, for example, it has been observed that PE usually only occurs once a week for 40 minutes per class [22]. Moreover, increased time spent watching television contributes to reduced physical activity at home. It also increases exposure to food advertising. Studies estimate that Mexican children who watch 2 hours of television a day will absorb approximately 12,400 food commercials in a year (Exhibit G) [11].

In 2010, as part of the National Agreement for Nutrition and Health, the *Secretaría de Educación Pública* (SEP) was required to regulate school snacks and beverages and increase physical activity requirements in an effort to control childhood overweight and obesity (Exhibit H) [11]. However, it is not clear whether these policies will be effective, nor do they account for children's exposures at home or individual variation in biological susceptibility to obesity and chronic diseases.

Food Security Status

Although overweight and obesity prevalence is increasing fastest among the middle class, household poverty and food insecurity^f is also implicated in the growing prevalence of overweight and obesity, particularly in urban households. In a 2007 study in schoolchildren in urban Mexico, the highest prevalence of overweight was observed in children with severe food insecurity (15.8%); in comparison, 10.4% of moderately food insecure children and 6.9% of food secure children were overweight [23]. Students that came from homes experiencing food insecurity consumed more sugary cereals, salty foods, and energy-dense sweets. However, these behaviors may be economically motivated, as research indicates that high fat, processed foods, sweetened beverages, and high energy staples are cheaper – both in actual cost and in terms of cost per calorie – than healthier options such as fruits, vegetables, lean protein sources, and low fat dairy [24].

^e More on the Mexican public school system can be found in Exhibit F.

^f The World Food and Agricultural Organization (FAO) defines food security as “a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life” [FAO. 2002. *The State of Food Insecurity in the World 2001*. Accessed from: <http://www.fao.org/docrep/005/y4671e/y4671e06.htm>]. The extent to which individual food security results in good nutrition also depends on non-food factors such as access to sanitary conditions, safe water, and primary health care. Thus, food security alone does not assure nutritional security [Pinstrup-Anderson, *Food Security: Definition and Measurement*. Food Security, 2009(1): p.5-7].

Cultural Perceptions

Cultural perceptions of obesity in Mexico are also undergoing rapid change. Historically –and as recently as the early 2000s– a body shape congruent with overweight or obesity was considered ideal in Mexico. This is consistent with cultural beliefs that “chubby children are healthy children” and the perception that feeding one’s child, particularly with treats, is a means of demonstrating love and affection [25]. Accordingly, a study on mothers in Northern Mexico showed that less than 60% of parents perceived obese children as having a weight problem (*pasado de peso*). Instead, their perceptions of overweight were based on whether or not a child is happy, active, and able to engage in typical activities [26]. Consistent with these cultural values, obese children in Mexico traditionally have not faced a great deal of stigma, with their experiences of self-esteem, acceptance, and mental health equaling those of their non-obese peers [25].

However, these perceptions of obesity may be shifting. A research study in the Northern border regions documented less-favorable opinions of overweight images among both parents and children [27]. Obesity was associated with negative attributes such as laziness and personal failing. In fact, within a 10-country study, Mexico had the third highest fat stigma scores [28]. Taken together, these conflicting cultural models of obesity represent the rapid and complex transitions occurring in Mexico.

Food & Nutrition Assistance Programs

A key government health program is the *Sistema Nacional para el Desarrollo Integral de la Familia* (DIF). DIF includes food assistance programs specifically targeting children aged 0-12 years, families in extreme poverty, and indigenous families. DIF consists of three main components: 1) a basic food basket that provides foods to cover essential nutrition needs of indigenous and rural families; 2) school breakfasts in target areas that meet 30% of the daily requirements for protein and calories; and 3) food assistance programs in marginal urban areas that subsidize maize tortillas and milk [29].

Another nutrition and health program is *Oportunidades*. The nutrition component of this program includes a monthly fixed cash transfer as well as nutritional supplements to specified populations. Women in charge of the family receive approximately US \$30 a month plus food and nutrition supplements for children, and pregnant and lactating women. Payments are given to the female head of family and receipt is dependent on compliance with program requirements, such as ensuring children to attend school and that family members receive preventative health care (*i.e.* antenatal care) [29, 30]. *Oportunidades* has been shown to have both short and long-term benefits in terms of school enrollment, access to healthcare, and child nutrition status [31]. As of 2011, 5.8 million households were receiving services through *Oportunidades* [32].

Since 2008, the Mexican government has launched an additional food aid program, *Programa de Apoyo Alimentario* (PAL) to provide support to families that do not qualify for *Oportunidades*. In 2010, this program served almost 1 million people. Lastly, two programs, the Social Milk Program (LICONSA) and the Rural Food Support Program (DICONSA) supply fortified milk and subsidize basic food products reaching over 35 million people [32].

