Re: Comments on the Scientific Report of the Dietary Guidelines Advisory Committee

Dear Office of Disease Prevention and Health Promotion at the U.S. Department of Health and Human Services,

We are a group of concerned graduate students in public health and nutrition programs from the George Washington University, Tufts University, John Hopkins University, and Michigan State University commenting on the Scientific Report of the Dietary Guidelines Advisory Committee (DGAC) for the 2015 Dietary Guidelines for Americans (DGA). We have been following DGAC's actions since they began meeting last summer, and have been consistently in support of the inclusion of sustainability in the guidelines.

Many of us were involved in a symposium held jointly by the George Washington and Tufts Universities entitled "My Sustainable Plate," where experts from academia, government, and industry discussed how the 2015 Dietary Guidelines for Americans could incorporate sustainability. Among these experts, we heard from former leaders at the USDA, including Robert Post and Kathleen Merrigan, the President of the Academy of Nutrition and Dietetics, Evelyn Crayton, and foreign officials that had implemented sustainable dietary guidance in their own countries, including Rianne Weggemans of the Netherlands and Carlos Monteiro of Brazil.

These international perspectives gave us important insight into the many different ways that our food systems can be improved if we move beyond traditional nutrition science to encompass a more comprehensive public health perspective on food and the entire food system. In addition to considering how food is grown, several other countries have begun to expand their dietary guidance beyond only recommending foods to incorporating how food is prepared. For example, Brazil's dietary guidelines focused less on individual nutrients and discrete food groups and more broadly on one "golden rule": "Always prefer natural or minimally processed foods and freshly made dishes and meals to ultra-processed foods" (Brazil Ministry of Health, 2014).

While Brazil's guidelines must ultimately be assessed for their both their effectiveness as dietary guidance and applicability to the American context, in addition to its simplicity, a primary advantage of this guidance is that it does not prescribe a particular diet or completely exclude particular types of foods or patterns of eating. (The alleged, and unsupported, accusation that Scientific Report advocates a reduction and/or complete exclusion of meat and other animal products is a source of contention among farm and industry interests.) Rather, Brazil's guidelines offer broad guidance incorporating considerations of food production and processing while also accommodating diverse cultural values and individual needs and preferences. We believe this approach should be considered by future Dietary Guidelines Advisory Committees.

As graduate students from public health, nutrition, policy, epidemiology, agriculture, and sustainability programs, we want to stress that our health is inexorably linked to our food supply, and that natural resources such as arable land and water are limiting factors for our national and global food security. We commend the DGAC for including sustainability in regard to food security concerns, and we appreciate this opportunity to provide a comment to the USDA and HHS. Our more detailed comments follow below.

Thank you for considering our comments.

Sincerely,

Margot Bolon, MPA, The George Washington University

Chelsea Clarke, MS Candidate, Tufts University

Naglaa El-Abbadi, PhD Candidate, Tufts University

Yukyan Lam, PhD Candidate, John Hopkins University

Megan Lehnerd, MS, PhD Student, Tufts University

Sara Lupolt, MPH Candidate, The George Washington University

Jamie Mayer, MPH Candidate, The George Washington University

Meghan McGonigle, MPH Candidate, The George Washington University

Philip McNab, PhD Student, John Hopkins University

Katie Merritt, MPH Candidate, The George Washington University

Michaela Oldfield, PhD Candidate, Michigan State University,

Nicole Tichenor, MS, PhD Candidate, Tufts University

I. *The Dietary Guidelines for Americans, 2015 should include sustainability to reflect the interconnections between health, nutrition, agriculture, and food security.*

We commend the DGAC for including concerns of sustainability in their Scientific Report. We support the inclusion of sustainability in the dietary guidelines because food consumption, rather than occurring in a vacuum, is inexorably linked to agricultural practices, health, economics, and culture in which it occurs. Our food policies, of which one component is the Dietary Guidelines for Americans, should attempt to take into account the direct linkages between the production, distribution and consumption of food, and subsequent effects on the health of Americans. The report states that:

