APPLICATION OF GROCERY PURCHASE DATA TO UNDERSTANDING PATTERNS OF SALMONELLA ENTERITIDIS ILLNESSES IN THE UNITED STATES, 2004-2006

by

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ABSTRACT

Introduction: Salmonellosis, caused by infection with *Salmonella species*, is a significant public health problem, both in the disease burden and economic costs. Over 1 million illnesses every year are due to Salmonella infections. *Salmonella enteritidis* accounts for approximately 20% of reported illnesses. It has been estimated that approximately 90% of illnesses are acquired from exposure to contaminated foods in the home. This is a study to determine the association between household-reported grocery purchases and *Salmonella enteritidis*.

Methods: This is a retrospective, ecological, cross-sectional study that analyzed Homescan market as unique geographic areas. Food data comes from Homescan, and illness data comes from National *Salmonella* Surveillance System (NSSS). Food data was standardized and a per-capita annual *Purchase-Weight* was calculated for each Food Category. A risk score for each Homescan market was calculated which identifies the average relative risk of foods reported by households in the Homescan market. A negative binomial model was applied to the Homescan market risk score as the independent variable and the incidence rate of *Salmonella enteritidis* illnesses as the dependent variable with the size of each Homescan market population included as an offset.

Results: From 2004 to 2006 there were 12,589 cases of *Salmonella enteritidis* reported in the United States. The Homescan market incidence rate varied from <1 to 7 cases per 100,000 persons. In the same time period, 21,124 households reported 19,152,019 food observations which were grouped into 1 of 62 Food Categories. The population-weighted risk score varied between Homescan markets from 1.47 (San Diego) to 2.36 (Birmingham). There was no association between rates of salmonellosis and relative high-risk food exposure in Homescan market areas.

Discussion: This is the first attempt to utilize grocery purchases as a proxy for food exposure and sporadic salmonellosis. Differences in relative amounts of high-risk food exposure were found at a population-level, demonstrating variation in food exposure throughout the United States. While there was no association with rates of salmonellosis, this may have been because there was not sufficient heterogeneity between the geographic units due to their size. As a result, a replication of this approach among smaller geographic units should be considered.

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PREFACE

I want to thank the faculty and staff in the Department of Behavioral and Community Health Sciences for their support and encouragement. I especially want to acknowledge Dr. Edmund Ricci, Dr. Ravi Sharma, and Cynthia Salter, whose guidance and feedback I depended on in the most trying of times. And finally, I want to thank my family and friends who were my biggest cheerleaders.

1.0 INTRODUCTION

Bacterial foodborne diseases are a significant economic and public health issue (Frenzen et al., 1999; Scallan et al., 2011; Scharff, 2012). Salmonellosis, illnesses caused by *Salmonella species*, are the most commonly reported foodborne disease with more than an estimated 1 million illnesses each year (Scallan et al., 2011). Most infections are due to contact with contaminated food products because bacteria are naturally occurring in the gut of food-animals, such as poultry, pigs, and cattle. As a result, salmonellosis is a Public Health priority for government, food industry, Public Health advocates, and health educators. However, salmonellosis is recognized as difficult to control due to *Salmonella's* ability to survive under a wide range of conditions and dynamic interactions between foods.

Salmonella enteritidis (*S. enteritidis*) is one of the top 2 reported *Salmonella* serotypes in humans, accounting for 15% to 20% of illnesses (Crim, 2014). Although a certain level of contamination is unavoidable in raw meat, raw poultry, and shell eggs available in the marketplace, there are federal regulations set for contamination levels on foods as well as consumer education efforts. Despite these efforts, in the past 15 years *S. enteritidis* incidence rates have not declined (Crim, 2014) and vary across the United States (Centers for Disease Control and Prevention (CDC), 2013a). The stubborn incidence of salmonellosis throughout the population in the United States reflects the challenge in reducing individual exposure to contaminated foods and suggests that there are population-level differences in exposure to contaminated foods.

A major challenge with developing strategies to reduce salmonellosis is capturing foods and behaviors between individuals and food. No studies of salmonellosis target the home environment even though that is where approximately 90% percent of salmonellosis are believed to occur (Crim, 2014). Furthermore, previous salmonellosis studies focused on the ill individual and their consumption of select foods. This approach makes two assumptions about food exposure and salmonellosis that are known to be incomplete. First, households are composed of

multiple individuals that share a common space and it is not reasonable to expect that all household members have the same knowledge regarding food-related behaviors or know every component of food they consume. As a result, individual-level studies are unable to capture the complete picture of risky behaviors or exposure to high risk foods that lead to *Salmonella* infection and limit the data needed to refine Public Health efforts. In every household there are individuals, called "head-of-household (HOH)," who are responsible for all food-related decisions, such as the type and quantity of foods brought into the home, how food is stored, and how food is prepared. Thus, the HOH has more complete data on direct and indirect at-home exposures affecting all household members. Second, focusing on select foods overlooks the fact that *Salmonella* can withstand a range of environments and contaminate foods and surfaces, known as cross-contamination. Public health studies target shell eggs and raw poultry products because initial epidemiological *S. enteritidis* studies identified shell eggs as a risk factor for human illnesses (Mishu et al., 1994; Mohle-Boetani et al., 1998; Passaro et al., 1996; St Louis et al., 1988). However, cross-contamination likely plays a significant role in spreading *Salmonella* at home since high-risk foods are common and any food that shares the same space with contaminated foods has the potential to be the proximal source of illness. This enables individuals to become infected without direct contact with the originally contaminated food. As a result, the dynamic nature of food interactions in the home implies that there is likely a substantial amount of information from food exposure at the consumer level that is not captured under current methodologies used in salmonellosis studies.

The gap in the literature may explain why the overall rate of *S. enteritidis* illness in the United States has not continued to decrease (Crim, 2014). As a result, a clear understanding of the household relationship with foods is likely critical to developing successful public health strategies and improve study design. The relationship between the amount of high risk foods to low risk foods in the home may help identify if that is a component to the geographical difference between rates of illness. This leads to the question, is the relative amount of risky foods in the home associated with *S. enteritidis* illnesses?

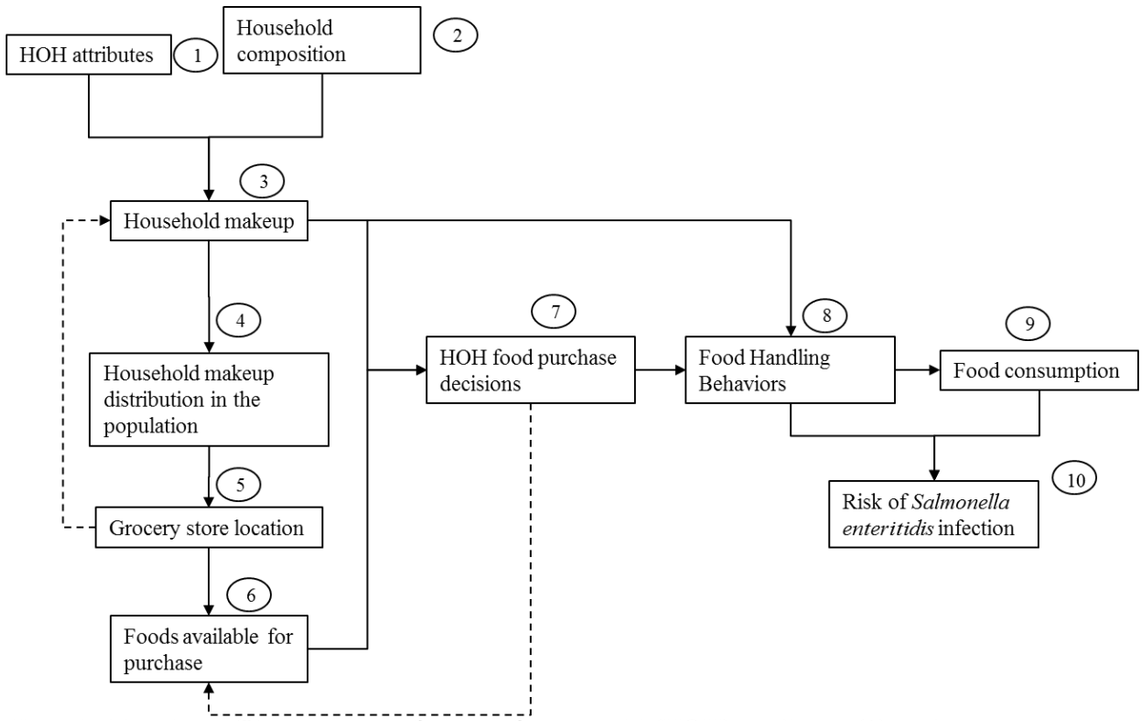
Households with similar HOH and household attributes tend to cluster in geographic areas, as seen in the development of enclaves. Thus, the exposure to foods of different risk levels is likely to be similar within populations in a particular area. This suggests that a study of

exposure to foods between geographic units can provide a foundation to improve study design of foodborne disease studies as well as targeted and specific health education materials.

No study is known to exist that assesses the risk of exposure at the household level. Whether or not a food item is considered risky is based upon host relationship between *Salmonella* and food animal, and effective ways to control pathogen growth. This is important because the choices the HOH makes in regards to both foods and food-related behaviors affect all household members through direct and indirect food exposure since all household members share common food-related spaces (eg., kitchen, pantry). This is in part because there are a large number of foods that could potentially be in a household, and there are multiple reasonable and common approaches to manipulate food at-home over similar time frames (eg., preparation of shell eggs includes fried, boiled, scrambled, poached, over easy for direct consumption or used as a binder in baking efforts). Data that contains the state and amount of every food item as it enters the home may be used to determine the relative amount of risk the household members are exposed to when comparing the amount of high risk to low risk foods.

Most food in the home is obtained from purchases made at a stand-alone retail store, known as grocery purchases. Grocery purchase data has never been used in in a study of salmonellosis, but a dataset that contains detailed information on all groceries purchased by a household may be the easiest attainable complete source of food information available. The amount of each food purchased is the maximum amount of food that is exposed to each household member. Therefore, household-level grocery purchase data that contains the quantity of each food and detailed information on how food is processed and sold at retail, can be used to identify the risk of household members. (**Figure 1**)

This is the first foodborne disease study to use grocery purchase data to identify if there is an association between foods in the home and rates of *S. enteritidis* illnesses between unique geographic areas throughout the United States. Findings may provide key insights into foods that are commonly available together in a household which can imply potential sources of improper or unsafe food handling behaviors that may be more prevalent in certain populations. The results can provide a deeper understanding of sporadic illnesses which can inform and help to develop targeted and specific Public Health efforts that reduce salmonellosis in the population.



Household makeup (3), composed of Head-of-household (HOH) attributes (1) such as race, age, and gender and Household composition (2) such as household size, age of household members, and socio-economic status, summarize preferences for food that fit lifestyle, experience, and enjoyment for all members in a household. The distribution of the characteristics that make up Household makeup (3) in a geographic area create a population profile of variables that are part of Household makeup (4). The population distribution of variables that are part of Household makeup (4) are used by retailers to determine the presence of a grocery store (5). There are different types of grocery stores (eg., full service, specialty, convenience) and each sells a different variety and quantity of food items which determine what foods are available for households in the geographic area (6). The Household makeup (3) and foods available for purchase (6) contribute to the HOH food purchase decisions (7). The purchased foods (7) that are brought into the home and variables that are part of Household makeup (3) determine household Food Handling Behaviors (FHBs) (8) which result in the foods that are consumed (9). The food purchase decisions (7) make up the foods in the home which determine the risk score, which is the ratio of the quantity of high risk foods to low risk foods. Individual exposure to contaminated food products that lead to risk of S. enteritidis infection (10) occurs through FHBs (8) or food consumption (9). Changes at the population level can influence risk of Salmonella enteritidis infections in households over time, such as shifts in food purchases (7) which alter the foods available for purchase (6) or if changes to the distribution of the household makeup in the population (4) alter the distribution of grocery store types (5) in a geographic area which then affects individual household makeup (3).Dotted lines indicate feedback loops that are included for illustrative purposes and as a reminder that this is a dynamic process over time, even though this study is a static snapshot examining a three-year period.

Figure 1. Conceptual model of socio-demographic characteristics leading to risk of sporadic *Salmonella enteritidis* infection at-home

2.0 REVIEW OF THE LITERATURE

2.1 SALMONELLOSIS

Foodborne diseases are a significant public health issue, because food is necessary for human survival. As a result, everyone is at risk for infection. Salmonellosis is the most commonly reported bacterial foodborne disease. Salmonellosis is caused by infection of *Salmonella*, a gram-negative bacteria. There are over 2,500 documented *Salmonella* serotypes which differentiate structures on the surface of the bacteria. The only serotype that is not associated with food or animals is *Salmonella typhi* (*S. typhi*), which is studied as a separate disease. All other non-typhi salmonellosis are classified as a foodborne disease because it typically occurs as a result of direct contact with an infected animal or contaminated food product since *Salmonella* naturally resides in the intestinal tract of birds, rodents, livestock, and domestic fowl (Rabsch et al., 2002). Thus, food and salmonellosis are inter-related.

Symptoms of non-typhi salmonellosis, including diarrhea, fever, and abdominal cramps, can last up to 14 days and leads to approximately 23,000 hospitalizations and 450 deaths per year (Scallan et al., 2011). Infections have been identified as a risk factor for additional sequela long after the initial illness has been resolved, such as reactive arthritis (Taggart & Bell, 1989) or irritable bowel syndrome (Cremon et al., 2014). Severe outcomes are more likely to occur among the elderly (≥65 years) (P. L. Chen et al., 2012; Cummings, Sorvillo, & Kuo, 2010; Gradel et al., 2008), infants (<12 months) (Cummings et al., 2010; Sirinavin, Jayanetra, & Thakkinstian, 1999), immunocompromised (Ramos et al., 1994), men (Cummings et al., 2010), Asians (Cummings et al., 2010), and Blacks (Cummings et al., 2010) indicating vulnerable subgroups. The population-adjusted incidence rate of non-typhi salmonellosis has ranged from 15 to 16 cases per 100,000 persons each year since 1996[1] which is higher than the Healthy People 2020 goal (11.4 per 100,000 persons) (Franco, Hsu, & Simonne, 2010). However, salmonellosis is considered underreported and the actual number of illnesses is estimated at over 1 million persons per year (Scallan et al.,

[1] Data reported by FoodNet and presented on "Table 2b. Incidence* of culture-confirmed bacterial and laboratory-confirmed parasitic infections, and postdiarrheal hemolytic uremic syndrome (HUS) by year and pathogen, Foodborne Diseases Active Surveillance Network (FoodNet), United States, 1996–2014" (http://www.cdc.gov/foodnet/trends/2014/number-of-infections-by-year-1996-2014.html#table2b)

2011). This updates the incidence rate of non-typhi salmonellosis to approximately 356 illnesses per 100,000 persons. Salmonellosis also poses an economic burden with over an estimated $4 billion US annually in direct and indirect costs (Frenzen et al., 1999; Scharff, 2012).

The majority of non-typhi salmonellosis cases are likely due to food that went through the food supply. The United States food system is mostly centralized, and the pathway to consumer exposure is known as the farm-to-fork continuum (**Figure 2**). Salmonellosis is complicated because meat, poultry, and eggs, which are the most likely original source of food contamination, are common food items. According to Economic Research Service within the United States Department of Agriculture (USDA-ERS)[2], approximately 250 shell eggs, more than 50 pounds of edible chicken, and approximately 100 pounds of edible red meat were consumed per person per year since 2000. As a result, it is not realistic to remove food-animals and food-animal products from the food supply.

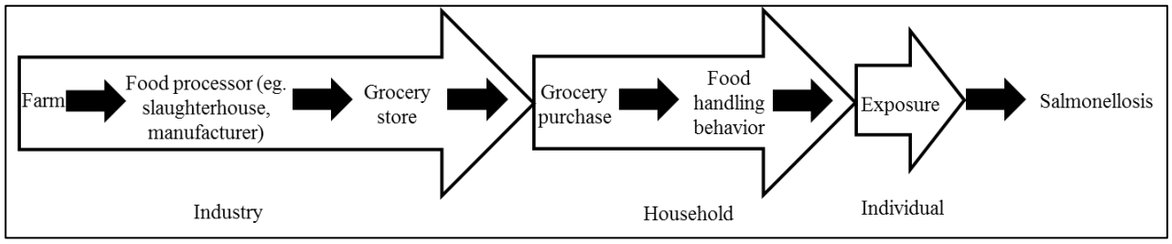


Figure 2. Adaptation of farm-to-fork continuum for food obtained in the home

Multiple groups within the federal government, Food Safety Inspection Service (USDA-FSIS), Center for Food Safety and Applied Nutrition (FDA-CFSAN), and Centers for Disease Control and Prevention (CDC), collaborate with state and local health departments to monitor food-related illnesses as well as work with the food industry to improve food safety in order to reduce human illnesses. Despite concerted efforts, ranging from federal regulations of pathogen load on food products to consumer education, the rate of salmonellosis has remained relatively stable over the past two decades (Crim, 2014). The ongoing challenges in identifying a practical and reasonable approach that would reduce salmonellosis in the population is a priority to organizations concerned with food safety. However, the dynamic and complex disease pathway

[2] Data from the ERS Food Availability (Per Capita) Data System which are national estimates that serve as proxy for consumption (http://www.ers.usda.gov/data-products/food-availability-(per-capita)-data-system/.aspx)

likely contributes to gaps in the literature which limited intervention development and prevented continued declines.

The top 10 *Salmonella* serotypes account for approximately 60% of reported isolates in humans. Epidemiological studies have noted serotype-specific differences in the distribution of population-adjusted incidence rates by socio-demographic characteristics and risk factors (Food Safety and Inspection Service, 2012; Guo et al., 2011; Jones et al., 2008; Whitney et al., 2015). As a result, serotype-specific studies may be the key to developing focused strategies.

2.2 *SALMONELLA ENTERITIDIS* (*S. ENTERITIDIS*)

One of the most commonly reported *Salmonella* serotypes is *Salmonella enteritidis* (*S. enteritidis*) which accounts for approximately 20% of all reported *Salmonella* isolates in humans each year according to the FoodNet, a nationally representative population-based active surveillance program. *S. enteritidis* is a significant public health issue because declines in illnesses that were noted from 1987 to 1998 (Olsen et al., 2001) have not continued. These early declines have been attributed to increased public awareness and government oversight. More recent data has shown that the rate of illness has significantly increased, compared to a 1996 to 1998 baseline (76% increase, confidence interval 45% to 113%) and a 2004 to 2006 baseline (36% increase, confidence interval 17% to 57%) (Crim, 2014), with higher increases seen among children <5 years, elderly ≥60 years, and states classified in the Southern United States (Chai et al., 2012).

Studies of *S. enteritidis* identified individual and social characteristics associated with illnesses. There was a positive association between *S. enteritidis* and high socio-economic status (Simonsen, Frisch, & Ethelberg, 2008), Black race (Arshad et al., 2007), Hispanic ethnicity (Arshad et al., 2007), and children <5 years (Arshad et al., 2007; Banatvala, Cramp, Jones, & Feldman, 1999; Younus, Wilkins, Arshad, Rahbar, & Saeed, 2006). Unmarried adults with no partner, living with children, number of children in a household, and having a foreign-born parent were associated with a lower risk of *S. enteritidis* infection (Simonsen et al., 2008). Origin of parentage was the first characteristic examined in an epidemiological study of salmonellosis that references the importance of underlying household dynamics between household members, since the influence of parental origin impacts household members' behaviors and relationship with food

(Savage, Fisher, & Birch, 2007). Studies of characteristics that were not found to be associated with *S. enteritidis*, including number of years of education (Simonsen et al., 2008), residence in a rural area (Younus et al., 2006), and gender (Younus et al., 2006), may be because these studies were conducted in populations outside the United States or in selected states, and the population may not be sufficiently varied to identify an association with these characteristics.

Surveillance reports indicated that the incidence rate of *S. enteritidis* varied by county (range: 0.01 to >2.2 cases per 100,000 persons) (Centers for Disease Control and Prevention (CDC), 2013b) and state (range: 1.6 to 7 cases per 100,000 persons) (Centers for Disease Control and Prevention (CDC), 2013b) suggesting that there was variation between community-level characteristics associated with *S. enteritidis* across the United States. Additionally, the multi-level characteristics that have been associated with *S. enteritidis* have led to an interest in group level analysis of geographic units as a way to better understand disease rates. A study by Chang et.al. found that county-level estimates of socio-demographic characteristics were associated with the incidence of salmonellosis and also recommended serotype specific studies (Chang, Groseclose, Zaidi, & Braden, 2009). There have been three ecological studies that specifically analyzed *S. enteritidis* and found significant associations between high incidence rates and areas with high socio-economic status (Banatvala et al., 1999; Varga et al., 2013; Whitney et al., 2015), number children in the home (Varga et al., 2013), and high proportion of non-Whites (Varga et al., 2013). Only 1 study was conducted in the United States, among illnesses reported in Connecticut (Whitney et al., 2015). This suggests that there is still research that needs to be done in nationally representative studies of geographic units to uncover community-level characteristics associated with *S. enteritidis*.

Although non-food related exposures, such as international travel (Marcus et al., 2007; Tighe et al., 2012) and contact with birds or reptiles (Aiken, Lane, & Adak, 2010; Marcus et al., 2007) have been associated with *S. enteritidis*, exposure to contaminated food products is considered the source of most infections. In particular, chicken and eggs are considered the primary vehicle for infection (Centers for Disease Control and Prevention (CDC), 2013a; Chai et al., 2012; Food Safety and Inspection Service, 2012; Gu, Vieira, Hoekstra, Griffin, & Cole, 2015; Guo et al., 2011; Hald, Vose, Wegener, & Koupeev, 2004). This is because food-animals are the original host of *S. enteritidis.*

There are two federal agencies, Food Safety and Inspection Service within the United States Department of Agriculture (USDA-FSIS)[3] and Center for Food Safety and Applied Nutrition within the Food and Drug Administration (FDA-CFSAN)[4], tasked with food safety in the United States. Current federal laws do not consider *Salmonella* an adulterant in raw meat, raw poultry, or shell eggs, meaning its presence is accepted and does not disqualify the food products containing it from being available and sold in the marketplace. USDA-FSIS found that less than 2% of the FSIS' adjusted volume-weighted for raw product commodities[5] are positive for *S. enteritidis* (Food Safety and Inspection Service, 2012). As expected, microbiologic tests found that raw products were contaminated with *S. enteritidis* at retail (Centers for Disease Control and Prevention (CDC), 2013b; Melendez et al., 2010; National Antimicrobial Monitoring System, 2011), the first point in the food supply where food is accessible to consumers. This means that contaminated food products are in the food supply and all consumers are at risk for infection.