Agriculture & Food Industry Sectors

Some argue that The North American Free Trade Agreement (NAFTA) was the catalyst for Mexico’s changing diet patterns [15, 17]. The agreement was originally proposed by Mexico and signed by Mexico, the US, and Canada in 1994. NAFTA eliminated tariffs on agricultural products and removed

or reduced trade barriers on many other key products. Under NAFTA, it became easier for US and Canadian companies to invest in the Mexican economy. As a result of NAFTA, US foreign direct investments (FDIs) in the Mexican food processing industry increased from US \$210 million to US \$5.3 billion between 1988 and 1997 [17]. Critics of NAFTA say that the changes in Mexico's agricultural landscape since NAFTA destabilized communities' access to locally grown fresh food [33]. The decline in maize production by small-scale farmers is frequently cited as an example (Exhibit I) [33-35].

On the other hand, economic growth since NAFTA has been substantial (Exhibit J). The value of Mexican goods exported to the US grew from US \$39.9 billion in 1993 to US \$ 210.8 billion in 2007, and during the same period, GDP increased 46 percent in Mexico [35]. Mexican employment levels have been more volatile since the implementation of NAFTA; but, as of 2005, the Mexican affiliates of U.S. companies employed nearly 840,000 people. Wages for Mexican workers have grown steadily since the 1994 peso crisis (reaching pre-crisis levels in 1997) and have increased each year since (Exhibit K) [35]. For these reasons alone, the debate continues as to whether trade liberalization has negatively or positively impacted Mexico's economy and its domestic food and nutrition environments.

In 2001 the Mexican government adopted the *Ley de Desarrollo Social Sustentable*, an umbrella law for rural development. Following passage of this law, numerous agricultural projects were implemented to improve food availability in Mexico. Resources allocated to the Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA) nearly doubled from 48 billion pesos in 2001 to approximately 74 billion pesos in 2011 [32]. Agricultural production increased at an average annual rate of 2.4 percent from 2000 to 2010. However, in his recent trip report, the UN Special Rapporteur on the Right to Food noted that Mexican agricultural policies were "insufficiently pro-poor... in 2005, the poorest six states received only 7 % of total agricultural public expenditures despite being home to 55 % of those living in extreme poverty" [32].

V. Summary

Dr. Hernandez is caught between intense international pressure to develop a plan that will effectively mitigate the obesity epidemic that currently plagues Mexico's children and the government's priorities for economic expansion. As a multi-disciplinary consultant team to Dr. Hernandez and his staff, you must build an innovative, effective, justifiable, and financially sound plan that the Cabinet and the Mexican people will support.

VI. References

1. Central Intelligence Agency. *The World Factbook: Mexico*. 2011 [cited 2011 October 20, 2011]; Available from: <https://www.cia.gov/library/publications/the-world-factbook/geos/mx.html>.
2. Hernandez-Avila, M., *Priority-setting and expenditures on health in Mexico*, Email communication, W.C. Kim, Editor 2011.
3. Wang, Y. and T. Lobstein, *Worldwide trends in childhood overweight and obesity*. *International Journal of Pediatric Obesity*, 2006. **1**(1): p. 11-25.
4. Cuevas-Nasu, L., et al., *Overweight and obesity in school children aged 5 to 11 years participating in food assistance programs in Mexico*. *Salud pública de México*, 2009. **51 Suppl 4**: p. S630-7.
5. Bonvecchio, A., et al., *Overweight and obesity trends in Mexican children 2 to 18 years of age from 1988 to 2006*. *Salud pública de México*, 2009. **51 Suppl 4**: p. S586-94.
6. González de Cossío, T., et al., *Child malnutrition in Mexico in the last two decades: prevalence using the new WHO 2006 growth standards*. *Salud pública de México*, 2009(51): p. Suppl 4: S494-506.
7. Darnton-Hill, I., C. Nishida, and W. James, *A life course approach to diet, nutrition and the prevention of chronic disease*. *Public Health Nutrition*, 2004(7(1A)): p. 101-121.
8. Lobstein, T., L. Baur, and R. Uauy, *Obesity in children and young people: A crisis in public health*. *Obesity Reviews*, 2004. **5 Suppl 1**: p. 4-104.
9. Finkelstein, E.A., I.C. Fiebelkorn, and W.G. J., *National medical spending attributable to overweight and obesity: How much, and who's paying?* *Health Affairs*, 2003. **22**(4): p. W219-26.
10. Yach, D., D. Stuckler, and K.D. Brownell, *Epidemiologic and economic consequences of the global epidemics of obesity and diabetes*. *Nature Medicine*, 2006. **12**(1): p. 62-66.
11. Barquera-Cevera C., e.a., *Acuerdo Nacional para la Salud Alimentaria: Estrategia contra el Sobrepeso y la Obesidad*, 2010, Ministry of Health Mexico. p. 19, 37, 38, 41, 42.
12. Wang, G. and W.H. Dietz, *Economic burden of obesity in youths aged 6–17 years: 1979–1999*. *Pediatrics*, 2002: p. 109-E81.
13. Au, N., *The health care cost implications of overweight and obesity during childhood*. *Health Services Research*, 2011.
14. McCarthy, M.I., *Genomics, type 2 diabetes, and obesity*. *New England Journal of Medicine*, 2010. **363**: p. 2339-2350.
15. Nevaer, L.E.V. *Mexico's NAFTA Generation Confronts Morbid Obesity*. 2009 July 16, 2009 November 19, 2011]; Available from: http://www.imdiversity.com/villages/hispanic/family_lifestyle_traditions/nam_nafts_0709.a.sp.
16. Rivera, J.A., et al., *Epidemiological and nutritional transition in Mexico: rapid increase of non-communicable chronic diseases and obesity*. *Public Health Nutrition*, 2002(5): p. 113-122.
17. Hawkes, C., *Uneven dietary development: linking the policies and processes of globalization with the nutrition transition, obesity and diet-related chronic diseases*. *Globalization and Health*, 2006. **2**: p. 4.
18. Rivera, J.A., et al., *Nutrition transition in Mexico and in other Latin American countries*. *Nutrition Reviews*, 2004. **62**(7 Pt 2): p. S149-57.
19. Barquera, e.a., *Energy intake from beverages is increasing among Mexican adolescents and adults*. *Journal of Nutrition*, 2008(138): p. 2454-2461.
20. Lozada, M., et al., *School food in Mexican children*. *Public Health Nutrition*, 2008. **11**(9): p. 924-33.
21. Aburto, N.J., et al., *Effect of a school-based intervention on physical activity: cluster-randomized trial*. *Medicine and Science in Sports and Exercise*, 2011. **43**(10): p. 1898-906.
22. Jennings-Aburto, N., et al., *Physical activity during the school day in public primary schools in Mexico City*. *Salud pública de México*, 2009. **51**(2): p. 141-7.