> *"Individual nutrition and physical activity behaviors and other health-related lifestyle behaviors are strongly influenced by personal, social, organizational, and environmental contexts and systems. Positive changes in individual diet and physical activity behaviors, and in the environmental contexts and systems that affect them, could substantially improve health outcomes." (Executive Summary, Lines 15-19)*

This simplicity recognizes that health is not just a matter of consuming healthful foods—it encompasses having the economic capacity to afford such foods, and the social and environmental context that supports making healthful choices.

The premise of the DGA is to increase general public health and reduce risk of chronic disease in the American population. It is the guiding force of public health policy and programs, and as such the DGA has a commitment to consider the many factors influencing Americans' potential dietary choices. The definition of a sustainable diet as presented in the Scientific Report focuses on the promotion of health and food security within the context of availability of natural resources for both present and future generations. According to the report, a sustainable diet is defined as "a pattern of eating that promotes health and well-being and provides food security for the present population while sustaining human and natural resources for future generations (Chapter 5, Lines 23-25)." The report further defines food security to exist "when all people now, and in the future, have access to sufficient, safe, and nutritious food to maintain a healthy and active life." (Chapter 5, Lines 27-28)

As the DGA is updated every five years to reflect new understanding and discovery in nutrition science and health, we endorse the DGAC's consideration of the science that is now clearly showing an urgent need to address how changing dietary patterns are affecting global ecosystems that could jeopardize food security for our population.

Chapter 5 of the Scientific Report emphasizes the need to consider the complete food system, stating:

> *"Overall, it is clear that environmental sustainability adds further dimensions to dietary guidance; not just what we eat but where and how food production, processing, and transportation are managed, and waste is decreased." (Chapter 5, Lines 106-109)*

Although the report assesses dietary impacts on the environment—and thus the long-term food security of the nation—we encourage the DGA to recognize that sustainability includes the long-term economic viability and the social impacts of food production, distribution, and consumption. We believe these factors are important to take into consideration because they affect the "personal, social, organizational, and environmental contexts and systems" in which individuals must make dietary and physical activity choices. A recent report by the Institute of Medicine, "A Framework for Assessing Effects of the Food System," provides a template for understanding how American's dietary choices affect numerous other factors in the environmental, economic, and social well being of the U.S.

We support and urge the DGA to address Americans' actual experiences with food in terms of providing actionable, understandable, and relevant guidelines. We commend the DGAC for addressing environmental sustainability as a consideration in the DGA, which is reinforced by scientific evidence. Making more sustainable food choices may support the economic and social wellbeing of food chain workers and consumers, promote fair trade and wages, and reward conscientious, community oriented businesses (Feenstra, 1997). We therefore encourage the DGAC to broaden the conceptualization of sustainability to incorporate how dietary choices of Americans affect the economic and social sustainability of the food system, and not just the long-term environmental viability of certain dietary patterns.

> **Recommendation:** The USDA and HHS should incorporate food system frameworks such as the IOM's Framework for Assessing the Health, Environmental, and Social Effects of the Food System when weighing evidence for dietary guidance.

II. *The DGAs should recommend reduced consumption of animal-sourced foods because current levels of consumption are incompatible with long term food security.*

Animal agriculture is a significant contributor to global environmental change. The global livestock sector is responsible for 14.5 percent of anthropogenic greenhouse gas (GHG)

emissions (Gerber et al., 2013). Feed production accounts for about half of these emissions, including the GHGs released from forests and other lands converted to feed crop or grazing land for livestock (FAO 2013). In the U.S., meat, poultry, dairy and eggs are responsible for 78 percent of the climate impact of an average consumer's diet (Heller and Keolian 2014). Furthermore, demand for livestock products has driven drastic alterations of global nitrogen and phosphorus cycles (Bouwman et al. 2013). Intensification of feed and animal production systems and the resultant decoupling of supply and demand for manure nutrients pollutes ground and surface waters, threatening human health, biodiversity, and aquatic ecosystem integrity (Bouwman et al. 2013; Preston et al. 2011; Weldon and Hornbuckle 2006).