While USDA-FSIS and FDA-CFSAN can request product recalls from the marketplace, strong epidemiological evidence linking contaminated food products to illness is required. This only occurs as a result of outbreaks, two or more cases of the same illness from a common food source, when there are resources available to launch a full scale investigation. However, <10% of illnesses are estimated to be part of a recognized outbreak (Crim, 2014; Scallan et al., 2011). The majority of non-outbreak cases, known as sporadic cases, are believed to be acquired in the home since that is where over 65% of food interactions occur (Hamrick, Andrews, Guthrie, Hopkins, & McClelland, 2011). Thus, the lack of sustained declines in *S. enteritidis* illnesses suggests that efforts to reduce salmonellosis should focus on food exposures in the home.

2.3 HOME ENVIRONMENT

Homes are designed with central locations for food storage and preparation. Approximately 72% of the population resides in a home with other people.[6] Therefore, an assumption is that all

[3] Regulates meat, poultry, egg products, catfish
[4] Regulates shell eggs, products that do not contain meat and poultry, imports
[5] Broilers, Intact Beef, Ground Beef, Ground Chicken, Ground Turkey, Market Hog, Turkey
[6] Data obtained from US Census estimates on Table HH-4 (https://www.census.gov/hhes/families/data/households.html)

individuals in the household are exposed to all food in the home. However, an analysis of the American Time Use Survey (ATUS)[7] found that 34% of individuals do not prepare their own food and 14% prepare food half the time (Hamrick et al., 2011). As a result, a large proportion of the population are likely to be unaware of their true food exposures.

However, within each home there are designated individuals in each household, head-of-household (HOH), who serve as a gatekeeper for food. The HOH is the primary person responsible for all food-related aspects such as where it is obtained, what is obtained, how it is stored, and how it is prepared. Thus, the HOH has the most comprehensive knowledge regarding all household members' direct and indirect interactions with food. A limitation of previous salmonellosis studies was that they interviewed the ill people only and the study questionnaire was conducted at the point-of-consumption. Food data collection methods in previous studies of salmonellosis are subject to measurement and reporting biases since only the ill[8] person was interviewed and the studies depended upon individual recall. The difference between analyzing a HOH instead of ill cases only was demonstrated during the 2008 *Salmonella Saintpaul* outbreak when the only study that found an association with peppers, which was determined to be the source of contamination, was conducted among HOHs (Barton Behravesh et al., 2011). Thus, the HOH is likely an underutilized resource that may provide unique insight into sporadic salmonellosis that would not be otherwise captured.

However, household-level studies are challenging because of dynamic and complex pathway toward infection. This is primarily because *Salmonella* is able to withstand stressful environments. Only a combination of time and temperature can reduce the amount of *Salmonella* to non-detectable levels (Angelotti, Foter, & Lewis, 1961a; Doyle & Mazzotta, 2000). This is important because *Salmonella* is able to contaminate other foods, also known as cross-contamination. Cross-contamination can occur when contaminated foods come into contact with foods or surfaces that are not properly cleaned (**Figure 3**) (Jensen, Friedrich, Harris, Danyluk, & Schaffner, 2013; Kuda, Shibata, Takahashi, & Kimura, 2015; Pouillot, Hoelzer, Ramirez, deGraft-Hanson, & Dennis, 2014; Roccato et al., 2015; Sreedharan, Schneider, & Danyluk, 2014). Outbreaks of *S. enteritidis* illnesses have been linked to a range of contaminated foods including

[7] Survey sponsored by the Bureau of Labor Statistics and conducted by the U.S. Census Bureau. Sample of nationally representative households

[8] Adult proxy were used for ill persons who were not able to be interviewed

bean sprouts[9], pine nuts[10] , shell eggs[11], frozen raw chicken containing foods[12], and fresh raw ground beef[13]. A study of every identified *S. enteritidis* outbreak in humans from 1998 to 2010 found that all 10 food commodities (eggs, fish, crustaceans, dairy, beef, poultry, poultry, fruits-nuts, leafy vegetables, sprouts, and vine-stalk vegetables) were associated with *S. enteritidis* (Painter et al., 2013). As a result, any food can theoretically be the most proximal vehicle of infection.

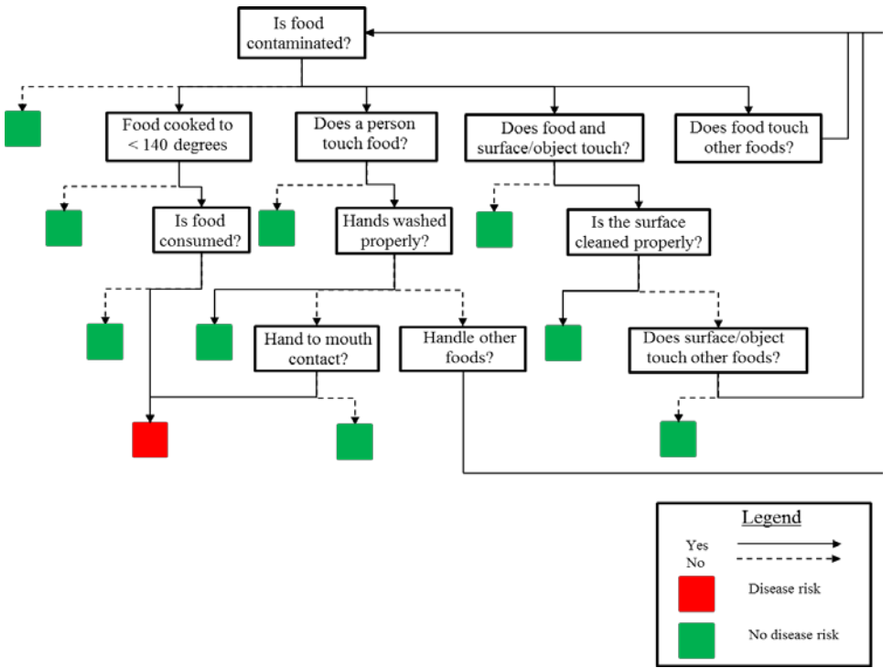


Figure 3. Pathways for cross-contamination in the home

Despite the role of cross-contamination in *Salmonella* infections, a limitation of previous salmonellosis studies is that the study questionnaire focused on select foods which overlooks the dynamic interactions between foods that lead to infection. This is complicated because there are no policies, regulations, or active food safety education in place for the home environment. As a result, there are no social constraints around behaviors in the home. Observational studies of consumers in their own kitchen found that food safety failures were common despite a large proportion of the population knowing proper behaviors (Abbot, Byrd-Bredbenner, Schaffner, Bruhn, & Blalock, 2009; Anderson, Shuster, Hansen, Levy, & Volk, 2004). Additionally, behaviors can change with each food interaction and every individual is exposed to food an

[9] http://www.cdc.gov/*Salmonella*/*enteritidis*-11-14/index.html
[10] http://www.cdc.gov/*Salmonella*/2011/pine-nuts-11-17-2011.html
[11] http://www.cdc.gov/*Salmonella*/2010/shell-eggs-12-2-10.html
[12] http://www.cdc.gov/*Salmonella*/frozen-chicken-entrees-07-15/index.html
[13] http://www.cdc.gov/*Salmonella*/*enteritidis*-07-12/index.html

estimated 4-6 times per day, totaling approximately 3 hours (Hamrick et al., 2011). As a result, the availability of contaminated foods in the home determines the underlying risk of disease, thus potentially leading to human illness (Angelotti, Foter, & Lewis, 1961b; Das, Gurakan, & Bayindirli, 2006; Franco et al., 2010; Thanissery & Smith, 2014). Thus, if there are no contaminated foods in the home, cross-contamination is a moot point.

However, high risk foods are common in the home. In the 2006-2007 FoodNet population survey, 28% of respondents reported consuming any product with raw eggs and 65% of respondents reported consuming any chicken prepared at home (Centers for Disease Control and Prevention (CDC), 2006-2007). Furthermore, the number and amount of foods individuals are exposed to vary between populations; there are multi-level factors that are important in understanding the variety and amount of foods in the home which determine the individual risk to foods in the home. Studies of socio-demographic characteristics associated with Food Consumption or Food Diets in the home were reviewed along with Food Choice because consumption, diet, and choice attempt to describe the spectrum of food exposure. Food Choice, Food Consumption, and Food Diets were found to vary by poverty status (Bove & Olson, 2006; Grimm, Foltz, Blanck, & Scanlon, 2012), social class (Harrington et al., 2011), household income (Ni Mhurchu et al., 2013; Worsley, Blasche, Ball, & Crawford, 2003), household size (Harnack, Story, Martinson, Neumark-Sztainer, & Stang, 1998), marital status (Eng, Kawachi, Fitzmaurice, & Rimm, 2005; Harrington et al., 2011; Mancino & Newman, 2007), HOH gender (Centers for Disease Control and Prevention (CDC), 2006-2007; Harnack et al., 1998; Otnes, 2001; Song, Simon, & Patel, 2014; Worsley et al., 2003), race (Centers for Disease Control and Prevention (CDC), 2006-2007; Song et al., 2014), HOH age (Centers for Disease Control and Prevention (CDC), 2006-2007; Drewnowski & Shultz, 2001; Harnack et al., 1998; Worsley et al., 2003), HOH education level (Harrington et al., 2011; Ricciuto, Tarasuk, & Yatchew, 2006; Turrell & Kavanagh, 2006), HOH employment level (Bove & Olson, 2006), age of household members (Ricciuto et al., 2006), alcohol consumption and smoking status (Harrington et al., 2011), and geography (Centers for Disease Control and Prevention (CDC), 2006-2007). While there is an expectation that the presence of children will influence food choice, a study that looked at diet behavior in new parents did not find any association (Laroche, Wallace, Snetselaar, Hillis, & Steffen) which may be due to the age of the children in the study. As a result, information on the state of the food item as well as the amount is necessary to determine risk between populations. A

ratio between the amount of high risk to low risk foods individuals are exposed to can account for both food diversity and differential amounts of food between individuals.

2.4 GROCERY PURCHASES

Grocery data is a potentially valuable source of food data because it is the primary source of food in the home. Approximately 75% of food that was reported consumed in the United States in the 2005-2006 survey cycle of the National Health and Nutrition Examination Survey (NHANES) was from food obtained from a grocery store, mail-order purchase, or caught or grown by someone the consumer knows (Todd, 2014). Of the three food sources, it is likely that the majority of food is obtained from grocery stores. Foods from grocery stores are purchased as raw ready-to-eat (eg., apple), raw not ready-to-eat (eg., fresh meat), processed not ready to eat (eg., frozen pizza), or processed ready-to-eat (eg., potato chips). Detailed grocery data provides the quantity and description of each food item necessary to determine risk of food contamination from food brought into the home. For example, the risk of already cooked chicken is different from the risk of raw chicken. As a result, grocery data provides detailed data on foods in the home that are not available from self-report methods and are not as affected by recall issues that impact point-of-consumption studies if they are reported as the food enters the home.

2.5 ECOLOGICAL ANALYSIS

Ecological analysis of food exposure and salmonellosis may provide unique insight in the role that both community and individual level factors play in geographic variation of disease rates. Community-level analysis is possible if the population variation within a community is smaller than the variation between communities. Variation between communities exist because communities throughout the United States develop as explained by the social capital theory, which is the collective groupings of individuals based on shared ideas, behaviors, decisions, and characteristics. Studies have found that social capital creates a community structure, which can have an effect on behaviors and health (Aslund, Starrin, & Nilsson, 2010; Bolin, Lindgren,

Lindstrom, & Nystedt, 2003; Morland, Wing, Diez Roux, & Poole, 2002; Treuhaft). This explains the development of geographically homogeneous areas, like an ethnic enclave, that are unevenly distributed throughout the United States.

Although there is variation within communities, at a population level, there is likely more heterogeneity in food exposure between populations. The same multi-level individual, HOH, and household characteristics which inform community development also determine the foods in the home (Byrd-Bredbenner et al., 2007; Fein, Lando, Levy, Teisl, & Noblet, 2011; Meer & Misner, 2000; Patil, Cates, & Morales, 2005; Roseman & Kurzynske, 2006; Shiferaw et al., 2012; Shiferaw et al., 2000; Wardle et al., 2004; Yang et al., 1998). This can be seen in food deserts, geographic areas that contain populations that have less fresh fruits and vegetables per person than populations in non-food deserts due to barriers that are structural, economic, and food preferences (Economic Research Service (ERS), 2009; Rahkovsky & Snyder; Rose & Richards, 2004). Therefore, the amount and variety of grocery purchases should also vary across geographical areas. As a result, the spatial differences in rates of *S. enteritidis* may be due to spatial differences in population exposure to high risk foods.

3.0 PURPOSE OF STUDY

S. enteritidis is one of the most commonly reported serotypes in salmonellosis with increasing annual rates. The diversity of available foods and *Salmonella's* ability to withstand a range of environments has been hypothesized as the source of the difficulty in developing food safety strategies that result in illness declines and explain spatial differences in rates of salmonellosis. While there have been several studies that have explored socio-demographic associations with food or with salmonellosis at the ecological level, there have been no studies that have looked at the association between all foods in the home and salmonellosis. Furthermore, household-reported grocery data is a source of data that represents a universe of potential household food exposures that has not been previously used in foodborne studies.

I attempted to explore whether there is an ecological relationship between at-home food exposure and *Salmonella enteritidis* cases. I determined the individual risk to foods in the home based on the ratio of the amount of high risk to low risk foods. First, I determined population-weighted average risk. Second, I modeled the relationship between *Salmonella enteritidis* and the population-weighted average risk at a spatial level.

The objective of this study is to examine the spatial relationship between exposure to risky foods and *Salmonella enteritidis* cases through the following specific aims:

Specific Aim 1: To identify exposure to risky foods

Hypothesis 1: There are variations in individual, household, and spatial level exposure to risky foods.

Specific Aim 2: To identify socio-demographic distribution differences in the population

Hypothesis 1: There is geographic variation in the distribution of socio-demographic differences in the population

Specific Aim 3: To explore the relationship between risky food exposure and *Salmonella enteritidis.*

Hypothesis 1: The proportion of the population exposed to risky foods is related to the population-adjusted incidence rate of *Salmonella enteritidis*

4.0 METHODS

4.1 SUMMARY OF METHODS

This is a retrospective, ecological, cross-sectional study using data from two non-related data sources that are supplemented with data from an additional two non-related data sources in order to explore the relationship between household food exposure and infections from *Salmonella enteritidis* (*S. enteritidis*) by analyzing Homescan markets[14]. The four data sources were from: 1) National *Salmonella* Surveillance System (NSSS), 2) Homescan, 3) FoodBorne Disease Active Surveillance Network (FoodNet), and 4) United States Department of Agriculture-Economic Research Service (USDA-ERS).

4.2 DATA SOURCES

4.2.1 National *Salmonella* Surveillance System (NSSS)

For this study, data on cases of *Salmonella enteritidis* (*S. enteritidis*) were from the National *Salmonella* Surveillance System (NSSS). NSSS is a passive surveillance system composed of electronic reports of all human isolates that are culture-confirmed for *Salmonella* by each state Public Health Laboratory. Each record in the NSSS database include information on *Salmonella* serotype, specimen collection date, state reporting disease, residence zip code of ill person, gender of ill person, race of ill person, and birthdate of ill person. NSSS data for all illnesses reported in the United States is stored and maintained by epidemiologists on the National Surveillance Team in the Enteric Diseases Epidemiology Branch (EDEB) at the Centers for Disease Control (CDC).

A unique feature of this study is that an agreement was made with EDEB to create a specially designed NSSS dataset that contained the Homescan market for each case of salmonellosis using the zip code of the residence of the individual from whom the isolate was obtained. The United States Department of Agriculture-Economic Research Service (USDA-ERS)

[14]Described in ***Methods->Data Sources->Homescan->Homescan data structure***

provided a spreadsheet with the zip code and Federal Information Processing Standard (FIPS) codes for every Homescan market. This document was sent to the Surveillance Coordinator of the National Surveillance Team[15]. The Surveillance Coordinator matched the residence zip code of every case to the appropriate Homescan market. For cases that were missing residence zip code, the state of residence was used to identify the Homescan market if the state of residence was wholly contained in a single Homescan market. Then, the Surveillance Coordinator e-mailed a de-identified dataset with the Homescan market, *Salmonella* serotype, gender of ill person, race of ill person, birthdate of ill person, and specimen collection date for each case (**Table 1**). This unique dataset, comprised of every reported case of salmonellosis reported to NSSS, served as the illness data for this analysis.

Table 1. Demographic data collected from 2004 to 2006 from the National *Salmonella* Surveillance System (NSSS) to describe *Salmonella enteritidis*

Demographic variables	*Salmonella* variables
Birthdate	Serotype
Gender	Specimen collection date
Race	
Homescan market	

4.2.2 Homescan

4.2.2.1 Data source summary

Homescan is part of the National Consumer Panel run by the Nielsen Company. Nielsen is a for-profit company that collects data on consumers and consumer behavior. Data reported by participating households represent the shopping habits of consumers in the United States. The Economic Research Service, a federal agency within the United States Department of Agriculture, (USDA-ERS) purchased Homescan data directly from the Nielsen Company. Another unique aspect of this study was that an agreement was made with USDA-ERS to share all Homescan data, including household demographic data and food purchase data, obtained from Nielsen for this analysis.

[15] Coordination occurred with Kathleen Fullerton, MPH, Surveillance Coordinator, National Surveillance Team in 2012

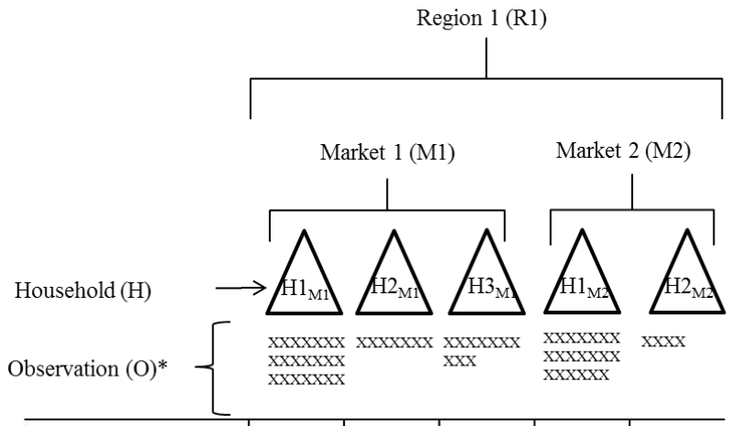
4.2.2.2 Homescan data structure

Homescan consists of 4 datasets that contain data on food purchases and 1 dataset that contains demographic information about the household and persons within the household. A unique household identifier was used to link all the records in the 5 datasets together. The data structure of households is separate from the data structure of foods.

Homescan households: The households are a representative sample of the United States population. Each household is assigned a household-specific projection factor[16] that when multiplied by the household size serves as a population-weight to the population in a Homescan market. The aggregated estimated Homescan market population represented the Homescan population in the United States. Each household reports all foods purchased at a retail store. (**Figure 4**)

Homescan identifies geographically unique areas, called Homescan markets, which consists of areas that compose a large market share[17]. All households in Homescan are linked to a Homescan market by the Federal Information Processing Standard (FIPS)[18] code of the residence location. There are 1,503 (48%) FIPS codes that make up the 52 Homescan markets of interest. Homescan markets have not changed in size since Homescan began collecting data and are named based on a highly populated city within its boundaries (**Figure 5**) (Nielsen, 2000b). The number of households in each Homescan market[19] ranges from <15 to 827 per year. Homescan markets can also be further grouped into United States census regions which are called Homescan regions (**Figure 6**) (Nielsen, 2000a). As a result, the size of the population in each Homescan market varies but each contains population dense areas.

[16] Described in ***Methods->Data Sources->Homescan->Sampling and recruitment into Homescan***
[17] Business terminology that typically uses retailer sales revenue to determine market share.
[18] FIPS codes identify counties or county equivalents
[19] Described in ***Methods->Data Sources->Homescan->Homescan data structure***



Household size	2	2	4	1	2
Projection factor	2,401	34,225	35,916	3,029	4,28
US Population accounted for by household	4,802	68,450	14,3664	3,029	856
Population in Market	216,916			3,885	

*Unique food product (type, size, packaging) compared to all other food products purchased on the same day

Figure 4. Diagram of Homescan data structure from 2004 to 2006

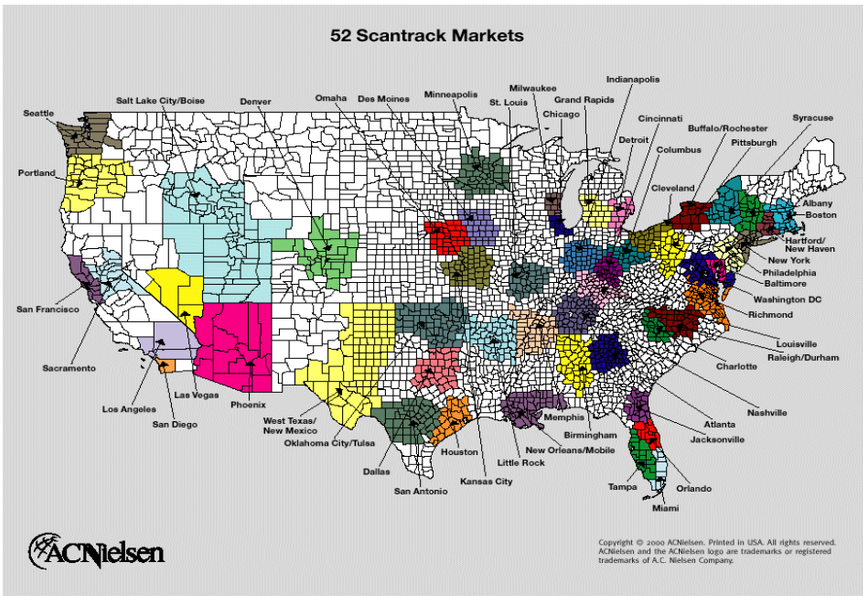


Figure 5. Map of 52 Homescan markets areas and market name

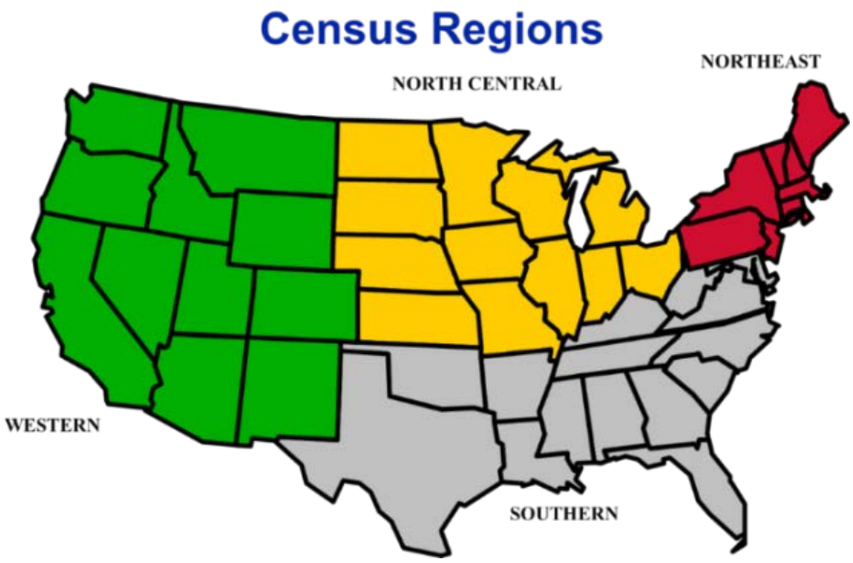


Figure 6. Region of Homescan markets defined by US Census

Food data: Homescan collects food data purchased over 12 months in 2 panels: universal product code (UPC) and random-weight. The UPC panel is composed of all foods with a UPC. UPCs are globally unique and assigned by a non-profit organization. UPCs use 5 dimensions to differentiate products: food product, brand, size, package type, and composition of package at point-of-sale. For example, 1 pack that contains 5 sticks of Wrigley's spearmint gum has a different UPC than a package that consists of 12 packs that each contains 5 sticks of Wrigley's spearmint gum, where the food product is gum, brand is Wrigley's, size is sticks, and package type is pack. The random-weight panel is composed of all foods with a retailer specific code. These foods are ones where the purchase-amount is determined by the customer, such as bulk bin items, loose fruits and vegetables, and items from the deli-case. Food items reported as a single observation are identical in every dimension and purchased on the same day (**Figure 7**). Together, both panels represent all foods available for sale at a retail store. From 2004 to 2006, an annual average of 7,043 households participate in both panels (range: 6,544 – 7,419 households).