23. Ortiz-Hernandez, L., et al., *Organo del Hospital de Enfermedades de la Nutricion [Food insecurity and obesity are positively associated in Mexico City schoolchildren]*. *Revista de Investigacion Clinica*, 2007. **59**(1): p. 32-41.
24. Drewnowski, A., *Obesity, diets, and social inequalities*. *Nutrition Reviews*, 2009. **67 Suppl 1**: p. S36-9.
25. Brewis, A., *Biocultural aspects of obesity in young Mexican schoolchildren*. *American Journal of Human Biology*, 2003. **15**(3): p. 446-60.
26. Reifsnider, E., et al., *Perceptions of children's body sizes among mother living on the Texas-Mexico border*. *Public Health Nursing*, 2006(6): p. 488-95.
27. Bacardi-Gascon, M., M.J. Leon-Reyes, and A. Jimenez-Cruz, *Stigmatization of overweight Mexican children*. *Child Psychiatry and Human Development*, 2007. **38**(2): p. 99-105.
28. Brewis, A.A., et al., *Body norms and fat stigma in global perspective*. *Current Anthropology*, 2011. **52**(2): p. 269-276.
29. Barquera, S., J. Rivera-Dommarco, and A. Gasca-García, *Food and Nutrition Policies and Programs in Mexico*. *Saluda Publica Mex*, 2001(43): p. 464-477.
30. Federal Government of Mexico. *Oportunidades, a Human Development Program 2012*. 2012 January 23, 2012]; Available from: http://www.oportunidades.gob.mx/Portal/wb/Web/oportunidades_a_human_development_program.
31. Fernald, L.C., P.J. Gertler, and L.M. Neufeld, *10-year effect of Oportunidades, Mexico's conditional cash transfer programme, on child growth, cognition, language, and behaviour: a longitudinal follow-up study*. *Lancet*, 2009. **374**(9706): p. 1997-2005.
32. de Schutter, O., *Mandate of the Special Rapporteur on the Right to Food*, 2011, United Nations High Commission for Human Rights June 2011.
33. Schwentesius, R. and M.Á. Gómez, *Supermarkets in Mexico: Impacts on horticulture systems*. *Development Policy Review*, 2002. **20**(4): p. 487-502.
34. Relinger, R. *NAFTA and US corn subsidies: Explaining the displacement of Mexico's corn farmers*. *Prospect Journal of International Affairs at UCSD* 2010 [cited Jan 2012; Available from: <http://prospectjournal.ucsd.edu/index.php/2010/04/nafta-and-u-s-corn-subsidies-explaining-the-displacement-of-mexicos-corn-farmers/>].
35. Sommer, H. *The Economic Benefits of NAFTA to the United States and Mexico*. National Center for Policy Analysis 2008 January 23, 2012 Jan 16, 2012]; Available from: <http://www.ncpa.org/pub/ba619>.