These environmental impacts jeopardize the ability to produce adequate amounts of food for a growing population. In particular, the uneven effects of climate change may exacerbate global inequalities in food production (Parry, Rosenweig, Iglesias, Livermore, & Fischer, 2004); Africa and Asia are among the places that may be especially vulnerable. As explained by Erlich and Erlich (2013), "The threat from climate disruption to food production alone means that humanity's entire system for mobilizing energy needs to be rapidly transformed" (p. 3).

Unfortunately, the United States far outpaces most other countries with regard to per capita meat consumption (Daniel, Cross, Koebnick, & Sinha, 2011). Over half of the meat eaten by the country is red meat (Daniel et al., 2011), which is uniquely inefficient to produce (Bouwman et al. 2013). To make matters more even challenging, the global population is expected to swell to nine billion by 2050 (FAO, 2009), and the worldwide demand for meat is projected to skyrocket as well (FAO, 2006). Thus, U.S. meat consumption needs to be curtailed in order to mitigate the aforementioned environmental effects and enhance the prospect of long-term food security.

Research indicates that this curtailment is possible and effective. Shifting to a vegan or vegetarian diet can both reduce the emission of GHGs and be nutritionally adequate (Heller and Keolian 2014). Healthy, sustainable diets can even include meat, albeit at lessened levels of consumption (MacDiarmid et al 2012). The consumption of red meats such as beef and pork should especially be limited, due to their heightened burdens relative to other animal proteins (de Vries and de Boer, 2010). Finally, a recent study in Europe found that diminished animal-sourced food consumption would not only benefit the environment; it would also decrease mortality from cardiovascular disease (Westhoek et al. 2014). In sum, to ensure future food security, promote health, and safeguard the environment, consumers should reduce consumption of animal-based foods and increase consumption of plant-based foods.

Recommendation: The Dietary Guidelines should recommend reduced consumption of animal-sourced foods.

III. *Sustainability should be included in the Dietary Guidelines for Americans because of the strong link between plant-based diets and both health and environmental benefits.*

The Dietary Guidelines for Americans is meant to provide nutritional guidance for health professionals and provide a basis for food-related public health policy and programs. It reaches the population and the individual through federal nutrition programs such as SNAP, WIC, the National School Lunch Program, and also in the form of MyPlate. Yet dietary adherence to nutritional guides is generally low in the US population, with overconsumption of protein and below recommended intake of fruits and vegetables, which has established health implications (Haack & Byker, 2014). There is also concern that trends towards a western-style dietary pattern by a larger proportion of the international community will exacerbate what are already considered to be unsustainable levels of meat, seafood, and dairy consumption. There is therefore an urgent need to identify and emphasize those foods that are nutrient dense while less environmentally burdensome (Reynolds et al., 2014).

The dietary pattern of Americans has shifted and fractured since the early establishment of the DGA due in part to the increased availability of highly processed, energy dense foods that are low in nutrients (Johnston, Fanzo, & Cogill, 2014). This has contributed to the current paradox where 35% of US adults are obese (Haack & Byker, 2014) yet, simultaneously, an estimated 14.3% suffer from food insecurity, hunger and/or micronutrient deficiencies (Coleman-Jensen, Gregory, & Singh, 2014). It is imperative that the U.S. balances the need to supply an adequate amount of health-promoting food for the population while preserving agricultural resources to ensure that food production can continue into the future.

