Title: Foods Distributed During Federal Disaster Relief Response In Puerto Rico Did Not Fully Meet Federal Nutrition Recommendations

Running Title: Federal Emergency Foods after Hurricane María

RESEARCH SNAPSHOT (n=100)

Research Question: Did federal emergency foods intended for household distribution after Hurricane María meet the Dietary Guidelines for Americans?

Key Findings: This rapid assessment conducted in a rural municipality of Puerto Rico in the aftermath of Hurricane María (November 2017) found that 41% of emergency foods were snacks and sweets, while fruits, vegetables, proteins, and grains comprised 13%, 4% 13%, and 7%, respectively. Almost half of all foods (46%) were high in sodium, saturated fats or added sugars, which made it challenging for registered dietitians to design meal plans that did not exceeded the upper limit recommendations for those nutrients.

ABSTRACT

Background: Emergency foods distributed during federal disaster relief response must follow the federal Dietary Guidelines for Americans (DGA) according to the 1990 National Nutrition Monitoring Related Research Act. Nutrition information of emergency foods for household distribution is scarce.

Methods: Using structured observation protocols, foods received daily at a federal distribution center in Puerto Rico after Hurricane María (November 10-25, 2017) were grouped into DGA ChooseMyPlate food groups. Data about their sodium, saturated fat, added sugars and fiber content per serving were captured. Registered dietitians (RDs) designed meal plans with the foods distributed.

Results: Of 107 unique food items, 41% were snacks and sweets; fruits, vegetables, proteins, and grains comprised 13%, 4% 13%, and 7%, respectively. Fifty-eight percent of all foods were low in fiber (≤1 g); 46% had high content of sodium, saturated fats or added sugars (≥20% Daily Value). The RDs were able to design meal plans that complied with the DGA food group recommendations, but they exceeded upper daily limits for sodium, saturated fat or added sugars.

Conclusions: In view of projected increases in natural disasters and diet-related chronic diseases, DGA compliance must be improved so that federal emergency foods can support the health of survivors.

Key words: Hurricane María, Dietary Guidelines for Americans, Puerto Rico, emergency response, humanitarian assistance

INTRODUCTION

In September of 2017, the Caribbean was devastated by two powerful hurricanes. In Puerto Rico approximately 3,000 deaths were attributed to hurricane María.[1-3] The population was already highly vulnerable to poverty, food insecurity, and exhibited high rates of obesity, diabetes, and hypertension.[4, 5] Puerto Rico experienced a near destruction of local food production, the collapse of the power grid, and decimated potable water systems, with repercussions that lasted for months.[6-10] The disruption in the power grid limited access to Family's Electronic Benefit Transfer (EBT) or to cash via automated teller machines (ATM), which further limited ability to purchase foods.[8, 11] The storm also disrupted the supply chain of imported foods, on which the Caribbean depends heavily.[8, 10]

Three days before Hurricane María's landfall in Puerto Rico, the White House issued a Presidential Disaster Declaration that activated the U.S. National Response Framework.[12] This framework is designed to ensure a single, comprehensive approach to disaster response. It designates the Federal Emergency Management Agency (FEMA) as the lead federal agency in relief and recovery and the US Department of Agriculture (USDA) as responsible for coordinating with state and territorial officials, Federal and non-Governmental and private volunteer organizations to "determine the nutrition needs of the population in the affected areas".[13] The USDA may facilitate congregate feeding, activate the Disaster Supplemental Nutrition Assistance Program (D-SNAP) and/or distribute boxes of foods to households.[14]

Any foods provided by federal programs must comply with the Dietary Guidelines for Americans (DGA), according to the 1990 National Nutrition Monitoring Related Research Act (NNMRRA).[15] The DGA are meant to help US citizens make healthier food choices.[16] During disasters, personnel from the USDA's Food and Nutrition Service (FNS) and Center for Nutrition Policy and Promotion (CNPP) are responsible for aligning food choices with the DGAs.[17] The use of donated foods is also subject to USDA FNS approval.[18]

Relief efforts were criticized for distributing foods of poor nutritional quality in Puerto Rico in the aftermath of Hurricane María.[19-23] However, data about how emergency foods intended for household distribution meet the DGAs is extremely limited (in this and other disasters) because of the fast-paced

nature of the response and because foods come from varied contracts and donation sources.[18] Filling this data gap can improve the effectiveness of humanitarian actions in responding to the nutritional needs of communities coping with disasters.