VII. Exhibits

Exhibit A. Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases

Please see linked document:

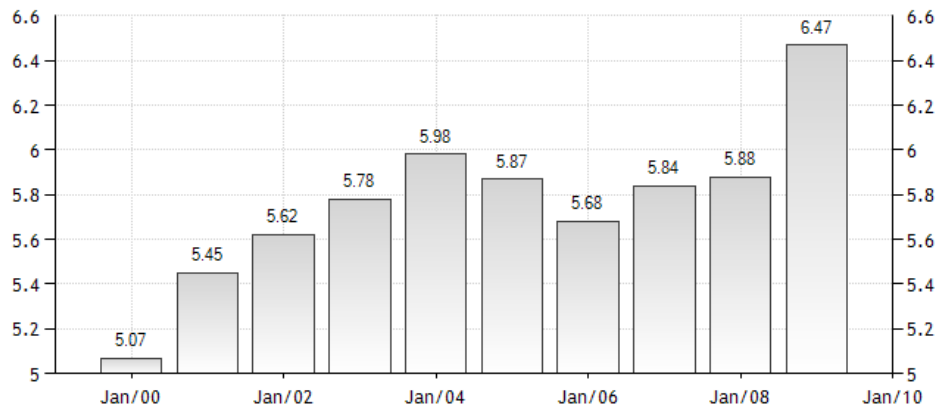
UN General Assembly, 66th session. Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases ([A/66/L.1](#)). New York, NY: United Nations; 2011 Sep 16. Available from: http://www.un.org/ga/search/view_doc.asp?symbol=A/66/L.1

Exhibit B. Map of Mexico



(Source: <http://www.nationsonline.org/oneworld/map/mexico-administrative-map.htm>)

Exhibit C. Total Health Expenditures in Mexico as % GDP



(Source: <http://www.tradingeconomics.com/mexico/health-expenditure-total-percent-of-gdp-wb-data.html>)

Exhibit D. Prevalence of Childhood Obesity and Overweight in Mexico (2006)

(Source: Bonvecchio, A, Safdie M, Monterrubio E, et al. Overweight and obesity trends in Mexican children 2 to 18 years of age from 1988 to 2006. *Salud pública de México*. 2009; 51(sup 4): 586-594)

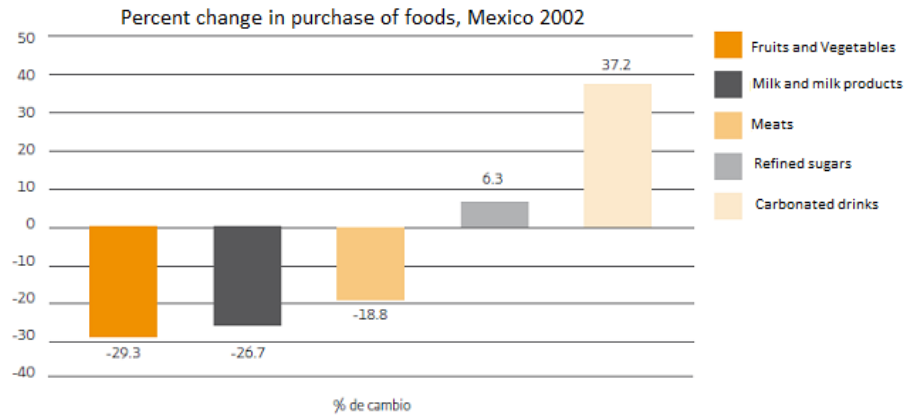
(See next page)