The DGAs are poised to influence the choices of Americans when it comes to improving dietary patterns. An overarching theme provided by the DGAC Scientific Report states:

> *The overall body of evidence examined by the 2015 DGAC identifies that a healthy dietary pattern is higher in vegetables, fruits, whole grains, low- or non-fat dairy, seafood, legumes, and nuts; moderate in alcohol (among adults); lower in red and processed meats[iii]; and low in sugar-sweetened foods and drinks and refined grains. (Chapter 2, Lines 43-47)*

Besides the apparent health benefits of a diet based more heavily in plant-based foods, this dietary pattern is linked, as found to be evident by the DGAC, to lower levels of environmental impact (i.e. greenhouse gas emissions, land use, water use, and energy use) when compared to the typical American diet in which animal-based foods are central. The inclusion of more sustainable, plant-focused diets as a component in the

DGA could then serve a dual purpose of simultaneously encouraging healthier eating practices and supporting the longevity of the agriculture sector.

Recently, there has been an abundance of information in the media that makes the connection between diet and sustainability—but the information is unregulated and highly inconsistent. This is also a time where consumers are increasingly concerned about the source, quality, and ethicality of their food, as made evident by falling sales of fast food companies and changing business practices. The DGA has an inherent responsibility to provide guidance on how to optimize nutrition within environmentally sustainable constraints, and 2015 is the optimum time for the DGAs to lead the public conversation.

Therefore, we support the DGAC's commitment to raising the issue of sustainable food systems and encourage additional consideration of how best to align dietary quality with environmental sustainability.

Recommendation: The USDA and HHS should include sustainability in the 2015 Dietary Guidelines for Americans since the recommendation to shift to a more plant-based diet for health reasons is in line with the same recommendation for sustainability reasons. Furthermore, guidance should consider using an environmental message as well as a health message in advising consumers to make dietary choices.

IV. *Dietary guidance for seafood should use a risk-based approach such as food safety. Specifically, data used for these conclusions should be as specific as possible to the fish commonly consumed in the US.*

While the committee is tasked with recommending a diet of adequate nutrients, it must also balance those recommendations with any and all other (chemical, biological, or physical) risks associated with consumption of those foods. The committee has considered specifically safety of two components in this report—caffeine and aspartame; however, despite being within the sustainability section, the Committee, provided a recommendation for seafood that attempts to directly balance chemical risks and nutrient benefits:

> *"Regarding contaminants, for the majority of wild caught and farmed species, neither the risks of mercury nor organic pollutants outweigh the health benefits of seafood consumption." (Chapter 5, Lines 282-3)*

While we are not interested in questioning or further discussing the Committee's conclusion on this point, it should be noted that these conclusions were not based on a US-specific exposure assessment. In the future, USDA and HHS should incorporate frameworks to assess seafood for food-safety with risk-based science. This will be of greater importance as primary sources of atmospheric mercury (i.e., gold mining and

coal combustion) continue to impact to some degree the amount of mercury present in both farmed and wild caught fish. Furthermore, the primary anthropogenic sources of mercury are also a major driver of climate change (EPA, 2014), the impacts of which may increase the prevalence of both chemical and microbiological risks in the food supply. I refer the committee to the evidence considered by the DRAFT *Climate and Health Assessment* just released by the U.S. Global Change Research program and presented as key finding 2 from Chapter 6 of the Draft Climate and Health Assessment:

> *"Elevated sea surface temperatures and increases in certain weather extremes associated with climate change will increase human exposure to water contaminants in food [Likely, Medium Confidence]. Climate change will also alter the incidence and distribution of pests, parasites, and microbes [Very Likely, High Confidence], which will lead to increases in the use of pesticides for crop protection, animal agriculture, and aquaculture. Increased use of pesticides may result in increased human exposure to chemical contaminants in the food chain [High Confidence]." (USGRCP, 2015)*

Even without climate change, the increasing complexity of our global food system requires an evaluation of the tradeoffs between exposures to environmental pollutants and consumption of key nutrients and will increasingly be expected of the committee. Both our food supply, and the environment we use to cultivate it, is changing, as is the way that Americans consume and interact with their food. The primary challenge for future Dietary Guidelines Advisory committees will be to remain relevant for the average, overworked and out of shape, overweight and undernourished American, while balancing nutrient needs, food safety risks, and consumer preferences within an increasingly complex and evolving food supply. A broadening of the expertise (to include risk assessors, toxicologists, and behavioral scientists etc.) present on and available to future Dietary Guidelines committees may be necessary and should be considered in order to adequately assess seafood recommendations through food safety frameworks.