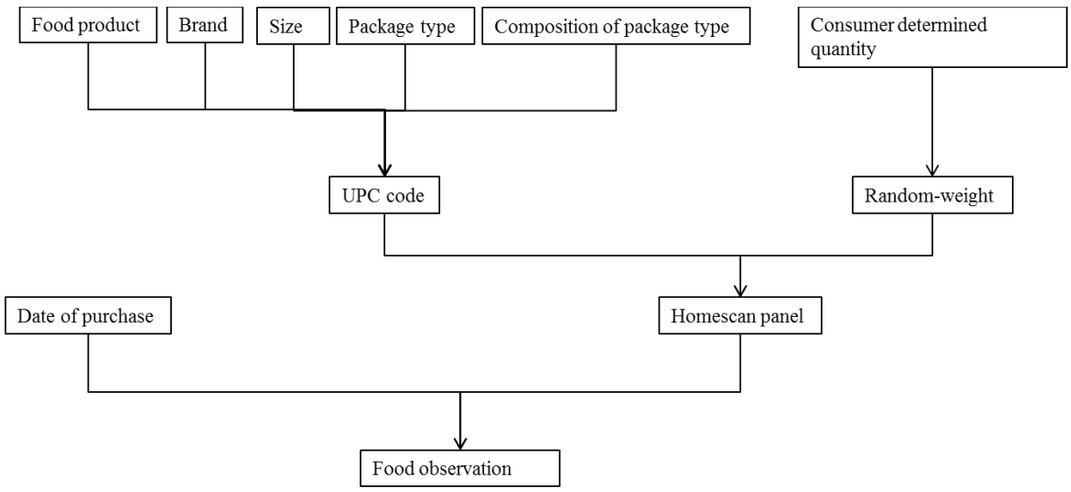


Figure 7. Diagram of components that determine each food observation in Homescan food datasets from 2004 to 2006

4.2.2.3 Sampling and recruitment into Homescan

Homescan solicits potential households through internet notices (70%) and direct mail (30%). Internet notices are sent to e-mail addresses and appear on web page advertisements. Certain web pages are specifically targeted to improve recruitment of groups that are typically difficult to maintain, such as young, single, low-income, and ethnic households. Direct mail is used to target households that do not have internet service; Nielsen obtained name and address information from companies with contact and demographic data of households. Households that respond to the initial solicitation are required to answer a series of demographic questions to determine eligibility.

All eligible households are entered into a central pool for up to 24 months[20]. Nielsen maintains contact with these households by sending out surveys and questionnaires each month. Homescan uses a distance algorithm to select households from the central pool to participate in the panel. Households are selected based on how closely their demographic profile matches gaps in county-level demographic distribution of already participating households. Homescan constructs the population distribution from demographic data purchased from Claritas, Inc. The demographic data consists of 9 household characteristics: household size, household income, head-of-household age, female head-of-household education, male head-of-household education, children in home, race, ethnicity, and head-of-household employment. Homescan updates the household-specific projection-factor each year by using an iterative proportion fitting procedure

[20]Households that are not selected after 24 months in the central pool are required to volunteer for the study again in order to be considered for the panel.

using household responses to the 9 demographic variables. Households are assigned a household-specific projection-factor for each panel that they participate in because the number of households in each panel varies. However, this study only used the household-specific projection factor calculated for the random-weight panel because all households that are enrolled in the random-weight panel also participated in the UPC panel and were included in this analysis.

Households that enter the Homescan panel are enrolled for 12 consecutive months and then are required to renew their participation for subsequent years. Households that voluntarily decide to exit the panel before 12 consecutive months have passed or do not adequately report purchase activity[21] were excluded from the analyzed dataset. Homescan compensates all households for their time.

4.2.2.4 Homescan data collection

Each household in Homescan reports foods purchased at a retail store and completes a demographic questionnaire. A list of demographic and food-related variables collected in Homescan are presented in **Table 2**.

Table 2. Demographic and food-related data collected in Homescan from 2004 to 2006

Demographic variables	Food-related variables
Homescan market	Product description
Household identifier	Universal Product Code (UPC)
Homescan region	Product module
Household size	Quantity of food
Projection factor	Quantity of package type
Head-of-household[1] age	Number of items in a multipack
Head-of-household[1] gender	
Head-of-household[1] number of hours employed per week	
Head-of-household[1] highest level of education	
Household participation in Women, Infant, Children (WIC) program	
Household income	
Household race	
Age of up to 3 individuals[2] <18 years	

[1]Up to 1 male and 1 female

[2]Age groups: <6 years, 6-12 years, 12-17 years

[21] No definition for how much activity is considered adequate. A minimum threshold is a report 10/12 months per year.

Food purchases: Households are required to report food purchased from gas convenience stores, supermarkets, supercenters, independent food stores, and drug stores on a weekly basis. Homescan provides each household with a UPC scanner to scan bar codes and a scale to weigh random-weight items. Households also enter data regarding the number of packages (Quantity of the package type) and the number of multipacks (Quantity of the package encompassing the Quantity of food) purchased for each unique food item.

Food data is saved in an online database that households are able to edit and enter information about random-weight food purchases. The online database is uploaded to Nielsen on a weekly basis. Nielsen performs cleaning routines to complete a product description that describes the food product. USDA-ERS also assigns codes called Product Modules to describe groupings of food items.

Household Demographics: Each year, participating households are sent a demographic questionnaire by Nielsen. The questionnaire includes questions on household makeup, head-of-household characteristics, and participation in social services. Households that wish to participate in Homescan any subsequent year are required to answer the demographic questionnaire again in order to account for changes to household structure.

4.2.3 USDA-Economic Research Service (ERS)

A supplemental data source to Homescan was obtained from the USDA-Economic Research Service (USDA-ERS) website. USDA-ERS created[22] codes, called Rural-Urban Continuum Codes, that describe the metropolitan status[23], based on the population size and proximity to metropolitan areas, of each county and county-equivalent[24] in the United States (**Table 3**). This serves as a measure of population density, "rurality". USDA-ERS updates the Rural-Urban Continuum Codes and population size every 10 years to correspond with updated United States Census estimates. The dataset with Rural-Urban Continuum Codes assigned to every

[22] Methodology described in http://www.ers.usda.gov/data-products/rural-urban-continuum-codes/documentation.aspx

[23] USDA-ERS area definition based on county-level "population size of their metro area, and nonmetropolitan (nonmetro) counties by degree of urbanization and adjacency to metro areas" (http://www.ers.usda.gov/data-products/rural-urban-continuum-codes/documentation.aspx)

[24] Federal information processing standard (FIPS) codes are used to identify counties and county-equivalents

Federal Information Processing Standard (FIPS) code in the 2003 United States Census is used for this study (**Table 4**).

Table 3. 2003 USDA-ERS defined Rural-to-Urban continuum codes

2003 Rural-Urban Continuum Code	Description for 2003 codes
1	County in metro area with 1 million population or more
2	County in metro area of 250,000 to 1 million population
3	County in metro area of fewer than 250,000 population
4	Nonmetro county with urban population of 20,000 or more, adjacent to a metro area
5	Nonmetro county with urban population of 20,000 or more, not adjacent to a metro area
6	Nonmetro county with urban population of 2,500-19,999, adjacent to a metro area
7	Nonmetro county with urban population of 2,500-19,999, not adjacent to a metro area
8	Nonmetro county completely rural or less than 2,500 urban population, adj. to metro area
9	Nonmetro county completely rural or less than 2,500 urban population, not adj. to metro area

Table 4. Data from USDA-ERS Rural-to-Urban dataset used to calculate "rurality" in Homescan markets

Demographic variables
Federal information processing standard (FIPS) codes
Rural-to-Urban Continuum code
Population in FIPS code

4.2.4 Foodborne Diseases Active Surveillance Network (FoodNet)

An alternative data source for race was obtained from the Foodborne Diseases Active Surveillance Network (FoodNet) because the percent of *Salmonella enteritidis* (*S. enteritidis*) cases in the National *Salmonella* Surveillance System (NSSS) missing race is >85%.

FoodNet monitors foodborne pathogens, including *Salmonella*. Similar to NSSS, FoodNet data is composed of electronic reports of all human isolates that are culture-confirmed for *Salmonella* by each state Public Health Laboratory. FoodNet data for all illnesses reported in the United States is stored and maintained by epidemiologists on the FoodNet Team in the Enteric Diseases Epidemiology Branch (EDEB) at the Centers for Disease Control (CDC). Race (White, Asian, Black, and Other race) is collected for each case. Figure 24 and Figure 25a-j in the

publically available 2004 FoodNet Annual Report[25] were used to estimate the race-adjusted incidence rate in every Homescan market. Figure 24 and Figure 25a-j contain information on the total catchment population in each race group by FoodNet site and the number of *Salmonella* cases in each race group by FoodNet site, respectively (**Table 5**).

Table 5. Data from 2004 FoodNet Annual Report used to estimate race of *Salmonella* cases in Homescan market

Demographic variables	*Salmonella* variables
FoodNet Site Catchment population Catchment population by race	Number of reported illnesses per race and FoodNet site

FoodNet is a population-based active surveillance program composed of 10 catchment areas that are made up of selected counties or the entire states in California, Colorado, Connecticut, Georgia, Maryland, Minnesota, New Mexico, New York, Oregon, Tennessee (**Figure 8**) (Centers for Disease Control and Prevention (CDC), 2004). The 2004 FoodNet catchment area accounted for 44,470,395 persons, between 1,903,289 persons (New Mexico) to 8,829,383 persons (Georgia) per site, and is representative of the United States population (Jones, Scallan, & Angulo, 2007). Counties in FoodNet sites are part of 17 Homescan markets (range: 3% to 100% of counties in Homescan market overlap with FoodNet site) (**Table 6**). FoodNet catchment areas are wholly contained in one of 4 Homescan regions: Midwest-Minnesota, Northeast-Connecticut and New York, West - California, Colorado, Oregon, and South - Georgia, Maryland, New Mexico, Tennessee.

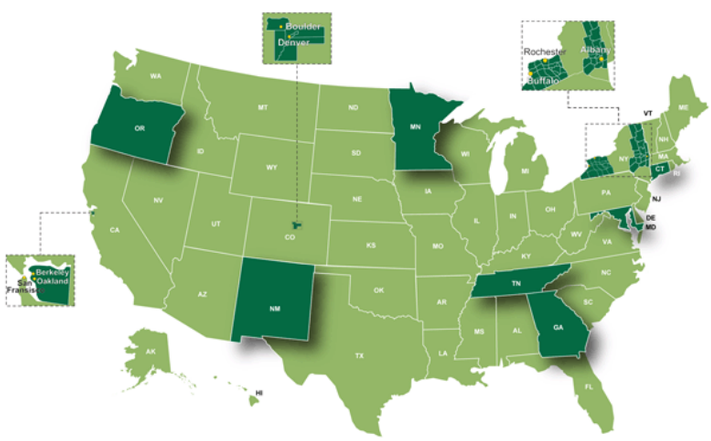


Figure 8. Map of FoodNet sites in 2004

[25] 2004 FoodNet Annual Report PDF available: http://www.cdc.gov/foodnet/PDFs/Tables.pdf

Table 6. Corresponding 2004 FoodNet site to Homescan market and Homescan region used to impute race-adjusted incidence rate (per 100,000 persons) in Homescan markets

FoodNet Site	Homescan market	US census region
California	San Francisco	West
Connecticut	Hartford-New Haven; Boston; Exurban NY	Northeast
Colorado	Denver	West
Georgia	Atlanta; Jacksonville	South
Maryland	Baltimore; Pittsburg; Washington, DC	South
Minnesota	Minneapolis	Midwest
New Mexico	--	South
New York	Buffalo-Rochester; Albany; Syracuse	Northeast
Oregon	Portland, OR	West
Tennessee	Nashville; Memphis	South

4.3 DATA ANALYSIS

Each data source used in this study was collected independently from the other data sources. Homescan market is the smallest common shared unit (**Table 7**). As a result, data from each data source were individually reviewed and aggregated to the Homescan market level in order to standardize the data. All data analysis was conducted in SAS 9.4.

Table 7. Level of data being reported by each data source used in the study

Level of data being reported	**Data source**			
	National *Salmonella* Surveillance System (NSSS)	**Homescan**	**Foodborne Diseases Active Surveillance Network (FoodNet)**	**Economic Research Service (USDA-ERS)**
Individual	X	X		
Head-of-household (HOH)		X		
Household		X		
Geographic area				
Homescan market				X
Other catchment area			X	

Note: Time period – NSSS and Homescan (2004-2006); FoodNet (2004); USDA-ERS (2003)

4.3.1 Population

The estimated population in each Homescan market and each age group was calculated from household size and household-specific projection factor reported in the Homescan demographic dataset. These estimates were the denominators used to describe the epidemiology of *Salmonella enteritidis* (*S. enteritidis*) infections, determined the population distribution of socio-demographic characteristics, and the proportion of the population with food purchase patterns. Illness and socio-demographic data from 2004 to 2006 were analyzed as a single time point.

Population in each Homescan market: The number of individuals in the population each household accounts for was calculated by multiplying household size and household-specific random-weight projection factor. The total number of individuals in each Homescan market was the sum of the estimated individuals in the population for all households in the Homescan market.

Population in each age group: The age group of individuals in each household are reported separately for individuals <18 years and individuals ≥18 years. Individuals <18 years are reported as <6 years, 6-12 years, or 13-17 years. The Homescan demographic survey reports up to 3 individuals <18 years, but only 1 individual in each age group can be reported. The age of individuals ≥18 years are reported in age groups from 18-25 years, in 5 year increments from 25-54 years, 55-64 years, and ≥65 years. Age is known for the head-of-household (HOH) only, and can be reported for 1 HOH of each gender. There is a maximum of 5 individuals in a household with a known age group. The number of individuals in each age group that each household accounts for was calculated by multiplying the number of individuals in a household in each age group and household-specific random-weight projection factor. The total number of individuals in each age group in a Homescan market was the sum of the estimated individuals in each age group in the population for all households in the Homescan market. The difference between the estimated total Homescan market population and the estimated Homescan market population with a reported age group was the number of individuals in a Homescan market with unknown age.

4.3.2 *Salmonella enteritidis* illnesses

A key strength of this study was the ability to combine illness data and food data under a common measurable analytic unit. Only *Salmonella* cases with a specimen collection date occurring from 2004 to 2006 were analyzed. The number of *Salmonella enteritidis* (*S. enteritidis*) cases in a Homescan market was the aggregated count of all *S. enteritidis* cases that have a reported residence in the same area that is covered by a Homescan market. The population-adjusted incidence rate (per 100,000 persons) was calculated as the number of *S. enteritidis* cases divided by the total estimated population[26] from 2004-2006.

95% confidence intervals (CI) around each Homescan market population-adjusted incidence rate were calculated as:

$$95\%\ CI = \text{incidence rate} \pm 1.96\ (\text{Standard error})$$

and

$$Standard\ error = \sqrt{\frac{(p * (1-p))}{n}}$$

Where:

$$p = proportion\ of\ illnesses$$

$$n = population\ in\ Homescan\ market$$

4.3.3 Food-related data

Food and demographic data are reported by 9,675 unique households in 52 Homescan markets[27]. Households that are enrolled in Homescan for more than 1 year from 2004 to 2006 were further identified by the year that the household is a participant and were treated as a new household. Thus, data from 21,127 households were analyzed. All food data reported by a household in a calendar year was analyzed as a single time point.

Every food observation in the 4 Homescan food datasets contains multiple variables about the product (Product-Variables) and multiple variables that describe different characteristics of the

[26] Described in ***Methods->Data Analysis->Population->_Population in each Homescan market***
[27] Described in ***Methods->Data Sources->Homescan->Homescan data structure***

amount of product purchased (Purchase-Variables) (**Figure 9**). The Product-Variables and Purchase-Variables in each observation underwent a series of steps to calculate the total annual *Purchase-Weight*. First, food observations were classified, second, purchase data was checked for quality, and third, data was standardized and summarized for each household. The total annual *Purchase-Weight* was then used to calculate Homescan market food risk (**Figure 10**).

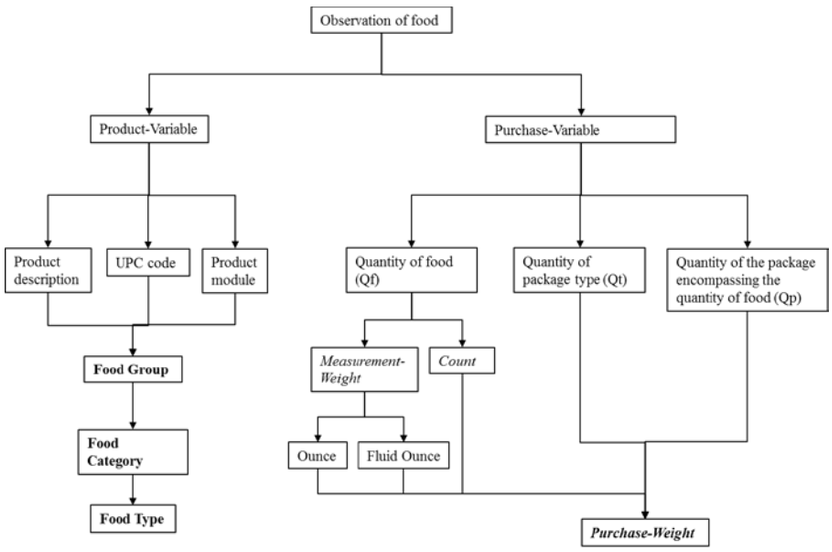


Figure 9. Relationship between Product-Variables and Purchase-Variables in each observation of food reported in Homescan food dataset from 2004 to 2006

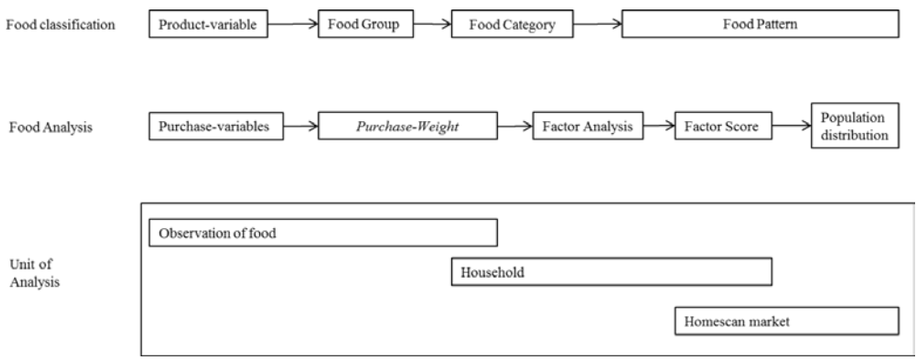


Figure 10. Diagram of processes used on Homescan food data to describe food purchase patterns in the Homescan population, Homescan food datasets 2004-2006

4.3.3.1 Food Classification for Observations of Food

Each food observation has 3 variables, identified as Product-Variables, that contain data that was used to classify observations with similar characteristics: product description, Universal Product Code (UPC), and product module. The product description was the primary source of information used to classify food observations. For observations of food where there is an insufficient amount of data in the product description, the UPC of the observation was entered into

an online search engine[28] for either a photo or a manufacturer description of the food item that has sufficient information to classify the observation. The product module was used for foods that are missing a UPC or the online search did not identify a food product. When more than 1 Product-Variable is available, the schematic "product description > UPC > product module" was followed.

There were 3 classification schemes used to classify each food observation: "Food Group", "Food Category", and "Food Type". Each scheme was based on a different set of parameters. Every observation was assigned 1 Food Group, 1 Food Category, and 1 Food Type.

Food Group: Food Group described specific attributes of the food product, storage state at retail, and package nuances that were considered important (**Table 8**). Food Group was the most specific level of classification given the available information in each observation and was used to verify data reporting and accuracy. Observations within a Food Group were nearly identical in food item, manufacturer processing technique, and packaging. Non-edible food products, non-human food products, alcohol and alcohol mixes, and ice were excluded from additional analysis.

Table 8. Parameters and examples used to reduce observations from Homescan food datasets from 2004 to 2006 into a Food Group

Parameters	Example
Panel	Random-weight, UPC
State of preservation	Fresh, raw, precooked, dried
Storage at retail	Canned, fridge, frozen
Product nuances	Fat content, cut or whole, ground or intact
Purchase data[29]	Ounce, fluid ounce, *Count*
Food item	Beef, chicken, ice cream

Food Category: Food Category described differences between foods that have been associated with different populations in social, nutritional, or salmonellosis studies, or have varying levels of at-home preparation recommendations from manufacturers or social norms (**Table 9**). Complex foods that are composed of >1 food item as a substantial ingredient, such as pizza, because it has bread, sauce, and cheese, were classified based on the level of at-home preparation required (eg., a frozen pizza versus a ready-to-eat pizza). Foods that are marinated or seasoned were not considered complex foods and classified

[28] www.Google.com

[29] Described in ***Methods->Data Analysis->Food-related Data->Food Group and Food Category calculations of Purchase-Weight***

into the Food Category of the major food item (eg, raw chicken marinated with spices is placed with other raw chicken). When a characteristic that determined the Food Category is missing (eg., unknown whether meat is raw, ready-to-eat, or needs additional preparation), the Food Group was categorized into the Food Category that contains the largest number of observations of the major food item. Food Category was the unit of analysis for the risk score.

Table 9. Parameters and examples used to reduce observations into a Food Category

Parameters	Example	Reference
Nutritional association	Dark leafy greens, whole grains, butter	(Grimm et al., 2012)
Previous *Salmonella* associations	Shell egg, poultry, leafy greens	(Braden, 2006; Fearnley, Raupach, Lagala, & Cameron, 2011)
Consumption differences by demographic characteristics	Lean meat, fresh vegetables, fresh fruits, processed meats	(Byrd-Bredbenner et al., 2008)
Additional processing required	Ready-to-eat, not ready-to-eat	

Food Type: Food Type was the most general classification and represented the major food component. Food Type described not only the food but the state of the item at retail.