This study undertook a rapid assessment of the nutritional qualities of emergency foods distributed to households after Hurricane María in Puerto Rico to evaluate how these foods met the DGAs recommendations about food groups, fiber sodium, saturated fats and added sugars.

METHODS

A case-study approach was used to conduct this rapid assessment. This approach is most appropriate for: (a) studies that ask 'how' questions (i.e. *how did the foods meet the DGA recommendations?)*; (b) where the investigator has little control over events; and (c) where the focus of the study is on a contemporary phenomenon within a real-life context.[24]

Study Setting: FEMA set up a distribution chain, described elsewhere,[8, 9, 25, 26] that was fully operational nearly one month after Hurricane María made landfall and continued until May 2018.[8] The research team conducted structured observations in two sites: (a) the federal distribution center in the San Juan metropolitan area (herein referred to as the urban site), which received foods and beverages from outside of Puerto Rico and distributed these to 11-14 rural municipalities, and (b) the distribution center of a rural municipality (herein referred to as the rural site) which received these items from the urban site. The rural site was Barranquitas, a low-income municipality located in the mountainous area of Puerto Rico's main island.[27] The rural site sustained significant infrastructure damage during the hurricane and was purposefully selected to represent the experience that low-income, rural municipalities may have faced in the aftermath of Hurricane Maria.[28, 29]

Observation Protocol: Co-authors (AR and UCR) designed an observation protocol to document the types of foods that were available for household distribution in the study sites. The protocol was available in paper and electronically via a mobile application.[30] However, it was not possible to exclusively use the mobile data-capture application due to persistent power outages. The protocol was designed to capture date and time of observation, quantity of boxes, pallets, and individual items per box;

92 the number of boxes/pallets distributed to families, and the types of foods included in the boxes (e.g.
93 quantities and types of dairy, canned vegetables, canned protein, canned fruits, starches, beverages, and
94 desserts) following established guidance [31]. Pictures were also taken of pallets, boxes, and content of
95 boxes. The protocol included a space for RA to add open-ended notes. The study protocol was reviewed
96 by the institutional review board of George Washington University, which determined that it did not meet
97 the definition of human subjects' research.

98 The data collection team (UCR and six research assistants (RA)) were from Puerto Rico and
99 familiar with the rural site. RAs underwent an 8-hour training on how to conduct the structured
100 observations.

101 ***Data collection and analysis in urban site:*** Observations in the urban site occurred between November
102 10-24, 2017. The research team met twice daily to discuss and resolve challenges to data collection as
103 they arose, in line with recommendations for case-study methodology. [32] An initial challenge faced was
104 that the team was not allowed to open pallets or boxes in the urban site, and therefore, the team took notes
105 and photographs of the alpha-numeric codes instead. These codes identified each box, the name of the
106 contractor company, and the intended date of delivery to the rural site--information that was then used to
107 verify deliveries in the rural distribution center.

108 Observations of number of pallets and boxes were enumerated across the study period. Any
109 observation notes provided by the RA were entered into the enumerated observations by date.

110 ***Data collection in rural site:*** Observations took place over a 11-day period (November 15- 25), when
111 RAs used the structured observation protocols to note the foods that were arriving at the location, and
112 note the content of opened boxes. RAs systematically photographed: (a) the exterior of the boxes; (b) the
113 contents inside each box (boxes were either a mix of different food items or filled with one food item); (c)
114 the package label with brand and size for individual items; (d) the Nutrition Facts Label; and (e) the list of
115 ingredients. The RAs also noted and photographed the alpha-numeric code that identified the pallets.

116 ***Data analysis in rural site:*** The photos were coded by study site and by topic into one of two: (a) photos
117 of the outside of boxes or pallets displaying alpha-numeric codes or (b) photos of the contents of the box.