Furthermore, the data used for future assessments should be as specific to US consumers as possible, in order to give guidance that is tangible and relevant for Americans. Shrimp, salmon, canned tuna, tilapia, and pollock are the most commonly consumed fish in the United States according to the National Marine Fisheries Service, and therefore recommendations about sustainability, health benefits, and contaminants should focus around these species and other commonly consumed species rather than general groupings such as wild-caught or farmed-raised. Interestingly, DGAC did not differentiate plants and land-animals by production techniques (e.g., pastured versus grain-fed beef); and, it is unclear why the committee felt this was appropriate for seafood.

Recommendation: DGAC recommendations for farmed, rather than wild, fish should not be included in the Dietary Guidelines for Americans, 2015. Additionally, USDA and

HHS should wait until the EPA and FDA release their new guidance on seafood safety before modifying the Dietary Guidelines.

V. *For both moral and practical reasons, the Dietary Guidelines for Americans, 2015 should encourage consumers to, as much as possible, purchase foods that were produced, processed, distributed, prepared, and sold under fair working conditions.*

Worker abuses can occur in myriad industries spanning the entire food supply chain. On the production side, agricultural workers face greater occupational health risks compared to most other sectors. In 2013, there were between 5.5 and 6.2 non-fatal injuries and illnesses per 100 full-time employees involved in terrestrial crop and animal production (Bureau of Labor Statistics [BLS], 2014a); these rates compare to just 3.3 injuries and illnesses per 100 employees across all sectors. Crop workers and their families may be exposed to carcinogenic pesticides (Alavanja et al., 2004; Arcury et al., 2005). Foreign-born, undocumented farm workers—who comprise over half of crop workers (Kandel, 2008)—are especially vulnerable to dangerous working conditions, due to limited access to social services, fear of engaging law enforcement, and lack of political influence (Holmes, 2007; Stuesse, 2010).

Likewise, aquacultural workers, both in the U.S. and abroad, are at risk of labor and human rights abuses. For example, the US imports significant amounts of shrimp from countries with documented exploitative practices, like debt bondage and trafficking of migrant workers (Accenture, 2013). Moreover, aquacultural workers experience relatively high injury, illness, and fatality rates (BLS, 2014a, 2014b). Drowning, electrocution, and falls are some of the potentially tragic outcomes for aquacultural workers (Myers, 2010).

Lastly, food service workers—a broad category that accounts for over 12 million people—are among the lowest paid workers in the United States (BLS, 2015). In 2014, fast food cooks were paid only $9.15 per hour, on average. Further, food service workers often face uneven work schedules, a lack of health insurance, uncertain income, improper training, unpaid sick days, and limited breaks (Food Chain Workers Alliance, 2012). All of these factors combine to create conditions that are not only unjust to the workers; consumers may be directly affected via the transmission of food-borne illnesses (Greig, Todd, Bartleson, & Michaels, 2007).

These are just a few examples of the poor working conditions that characterize much of the food system. Undoubtedly, improvements to these conditions will require changes at multiple levels (e.g., policy). The onus is not entirely on consumers. Still, consumers should seek to support companies that treat their workers fairly. Mobile apps (e.g., ROC

National Diners' Guide) and food labels (e.g., Food Justice Certified) are among the tools that can assist consumers with this effort.

Recommendation: The USDA and HHS should take an active role in the Dietary Guidelines for Americans, 2015 to encourage consumers to purchase food that stems from fair labor conditions throughout the food supply chain.