4.3.3.2 Food Group and Food Category calculations of *Purchase-Weight*

Each food observation has 3 variables, identified as Purchase-Variables, that describe the purchase data. The Purchase-Variables are: Quantity of food (Qf), Number of items in a multipack (Qp), and Quantity of package type (Qt). Each Purchase-Variable describes a different aspect of the observation and are independent of each other. The observation Qf is reported as ounce, fluid ounce, or *Count*. Ounce and fluid ounce were described as a *Measurement-Weight* and *Count* was the number of units. Qp and Qt are unitless values ≥1. All observations missing any Purchase-Variable were excluded from analysis.

The *Observation Purchase-Weight* was calculated as the product of all the Purchase-Variables (Qf*Qp*Qt) when Qf has a *Measurement-Weight*. For example, two 6-packs of soda where each can is 8 ounces is represented as Qf =8, Qp = 6, and Qt =2, and the *Observation Purchase-Weight* was calculated as 96 ounces (8*6*2). The *Observation Purchase-Weight* was converted to pounds in order to make the data easier to contextualize. Observations reported with

fluid ounce were first converted to ounce using the density of water as a multiplier (1.04 ounce) since water is a basis for liquids suitable for human consumption. The *Purchase-Weight* in pounds was calculated as the amount in ounces divided by 16.

Data quality was assessed for Purchase-Variables at the Food Group level and *Observation Purchase-Weight* at the Food Category level. Observations with a *Count* underwent *Measurement-Weight* estimation. (**Figure 11**)

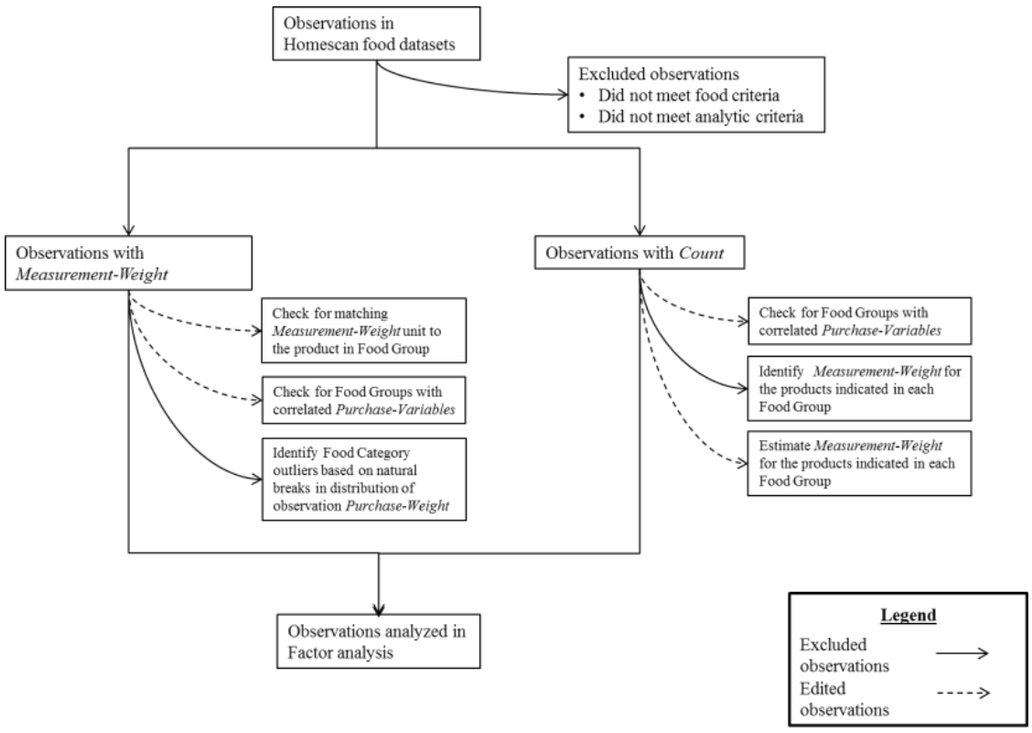


Figure 11. Diagram of procedures conducted on Purchase-Variables with *Measurement-Weight* or with *Count* for each observation of food reported in Homescan food datasets

(a) Data quality

There were 2 different procedures used to review the data quality of Purchase-Variables at the Food Group level and 1 procedure used to review the data quality at the Food Category level (**Table 10**).

Table 10. Description of data quality activities conducted on observations with *Measurement-Weight* from data reported in Homescan food datasets between 2004 to 2006

Data component checked	Issue	Analysis	Solution
Purchase-Variable	Accuracy of *Measurement-Weight*	*Measurement-Weight* reported unit match item described in Food Group	Conversion factor calculated and applied to incorrect Measurement-Weight
	Independence between Purchase-Variables	Correlation between Purchase-Variables	Edit a Purchase-Variable to preserve independence
Purchase-Weight	Unreasonable amount of food reported purchased	*Observation Purchase-Weight* exceeds a reasonable amount purchased in a single purchase event	Observations excluded from analysis

Purchase-Variable data quality activities: The unit of the *Measurement-Weight* reported in each Food Group was matched to the type of food in the Food Group. Liquids sold at the point-of-retail are expected to be reported as a fluid ounce and dry goods/solids sold at the point-of-retail are expected to be reported as an ounce. An average conversion factor (Cf) was calculated for observations in Food Groups where the reported *Measurement-Weight* was determined to be incorrectly reported. The Cf is a ratio between the true *Measurement-Weight* and reported *Measurement-Weight* of items within a Food Group. The true *Measurement-Weight* was determined by identifying the *Measurement-Weight* of a random sample of food items found online[30] that had a picture that showed the *Measurement-Weight* for both liquids and dry/solid goods that matched the observation in the dataset. An *Updated Observation Purchase-Weight* of observations with incorrectly reported *Measurement-Weight* was calculated as Qf * Cf* Qp*Qt.

The other data quality check performed was to test the independence of Purchase-Variables (Qf, Qp, and Qt) among observations in every Food Group. A scatterplot matrix between the Purchase-Variables was created for each Food Group. The Qp or Qt was changed to 1 for all observations in a Food Group with correlated Purchase-Variables. An *Updated Observation Purchase-Weight* of observations with correlated Purchase-Variables was calculated as Qf * Qp_1*Qt_1, where Qp_1 and Qt_1 are the updated Qp or updated Qt, respectively.

Purchase-Weight data quality activities: The Food Category distribution of the appropriate *Observation Purchase-Weight*[31] was created to identify outliers. Suspect outliers, >3 interquartile range (IQR), in every Food Category were further reviewed to determine if responses in the Purchase-Variables are unreasonable. There were 2 approaches used to decide if an outlier was unreasonable. First, a combination of information in product description, UPC, and pictures or descriptions of the food item online were used to determine if the values entered into the Purchase-Variable are valid. Second, subjective measures of reasonability were used with the assistance of online

[30] www.Amazon.com

[31] Methods used to determine which Food Groups have an *Updated Observation Purchase-Weight* due to edited Purchase-Variables is described in ***Methods->Data Analysis->Food-related Data->Food Group and Food Category calculations of Purchase-Weight->Data quality->Purchase-Variable data quality activities***

anecdotes, reports of the purchase of a similar *Purchase-Weight* in a single event, or reports of short term use of amounts of a food that are similar to the *Purchase-Weight* of the suspect outlier. Observations that were determined to be an unreasonable outlier were excluded from further analysis.

(b) Data estimation

All observations reported with *Count* were estimated if >40% of observations in a Food Category that any household reports contain *Count*. Observations with *Count* that did not meet this criteria were excluded from further analysis.

The *Estimated Measurement-Weight* (Qf_e) was determined for every unit in *Count* and applied to every observation reported with *Count* in the Food Group. The distribution of *Count* in every Food Group was reviewed to determine the most reasonable item represented by *Count*, because there is no data on the unit represented in *Count.* For example, if observations of candy are reported with a *Count* of 1 to 100 the *Estimated Measurement-Weight* would be of individual candies and not bags of candy since it is more reasonable to expect that a bag of candy contains 100 pieces than a household purchases 100 bags of candy in a single purchase event.

There were 4 data sources used to determine the *Estimated Measurement-Weight:* National Nutrient Database for Standard Reference[32], publically available data from either estimates of a food product in a table or pictures of food products with visible packaging size and *Measurement-Weight*, average population-weighted *Measurement-Weight* of food items from the same Food Group or a similar Food Group that had a *Measurement-Weight* that estimated the same quality that is represented in *Count* (**Table 11**), or average population-weighted *Measurement-Weight* of food items from the same Food Category or a similar Food Category that had a *Measurement-Weight* that estimated the same quality that was determined to be represented in *Count* (**Table 11**). When more than 1 data source was available, the schematic "National Nutrient Database > publically available tables/pictures > population-weighted *Measurement-Weight* of Food Group > population-weighted *Measurement-Weight* of Food Category" was followed. An *Updated*

[32] US Department of Agriculture, Agricultural Research Service, Nutrient Data Laboratory. USDA National Nutrient Database for Standard Reference, Release 28. Version Current: September 2015. http://www.ars.usda.gov/nea/bhnrc/ndl

Observation Purchase-Weight of observations with *Count* was calculated as Qf_e * Qf * Qp*Qt where Qf_e is the estimated *Measurement-Weight* of the unit reported as a *Count*.

Table 11. Steps to calculate average food group or food category household *Purchase-Weight* in the population used to estimate the *Measurement-Weight* of the Purchase-Variable in observations reported to Homescan food datasets with a *Count*

Level	Food group		Food category	
	Purchase-weight	**Items purchased**	**Purchase-weight**	**Items purchased**
Observation	Total observation purchase-weight = Qf*Qp*Qt	Total items purchased = Qp*Qt	Total observation purchase-weight = Qf*Qp*Qt	Total items purchased = Qp*Qt
Household	Household food group purchase-weight: Sum total observation purchase-weight for all observations in a food group that a household reports in year X	Total items purchased by a household: Sum total items purchased for all observations in a food group that a household reports in year X	Household food category purchase-weight: Sum total observation purchase-weight for all observations in a food category that a household reports in year X	Total items purchased by a household: Sum total items purchased for all observations in a food category that a household reports in year X
Household → Population	Total food group purchase-weight in the population accounted for by household: Household food group purchase-weight * household-specific projection factor	Total food items purchased in the population accounted for by household: Total items purchased by a household * household-specific projection factor	Total food category purchase-weight in the population accounted for by household: Household food category purchase-weight * household-specific projection factor	Total food items purchased in the population accounted for by household: Total items purchased by a household * household-specific projection factor
Population	Total food group purchase-weight in the population: Sum total food group purchase-weight in the population accounted for by household for all households that report a food group	Total items purchased in a food group: Sum total food items purchased in the population accounted for by household for all households that report a food group	Total food category purchase-weight in the population: Sum total food category purchase-weight in the population accounted for by household for all households that report a food category	Total items purchased in a food category: Sum total food items purchased in the population accounted for by household for all households that report a food category
Population-average quantity of food amount	Total food group purchase-weight in the population / Total items purchased in a food group		Total food category purchase-weight in the population / Total items purchased in a food category	

Qf = Quantity of food
Qp = Quantity of the package encompassing the quantity of food
Qt = Quantity of package type
Note: Underlined text indicates a value generated from a previous calculation

(c) Per-capita Annual Household Purchase-Weight for Food Categories

The appropriate *Observation Purchase-Weight*[33] were aggregated for all observations in each Food Category reported by a household in a year. This became the household reported Food Category total annual *Purchase-Weight* which is the maximum amount of each Food Category that household members were exposed to in a year. The household reported Food Category total annual *Purchase-Weight* was converted to a per-capita estimate because the number of individuals in a household varies and it is reasonable to assume that the amount of certain foods purchased are in proportion to the number of people consuming the item (eg., sodas, bread) while other foods are not (eg., dried herbs). The total annual per-capita Food Category *Purchase-Weight* was calculated

[33] Methods used to determine which Food Groups have an *Updated Observation Purchase-Weight* due to edited Purchase-Variables is described in ***Methods->Data Analysis->Food-related Data->Food Group and Food Category calculations of Purchase-Weight->Data quality->Purchase-Variable data quality activities***

as the household reported Food Category total annual *Purchase-Weight* divided by the household size.

4.3.3.3 Determining Homescan market food risk score

The Homescan market population risk to foods is reported as the population-weighted average of the proportion of the population categorized in each household risk level. The ratio of high risk to low risk foods in each household is used to create a distribution of high risk food exposure in the population. A food risk score is created in order to standardize the exposure to risky food between Homescan markets. Food data is processed in 6 steps to produce the risk score:

First, each Food Category is categorized into 3 levels of risk: high, medium, or low. High risk foods are those that are raw or minimally processed food products of food animal origin, such as Intact Meat or Shell Eggs. Medium risk foods are raw or minimally processed food products that are not of food animal origin, such as fresh fruits and vegetables. Low risk foods are products that are produced under processes that suppress pathogen growth, such as canning or salting.

Second, the per-capita total annual *Purchase-Weight* for each risk group is calculated per household and year.

Third, a ratio between high risk to low risk foods is calculated for every household. Households that reported no low risk foods were excluded from further analysis.

Fourth, the calculated household-risk ratio is weighted to the population by multiplying household size by the household-weight.

Fifth, the distribution of the population-weighted household-risk ratio is used to determine the cutoff for the 3 levels of risk: the bottom 25% is considered households with low risk and assigned a 1, the middle 50% is considered households with medium risk and assigned a 2, and the upper 25% is considered households with high risk and assigned a 3.

Sixth, a score is created as the weighted average of the proportion of the population categorized in each risk level for both Homescan market and Homescan region.

4.3.4 Socio-demographic characteristics

Every household that participates in Homescan and every case of salmonellosis in the National *Salmonella* Surveillance System (NSSS) report selected socio-demographic

characteristics. Additional socio-demographic data on the population and cases of salmonellosis that can be measured at a Homescan market level are available from the Economic Research Service (USDA-ERS) and Foodborne Diseases Active Surveillance Network (FoodNet). Each level measured in a socio-demographic variable became a unique variable because each Homescan market potentially had some number of individuals in every level.

4.3.4.1 National *Salmonella* Surveillance System (NSSS)

NSSS reports birthdate and gender for cases of *Salmonella enteritidis* (*S. enteritidis*). Age at time of specimen isolation was calculated as the difference between birthdate from specimen collection date. Age was categorized into age groups <6 years, 6-64 years, and ≥65 years. Age-adjusted incidence rate was calculated for each Homescan market as the total number of cases in an age group divided by the total population in the age group[34] multiplied by 100,000 persons. The percent of cases in each Homescan market reported as male or female was calculated as the total number of gender-specific cases of *S. enteritidis* divided by the total number of cases of *S. enteritidis*. Thus, there were 4 socio-demographic characteristics that were analyzed at the Homescan market level:

- *Percent of illnesses that are female*
- *Age-adjusted incidence rate among <6 years*
- *Age-adjusted incidence rate among 6-64 years*
- *Age-adjusted incidence rate among ≥65 years*

NSSS also collects data on race, but >85% of the data is missing. FoodNet provided more complete race data on *Salmonella* which was used as a proxy for *S. enteritidis*.

4.3.4.2 Homescan

There are 8 socio-demographic characteristics measured in the Homescan demographic dataset that were used to describe attributes previously found to be related to food purchase or food consumption. These are:

- Head-of-Household (HOH) highest level of education
- HOH number of hours employed for pay
- Age group of HOH
- Age group and presence of children
- Household size

[34] Described in ***Methods->Data Analysis->Population->Population in each age group***

- Household income
- Race
- Current participation in WIC[35,36]

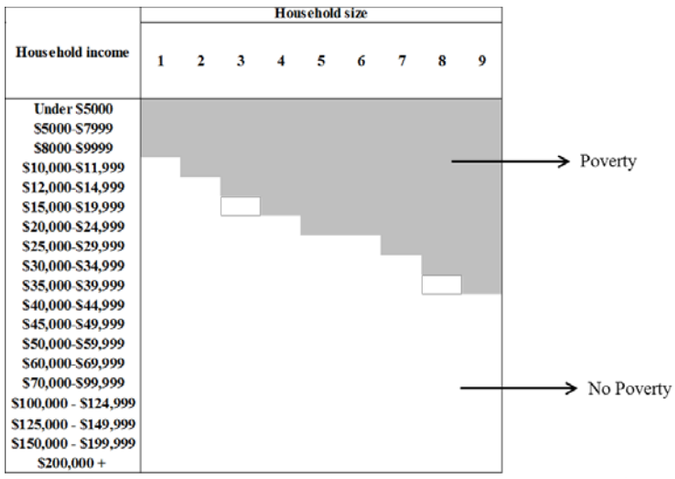
HOH characteristics are reported for up to 1 male and 1 female HOH in each household. Age group was recoded to <6 years, ≥65 years, and a separate age variable for the number of individuals in a household ≥18 years[37]. Household income and household size were combined to measure household poverty[38] status which was labeled as "poverty" or "no poverty" (**Figure 12**). Households with a household size and household income range that straddles the level between "poverty" and "no poverty" were classified as "poverty" if the household income that determines the threshold is less than 50% of the household income range. Household size was also used to identify households with 1 person and households with >1 person. Education level was recoded households where the highest education level of the HOH is high school graduate. As a result, the 8 socio-demographic characteristics reported in the Homescan demographic data were transformed into 8 measured socio-demographic variables (**Table 12**).

[35] WIC stands for Women, Infants, and Children (WIC) program which is a special supplemental nutrition program that provides federal funds for supplemental foods, health care referrals, and nutrition education for low-income pregnant, breastfeeding, and non-breastfeeding postpartum women, and to infants and children up to age five who are found to be at nutritional risk (http://www.fns.usda.gov/wic/women-infants-and-children-wic).

[36] Collected in 2006 only

[37] Described in ***Methods->Data Analysis->Population->Population in each age group***

[38] 2004 Poverty thresholds used. Data obtained from http://www.census.gov/hhes/www/poverty/data/threshld/index.html



Note: Poverty status and income ranges adopted from 2004 Poverty thresholds obtained from http://www.census.gov/hhes/www/poverty/data/threshld/index.html

Figure 12. Annual household income levels and household size that determines poverty status from household responses on the Homescan demographic survey from 2004 to 2006

Table 12. Socio-demographic characteristics and the levels that were analyzed from data obtained in the Homescan demographic dataset from 2004 to 2006

Demographic characteristic	Level
Socio-economic status (SES)	Poverty, No Poverty
Race	White, Asian, Black, Other
Household size	1 person, >1 person
WIC[1] participation	Yes, No
Age	<6 years, <18 years, 65+ years
HOH[2] gender	Male, Female
HOH[2] employment	HOH not employed for pay, HOH employed <30 hours per week, HOH employed ≥30 hours per week
HOH[2] highest education	At least high school graduate, more than high school graduate

[1]Women, Infant, and Children

[2]HOH – Head-of-Household

Socio-demographic characteristics measured for the HOH or household were assumed to be constant for every individual in the household. Thus, household level characteristics were interpreted as "Individuals that are part of a household with household characteristic" and HOH level characteristics were interpreted as "Individuals that are part of a household with HOH characteristic" (**Figure 13**). The number of responses in each level of a socio-demographic characteristic was extrapolated to the population by multiplying the household size and household-specific random-weight projection factor. The percent of the Homescan market population in each level of a socio-demographic variable was calculated as the number of individuals that are part of

a household with a socio-demographic characteristic divided by the total population[39] in the Homescan market.