Table 1
OVERWEIGHT AND OBESITY BY AGE GROUP, MEXICO, ENSANUT 2006

	Children 2 to 18 years				Children 2-4 years				Children 5 to 11 years				Adolescents 12 to 18 years							
	Overweight		Obesity		Overweight		Obesity		Overweight		Obesity		Overweight		Obesity		Overweight		Obesity	
	N thousands	% (CI)	N thousands	% (CI)	N thousands	% (CI)	N thousands	% (CI)	N thousands	% (CI)	N thousands	% (CI)	N thousands	% (CI)	N thousands	% (CI)	N thousands	% (CI)	N thousands	% (CI)
National	33 459	18.2(17.5,18.9)	8.1(7.6,8.7)	26.3(25.5,27.1)	5 129	6 190	12.5(10.9,14.2)	4.2(3.5,4.9)	16.7(15.0,18.4)	15 111	15 816	17.3(16.2,18.4)	8.9(8.1,9.6)	26.1(24.8,27.5)	13 219	16 772	21.2(20.0,22.3)	8.9(7.8,9.9)	30.1(28.6,31.5)	
Sex																				
Male	16 705	19 482	17.5(16.5,18.4)	8.4(7.5,9.2)	25.8(24.7,27.0)	2 617	3 132	11.7(9.7,13.6)	4.2(3.1,5.3)	15.9(13.8,18.0)	7 567	7 883	16.9(15.5,18.3)	9.1(8.1,10.2)	26.1(24.3,27.8)	6 521	8 467	20.1(18.5,21.7)	9.2(7.5,10.9)	29.3(27.2,31.4)
Female	16 754	19 295	19.0(18.0,20.0)	7.9(7.2,8.5)	26.8(25.1,27.9)	2 512	3 058	13.4(10.9,15.8)	4.2(3.1,5.2)	17.6(15.0,20.1)	7 544	7 933	17.7(16.2,19.2)	8.6(7.5,9.6)	26.2(24.4,28.0)	6 698	8 304	22.3(20.7,23.8)	8.6(7.4,9.7)	30.8(28.9,32.7)
Region																				
North ^a	7 453	7 198	18.5(17.4,19.7)	10.1(9.3,11.0)	28.7(27.3,30.0)	1 118	1 167	10.2(8.2,12.3)	4.6(2.9,6.3)	14.8(12.2,17.4)	3 332	2 966	18.2(16.4,20.0)	11.0(9.6,12.5)	29.2(26.9,31.6)	3 003	3 066	22.0(20.1,24.0)	11.3(10.0,12.6)	33.4(31.2,35.5)
Center ^b	12 905	15 983	18.4(17.1,19.7)	8.4(7.3,9.6)	26.8(25.2,28.3)	1 977	2 518	10.3(7.4,13.2)	4.2(3.0,5.5)	14.5(11.6,17.5)	5 814	6 416	17.9(15.8,20.0)	8.7(7.3,10.0)	26.6(24.1,29.1)	5 114	7 049	21.7(19.7,23.7)	9.6(7.4,11.8)	31.3(28.6,34.0)
Mexico City ^c	737	2 601	20.2(16.9,23.5)	9.2(6.8,11.5)	29.3(25.5,33.2)	125	460	15.4(7.9,22.9)	3.5(2.6,6.8)	18.9(11.7,26.2)	313	1 013	22.0(15.9,28.1)	11.3(7.2,15.4)	33.2(26.7,39.7)	299	1 128	20.5(15.5,25.5)	9.6(6.1,13.1)	30.1(23.6,36.6)
South ^d	12 364	12 995	17.4(16.4,18.4)	6.5(6.0,7.1)	23.9(22.9,25.0)	1 909	2 045	15.9(13.2,18.6)	4.1(3.0,5.1)	20.0(17.1,22.8)	5 652	5 420	15.1(13.8,16.5)	7.4(6.5,8.4)	22.6(20.8,24.4)	4 803	5 529	20.2(18.4,21.9)	6.5(5.5,7.4)	26.6(24.6,28.7)
Area																				
Urban	22 860	28 143	19.3(18.4,20.1)	9.5(8.8,10.2)	28.8(27.8,29.8)	3 519	4 511	11.9(9.9,13.8)	4.7(3.7,5.6)	16.5(14.5,18.6)	10 159	11 384	19.0(17.6,20.4)	10.6(9.7,11.6)	29.6(28.0,31.3)	9 182	12 248	22.3(20.9,23.6)	10.2(8.9,11.6)	32.5(30.7,34.3)
Rural	10 599	10 636	15.3(14.3,16.4)	4.5(4.0,5.0)	19.8(18.7,21.0)	1 610	1 679	14.3(11.3,17.2)	2.9(2.0,3.8)	17.2(14.1,20.3)	4 952	4 432	12.8(11.2,14.5)	4.3(3.5,5.1)	17.2(15.3,19.1)	4 037	4 524	18.2(16.1,20.3)	5.2(4.2,6.2)	23.4(21.1,25.7)
Socioeconomic Level																				
Low ^a	11 629	13 053	14.9(14.0,15.9)	4.9(4.4,5.3)	19.8(18.8,20.9)	1 791	2 111	12.3(9.9,14.8)	3.0(2.1,3.9)	15.3(12.7,17.9)	5 255	5 337	12.5(11.1,13.9)	4.9(4.0,5.9)	17.4(15.6,19.2)	4 583	5 605	18.3(16.5,20.0)	5.6(4.6,6.5)	23.8(21.8,25.9)
Middle ^b	11 914	12 842	18.8(17.7,20.0)	8.6(7.8,9.3)	27.4(26.1,28.7)	1 852	2 072	12.0(9.7,14.2)	4.0(2.8,5.2)	16.0(13.5,18.4)	5 374	5 174	18.0(16.2,19.8)	9.9(8.7,11.0)	27.9(25.8,29.9)	4 688	5 596	22.2(20.4,23.9)	9.1(7.8,10.4)	31.3(29.3,33.2)
High ^c	9 791	12 751	21.0(19.5,22.4)	11.0(9.6,12.3)	31.9(30.2,33.6)	1 469	1 993	13.1(9.4,16.8)	5.7(4.0,7.4)	18.8(15.0,22.6)	4 426	5 255	21.5(19.5,23.5)	11.8(10.3,13.4)	33.4(30.9,35.8)	3 896	5 503	23.3(21.0,25.5)	12.0(9.4,14.6)	35.3(32.3,38.2)
Ethnic Background																				
Indigenous	3 890	4 488	15.0(13.3,16.8)	4.0(3.2,4.7)	19.0(17.2,20.9)	588	688	16.3(11.0,21.6)	3.0(1.5,4.5)	19.3(13.7,24.9)	1 844	1 931	13.6(11.0,16.1)	4.3(3.0,5.7)	17.9(15.0,20.9)	1 458	1 865	16.1(13.4,18.8)	4.0(2.7,5.2)	20.1(17.0,23.2)
Non-indigenous	29 564	34 285	18.6(17.9,19.4)	8.7(8.1,9.3)	27.3(26.4,28.2)	4 540	5 501	12.0(10.3,13.7)	4.4(3.5,5.2)	16.4(14.6,18.2)	13 882	14 882	17.1(16.6,19.0)	9.5(8.7,10.3)	27.3(25.9,28.7)	1 759	14 902	21.8(20.6,23.1)	9.5(8.3,10.6)	31.3(29.8,32.9)