The alpha-numeric codes pictured were then verified against those observed in the urban site. Photos of box contents were used to capture the following data of each food item pictured: brand, serving and package sizes, kilocalories (kcals), fiber (grams), sodium (micrograms), saturated fats (grams), and added sugars (g) per serving, if available. These nutrients were selected given the DGA recommendations to increase intake of whole grain/high fiber foods and to limit consumption of sodium, saturated fats, and added sugars to help prevent diet-related chronic diseases.[33]

The first four ingredients listed under the Nutrition Facts Label of each food item were used to identify the food from the list of categories in the Food and Nutrient Database for Dietary Studies codes linked to "What We Eat in America" (WWEIA), a national food survey of foods typically consumed in the US. [31] This information was used to then code each food item into food categories: milk and dairy, animal and plant-based protein, mixed dishes, grains, snacks and sweets, fruit, and vegetables.

The serving size was assessed in one of two ways: a) according to manufacturer's suggested serving size or b) according to the entire package size if products were packaged in discreet units and meant for individual consumption in one sitting (i.e. grab-and-go bags of chips, candy, main entrees).[34] If the nutrient facts panel was not printed on the food packaging, or illegible in the photograph of the food item, nutrient data were collected from the product manufacturer or from nutrient databases.[35-37] If there were discrepancies between these sources of data, the most conservative estimates were used (i.e. higher fiber or lower sodium, saturated fat, added sugars).

Food items, brands, serving size, and nutrients per serving size were enumerated by food categories from WWEIA.[31] Duplicate items (items with same brands and flavor) were eliminated, so that only unique food items were enumerated. Items that contributed 20% or more of the percent daily value (%DV) for sodium, saturated fats, and added sugars per serving (for those items that had the added sugars information available), were deemed to be high on those nutrients. The %DV is calculated based on the Dietary Reference Intakes from an intake of 2,000 calories per day. Fiber content per serving ($\leq$1g fiber per serving) was also noted.

Development of meal plans with emergency foods: To assess if intended beneficiaries would be able to meet the DGA recommendations on a given day with the list of foods and beverages observed, a registered dietitian (RD) from Puerto Rico was instructed to develop daily meal plans (breakfasts, lunch, dinner and snacks). The dietitian was directed to: a) select foods to meet the DGA ChooseMyPlate food group servings (6 oz grains, 2.5 cups vegetables, 2 cups fruits, 3 cups dairy, and 5.5 oz protein); b) prioritize the selection of foods that were whole grain or had the lowest content of sodium, saturated fat and/or added sugars per serving within each food group; c) include a variety of foods that would be typically consumed by the population. The RD was allowed to repeat foods in order to meet the 2000 kcal/day, and instructed to exclude foods that had sugar/corn syrup, chocolate, salt or a fat as the first ingredient (8% of items). All other snacks and sweets were included in the meal plan. This resulted in three different daily 'meal plans' that combined the foods in order to meet the DGA food groups. To check the justification and reliability of these meal plans, a second, senior RD (KR) independently reviewed using data from the USDA's SuperTracker online database[35] to ensure that servings were assigned to the closest 0.25 cup according to single serving size per ChooseMyPlate food groups. If a food item was not listed in this database, then the first listed ingredient was used to identify a food group assignment and serving. If the first ingredient was water, the second was used. Food selections were reviewed to ensure that the lowest sodium/saturated fat/added sugar items were chosen for the meal plans.

RESULTS

Commodities arrived in trucks directly from the ports to the urban sites on three days of the week and were delivered to (or picked up by) rural municipalities during the rest of the week. Foods thus arrived at the rural site on six of the 10 observation days, for a total of 35 pallets. Alpha-numeric codes were captured for boxes and pallets on four of those days (24 food pallets had total content; 12 pallets had missing content information). Once the food pallets arrived in the rural municipality, the research team confirmed their arrival, opened the boxes and photographed their content. Half of the pallets observed (n=12) contained shelf-stable meal modules that included two canned entrées (canned mixed dishes); one breakfast snack (snacks and sweets); one cereal (grain); one bread/crackers (snacks and sweets); one salty

snack (protein); one fruit/nut mix (protein); three fruit cups (fruit); three sweet snacks (snacks and sweets); one breakfast bar (snack and sweet); and one 8 oz. ultra high-temperature pasteurized (UHT) milk (dairy) (**Figures 1-2**).