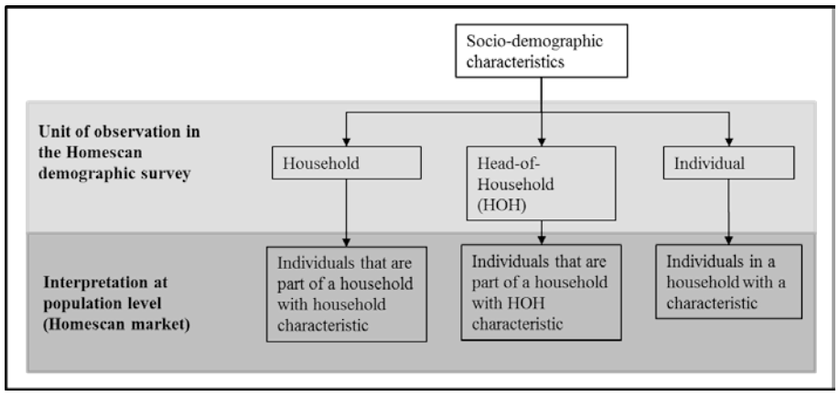


Figure 13. Unit interpretation of socio-demographic data measured at the household, head-of-household, and individual level for individuals in the population from data reported in Homescan demographic dataset from 2004 to 2006

Thus, there were 20 socio-demographic characteristics analyzed at the Homescan market level:

- *Part of a household in poverty*
- *Part of a household with members that participate in WIC*
- *Single person household*
- *White household*
- *Black household*
- *Asian household*
- *Other race household*
- *Part of a household with ≥1 individual <6 years*
- *Part of a household with ≥1 individual ≥65 years*
- *Part of a household with ≥1 individual <18 years*
- *Part of a household with a male head-of-household (HOH)*
- *Part of a household with a female HOH*
- *Part of a household with the female head-of-household highest education level is high school graduate*
- *Part of a household with the male head-of-household highest education level is high school graduate*
- *Part of a household with the female head-of-household not employed for pay*
- *Part of a household with the male head-of-household not employed for pay*
- *Part of a household with the female head-of-household employed for pay <30 hours/week*
- *Part of a household with the female head-of-household employed for pay ≥30 hours/week*
- *Part of a household with the female head-of-household employed for pay <30 hours/week*
- *Part of a household with the male head-of-household employed for pay ≥30 hours/week*

[39] Described in ***Methods->Data Analysis->Population->_Population in each Homescan market***

4.3.4.3 Economic Research Service (USDA-ERS)

The 9 Rural-Urban continuum codes were recoded to describe levels of rurality and named, "metropolitan areas", "next to metropolitan", or "rural" (**Table 13**). The 2003 Rural-Urban continuum dataset from the Economic Research Service (USDA-ERS) was downloaded from the USDA-ERS website (http://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx). The Federal Information Processing Standard (FIPS) codes were matched to the FIPS codes that make up each Homescan market. The percent of the Homescan market population in each level of rurality was calculated as the number of individuals in each level of rurality divided by the number of individuals in the population multiplied by 100. Thus, there are 3 socio-demographic characteristics that were analyzed at the Homescan market level:

- *Homescan market population that is in a metropolitan area*
- *Homescan market population that is next to a metropolitan area*
- *Homescan market population that is in a rural area*

Table 13. Categorization of 2003 USDA-ERS rural-to-urban continuum codes into Rurality classification

Rurality categories	Description of 2003 rural-to-urban codes
Metropolitan area	County in metro area with 1 million population or more County in metro area of 250,000 to 1 million population County in metro area of fewer than 250,000 population
Next to metropolitan area	Nonmetro county with urban population of 20,000 or more, adjacent to a metro area Nonmetro county with urban population of 2,500-19,999, adjacent to a metro area Nonmetro county completely rural or less than 2,500 urban population, adj. to metro area
Rural area	Nonmetro county with urban population of 20,000 or more, not adjacent to a metro area Nonmetro county with urban population of 2,500-19,999, not adjacent to a metro area Nonmetro county completely rural or less than 2,500 urban population, not adj. to metro area

4.3.4.4 Foodborne Diseases Active Surveillance Network

Figure 24 and Figures 25a-j from the 2004 FoodNet Annual Report was downloaded from the CDC website (http://www.cdc.gov/foodnet/PDFs/Tables.pdf). Data in the 2004 FoodNet Annual Report is presented as a bar graph of the percent of each race group for each FoodNet site. The total population size of each race group by FoodNet site was calculated from Figure 24 as the percent of the population in each race group multiplied by the total population. The number of salmonellosis in each race group by FoodNet site was calculated from Figures

25a-j as the percent of salmonellosis in each race group multiplied by the total number of salmonellosis. The race-adjusted incidence rate for each FoodNet site and United States census region was calculated as the total number of salmonellosis divided by the total population in each race group. The FoodNet site race-adjusted incidence rate is imputed for the corresponding Homescan market and the United States census region race-adjusted incidence rate is imputed for Homescan markets that are not composed of a FoodNet site. (**Table 6**) Thus, there were 4 socio-demographic characteristics analyzed at the Homescan market level:

- *Race-adjusted incidence rate among Whites*
- *Race-adjusted incidence rate among Black*
- *Race-adjusted incidence rate among Asian*
- *Race-adjusted incidence rate among Other*

4.3.5 Population-level analysis

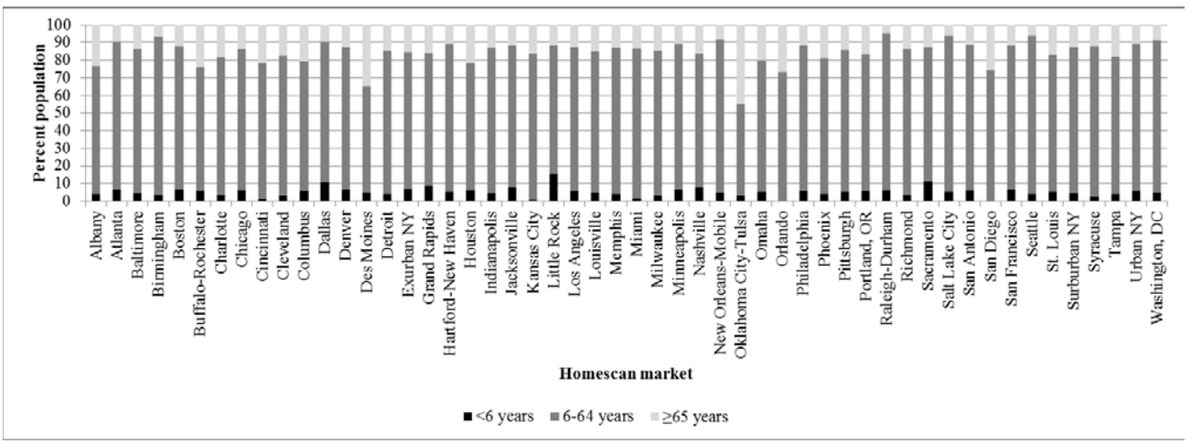
The Homescan market food risk score was used as an independent variable in a negative binomial model. Confounders were identified by selecting socio-demographic characteristics at the Homescan market level that were significantly associated (p-value <0.05) with both Homescan market food risk and *S. enteritidis* illnesses. The SAS procedure Proc Genmod was used to model population-adjusted rates of *Salmonella enteritidis* (*S. enteritidis*) between Homescan markets. Homescan market estimated population from 2004 to 2006 was used as an offset.

5.0 RESULTS

5.1 POPULATION

From 2004 to 2006 there was an average of 406 households per Homescan market each year (range: 47 (Little Rock) to 2,348 (Philadelphia)). The estimated population in a Homescan market ranged from 2,920,202 individuals (Des Moines) to 48,002,566 individuals (Los Angeles). The population accounted for by households that participated in Homescan represented approximately 72% of the United States population and between 66% to 88% of the population in a United States census region. (**Table A1**)

There were 491,159,997 (76%) persons in the Homescan population with a known age group (range: ~67% (Los Angeles; Cleveland; Miami; Portland, OR) to ~90% (Kansas City; Washington, DC)). Every Homescan market had ≥1 year with a known age group in ≥70% of the population**.** The age distribution in the Homescan population was 5% among <6 years, 81% among 6-64 years, and 14% among ≥65 years, but varied by Homescan market. The percent of the population <6 years ranged from 0% (San Diego) to >10% (Dallas; Sacramento; Little Rock), among 6-64 years ranged from 67% (Phoenix) to >90% (Omaha; Raleigh-Durham; New Orleans-Mobile), and among ≥65 years ranged from 3% (Omaha) to >20% (Syracuse; Des Moines; Charlotte; Phoenix; Tampa; San Diego; Cincinnati; Orlando; Houston) (**Figure 14**).



Data source: 3 variables (age of child, age of female head-of-household, and age of male head-of-household) used from Homescan demographic survey. ***Note:*** *Estimated population in each age group is calculated as the sum of the household-specific random-weight projection factor for the number of individuals in a household in each age group.*

Figure 14. Distribution of age group (<6 years, 6-64 years, ≥65 years) among the estimated population with known age group in each Homescan market from data reported between 2004 to 2006 in the Homescan demographic survey

5.2 *SALMONELLA ENTERITIDIS* (*S. ENTERITIDIS*)

There were 112,200 cases of salmonellosis reported to the National *Salmonella* Surveillance System (NSSS) from 2004 to 2006; 71,310 (64%) cases occurred in individuals with a residence in one of the 52 Homescan markets. Of cases in Homescan, 12,589 (18%) were serotyped as *Salmonella enteritidis* (*S. enteritidis*). The 2004-2006 population-adjusted incidence rate for all *Salmonella* in Homescan population was 11 cases per 100,000 persons and the population-adjusted incidence rate for *S. enteritidis* was 2 cases per 100,000 persons. Both of these rates are similar to the overall incidence rate in the United States (**Table 14**). The number of cases reported in a Homescan market ranged from <5 to 1,000. The population-adjusted incidence rate (per 100,000 persons) varied by Homescan market from <1 (Atlanta; Dallas; Houston; Jacksonville; Louisville; Miami; New Orleans-Mobile; Orlando; Salt Lake City; San Antonio; St. Louis; Tampa) to >7 (San Diego, Denver). The population-adjusted incidence rate (per 100,000 persons) was grouped into 3 significantly different levels: low (0.03 - 0.22 (95% CI: 0 -- 0.27)), medium (0.46 - 5.73 (95% CI: 0.31 -- 6.11)), and high (7.33 - 8.15 cases (95% CI: 6.72 -- 8.73)). (**Figure 15**)

Table 14. Number and population-adjusted incidence rate (per 100,000 persons) of *Salmonella* cases reported from 2004 to 2006 with a residence in an area considered to be a Homescan market and in the United States, National *Salmonella* Surveillance System (NSSS)

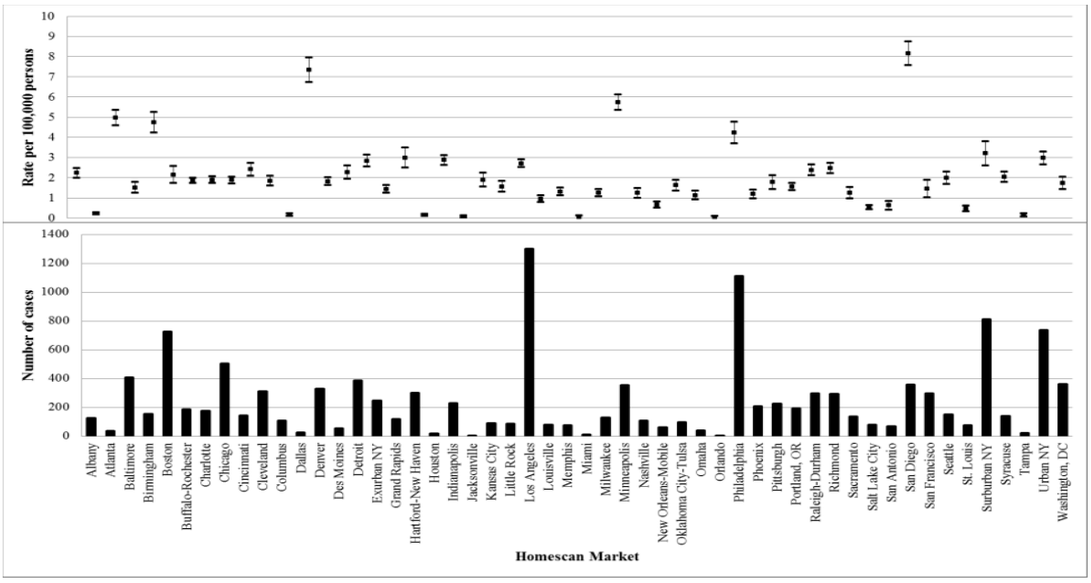
Salmonella serotype	Homescan markets		United States	
	#	Population-adjusted incidence rate (per 100,000 persons)[a]	#	Population-adjusted incidence rate (per 100,000 persons)[b]
S. enteritidis	12,589	2.0	18,501	2.1
Other serotypes	54,303	8.4	87,014	9.8
Unknown serotypes	4,418	0.7	6,685	0.8
Total	71,310	11.1	112,200	12.6

Data source: Salmonella cases obtained from 2004-2006 National Salmonella Surveillance System (NSSS). Estimated population in Homescan is obtained from Homescan demographic survey, 2004-2006. United States population obtained from Table Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2000 to July 1, 2006 (NST-EST2006-01) from US Census Bureau, Population Estimates Program (http://www.census.gov/popest/data/historical/2000s/vintage_2006/)

*Note: There are 2,955 S. enteritidis illnesses that do not have sufficient geographic information to identify whether they are part of a Homescan market. Estimated population is calculated as household-specific random-weight projection factor * household size.*

[a]2004 - 2006 population = 643,194,177 persons.

[b]2004 - 2006 population = 889,543,703 persons.



Data source: Salmonella cases obtained from 2004-2006 National Salmonella Surveillance System (NSSS). Estimated population in Homescan is obtained from Homescan demographic survey, 2004-2006.
*Note: Estimated population is calculated as household-specific random-weight projection factor * household size.*

Figure 15. Number of cases and population-adjusted *Salmonella enteritidis* incidence rate (per 100,000 persons) with 95% confidence intervals by Homescan market between 2004 to 2006

5.3 SOCIO-DEMOGRAPHIC CHARACTERISTICS

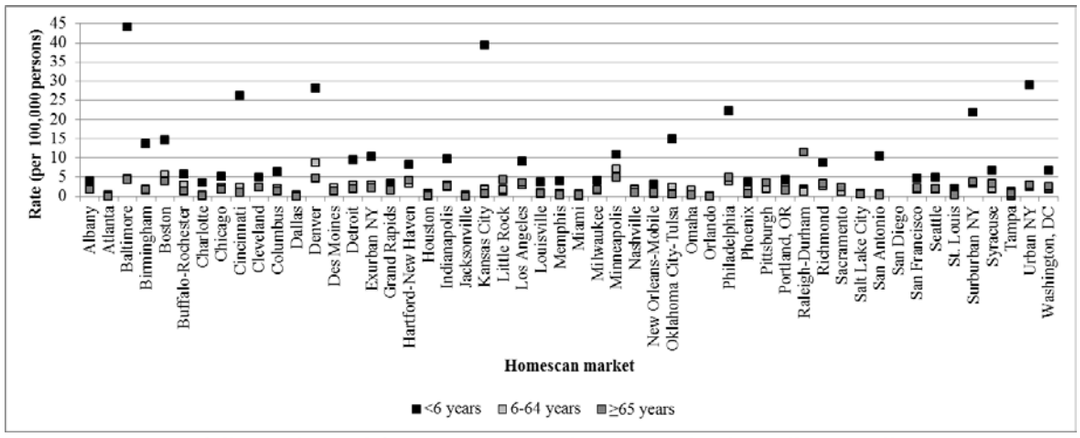
5.3.1 National *Salmonella* Surveillance System (NSSS)

In the NSSS dataset, gender was missing for 978 (8%) and age was missing for 1,765 (14%) *Salmonella enteritidis* (*S. enteritidis*) cases. There were 11 Homescan markets missing age in ≥40% of cases in a year and 12 Homescan markets that had *S. enteritidis* cases in an age group as reported by NSSS, but did not have an estimated population in the same age group as reported in the Homescan demographic survey in the same year. There were 9 Homescan markets missing gender in ≥40% of cases in a year. Age and gender for these years were not analyzed in these Homescan markets and the Homescan market summary measure was created from remaining years. San Diego was excluded from age-specific analysis and Charlotte and Raleigh-Durham were excluded from gender-specific analysis because they did meet the criteria for any year.

Age: Among Homescan markets included in age-specific analysis, the age-adjusted incidence rate among individuals <6 years (8 cases per 100,000 persons) was 4 times higher than individuals 6-64 years and individuals ≥65 years (2 cases per 100,000 persons). The incidence rate of individuals between 6-64 years was higher than individuals <6 years in 5 Homescan market

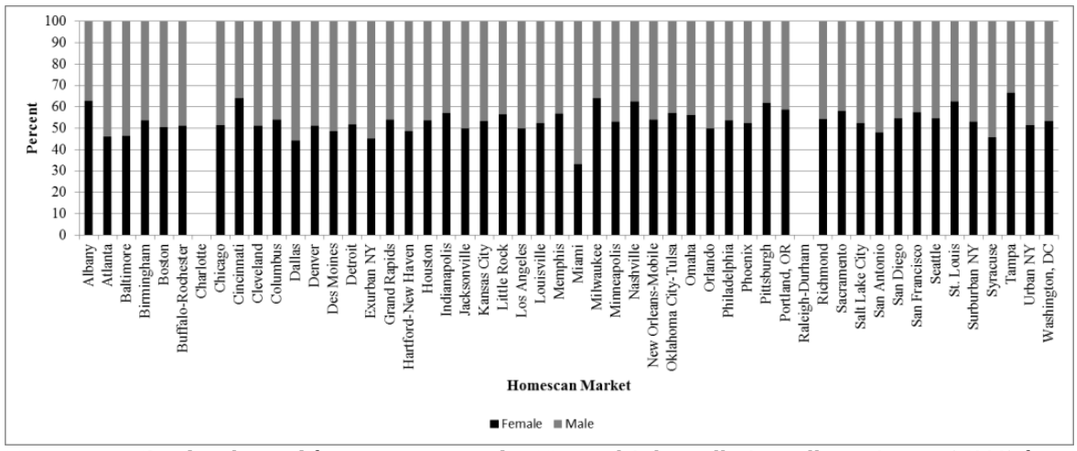
(Des Moines, Little Rock, Omaha, Orlando, Nashville) and the incidence rate of individuals ≥65 years was higher than individuals <6 years in 5 Homescan markets (Little Rock, Orlando, Pittsburgh, Raleigh-Durham, and Sacramento). (**Figure 16**)

Gender: Among Homescan markets included in gender-specific analysis, there was a slightly higher percent of *S. enteritidis* illnesses reported as female (53%) versus male (47%). Thirty Homescan markets had <10% difference between the percent of illnesses that were female and male (**Figure 17**).



Data source: Age of illness obtained from cases reported to National Salmonella Surveillance System (NSSS) from 2004 to 2006. Estimated population in Homescan obtained from Homescan demographic survey
*Note: San Diego is excluded because the illnesses did not meet the criteria in any year for age-specific analysis. Estimated population is calculated as household-specific random-weight projection factor * household size.*

Figure 16. 2004 to 2006 *Salmonella enteritidis* (*S. enteritidis*) age-adjusted rate (per 100,000 persons) by Homescan market for <6 years, 6-64 years, and ≥65 years



Data source: Gender obtained from cases reported to National Salmonella Surveillance System (NSSS) from 2004 to 2006.
Note: Raleigh-Durham and Charlotte are excluded because they did not meet the criteria in any year for gender-specific analysis.

Figure 17. Distribution of *S. enteritidis* illnesses reported as males and females by Homescan market from 2004-2006

5.3.2 Homescan demographic survey

From 2004 to 2006 the majority of the population in Homescan was *White* (72%), *part of a household with a male HOH* (76%), and *part of a household with a female HOH* (90%). The percent of the population that was *part of a household with a female HOH who does not work for pay* (40%) was similar to the percent of the population that was *part of a household with a female HOH who works ≥30 hours/week* (45%). The percent of the population *part of a household with a female HOH who works ≥30 hours/week* (45%) was less than the percent of the population that was *part of a household with a male HOH who works ≥30 hours/week* (72%). Fifty percent of the population was *part of a household with ≥1 household member <18 years*. (**Table 15**)

Table 15. Percent (overall and Homescan market range) of population that is part of a household with socio-demographic characteristic

Socio-demographic characteristic	% Overall	% Homescan market	
		Min	Max
Part of a household in poverty[1]	14	1	43
*Part of a household with members that currently participate in WIC**	1	0	44
Single person household	10	3	23
White household	72	46	99
Black household	15	0	44
Asian household	3	0	17
Other race household	10	0	39
Part of a household with ≥1 individual <6 years	17	0	57
Part of a household with ≥1 individual ≥65 years	16	3	35
Part of a household with ≥1 individual <18 years	50	20	72
Part of a household with a female head-of-household	90	75	100
Part of a household with the female head-of-household highest education level is high school graduate[2]	40	7	72
Part of a household with the female head-of-household not employed for pay[2]	40	20	77
Part of a household with the female head-of-household employed for pay <30 hours/week[2]	14	1	43
Part of a household with the female head-of-household employed for pay ≥30 hours/week[2]	45	22	72
Part of a household with a male head-of-household	76	48	95
Part of a household with the male head-of-household highest education level is high school graduate[2]	41	0	68
Part of a household with the male head-of-household not employed for pay[2]	26	4	49
Part of a household with the male head-of-household employed for pay <30 hours/week[2]	3	0	14
Part of a household with the male head-of-household employed for pay ≥30 hours/week[2]	72	51	100

Data source: Households that participated in Homescan and responded to the Homescan demographic survey from 2004 to 2006

*Data only collected in 2006

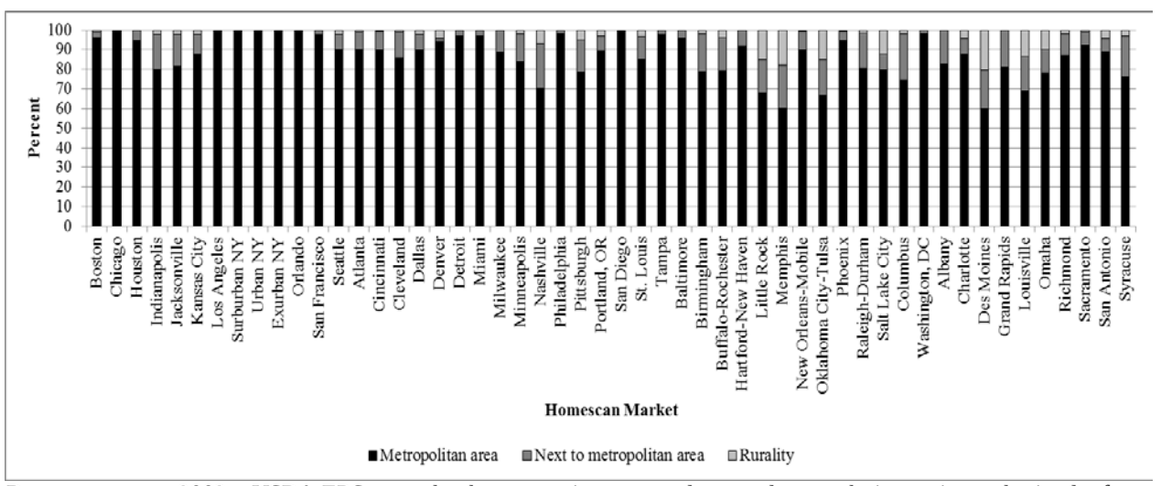
[1]Poverty is determined by threshold criteria based on household size and household income set by US Census bureau (https://www.census.gov/hhes/www/poverty/data/threshld/)

[2]Among households with a gender-specific head-of-household

The proportion of the population that was part of a household with a female HOH was similar between Homescan markets, but varied for all other socio-demographic characteristics. The percent of the population that was *part of a household that is classified as below Poverty* was higher in Little Rock, Louisville, Albany, Oklahoma City-Tulsa, and Memphis and the pattern was similar to the percent of the population that was *part of a household with members that participate in WIC*, the population that was *part of a household with a male HOH that is employed for ≥30 hours per week* made up a larger proportion of each Homescan market than other employment levels, and the majority of the population in each Homescan market was *part of a household with a female HOH*. (**Figure A1**)

5.3.3 USDA-Economic Research Service (USDA-ERS)

As expected, most of the population in each Homescan market was located in a metropolitan area. Little Rock; Memphis; Oklahoma City-Tulsa; Des Moines; Louisville; Omaha were the Homescan markets with the highest proportion of the population in rural areas (≥10%). None of the population was classified as being in a rural area in 19 Homescan markets (Chicago; Houston; Los Angeles; Surburban NY; Urban NY; Exurban NY; Orlando; San Francisco; Detroit; Miami; Milwaukee; Philadelphia; San Diego; Tampa; Baltimore; Hartford-New Haven; Washington, DC; Albany; Grand Rapids). (**Figure 18**)



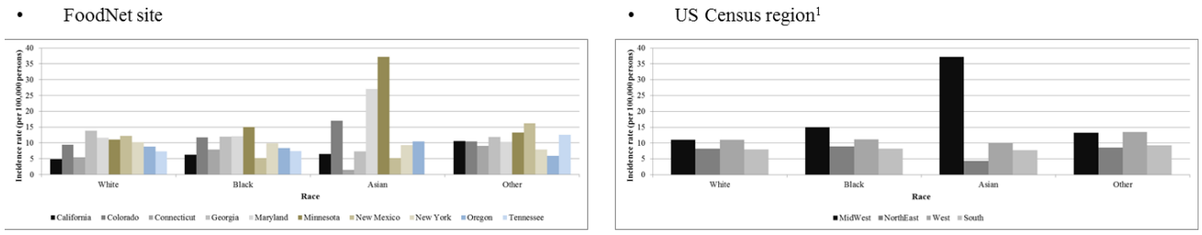
Data source: 2003 USDA-ERS rural-urban continuum codes and population size obtained from http://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx

Figure 18. Distribution of rurality groups (Metropolitan area, Next to metropolitan area, Rural) by Homescan market

5.3.4 Foodborne Diseases Active Surveillance Network (FoodNet)

Race (White, Black, Asian, Other race) was reported in 4,535 (70%) of *Salmonella* cases reported to the Foodborne Active Diseases Surveillance Network (FoodNet). The percent of FoodNet sites with known race ranged from 45% (California, Connecticut) to >90% (Minnesota, New Mexico, New York). Between 66% to 70% of cases in the Northeast, South, and West had known race and 94% of cases in Midwest had race.