ab, ac, ad, bc, bd, cd: significant difference between every couple of categories; abc: significant difference among categories a, b and c. * p < 0.05; ** p < 0.01

Exhibit E. Percent Changes in Purchase of Foods in Mexico, 2002



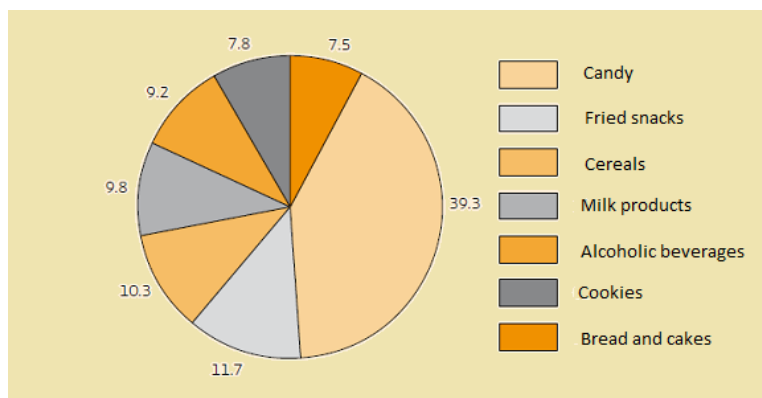
(Source: Barquera-Cevera C., et al, *Acuerdo Nacional para la Salud Alimentaria: Estrategia contra el Sobrepeso y la Obesidad, Bases Tecnicas*, Ministry of Health Mexico, February 2010, pg 15)

Exhibit F. Public School System in Mexico

The Mexican education system includes preschool (K1–K3), primary school (*primaria*: grades 1-6), lower secondary school (*secundaria*: grades 7-9), upper secondary education (*preparatoria*: grades 10–12), and higher education. Primary and lower secondary schools are compulsory. The school year is roughly 200 days long running from August to the following June. Primary school students spend 4 hours in class per day and have the option to attend one of three shifts (either morning, afternoon, or evening). Lower secondary schools meet for 7 hours per day in either the morning or afternoon with an additional night school option. As of 2005, 31 million students or roughly 87% of all students in Mexico were enrolled in the public school system (kindergarten, basic education, upper secondary, and higher education).

(Source: Santibañez, L., G. Vernez, and P. Razquin, *Education in Mexico: Challenges and Opportunities*, 2005, RAND Corporation; Accessed November 5, 2011; Available from: http://www.rand.org/pubs/documented_briefings/DB480.html.)

Exhibit G. Percentage of Advertisements by Food Group



(Adapted from: Barquera-Cevera C., et al, *Acuerdo Nacional para la Salud Alimentaria: Estrategia contra el Sobrepeso y la Obesidad, Bases Tecnicas*, Ministry of Health Mexico, February 2010, pg 42)

Exhibit H. School Food and Nutrition Programs in Mexico

The SEP action steps, in adherence to the National Agreement for Nutrition and Health, mandate that all public schools:

- Promote physical activity undertaken at least 30 minutes a day in school
- Promote gender equality in sport
- Promote, through the school curriculum, consumption of drinking water and nutrition literacy
- Ensure the installation of drinking fountains in public schools
- Promote and facilitate availability of water and low-calorie soft drinks in collaboration with the food industry
- Create guidelines for school food providers aimed at reducing consumption of sugars; and
- Promote a secretarial agreement for the sale of food and beverages in stores and cooperatives school campuses for a sound basic education school feeding.