References

Accenture. (2013). *Exploitative labor practices in the global shrimp industry.* Retrieved from https://www.motherjones.com/files/accenture_shrimp_report.pdf

Alavanja, M.C.R., Dosemeci, M., Samanic, C., Lubin, J., Lynch, C.F., Knott, C., Coble, J. (2004). Pesticides and lung cancer risk in the agricultural health study cohort. *American Journal of Epidemiology, 160*(9), 876-885.

Arcury, T.A., Quandt, S.A., Rao, P., Doran, A.M., Snively, B.M., Barr, D.B., . . . Davis, S.W. (2005). Organophosphate pesticide exposure in farmworker family members in western North Carolina and Virginia: Case comparisons. *Human Organization, 64*(1), 40-51.

Bouwman, L., K.K. Goldewijk, K.W.V.D. Hoek, A.H.W. Beusen, D.P.V. Vuuren, J. Willems, M.C. Rufino, and E. Stehfest. 2013. Exploring global changes in nitrogen and phosphorus cycles in agriculture induced by livestock production over the 1900–2050 period. PNAS 110(52): 20882–20887.

Brazil Ministry of Health. (2014). *Dietary Guidelines for Brazil's Population.* Retrieved Sunday, April 19, 2015 from http://189.28.128.100/dab/docs/portaldab/publicacoes/guia_alimentar_populacao_ingles.pdf

Bureau of Labor Statistics. (2014a). *Employer-related workplace injuries and illness—2013*. Retrieved from http://www.bls.gov/news.release/archives/osh_12042014.pdf

Bureau of Labor Statistics. (2014b). *National Census of Fatal Occupational Injuries (preliminary results)*. Retrieved from http://www.bls.gov/news.release/archives/cfoi_09112014.pdf

Bureau of Labor Statistics. (2015). *Occupational employment and wages news release*. Retrieved from http://www.bls.gov/news.release/ocwage.htm

Coleman-Jensen A, Gregory C, Singh A. USDA ERS, Household Food Security in the United States in 2013 [Internet]. 2014 Sep [cited 2015 May 4]. Available from: http://www.ers.usda.gov/publications/err-economic-research-report/err173.aspx

Daniel, C. R., Cross, A. J., Koebnick, C., & Sinha, R. (2011). Trends in meat consumption in the USA. *Public Health Nutrition, 14*(04), 575-583.

De Vries, M., and I.J.M. de Boer. 2010. Comparing environmental impacts for livestock products: A review of life cycle assessments. Livestock Science 128(1–3): 1–11.

Ehrlich, P.R., and A.H. Ehrlich. 2013. Can a collapse of global civilization be avoided? Proceedings of the Royal Society of London B: Biological Sciences 280(1754): 20122845. http://rspb.royalsocietypublishing.org/content/280/1754/20122845

Feenstra, G. W. (1997). Local food systems and sustainable communities. American Journal of Alternative Agriculture, 12(01), 28. doi:10.1017/S0889189300007165

Food and Agriculture Organization. (2003). *World agriculture: Towards 2015/2030*. Retrieved from ftp://ftp.fao.org/docrep/fao/005/y4252e/y4252e.pdf

Food and Agriculture Organization. (2006). *Livestock's long shadow: Environmental issues and options*. Retrieved from ftp://ftp.fao.org/docrep/fao/010/a0701e/a0701e.pdf

Food Chain Workers Alliance. (2012). *The hands that feed us: Challenges and opportunities for workers along the food chain*. Retrieved from http://foodchainworkers.org/wp-content/uploads/2012/06/Hands-That-Feed-Us-Report.pdf

Gerber, P.J., Steinfeld, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., Falcucci, A. & Tempio, G. 2013. *Tackling climate change through livestock – A global assessment of emissions and mitigation opportunities.* Food and Agriculture Organization of the United Nations (FAO), Rome.