Whites (69%) made up the largest proportion of the population in FoodNet sites, followed by Blacks (14%), Other race (12%), and Asian (4%), but varied by FoodNet site. The race-adjusted incidence rate for Whites was lowest in California and Connecticut (5 per 100,000 persons) and highest in Georgia (14 per 100,000 persons), for Blacks was lowest in New Mexico (5 per 100,000 persons) and highest in Minnesota (15 per 100,000 persons), for Asians was lowest in Tennessee (0 per 100,000 persons) and highest in Minnesota (37 per 100,000 persons), for Other/Unknown was lowest in Oregon (6 per 100,000 persons) and highest in New Mexico (16 per 100,000 persons). Asians had the widest range of race-adjusted incidence rate between United States census regions (4 (Northeast) to 37 (Midwest) per 100,000 persons) (**Figure 19**).



Data source: 2004 FoodNet Annual Report (http://www.cdc.gov/foodnet/PDFs/Tables.pdf). Catchment population obtained from Figure 24: Ethnicity and Race Distribution in U.S. Census, by Site. Race of Salmonella illnesses obtained from Figures 25a-25j. Ethnicity and Race Distribution by Pathogen (By Site).
[1]Midwest – Minnesota; Northeast – Connecticut, New York; West – California, Colorado, Oregon; South – Georgia, Maryland, New Mexico, Tennessee

Figure 19. Race-adjusted incidence rate (per 100,000 persons) for White, Black, Asian, Other race, by FoodNet site and United States census region

5.4 FOOD

5.4.1 Food description

There were 240,689 unique products reported as 19,152,019 observations in Homescan food datasets from 2004 to 2006. Each observation was assigned to one of 6 Food Types[40]

[40] Names of Food Type, Food Category, Food Group are bold and italicized.

(***Beverages***; ***Pantry***; ***Raw Meat/Poultry/Seafood***; ***Fruit/Vegetable***; ***Processed***; ***Other***). Within these 6 Food Types, there were 62 Food Categories (**Table 16**). Each Food Category contained between 19,780 observations (***Whole Other Root Vegetable***) and 2,206,827 observations (***Needs Preparation***). These Food Categories were further subdivided into 888 informative Food Groups (**Table A2**). **Figure 20** The 19,152,019 observations were checked and verified as described in the Methods section and a flow chart showing the pathway for data cleaning and data verification is presented in **Figure 21.**

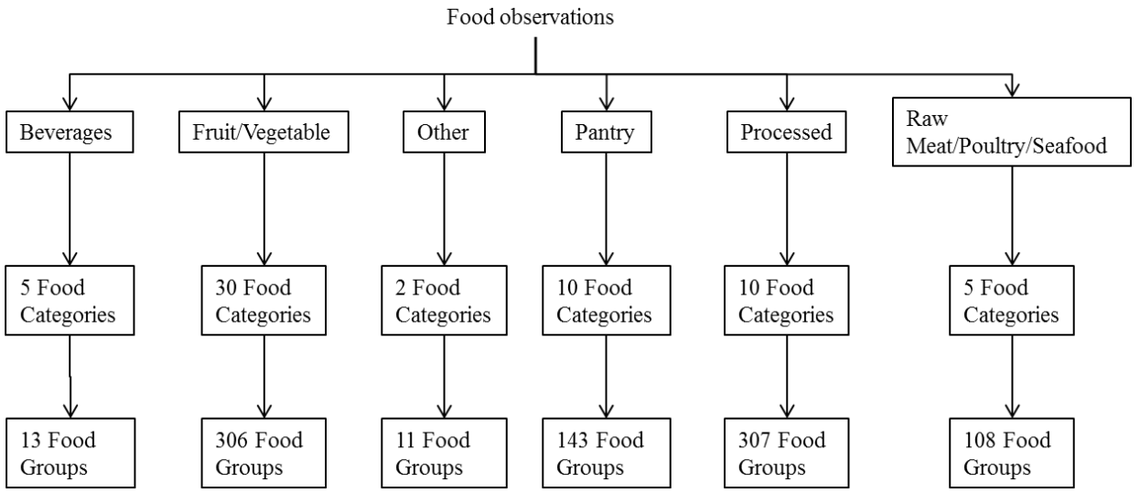


Figure 20. Diagram of number of each type of food classifications (Food Type, Food Category, Food Group) created to represent each food observation reported by households participating in Homescan from 2004-2006

Table 16. Name of Food Type and Food Category used to describe each food observation reported by households participating in Homescan from 2004 to 2006, Homescan food datasets

Food Type	Food Category	Example	Description*
Beverages	Fresh Fruit And Vegetable Juice	100% Fruit Juice, Tomato Juice, Apple Cider	Liquid Sold As Ready-To-Drink
	Milk	Liquid Milk	
	Other Beverages	Soymilk; Liquid Baby Formula	
	Soda And Sweetened Beverages	Soda, Juice Cocktail	
	Water/Tea/Coffee		
Pantry	Baking Supplies	Frosting, Chocolate Chips, Edible Decorations	Products Primarily Used To Decorate Or Enhance Sweet Baked Goods
	Beverage Mixes	Tea Bags, Instant Coffee, Powdered Beverage Mixes Like Kool-Aid	Dried Items That Are Intended To Be Turned Into A Beverage With The Addition Of A Liquid
	Butter		
	Condiments	Ketchup, Mayonnaise, Marinade, Sauces	Any Product Intended To Be Used To Change The Flavor, Texture, Or Complement Another Product
	Cooking Liquids/Oil	Olive Oil, Margarine, Lard, Broth	Product Used As Cooking Liquid Or Fat
	Dried Beans, Rice, Noodles, Grains, Cereals		Shelf Stable Processed
	Flour		Shelf Stable Processed
	Herbs/Spices	Salt, Pepper, Italian Seasoning, Dill	Shelf Stable Processed
	Mixes And Kits	Cookie Mix, Shelf Stable Macaroni And Cheese	Shelf Stable Products That Require The Addition Of Another Product (Eg., Water, Meat) To Turn It Into Advertised Product
	Other Pantry Items	Whole Bean Coffee, Bread Crumbs, Egg	Other Processed Staple Products

Table 16 (Continued) Name of Food Type and Food Category used to describe each food observation reported by households participating in Homescan from 2004 to 2006, Homescan food datasets

Food Type	Food Category	Example	Description*
Raw Meat / Poultry / Seafood	Ground Meat/Poultry	Beef, Pork	Store Or Manufacturer Ground Products
	Intact Meat	Ribs, Chops, Steaks	Store Or Manufacturer Non-Whole Meat
	Poultry Parts	Legs, Thigh, Breasts, Organs	Store Or Manufacturer Non-Whole Poultry
	Seafood	Fish, Shellfish	
	Whole Poultry	Chicken, Turkey, Duck	
Fruit/Vegetable	Canned/Jarred Other Fruit/Vegetables	Beans, Apple Sauce	Shelf Stable Processed
	Canned/Jarred Tomato	Tomato Paste, Diced Tomatos	Shelf Stable Processed
	Dried Fruit/Nuts/Seeds	Dates, Apricots, Pistachios	Shelf Stable Processed
	Fresh Herbs	Rosemary, Thyme, Lemons, Chile Pepper	Fresh
	Frozen Fruit/Vegetable		Flash Frozen Raw Products
	Packaged Fruit/Vegetable	Apple Slices, Carrot Sticks	Perishable Fruit Or Vegetables That Are Cut By A Manufacturer Or Retail Establishment Prior To Sale

Table 16 (Continued) Name of Food Type and Food Category used to describe each food observation reported by households participating in Homescan from 2004 to 2006, Homescan food datasets

Food Type	Food Category	Example	Description*
Fruit/Vegetable	Whole Apples		Fresh And Raw Products That Are Not Altered From Its Natural State
	Whole Banana/Plantain		
	Whole Beans/Legumes	Green Beans, Peas	
	Whole Berries	Strawberry, Blueberry	
	Whole Carrots		
	Whole Celery	Jalapeno, Habaneros	
	Whole Cruciferous Vegetables	Broccoli, Cauliflower	
	Whole Cucumber		
	Whole Fresh Leafy Greens	Kale, Spinach, Lettuce	
	Whole Garlic/Onion		
	Whole Grape		
	Whole Melon		
	Whole Mushroom/Fungi		
	Whole Other Citrus	Orange, Tangerine, Tangelo	
	Whole Other Fruit	Pomegranates, Pineapple	
	Whole Other Root Vegetable	Beet, Turnip, Parsnip	
	Whole Other Vegetable	Asparagus, Artichoke	
	Whole Pear		
	Whole Potato		
	Whole Squash/Gourd	Butternut Squash, Pumpkin	
	Whole Stone Fruit	Apricot, Nectarine, Avocado	
	Whole Sweet Pepper	Bell Pepper	
	Whole Sweet Potato/Yam		
	Whole Tomato		

Table 16 (Continued) Name of Food Type and Food Category used to describe each food observation reported by households participating in Homescan from 2004 to 2006, Homescan food datasets

Food Type	Food Category	Example	Description*
Processed	Bread Products And Food Wrappers	Bread, Tortillas, Bagels	Shelf Stable Processed Ready-To-Eat Products Composed Primarily Of Flour Or Other Grains
	Candy/Chocolate	Mint, Gum, Chocolate, Candy	Shelf Stable Processed Ready-To-Eat
	Cereals And Granola	Cheerios	Shelf Stable Processed Ready-To-Eat Breakfast Cereals And Granola
	Cheese/Yogurt		Perishable Ready-To-Eat
	Crackers, Chips, And Savory Snacks		Shelf Stable Processed Ready-To-Eat
	Ice Cream/Novelties	Ice Cream, Ice Cream Cake, Non-Dairy Frozen Treats	Ready-To-Eat Ice Cream And Other Frozen Treats, Or Products That Include Ice Cream And Other Frozen Treats
	Needs Preparation	Frozen Meal, Canned Soup, Frozen Bread, Cookie Dough	Products That Are Pre-Prepared And Is Recommended/Required To Have Additional Processing (eg., Heating/Cooking) Before Consumption
	Other Ready-To-Eat	Gelatin Products, Pudding, Fruit Snacks, Granola Bars, Dips (eg., Salsa)	Processed Ready-To-Eat Products
	Ready-To-Eat Meat/Poultry/Seafood	Beef Jerky, Lunch Meat	Processed Ready-To-Eat Products
	Sweet Baked Goods	Cookies, Cakes, Pies	Processed Ready-To-Eat Products
Other	Shell Eggs		Fresh And Raw Products That Are Not Altered From Its Natural State
	Excluded Foods	Non-Human Foods, Ice, Alcohol	Foods Not Included In Analysis

Data source: 2004-2006 Homescan food datasets (Random-Weight; Dairy; Dry Grocery; Fresh Produce Meat & Frozen)

* Food Category descriptions reflect the suggested or intended use based on manufacturer instructions and US societal behaviors.

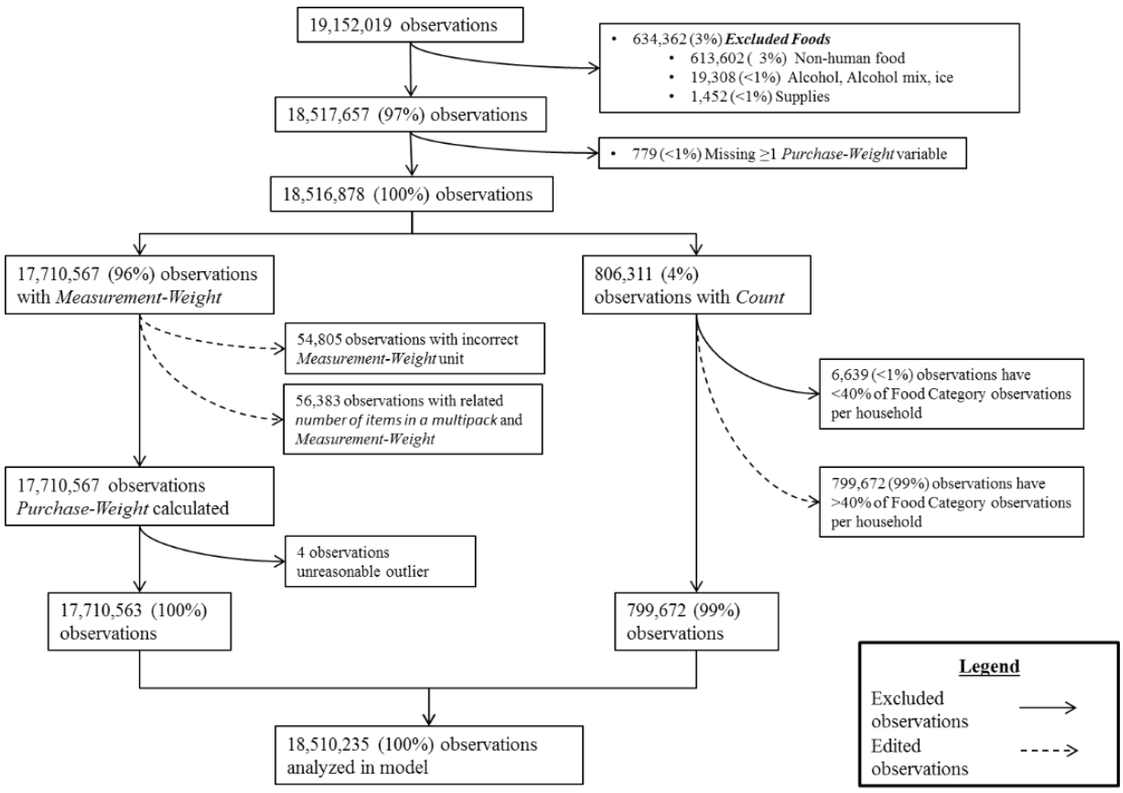


Figure 21. Flow diagram of data cleaning, data verification, and data estimation steps for observations reported in Homescan food datasets from 2004 to 2006

There were 634,362 (3%) observations in ***Excluded Foods*** that did not meet criteria for analysis (pet foods, ice, alcohol and alcohol mixes, non-edible supplies) and were excluded. An additional 779 observations among 15 Food Categories were not analyzed because they were missing at least 1 Purchase-Variable[41]. None of the excluded observations account for more than 1% of observations in any affected Food Categories.

Of the remaining 18,516,878 observations, 17,710,567 (96%) observations were reported with *Measurement-Weight* and 806,311 (4%) observations were reported with *Count*.

Observations with *Measurement-Weight*: There were 54,805 (20%) observations in ***Beverage Mixes***[42] with the *Measurement-Weight* reported to Homescan as a manufacturer stated liquid equivalent. The *Measurement-Weight* of those observations was multiplied by 0.04, which was the estimated average ounce to fluid ounce ratio (**Table A3**). There was an association between *Measurement-Weight* (Qf) and Number of items in a multipack (Qp)[43] for 24,032 (3%)

[41] Quantity of the item (collected as *Measurement-Weight* or *Count*) (Qf), quantity of packages (*quantity of package type*) (Qt), and number of items in a package (*number of items in a multipack*) (Qp).

[42] 2 Food Groups (***Instant Sweetened Juice Drink Mixes*** (51,902 observations) and ***Instant Milk/Milk Substitutes*** (2,903 observations))

[43] >1

observations in ***Bread Products And Food Wrappers***[44] and 30,860 (5%) observations in ***Sweet Baked Goods***[45] (r = 0.61 - 0.98). Number of items in a multipack (Qp) was changed to 1 to preserve *Purchase-Weight* variable independence. Four observations (3 (<1%) observations in ***Sweet Baked Goods***[46] and 1 (<1%) observation in ***Whole Other Vegetable***[47]) were identified[48] as outliers and excluded from analysis.

Observations with *Count*: There were 799,672 (99%) observations in 340 Food Groups and 39 Food Categories that met the criteria for *Measurement-Weight* estimation. These observations accounted for <1% to 100% of all observations reported in the Food Category (**Figure 22**). The National Nutrient Database was used to estimate the *Measurement-Weight* of 668,249 (84%) observations, followed by publically available reports or tables which were used to estimate the *Measurement-Weight* of 92,887 (12%) observations (**Table 17**). A detailed description of the unit measured by *Count*, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that met the criteria for *Measurement-Weight* estimation by Food Group is available in **Table A4**.

The final number of observations included for household-level analysis was 18,510,235 (17,710,563 observations with *Measurement-Weight* and 799,672 observations with estimated *Measurement-Weight*).

[44]10 Food Groups (Random Weight Baguette (1,491 observations), Random Weight Bially (160 observations) , Random Weight Club Hard Rolls (2,797 observations), Random Weight Dinner Rolls (2,045 observations), Random Weight Kaiser Rolls (2,733 observations), Random Weight Other Assorted Rolls (445 observations), Random Weight Other Types Of English Muffin (238 observations), Random Weight Other Types Of Bagel (7,167 observations), Random Weight Dark Bagels (88 observations), and Random Weight Other Types Of Rolls (8,359 observations))

[45]9 Food Groups (Random Weight Danish (2,951 observations), Random Weight Croissant (3,141 observations), Random Weight Brownie (1,031 observations), Random Weight Cinnamon Buns (1,965 observations), Random Weight Cookie (8,531 observations), Random Weight Cupcake (747 observations), Random Weight Donut (5,290 observations), Random Weight Muffin (4,279 observations), and Random Weight Other Sweet Baked Goods/Pastries (2,925 observations))

[46]3 Food Groups (Random Weight Danish, Random Weight Croissant, Random Weight Donut (1 observation each))

[47]1 Food Group (Random Weight Corn (1 observation))

[48]Unreasonable outliers in ***Sweet Baked Goods*** has an observation *Purchase-Weight* >9,500 ounce and ***Whole Other Vegetable*** has an observation *Purchase Weight* >15,000 ounce.

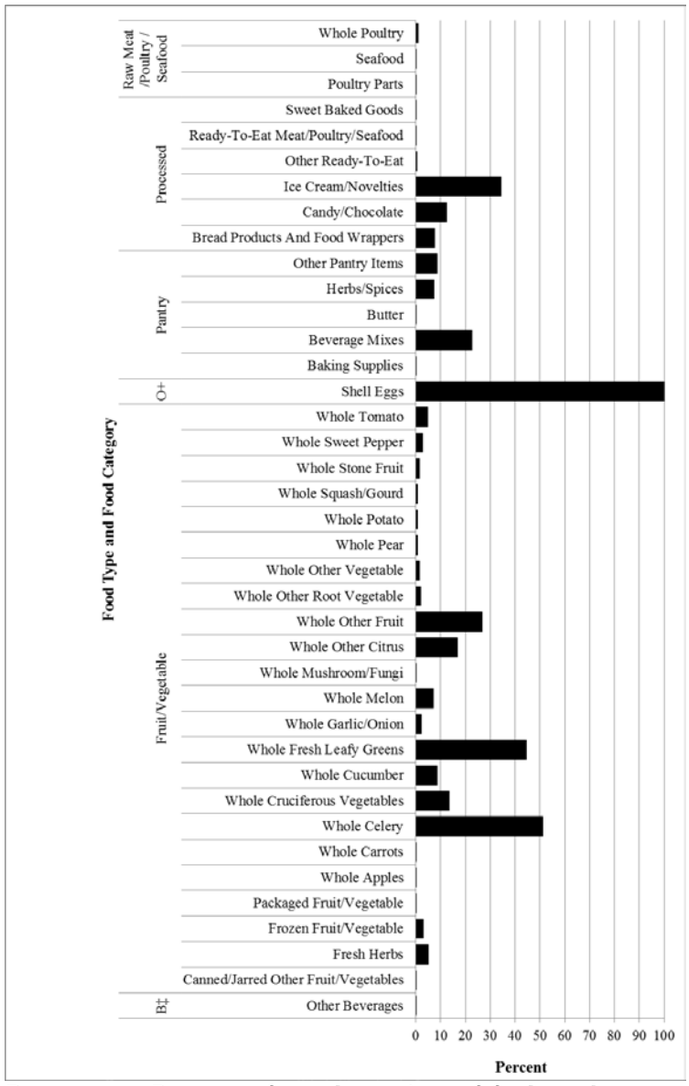
Table 17. Description of data sources or approach used to estimate *Measurement-Weight* of food observations reported with Count as a Purchase-Variable in Homescan food datasets from 2004-2006

Data source	Number of Food Groups	Observations	
		#	%
National Nutrient Database[1]	118	668,249	84
Online pictures/reports of similar or identical products	56	92,887	12
Corresponding Food Group[2]	133	24,609	<1
Combination of 2 sources*	13	8,585	1
Similar Food Group[2]	10	5,113	1
Corresponding Food Category[2]	8	129	<1
Food items are of similar size to another food item that has a report in the National Nutrient Database	2	100	<1
Total	340	799,672	

* Used for foods that were purchased as a fraction of a larger whole. The National Nutrient Database is used for the *Measurement-Weight* of the whole food and information from the food description is used to calculate the *Measurement-Weight* of the portion of the product purchased.

[1]Data source: National Nutrient Database for Standard Reference, Release 28 (http://ndb.nal.usda.gov/ndb/foods)

[2]Median household-weighted per-unit *Purchase-Weight*

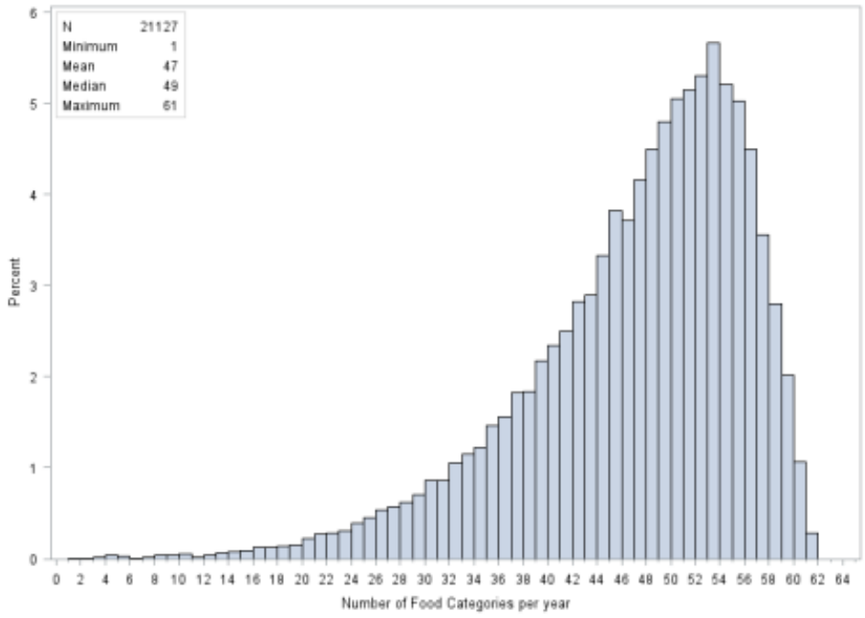


Data source: Responses from observations of food purchases reported to Homescan food datasets by 21,127 households that participated in Homescan from 2004 to 2006.
⁺: ***Other***
‡: ***Beverages***

Figure 22. Percent of observations in a Food Category that undergo *Measurement-Weight* estimation

5.4.2 Annual Household *Purchase-Weight* for Food Categories

Household reported an average of 41 Food Categories that were eligible for factor analysis each year (range: 1 to 61) (**Figure 23**). 3 households reported observations in fewer than 3 Food Categories and were excluded from analysis because there was insufficient information to detect food purchase patterns. There were 21,124 remaining households with food observations analyzed in the study.