The team also obtained pictures of other foods that were present in the rural site, but were not observed or documented in the urban one. These were all unlabeled boxes that contained only one type of food (i.e. boxed UHT milk, boxes of cereal, canned beans, canned vegetables, fruits) and came directly from the Department of Family Affairs in Puerto Rico during a one-time delivery at the time of the study. The research team was able to confirm this by contacting the Department of Family Affairs in the study municipality, and confirmed on USDA's website.[15] Given that these boxes provided a variety of vegetables and plant-based proteins that were not observed in the other boxes, these items were included in the nutrition analysis to be fully-representative of the food options intended for households.

Nutrition characteristics of emergency foods

A total of 189 photos of pallets, boxes, and their contents were taken during the period of observation (the full set of pictures available upon request from the corresponding author). For this analysis, 20 photos which showed pallets of bottled water and personal care products were excluded.

After deleting repeated items (same brands and flavors n=43), infant formulas and hydration solutions (n=3) and unidentified brands or flavors (n=11), and condiments (n=2) there were a total of 107 unique food items. **Figure 3** presents the distribution of these foods according to food categories in WWEIA[31]: 41% of these were categorized as snacks and sweets which included grain-based desserts (i.e. cookies, pastries) and dairy desserts (i.e. puddings).[33] Eighteen percent were mixed dishes such as canned pasta dishes or meat-based dinners. Canned fruits and vegetables comprised 13% and 4% of items, respectively. Plant-based and animal proteins were 13%, and grains (cereals, bread and bread products) were 7%. Four percent of foods were categorized as dairy, which included boxed milk (whole and low-fat).

More than half (58%) of the items were low in fiber ($\leq$ 1g per serving); and 46% were high sodium, saturated fats, or added sugars content (i.e. $\geq$20% of the DV for those nutrients per serving),

while the remaining 54% contributed below the 20% DV for all three: sodium, saturated fats and added sugars. Eight percent listed the first ingredient as sugar/corn syrup, chocolate, salt or fat**.**

Meal Plans created in alignment with USDA dietary recommendation

Daily meal plans were designed to meet the DGA food group recommendations (**Tables 1-3**) and contributed adequate amount of fiber (25-38 g) but exceeded the upper limits of sodium, saturated fat or added sugars. For example, Meal Plan 2 was virtually vegetarian (no animal protein), including unsweetened applesauce, fruits packed in 100% fruit juice, reduced sodium dishes and rice without seasoning. It came under the daily upper limits for added sugars and saturated fats, but exceeded upper limits for sodium.

DISCUSSION

Emergency foods distributed during federal relief efforts must follow the DGA according to the 1990 National Nutrition Monitoring Related Research Act.[18] However, this study found that almost half of the foods distributed after Hurricane María by federal relief efforts were high in sodium, saturated fats or added sugars. Our meal plan analyses suggest that even after excluding 8% of the foods which had very low nutritional value and choosing among the items that were lowest in sodium, saturated fats or added sugars, it would be challenging for survivors to meet DGA food groups without exceeding the upper limits for these harmful nutrients. This is particularly troublesome considering that the population for which these foods were intended exhibits high burdens of obesity and diet-related chronic diseases.[4, 5] With the increasing incidence of diet-related non-communicable diseases and frequency of natural disasters, there is an urgent need for emergency foods to better align with the DGA to support the health of survivors. [38]

The implications of this study are two-fold: first, the findings suggest that during emergencies, it is possible to provide pre-packaged and shelf-stable foods that contribute below the 20% DV of sodium saturated fats and added sugars. While almost half of the foods were high in these nutrients, 54% were low in all three (i.e. unsweetened fruit sauces; fruits packed in 100% fruit juice; canned vegetables packed in water without salt, or reduced sodium mixed dishes). Providing a more varied selection of these foods

can afford survivors the opportunity to create meal plans that comply with DGA food groups, contribute adequate fiber, and also do not exceed daily upper limits of sodium, saturated fats and added sugars. For future emergency recover efforts, a vendor certification program similar to the one required from vendors of the National School Lunch Program,[39] could improve the nutritional quality of emergency foods while at the same time complying with the challenges of rapid procurement and distribution from many different agencies and donors.