The SEP also created stringent regulations on the types of food and beverages that are allowed for purchase as school snacks. Under the new regulations, school snack items are to cover 15-20% of the daily recommendations for energy and nutrients for children (Table 1). Guidelines for preparing school snacks also emphasize the use of fresh ingredients, low-fat dairy, and seasonal produce, with limited sodium, fat, and sugar so that they contain less or equal to 130 kcals with less than 40% fat content. Drink sales are also restricted by grade level to meet the nutritional regulations (Table 2).

Table 1. Suggested energy recommendations for preschool, elementary and secondary school children

Grade Level	Estimated Energy Requirement (kcal/day)	Recommendation of Energy for School Refreshment (kcal/day)
Preschool	1,300 kcal	228 kcal (216-239)
Primary	1,579 kcal	276 kcal (263-290)
Secondary	2,183 kcal	382 kcal (362-401)

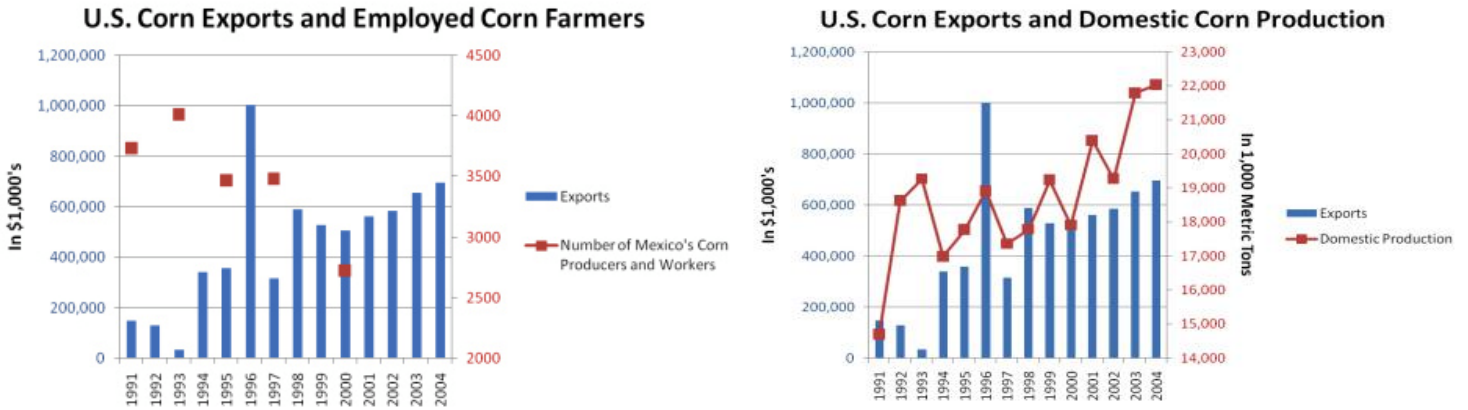
Table 2. School drink restrictions for preschool, elementary and secondary school children

Grade Level	Drink Restrictions
Preschool & Primary Secondary	<p>Preschool and Primary school children are only allowed to drink plain water</p> <p>Secondary school children are encouraged drink water, but consumption of additional beverages will be allowed provided they meet certain nutritional criteria:</p> <ul style="list-style-type: none"> - Portion size of 250 ml or less with maximum 10kcal per serving; - Contain less than 55mg of sodium; - May include non-caloric sweeteners less than 45mg/100ml; and - Does not have caffeine and/or taurine.

(Sources: 1. Barquera-Cervera C., et al, *Acuerdo Nacional para la Salud Alimentaria: Estrategia contra el Sobrepeso y la Obesidad, Bases Tecnicas*, Ministry of Health Mexico, February 2010

2. National Institute of Public Health. *National Agreement for Nutritional Health 2011 [Acuerdo Nacional para la Salud Alimentaria]*; Available from: <http://www.insp.mx/alimentosescolares/index.php>)

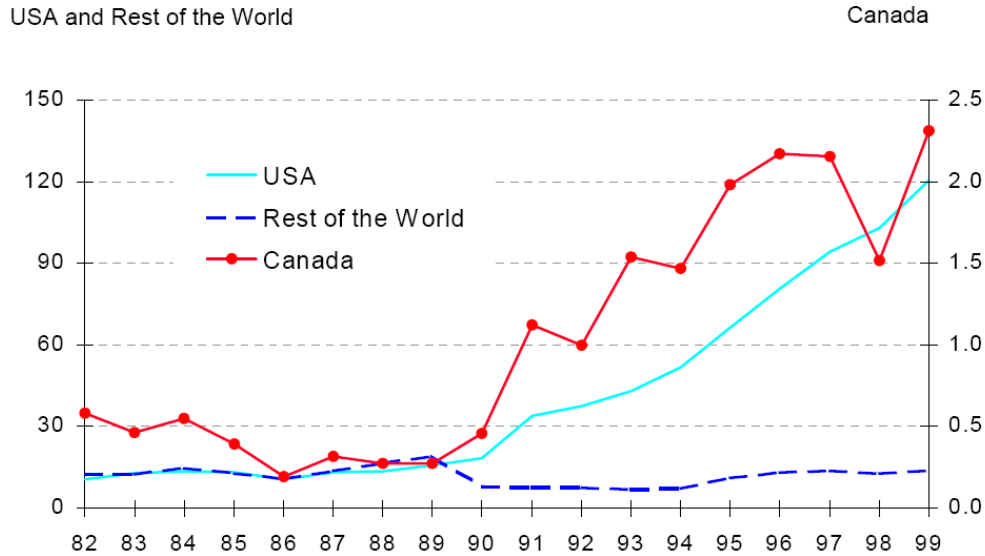
Exhibit I. US Corn Exports to Mexico and Agricultural Impacts