Data source: Responses from observations of food purchases reported to Homescan food datasets by 21,127 households that participated in Homescan from 2004 to 2006.

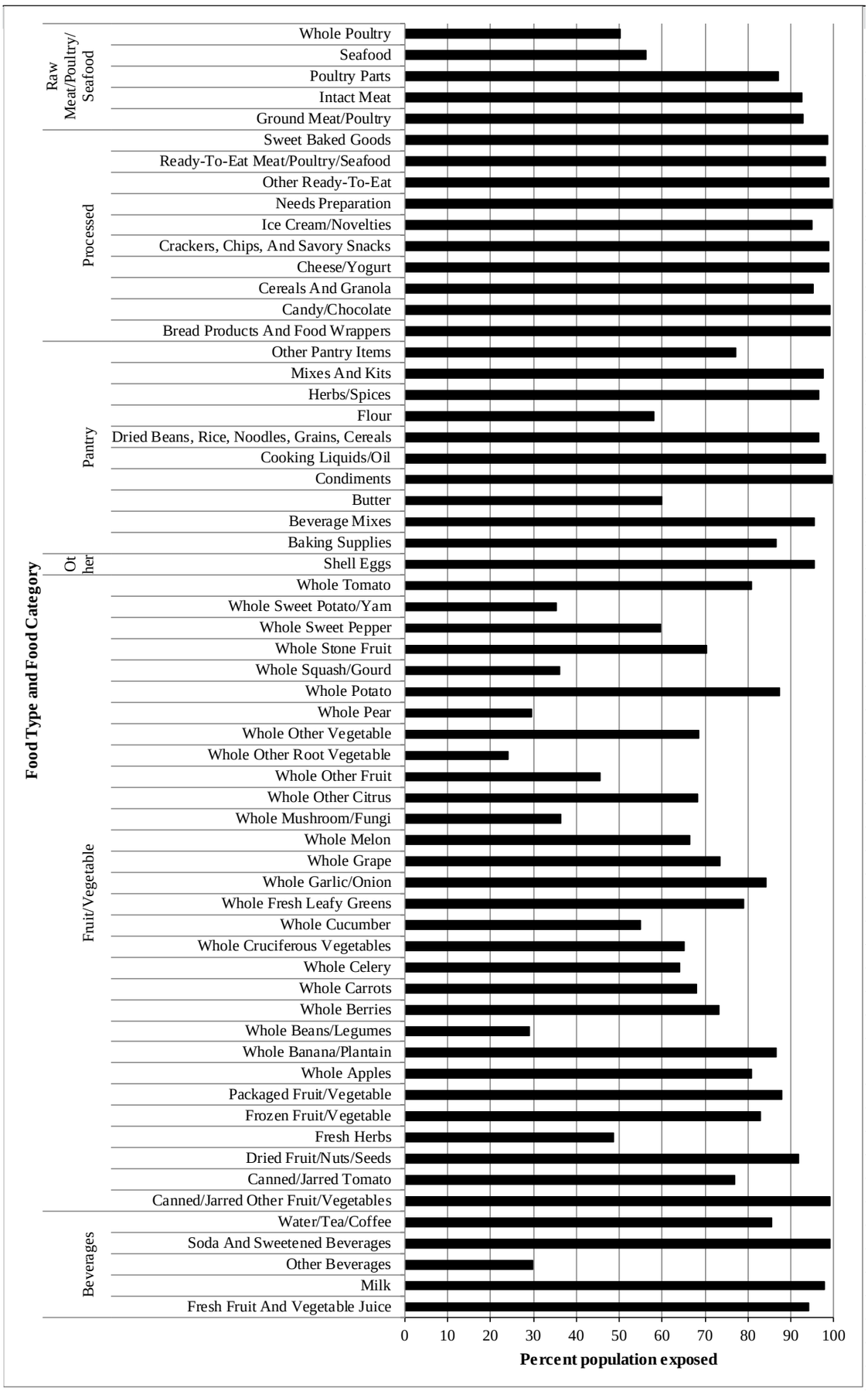
Figure 23. Distribution of number of Food Categories reported by households per year

Every household member was assumed to be exposed[49] to all reported foods since food preparation and food storage areas are shared by household members. The percent of the population that was exposed to a Food Category varied from <30% to >95% (**Figure 24**). As expected, over 90% of the population was exposed[50] to ***Intact Meat***; ***Ground Meat/Poultry***; ***Shell Eggs***; ***Sodas and Sweetened Beverages***; ***Sweet Baked Goods***; ***Milk***; ***Candy/Chocolate***. More than 90% of the population was exposed to every Food Category in the ***Processed*** Food Type. Three of the 4 Food Categories to which less than 30% of the population was exposed, were whole fresh fruits and vegetables.

The average amount of food reported purchased by a household in a year was approximately 2,000 pounds. Among Food Categories that were reported by a household, the range of the population-weighted maximum total annual *Purchase-Weight* that individuals were exposed to varied (abridged table: **Table 18**; complete table: **Table A5**). The typical individual was exposed to more food by weight in the Food Categories ***Sodas and Sweetened Beverages***, ***Milk***, and ***Needs Preparation*** than any other Food Category. ***Sodas and Sweetened Beverages*** had the highest population-weighted median total annual household *Purchase-Weight* (390 pounds) among all

[49] Defined as a report of a food observation that is categorized into a Food Category at least once a year.

Food Categories. ***Whole Potato*** had the highest population-weighted median total annual household *Purchase-Weight* (32 pounds) among all whole fresh fruit and vegetables, ***Needs Preparation*** had the highest population-weighted median total annual household *Purchase-Weight* (167 pounds) among Food Type ***Processed***, and ***Intact Meat*** had the highest population-weighted median total annual household *Purchase-Weight* (27 pounds) among Food Type ***Raw Meat, Poultry, and Seafood***. The Food Categories that had a total annual *Purchase-Weight* with the widest interquartile range (>100 pounds) were in the Food Type ***Beverages*** and Food Category ***Needs Preparation***. The Food Categories that had a total annual *Purchase-Weight* with the smallest interquartile range (≤5 pounds) were ***Fresh Herbs***; ***Whole Beans/Legumes***; ***Whole Celery***; ***Whole Mushroom/Fungi***; ***Whole Other Root Vegetable***; ***Other Pantry Items***.



*Estimated total population = 642,995,166 individuals represented by 21,124 households

Data source: Responses from observations of food purchases reported to Homescan food datasets by 21,124 households that participated in Homescan from 2004 to 2006

Note: Exposure is defined as a report of a food observation that is categorized into a Food Category at least once a year.

Figure 24. Percent of Homescan population exposed to each Food Category

Table 18. Range* of population-weighted maximum total annual Purchase-Weight (pounds), to which individuals are exposed, of foods purchased at grocery stores, by Food Category (Abridged Table)

Food Type	Food Category	Range of household annual *Purchase-Weight* (pounds)					
			Population-weighted				
		Minimum	Lower Quartile	Median	Upper Quartile	Maximum	Interquartile range
Beverages	Fresh Fruit And Vegetable Juice	0.36	27	69	142	1,829	115
	Milk	0.52	96	208	387	2,924	291
	Other Beverages	0.46	3	8	33	691	30
	Soda And Sweetened Beverages	0.54	184	390	730	10,040	546
	Water/Tea/Coffee	0.42	31	98	272	5,056	241
Fruit/Vegetable	Canned/Jarred Other Fruit/Vegetables	0.06	27	51	88	788	61
	Canned/Jarred Tomato	0.18	4	10	20	364	16
	Dried Fruit/Nuts/Seeds	0.05	3	7	15	2,336	12
	Fresh Herbs	0.002	1	3	6	234	5
	Frozen Fruit/Vegetable	0.06	5	14	36	702	31
	Packaged Fruit/Vegetable	0.04	4	10	20	491	16
	Whole Apples	0.09	6	13	28	565	22
	Whole Banana/Plantain	0.01	9	23	47	905	38
	Whole Beans/Legumes	0.05	1	2	5	112	4
	Whole Berries	0.15	3	6	12	183	10
	Whole Carrots	0.13	2	5	10	505	8
	Whole Celery	0.01	1	2	4	245	3
	Whole Cruciferous Vegetables	0.07	3	7	15	743	12
	Whole Cucumber	0.06	1	4	9	178	7
	Whole Fresh Leafy Greens	0.04	3	8	17	708	13
	Whole Garlic/Onion	0.01	4	10	20	287	16
	Whole Grape	0.21	4	8	17	243	13
	Whole Melon	0.03	6	15	33	1,271	27
	Whole Mushroom/Fungi	0.04	0.9	2	4	65	3
	Whole Other Citrus	0.10	5	11	23	754	19
	Whole Other Fruit	0.08	2	4	9	440	7

Data source: Responses from observations of food purchases reported to Homescan food datasets by 21,124 households that participated in Homescan from 2004 to 2006.

Note: Population-weighting was determined by multiplying household size and household-specific random-weight projection factor for each year a household participated in Homescan

*The range of each Food Category is among households that report ≥1 observation categorized in the Food Category only

5.4.3 Homescan market food risk

Among the 18,517,657 observations in Homescan, 1,237,954 observations are considered high risk, 5,302,984 observations are considered medium risk, and 11,976,719 observations are considered low risk. There are 2 households that were excluded from analysis because no low risk foods were reported. When the ratio between the per-capita amount of food per household is

<0.039, the household was considered to have a low risk, households with a ratio between 0.039-0.119 are considered medium risk and households with a ratio >0.119 was considered as high risk. The risk score varied between Homescan market from 1.47 (San Diego) to 2.36 (Birmingham) (**Figure 25**), but was similar for Homescan region from 1.96 (Midwest and West) and 2.03 (South and Northeast). As a result, Homescan region specific analysis was not performed.

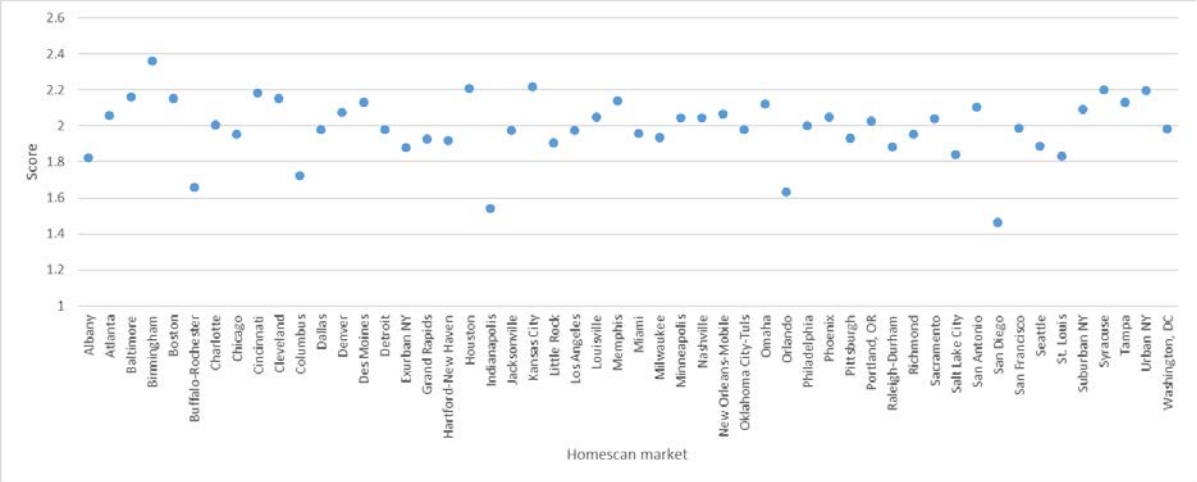


Figure 25. Homescan market risk score for each Homescan market from Homescan grocery data reported from 2004-2006 (1=low risk, 2=medium risk, 3=high risk)

5.5 POPULATION-LEVEL ANALYSIS

The population-adjusted rate of *S. enteritidis* illnesses >6 years was identified as a confounder because it is the only covariate that was significantly associated with both *S. enteritidis* illnesses and Homescan market risk score. The Homescan region score was included as a factor to account for larger geographic groupings. After adjusting for confounders there was not an association between Homescan market risk score and the population-adjusted rate of *S. enteritidis* illnesses (p-value = 0.42).

6.0 DISCUSSION

This is the first study to examine the relationship between all foods in the home and *S. enteritidis* infections, or any foodborne disease, in the United States. Population-based household-reported grocery purchase data collected from 2004 to 2006 was used to determine, quantify, and compare individual, household, and geographic risk to high risk foods throughout the United States. The results indicated that exposure to high risk foods varied between Homescan market population, but not by Homescan region. This suggests that the populations in some Homescan markets purchase more high risk foods than the population in other Homescan markets. However, this study was unable to find an association between *S. enteritidis* illnesses and exposure to high risk foods in the home at Homescan region and Homescan market.

The use of a household risk is a novel use of food data, and relationship with *S. enteritidis* illnesses warrants further attention. The benefit of a risk score as opposed to studying only the amount of high risk foods is that it puts into perspective the relationship between all foods in the home. This is important, because of the inter-relationships between foods. The lack of an association may be due to the size of the Homescan markets which may minimize the heterogeneity between analytic units. Future ecological studies should consider county and county-equivalents as geographic units in order to conduct ecological studies among population in smaller geographic areas.

While no association was found between illnesses and high risk food exposure, the diversity in high-risk food scores at a population level suggests that there may be HOH behaviors in the home that are the source of differential rates of disease. This would have a direct bearing on

whether the most efficient use of limited resources available for food safety would be more effective on upstream changes to the food supply such as in the form of increased testing or regulation of grocery stores, or be spent on developing better consumer education materials by targeting specific populations. Current education approaches are fairly broad (eg., cook foods thoroughly, avoid cross contamination) and have not resulted in lasting behavioral changes because the population may not comprehend the importance of food safety behaviors (Medeiros, Chen, Hillers, & Kendall, 2008) since proper behaviors are not necessarily part of the household norm. This supports growing interest in improving food safety education measures (Sivaramalingam et al., 2015) by providing a framework to focus food safety efforts, both in developing materials and conducting studies. Population-specific messaging may be more effective in changing behaviors since the language and materials can be targeted to specific constructs that are of particular relevance to the population (Abbot et al., 2009; Byrd-Bredbenner et al., 2007; G. Chen, Kendall, Hillers, & Medeiros, 2010; Medeiros et al., 2008; Quinlan, 2013; Scheule, 2004).

Grocery data is a novel approach to capturing and analyzing food data for foodborne disease studies. Homescan was used because it was the only available data source that contained the full range of foods in the home. Homescan provides a unique opportunity to appreciate the complexity of at-home food exposure that would otherwise be unexplored in other data collection strategies. The level of detail, on the state of the food, in the dataset provided a way to understand the variation and complexity of food diversity available in grocery stores throughout the United States that is not available in any other dataset. There are several strengths to using grocery purchase data as a proxy for at-home food exposure. First, the level of detail in grocery data allows the ability to determine the risk level of every observation. The flexibility may make this a powerful tool for studying other foodborne diseases which allows specific foods of interest to be

noted. Second, the detail of grocery data overcomes the need to differentiate the level of preparation of different food products that affects risk of exposure to contaminated products. Third, multiple hypothesis of different food interactions can be tested. As a result, Homescan provided a unique opportunity to describe variability in at-home food exposure which had not been done before.

Homescan data was collected from the HOH and provided a baseline for at-home food exposure for all household members. This approach may be less likely to be subject to measurement errors that are more likely to occur from data reported by other household members who may not be responsible for food purchases. The sample size is larger than other studies, that collect food data at the consumer level, which supports analysis for subgroups, and the level of detail in Homescan fills a data gap for studies of diseases that have an association with the state of food item, such as foodborne diseases (Dwyer et al., 2003). This is unique compared to other nationally representative data collection strategies at the individual level (eg., NHANES). Furthermore, the continuous collection of data may provide less biased estimates of uncommon foods, foods purchased infrequently, or in various quantities over small units of time.

The estimated population that the sample of households that participated in Homescan represented was representative of the United States population as indicated by a comparison of socio-demographic characteristics in the Homescan population and population estimates reported by the United States Census Bureau (**Table A6**). The largest differences between Homescan population and United States population was HOH gender which may be due to individual interpretation of HOH status for the purposes of food-related activities versus overall perception of HOH since there may be gender differences in household roles (Hilton & Haldeman, 1991). There were 5 households reported to Homescan that were not included in food-related analysis. The

projection factor for each household represented <1% of the population in their respective Homescan markets and overall population. Their exclusion likely did not affect the final results. These results suggest that the strategies employed by Homescan in ensuring that typically underrepresented populations — underserved, minorities, and women — were enrolled with similar success to efforts used by the United States Census Bureau to include these individuals. This was important in ensuring that the risk score is representative of the overall Homescan population. As a result, the food data collected were likely not biased towards a particular population more than the food data collected in other nationally representative studies. Thus, future studies can utilize Homescan to identify food-related differences in smaller populations that may be pertinent to understanding risk to contaminated food products and risky behaviors.

The risk score is dependent on the quality of the grocery purchase data since the amount of each food item purchased is used to determine the ratio of high risk foods to low risk foods. While Food Categories were not narrow enough to identify data quality issues, Food Groups were able to detect data anomalies and the affected Purchase-Variables were edited to increase confidence in the data quality. Furthermore, Food Groups helped determine a reasonable unit for observations reported with *Count*. The uncertainty surrounding this assumption is unknown, but a standard of reasonableness was applied to each decision in order to minimize potential errors. Another data issue that was addressed in this study is the identification of outliers. The typical definition used to define outliers in food-related studies, 3 times the interquartile range, may not be appropriate for grocery purchase data. Human ability to process and consume food is more narrow than what households purchase, which are constrained by availability, cost, and space to contain food. As a result, the distribution of the *Observation Purchase-Weight* is heavily skewed; evaluations of observations at the right hand of the tail revealed reasonable product purchase amounts, such as

the difference between offerings at warehouse stores versus convenience stores. The inconsistencies found within the observations of food were not noted in previous uses of Homescan data. This may be due to grouping parameters used in previous studies that were not capable of detecting data quality issues, observations of foods that were not described, or not analyzing observations from the Random-Weight panel which is where data issues occurred. While caution should be used when analyzing the data it does not detract from the overall utility of Homescan.

Similar to all food-related data collected from consumers, data accuracy is a concern. There are multiple data sources that serve as proxies for national amounts of food consumption or food intake. These data sources report national estimates of food at different points along the farm-to-fork continuum and are collected using different methodologies. For example, data reported in the USDA-ERS Food Availability (Per-Capita) Data System is calculated from data reported by farms, processing plants, and import/exports, while data reported in NHANES is collected as individual consumption over 2 nonconsecutive 24-hour periods. However, Homescan is the only dataset that reports quantities of food at the point-of-retail from the consumer perspective. Due to food losses at different points along the farm-to-fork continuum (eg., spoilage or waste), the estimates reported in each dataset are not expected to be equal. Furthermore, publically available reports of estimates from USDA-ERS[51] and NHANES[52] were not comparable to Homescan because descriptions of food groupings and quantities between each dataset were not consistent with each other or the Food Categories created from Homescan data. Furthermore, analysts of these other data sources did not recommend manipulating these data sources into a format that would allow for

[51] http://www.ers.usda.gov/data-products/food-availability-(per-capita)-data-system/.aspx
[52] http://www.ars.usda.gov/SP2UserFiles/Place/80400530/pdf/ficrcd/FICRCD_Intake_Tables_2005_06.pdf

comparisons. However, pricing data reported to Homescan was compared to pricing reports from retailers and found that the data quality of self-reported data was similar to other economic data sets (Einav, Leibtag, & Nevo, 2008; Zhen, Taylor, Muth, & Leibtag, 2009). Although cost was not analyzed in this study, the consistency of the data suggests that the *Measurement-Variables* were of similar quality. While the overall data quality was determined to be consistent, the analysis suggested that there may be non-random errors in Homescan data by age, race, education level, and male employment status. However, these differences were no worse than accuracy concerns facing other food-related datasets (Dwyer et al., 2003). Awareness of these issues tempers the conclusions, but does not detract from the utility of Homescan as a data source.

Though we were unable to determine if the quality of data would be different if any adult reported grocery data, it is likely that the HOH would be most invested in data reporting, and it is reasonable to expect that entering food data is built into household food-behaviors since the HOH reports grocery data on a regular basis. Although participation in Homescan is a burden, participants were compensated for their time and were made aware of the expectations. Additionally, the use of a UPC scanner, scale, and access to an online database reduced the burden on the HOH. Furthermore, 74% of households participated for more than 1 year suggesting that households were willing to invest the time and effort to participate in a study of this magnitude.

Although risk score has never been described prior to this study, a review of the distribution of foods reflects commonly held ideas about geographic distribution of food consumption or food exposure. For example, a greater percent of the population in Homescan markets that are located along the coasts (eg., Seattle) are part of a household that purchased raw fish than the percentage of the population in Homescan markets that are inland (eg., Kansas City) and the population-weighted median total annual per-capita household *Purchase-Weight* of ***Dried Beans, Rice, Noodles, Grains,***

Cereals is highest in the Miami Homescan market. As a result, the risk scores are a reasonably realistic representation of the relationship between high risk foods to low risk foods in different populations throughout the United States.

Although the risk score is an opportunity to better understanding complex and dynamic relationships of food interactions in the home, Homescan was not a simple study to implement. The burden of data collection is a challenge for food-related studies and the methods used in Homescan would not be practical option for typical foodborne disease studies. However, since Homescan is representative of the United States population, ranges of the total annual per-capita *Purchase-Weight* of different types of food could be used to develop a semi-quantitative food frequency questionnaire that would capture the magnitude and variability of food exposure over a year. The foods used in the form could be sensitive and specific to the known epidemiology of foodborne pathogens. Future studies interested in analyzing a risk score could utilize questionnaires, to reduce the burden on both the participant and the epidemiologist. This approach could be validated by comparing the distribution of risk score from a study population to a population that are similarly represented by a Homescan market.