Greig, J. D., Todd, E. C. D., Bartleson, C. A., & Michaels, B. S. (2007). Outbreaks where food workers have been implicated in the spread of foodborne disease. Part 1. Description of the problem, methods, and agents involved. *Journal of Food Protection, 70*(7), 1752-1761.

Haack SA, Byker CJ. Recent population adherence to and knowledge of United States federal nutrition guides, 1992-2013: a systematic review. Nutr Rev. 2014 Oct;72(10):613–26.

Heller, M. C., & Keoleian, G. A. (2014). Greenhouse Gas Emission Estimates of U.S. Dietary Choices and Food Loss. *Journal of Industrial Ecology*, n/a–n/a. http://doi.org/10.1111/jiec.12174

Holmes, S.M. (2007). "Oaxacans like to work bent over": The naturalization of social suffering among berry farm workers. *International Migration, 45*(3), 39-68.

Institute of Medicine. (2015). A Framework for Assessing Effects of the Food System. Retrived from https://www.iom.edu/Reports/2015/Food-System.aspx

Johnston JL, Fanzo JC, Cogill B. Understanding Sustainable Diets: A Descriptive Analysis of the Determinants and Processes That Influence Diets and Their Impact on Health, Food Security, and Environmental Sustainability. Adv Nutr Int Rev J. 2014 Jul 1;5(4):418–29.

Kandel, W. (2008). *Profile of hired farmworkers, a 2008 update*. Retrieved from http://www.ers.usda.gov/media/205619/err60_1_.pdf

Macdiarmid, J. I., Kyle, J., Horgan, G. W., Loe, J., Fyfe, C., Johnstone, A., & McNeill, G. (2012). Sustainable diets for the future: can we contribute to reducing greenhouse gas emissions by eating a healthy diet? *The American Journal of Clinical Nutrition*, *96*, 632–639.

Myers, M. L. (2010). Review of occupational hazards associated with aquaculture. *Journal of Agromedicine, 15*(4), 412-426.

Parry, M. L., Rosenzweig, C., Iglesias, A., Livermore, M., & Fischer, G. (2004). Effects of climate change on global food production under SRES emissions and socio-economic scenarios. *Global Environmental Change, 14*(1), 53-67.

Preston, S.D., R.B. Alexander, G.E. Schwarz, and C.G. Crawford. 2011. Factors Affecting Stream Nutrient Loads: A Synthesis of Regional SPARROW Model Results for the Continental United States. JAWRA Journal of the American Water Resources Association 47(5): 891–915.

Reynolds CJ, Buckley JD, Weinstein P, Boland J. Are the Dietary Guidelines for Meat, Fat, Fruit and Vegetable Consumption Appropriate for Environmental Sustainability? A Review of the Literature. Nutrients. 2014 Jun 12;6(6):2251–65.

Stuesse, A. C. (2010). What's "justice and dignity" got to do with it?: Migrant vulnerability, corporate complicity, and the state. *Human Organization, 69*, 19-30.

Weldon, M.B., and K.C. Hornbuckle. 2006. Concentrated Animal Feeding Operations, Row Crops and their Relationship to Nitrate in Eastern Iowa Rivers. Environ Sci Technol 40(10): 3168–3173.

Westhoek, H., Lesschen, J. P., Rood, T., Wagner, S., De Marco, A., Murphy-Bokern, D., … Oenema, O. (2014). Food choices, health and environment: Effects of cutting Europe's meat and dairy intake. *Global Environmental Change*, *26*, 196–205. http://doi.org/10.1016/j.gloenvcha.2014.02.004

US EPA. (2014). "Mercury Emissions: The Global Context." Retrieved Sunday, April 19, 2015 from http://www2.epa.gov/international-cooperation/mercury-emissions-global-context#worldwide.

US Global Change Research Program. (2015). *Climate and Health Assessment*. Retrieved Sunday, April 19, 2015 from http://www.globalchange.gov/health-assessment.