Second, survivors can meet their nutritional and energy needs without candies, chocolate bars and other foods of very low nutritional value (8% of the unique foods in this study). The provision of these 'empty calories' raises the question of whether FNS should accept nutritionally-poor foods during disaster relief and recovery efforts. Some may claim that receiving these foods may be better than no food at all, because they provide calories and "a sense of normalcy" or "comfort", even if at the cost of nutrition. [40] However, any foods intended for comfort must also follow the federal nutrition guidelines if they are part of a federal program, and must contribute to support the health of survivors.[15, 17] In addition, the meanings of comfort and normalcy should be defined by the recipient population, not the provider population. In Puerto Rico, many survivors felt disrespected when receiving boxes of only or mostly candy and chips during the relief efforts.[20]

The results must be interpreted within its limitations. First, this was a rapid assessment study not designed to answer questions about actual food consumption. Second, the types of foods observed may have varied before and after the period of observation, and should not be extrapolated beyond that period. Third, since added sugar content was not available for all foods, this study likely underestimated the number of products (and quality of meals) high in added sugars. Fourth, our results depict the distribution of unique items and not total quantities of food items, which may include repeated items. Regardless of the total quantities, all of the different types of foods should contribute to support the health of survivors. Fifth, this study is not an evaluation of USDA's multiple strategies to respond to emergencies; it focused only on household food distribution.

CONCLUSIONS

Short-term disaster relief such as food distributions could be expected to last longer in view of the increasing magnitude and frequency of natural disasters due to climate change[41] which are also projected to disproportionately affect already vulnerable populations. The findings emphasize the need to establish strategies that can improve the DGA compliance so that emergency foods intended for distribution to households can support the health of survivors.

REFERENCES

1. Santos-Burgoa C, Sandberg J, Suarez E, et al. Differential and persistent risk of excess mortality from Hurricane Maria in Puerto Rico: a time-series analysis. *Lancet Planet Health.* 2018;2:e478-e488.

2. Santos-Lozada AR, Howard JT. Use of Death Counts From Vital Statistics to Calculate Excess Deaths in Puerto Rico Following Hurricane Maria. *JAMA.*2018;320:1491-1493.

3. Kishore N, Marques D, Mahmud A, et al. Mortality in Puerto Rico after Hurricane Maria. *N Engl J Med.* 2018;379:162-170.

4. Elias-Boneta AR, Toro MJ, Garcia O, Torres R, Palacios C. High prevalence of overweight and obesity among a representative sample of Puerto Rican children. *BMC Public Health.* 2015;15:219.

5. Miranda JJ, Herrera VM, Chirinos JA, et al. Major cardiovascular risk factors in Latin America: a comparison with the United States. The Latin American Consortium of Studies in Obesity (LASO). *PloS One.* 2013;8:e54056.

6. Robles F, Ferre-Sarduni L. Puerto Rico's Agriculture and Farmers Decimated by Maria. *New York Times*. https://www.nytimes.com/2017/09/24/us/puerto-rico-hurricane-maria-agriculture-.html. Published Sept. 24, 2017. Accessed March 5, 2019.

7. U.S. Department of Energy, Infrastructure Security & Energy Restoration. Hurricanes Maria & Irma Event Summary (Report #69). https://energy.gov/sites/prod/files/2017/10/f38/Hurricanes%20Maria%20and%20Irma%20Event%20Summary%20October%2020%2C%202017.pdf. Published October 20, 2017. Accessed March 4, 2019.

8. Palin PJ, Hanson LS, Barton D, Frohwein A. Static on the Relief Channel. *Supply Chain Resilience and the 2017 Hurricane Season.* Arlington, VA: CNA Analysis & Solutions. https://www.cna.org/research/hurricane-supply-chain. Published October 2018. Accessed March 4, 2019.

9. Federal Emergency Management Agency. Hurricane Season FEMA After-Action Report. https://www.fema.gov/media-library-data/1531743865541-d16794d43d3082544435e1471da07880/2017FEMAHurricaneAAR.pdf. Published July 12, 2018. Accessed March 5, 2019.