(Generated from data compiled by USDA's Trade Exports and Production, Supply, and Distribution)

(Source: Relinger, R. 2010. NAFTA and US corn subsidies: Explaining the displacement of Mexico's corn farmers. Prospect Journal of International Affairs at UCSD. April. [Accessed Jan 2012]. Available from <http://prospectjournal.ucsd.edu/index.php/2010/04/nafta-and-u-s-corn-subsidies-explaining-the-displacement-of-mexicos-corn-farmers/>)

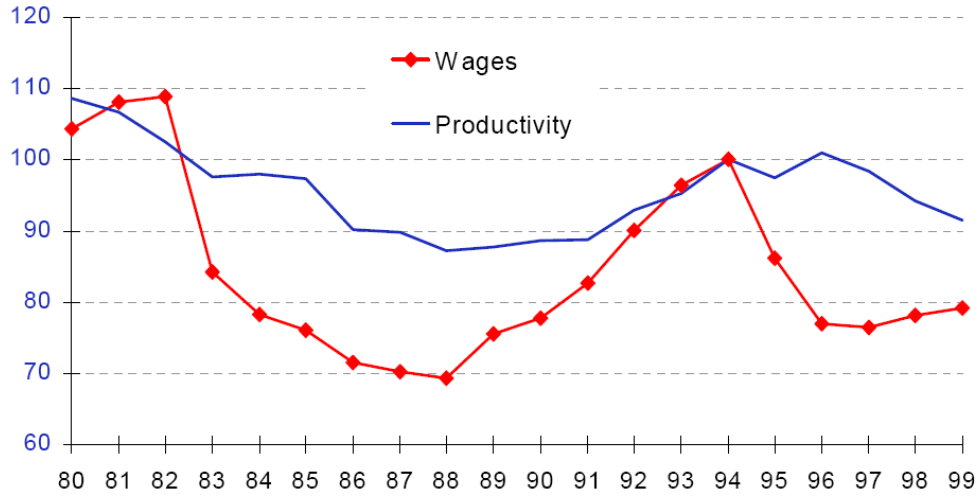
Exhibit J. Annual Mexican Exports to US, Canada, and Rest of the World (US\$ Billions), 1982-1999



Banco de México

(Source: Sanchez and Karp, 2000. NAFTA's economic effects on Mexico. Revised version of a paper presented at NBER 12th Annual Interamerican Seminar on Economics, Buenos Aires, December 2-4, 1999)

Exhibit K. Real Wages and Labor Productivity in Manufacturing Sector, 1980-1999 (1994=100)



Banco de México

(Source: Sanchez and Karp, 2000. NAFTA's economic effects on Mexico. Revised version of a paper presented at NBER 12th Annual Interamerican Seminar on Economics, Buenos Aires, December 2-4, 1999)

VIII. Acknowledgements

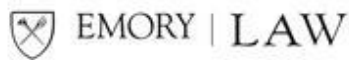
The Emory Global Health Case Competition Planning Committee gratefully acknowledges the dedication and contributions of each of the Writing Team members.

Writing Team and Emory University Affiliations:

Woon Cho Kim, School of Medicine (*Chair*)
Colleen Laurence, Rollins School of Public Health
Bonnie Fullard, Laney Graduate School of Arts and Sciences
N. Saman Wijesooriya, Rollins School of Public Health
Lilly Webster, School of Medicine
Diane Harper, School of Law
Alfonso Hernandez, Rollins School of Public Health
Megan Cheever, Gozuietta Business School
Emmy Corey, Candler School of Theology
Mohammed K. Ali, Rollins School of Public Health (*Faculty Advisor*)
Amy Webb Girard, Rollins School of Public Health (*Faculty Advisor*)

The Case Writing Team also recognizes valuable inputs and expert reviews from Dr. Jeffrey Koplan and Dr. K.M. Venkat Narayan.

The Emory Global Health Case Competition gratefully acknowledges support from the following organizations:



Student Government Association