10. Palin PJ, Hanson LS, Barton D, Frohwein A. Retail Resilience in Puerto Rico. *Supply Chain Resilience and the 2017 Hurricane Season.* Arlington, VA: CNA Analysis & Solutions. https://www.cna.org/cna_files/pdf/IIM-2018-U-018551-Final.pdf. Published October, 2018. Accessed March 4, 2019.

11. Healy J. With Widespread Power Failures, Puerto Rico Is Cash Only. *The New York Times*. https://www.nytimes.com/2017/09/29/us/puerto-rico-shortages-cash.html. Published September 29, 2017. Accessed March 4, 2019.

12. Federal Emergency Management Agency. President Donald J. Trump Signs Emergency Declaration for Puerto Rico HQ-17-125. https://www.fema.gov/news-release/2017/09/18/president-donald-j-trump-signs-emergency-declaration-puerto-rico. Published September 18, 2017. Accessed March 4, 2019.

13. Department of Homeland Security. National Response Framework. Third Edition. https://www.fema.gov/media-library-data/1466014682982-9bcf8245ba4c60c120aa915abe74e15d/National_Response_Framework3rd.pdf. Published June 2016. Accessed March 4, 2019.

14. U.S. Department of Agriculture. Food Assistance for Disaster Relief - Commonwealth of Puerto Rico Disaster Nutrition Assistance. https://www.fns.usda.gov/disaster/commonwealth-puerto-rico-disaster-nutrition-assistance. Published September 20, 2017. Revised September 7, 2018. Accessed March 5, 2019.

15. Congress U.S. National Nutrition Monitoring and Related Research Act of 1990. Public Law. 1990;101:445. https://www.govtrack.us/congress/bills/101/hr1608. Accessed March 5, 2019

16. Department of Health and Human Services. Dietary Guidelines for Americans 2015-2020. https://health.gov/dietaryguidelines/2015/guidelines/. Accessed March 5, 2019.

17. Abernathy T. Responsibilities of the USDA-Food and Nutrition Service in Nutrition Assistance Response to Natural Disasters. *J Nutr Sci Vitaminol (Tokyo)*. 2015;61 Suppl:S14.

18. U.S. Department of Agriculture, Food and Nutrition Service, Food Distribution Division. USDA Foods Program Disaster Manual. Washington, DC: US Government Printing Office. https://fns-prod.azureedge.net/sites/default/files/fdd/disaster-manual.pdf. Revised September 2017. Accessed March 5, 2019.

19. Willoughly M. Puerto Rico Food Aid from GA Contractor Sparks Outrage. *The Atlanta Journal Constitution.* https://www.ajc.com/news/national/puerto-rico-food-aid-from-contractor-sparks-outrage/5JeiNwTZn9bxFW0SLGmtpI/. Published November 13, 2017. Accessed March 5, 2019.

20. Dewey C. Why FEMA sent 'junk food' to Puerto Rican hurricane survivors. *Washington Post.* Washington, DC. 2017. https://www.washingtonpost.com/news/wonk/wp/2017/10/24/why-fema-sent-junk-food-to-puerto-rican-hurricane-survivors/?utm_term=.1810753a1993. Published October 24, 2017. Accessed March 5, 2019.

21. Macias K. FEMA contracts with company to send junk food aid to Hurricane Maria victims in Puerto Rico. *Daily KOS.* 2017. https://www.dailykos.com/stories/2017/11/15/1715817/-FEMA-contracts-with-company-to-send-junk-food-aid-to-Hurricane-Maria-victims-in-Puerto-Rico. Published November 15, 2017. Accessed March 5, 2019.

22. Andres J. *We Fed an Island: The True Story of Rebuilding Puerto Rico, One Meal at a Time*: HarperCollins; 2018.

23. Preocupado alcalde de Cayey por contenido nutricional de comida militar. *TunoticiaPR.com.* http://www.tunoticiapr.com/Gobierno-y-Politica/2015726753-Preocupado-alcalde-de-Cayey-por-contenido-nutricional-de-comida-militar. Published October 18, 2017. Accessed March 5, 2019.

24. Yin RK. *Case Study Research: Design and Methods.* 5th ed: SAGE Publications, Inc; 2013.

25. Federal Emergency Management Agency. Cadena de Distribucion Huracan Maria. 2017. https://www.fema.gov/media-library/assets/images/145365. Published October 5, 2017. Accessed March 5, 2019.

26. Federal Emergency Management Agency. Hurricane Maria Update (Release Number: R2 DR 4339-PR NR 023). https://www.fema.gov/news-release/2017/10/19/4339/hurricane-maria-update. Published October 19, 2017. Accessed March 5, 2019.

27. Department of Health and Human Services, Office of the Secretary. Annual Update of the HHS Poverty Guidelines. FR Doc. 2018–00814. *Federal Register: The Daily Journal of the United States Government*: National Archives and Records Administration. https://www.federalregister.gov/documents/2018/01/18/2018-00814/annual-update-of-the-hhs-poverty-guidelines. Published January 12, 2018. Accessed March 5, 2019.

28. Federal Communications Commission. Communications Status Report for Areas Impacted by Hurricane Maria. https://apps.fcc.gov/edocs_public/attachmatch/DOC-346861A1.pdf. Published September 24, 2017. Accessed March 5, 2019.

29. US Census Bureau, American Fact Finder: Percent of related children under 18 years below poverty level in the past 12 months - by State and for Puerto Rico. 2012-2016 American Community Survey 5-Year Estimates. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_16_5YR_GCT1702.US05PR&prodType=table. Accessed March 5, 2019.

30. Magpi: Advanced mobile data, messaging, and visualization [mobile application]. https://home.magpi.com/. Accessed March 5, 2019.

31. U.S. Department of Agriculture, Agricultural Research Service. What We Eat in America Food Categories 2013-2014. www.ars.usda.gov/nea/bhnrc/fsrg. Accessed March 5, 2019.

32. McQuillan RF, Wong BM. The SQUIRE Guidelines: A Scholarly Approach to Quality Improvement. *J Grad Med Educ*. 2016;8:771-772.

33. Dietary Guidelines Advisory Committee. Scientific report of the 2015 Dietary Guidelines Advisory Committee: advisory report to the Secretary of Health and Human Services and the Secretary of Agriculture. *US Department of Agriculture, Department of Health and Human Services–USA, Washington DC*. https://health.gov/dietaryguidelines/2015-scientific-report/. Last Accessed March 5, 2019.

34. Food and Drug Administration. Food Labeling: Serving Sizes of Foods that Can Reasonably Be Consumed at One Eating Occasion; Dual-Column Labeling; Updating, Modifying, and Establishing Certain Reference Amounts Customarily Consumed; Serving Size for Breath Mints; and Technical Amendments. *FDA-2004-N-0258-0136*2016. https://www.regulations.gov/document?D=FDA-2004-N-0258-0136. Published May 27, 2016. Accessed March 5, 2019.

35. [database] U.S. Department of Agriculture. Supertracker Database. https://www.supertracker.usda.gov/. Accessed May 5, 2018.

36. [database] Fooducate LTD © 2010-2018. https://www.fooducate.com/. Accessed March 5, 2019.

37. [database] Human Performance Resource Center. Combat Rations Database - MRE's 2016. Uniformed Services University, Consortium for Health and Military Performance. https://www.hprc-online.org/page/combat-rations-database-comrad. Accessed March 5, 2019.

38. World Health Organization. Noncommunicable Diseases Progress Monitor 2017. http://www.who.int/nmh/publications/ncd-progress-monitor-2017/en/. Published September 2017. Accessed March 5, 2019.

39. Food and Nutrition Service. Certification of Compliance With Meal Requirements for the National School Lunch Program Under the Healthy, Hunger-Free Kids Act of 2010; Correction. *Federal Register: The Daily Journal of the United States Government*: National Archives and Records Administration. https://www.federalregister.gov/documents/2014/01/16/2014-00624/certification-of-compliance-with-meal-requirements-for-the-national-school-lunch-program-under-the. Published January 16, 2014. Accessed March 5, 2019.

40. Goodhart RS, Jolliffe N. Principles of emergency feeding for a large metropolitan area in catastrophe. *Am J Public Health Nations Health*. 1952;42:373-378.

41. Rosen J. How an ocean climate cycle favored Harvey. *Science*. 2017;357:853-854.