The identification and distribution of the Homescan market risk score is sensitive to shifts in food relationships. There was overall consistency from year-to-year on the estimated Homescan population exposed to each Food Category and population-weighted per-capita total annual *Purchase-Weight*. However, this study used data from multiple years because there were not enough households that participated in each Homescan market in a year to accurately represent the food variability of the population. This was reflected in Homescan market year-to-year variation in the percent of population exposed and per-capita total annual *Purchase-Weight* for certain Food Categories. Based on previous reports of food trends, it may take several decades for shifts in food

behaviors to become apparent, depending on the food (Smith, Ng, & Popkin, 2013; United States Department of Agriculture, 2003; Wells, March 2008). The distribution of the population among quintiles in food purchase patterns, from studies representative of the United States population, would also indicate shifts in food purchasing behavior. As a result, future studies should be cautious that the food purchase behaviors identified from the population in this study are consistent with future study populations.

This study used Homescan data from 2004 to 2006 because it is the only time period that food data from the UPC panel and Random-Weight panel were reported. A secondary analysis conducted as part of this study with only the UPC panel found that the risk scores differed without the inclusion of the Random-Weight panel. This is likely due to the disproportionate amount of low risk and high risk foods that are more commonly purchased as part of the Random-Weight panel compared to the UPC panel. This indicated that the data from the Random-Weight panel was important to our understanding. As a result, it is necessary that any future study that collects observations of food directly from grocery stores includes both random-weight and UPC foods in order to accurately reflect and describe at-home food exposure.

There were several limitations to the *Salmonella* data. First, NSSS does not distinguish outbreak, travel, and domestically-acquired sporadic cases from each other. Although sporadic infections make up approximately 90% of salmonellosis, there may be population-level differences in the distribution of domestically-acquired sporadic illnesses (Johnson et al., 2011; Kendall et al., 2012). Second, although salmonellosis is nationally notifiable, there is evidence that there are geographic differences in the quality of data reporting (Centers for Disease Control and Prevention (CDC), 2013b). Third, there were 7,373 *Salmonella* cases that had an unknown serotype (4,418 cases) or could not be matched to a Homescan market (2,955 cases) because zipcode data was not

available. Finally, NSSS is a passive surveillance system and differences in health care seeking behaviors may result certain populations being underreported (Scallan et al., 2006). These limitations may lead to incorrectly estimating the magnitude of geographic variation in disease rates which affect the observed ecologic relationships. These limitations may result in less specific associations between risk score and *S. enteritidis* illnesses.

Variations in the geographic distribution of illnesses may be the result of environmental and social characteristics that are not detected at an individual-level. As a result, ecological studies are of growing interest to the foodborne disease literature because they include individual and community-level factors. Furthermore, ecological studies can help improve our understanding of exposure pathways and identify targets of food safety measures that will result in decreases in the population (Koopman & Longini, 1994) since there is evidence that the risk of access to contaminated food products has an environmental component that can be addressed at the structural level (Darcey & Quinlan, 2011; Quinlan, 2013). Previous ecological studies used county or county-equivalents as the geographical unit, which may identify greater heterogeneity between socio-demographic characteristics than between Homescan markets. This study used Homescan market as a unit of analysis because that was the smallest common unit that matched to illness data. Of the 3 socio-demographic factors previously associated with *S. enteritidis* in an ecological study only poverty was a similar finding from this study, with household size and level of rurality being new findings from this study (Banatvala et al., 1999; Varga et al., 2013; Whitney et al., 2015). The identification of additional socio-demographic variables associated with *S. enteritidis* may be due to the increased population since previous ecologic studies were conducted in smaller geographic areas. Although the location of households that participate in Homescan is unknown, households are distributed geographically in densely population areas and are assumed to be representative of

the entire population. While standardized age-rates were tested in the model with no change to the results, as with ecological studies, there may be other unexplored within-group confounders, and information bias could introduce errors. Furthermore, rurality was obtained from USDA-ERS so it was not linked to households. We used the data under the assumption that the Homescan market risk score would not be substantially affected by any population not well represented in Homescan.

7.0 CONCLUSION

Previous studies of food or salmonellosis have not accounted for the diversity of foods in the home which make up universe of food exposure in the home. At-home exposure to contaminated foods is the result of a complex pathway of food interactions where both the type of food and the state of the food product at retail is important to determine the opportunity for cross-contamination and infection. This study demonstrates the importance of the entire spectrum of food exposure and variation across populations. This study provides a framework to enhance study instruments for all sporadic foodborne diseases as well as efforts to design targeted interventions, and evidence to direct food-related efforts in anthropology, sociology, nutrition, and chronic diseases to better understand food behaviors.

APPENDIX: SUPPLEMENTAL MATERIAL

Table A1. Number of households and estimated population in each Homescan market

Homescan	# Households	Estimated population	
		#	%[a]
Albany	51	5,563,129	
Atlanta	2,282	17,732,360	
Baltimore	636	8,202,881	
Birmingham	138	10,263,858	
Boston	116	15,353,824	
Buffalo-Rochester	108	8,616,135	
Charlotte	104	9,405,456	
Chicago	1,641	26,653,713	
Cincinnati	114	7,705,222	
Cleveland	141	12,877,362	
Columbus	78	5,951,099	
Dallas	163	15,949,772	
Denver	87	4,487,415	
Des Moines	64	2,920,202	
Detroit	172	17,005,621	
Exurban NY	347	8,762,548	
Grand Rapids	109	8,167,174	[1]
Hartford-New Haven	106	10,106,443	
Houston	165	13,380,988	
Indianapolis	109	8,018,491	
Jacksonville	86	6,902,990	
Kansas City	102	4,822,134	
Little Rock	47	5,447,432	
Los Angeles	1,874	48,002,566	
Louisville	78	8,343,556	
Memphis	62	5,677,721	
Miami	187	18,499,654	
Milwaukee	102	10,394,212	
Minneapolis	79	6,176,816	
Nashville	103	8,674,397	
New Orleans-Mobile	117	9,570,148	
Oklahoma City-Tulsa	86	5,942,216	
Omaha	48	3,461,684	
Orlando	157	11,765,624	

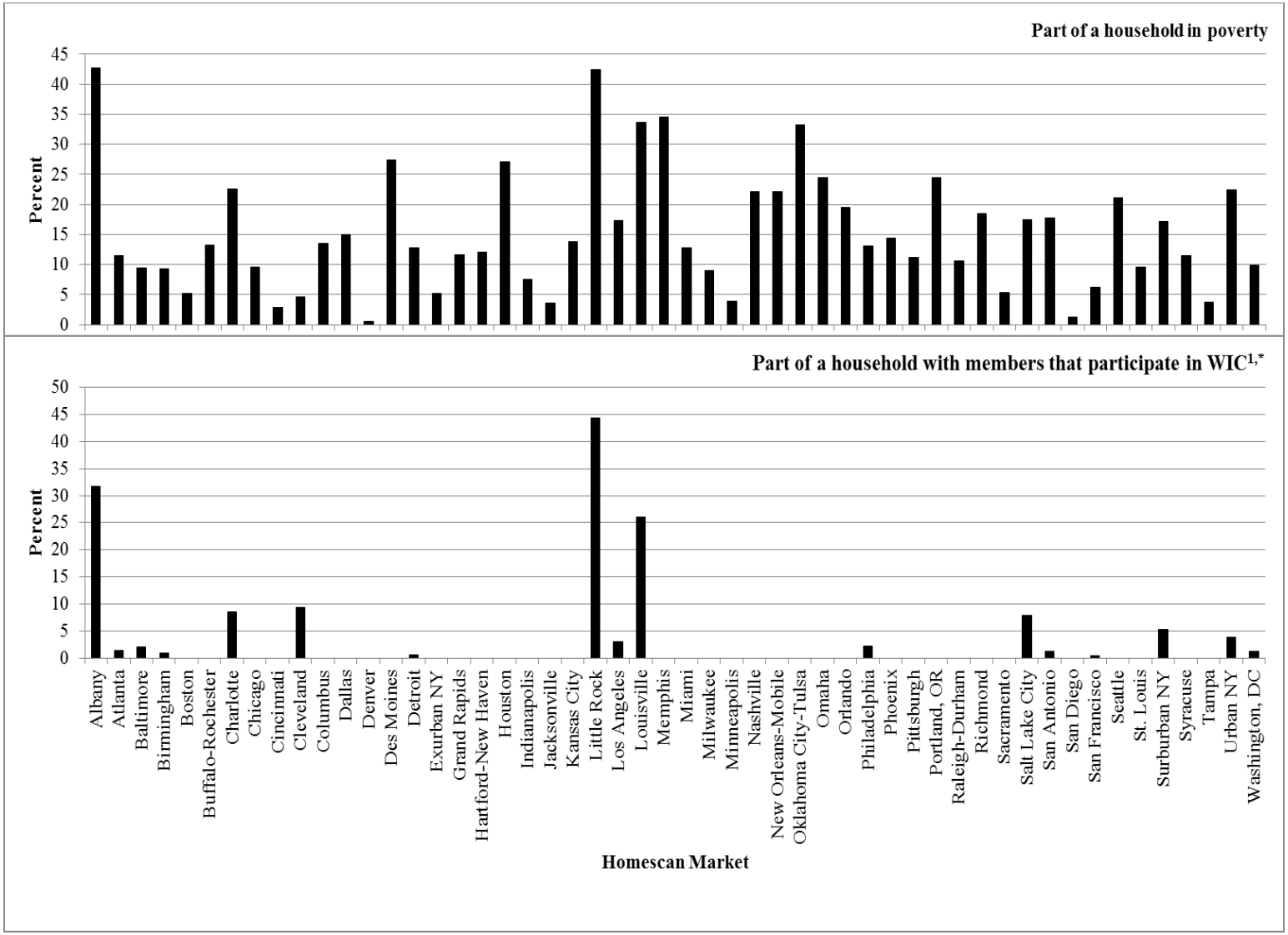
Table A1. (Continued) Number of households and estimated population in each Homescan market

Homescan	# Households	Estimated population	
		#	%[a]
Orlando	157	11,765,624	
Philadelphia	2,348	26,298,192	
Phoenix	254	17,511,649	
Pittsburgh	175	12,836,801	
Portland, OR	134	12,629,300	
Raleigh-Durham	174	12,507,448	
Richmond	136	11,894,982	
Sacramento	77	11,173,947	
Salt Lake City	166	14,967,529	
San Antonio	1,882	10,967,452	
San Diego	63	4,391,258	
San Francisco	2,090	20,489,768	
Seattle	91	7,507,598	
St. Louis	132	16,086,644	
Surburban NY	901	25,442,125	
Syracuse	146	6,967,940	
Tampa	211	14,979,812	
Urban NY	785	24,765,889	
Washington, DC	1,503	20,971,000	
Region			
Midwest	2,891	130,240,374	66
Northeast	5,083	144,713,026	88
South	8,317	227,079,747	70
West	4,836	141,161,030	69
Total	**21,127**	**643,194,177**	**72**

*Data source: Estimated population in Homescan is obtained from Homescan demographic survey, 2004-2006. Estimated population is calculated as household-specific projection factor from Random Weight Panel * household size. US Census population is obtained from US Census Bureau, Population Estimates Program (http://www.census.gov/popest/data/historical/2000s/vintage_2006/). Data obtained from Table Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2000 to July 1, 2006 (NST-EST2006-01).*

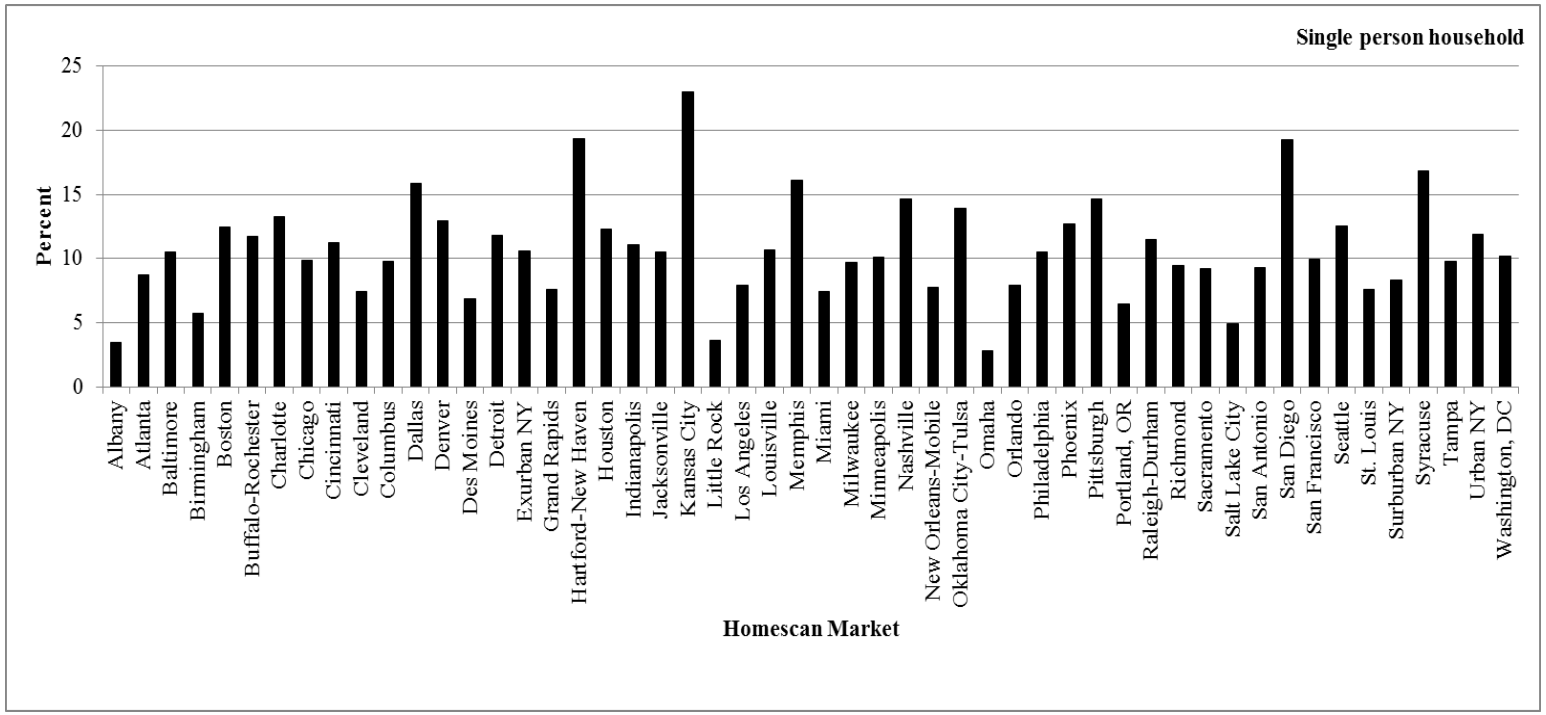
[a] 2004-2006 estimated US population (889,543,703 individuals); Estimated population by US Census region (Midwest - 197,836,778 individuals, Northeast - 164,006,926 individuals, South - 322,627,806 individuals, West - 205,072,193 individuals).

[1]Annual population in each Homescan market is not available.



*Data only collected in 2006

Figure A1. (Continued below) Distribution of socio-demographic characteristics among Homescan market population



[1]Poverty is determined by threshold criteria based on household size and household income set by US Census bureau (https://www.census.gov/hhes/www/poverty/data/threshld/)

Figure A1. (Continued) Distribution of socio-demographic characteristics among Homescan market population

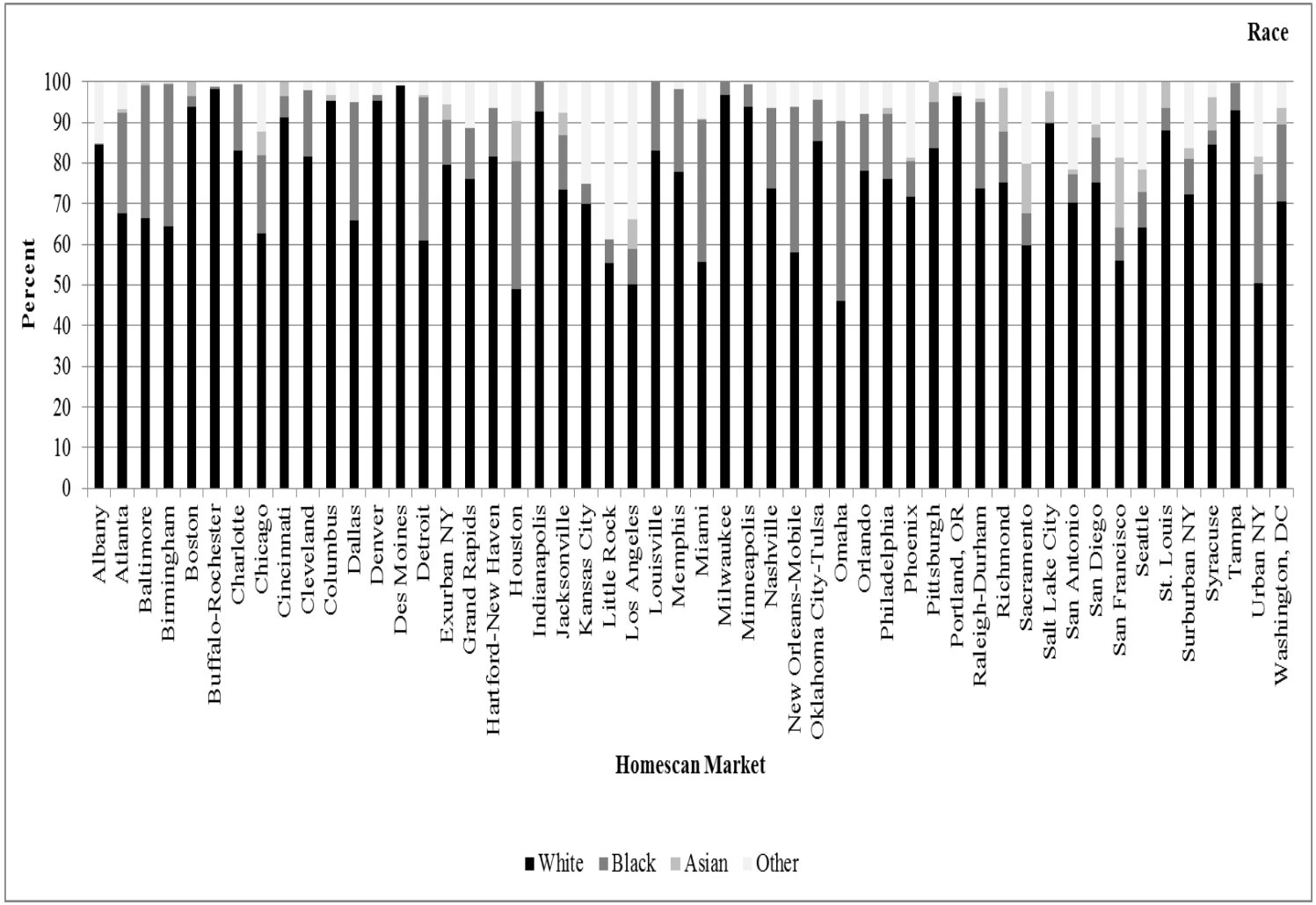


Figure A1 (Continued) Distribution of socio-demographic characteristics among Homescan market population

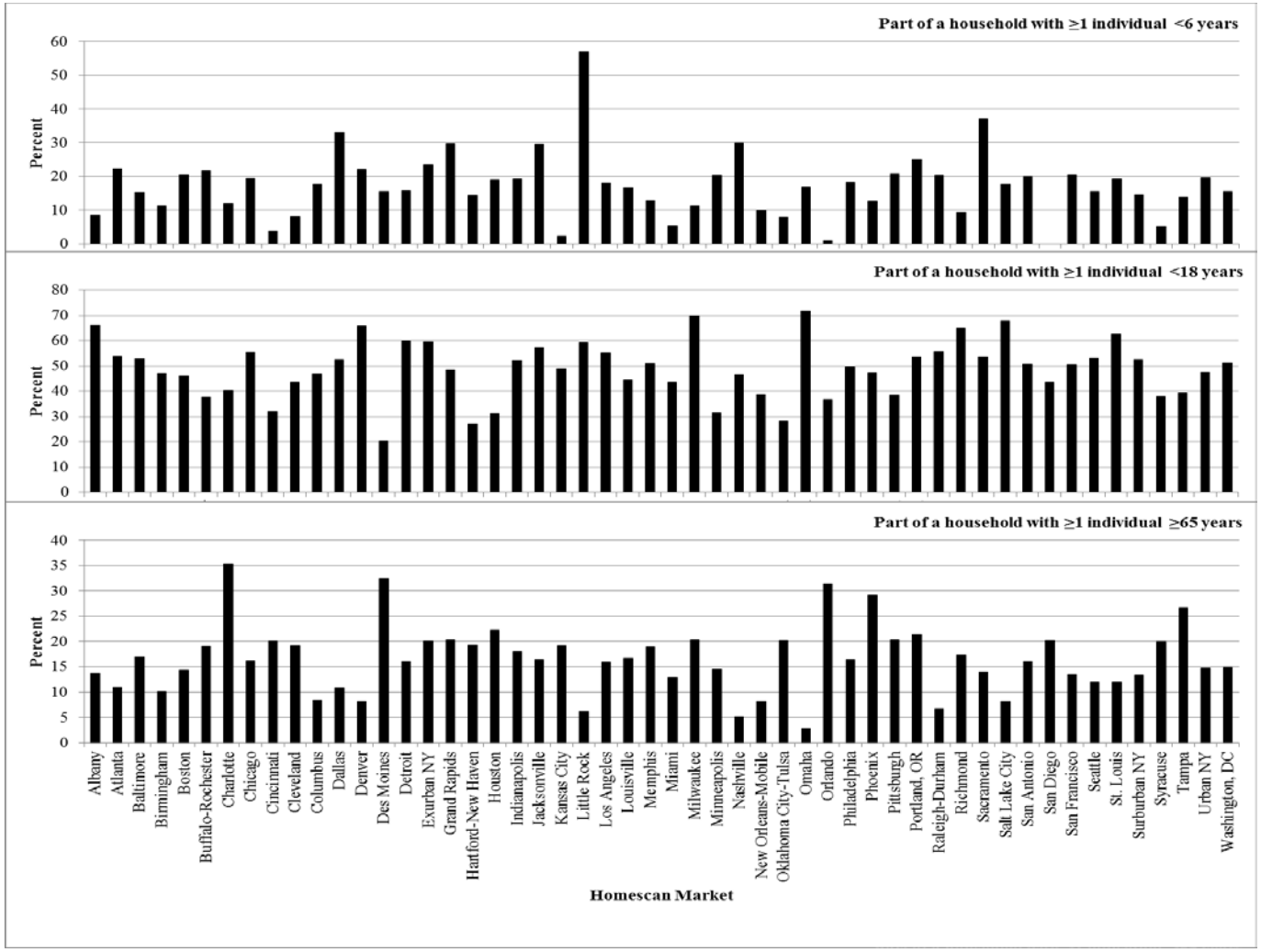


Figure A1 (Continued) Distribution of socio-demographic characteristics among Homescan market population

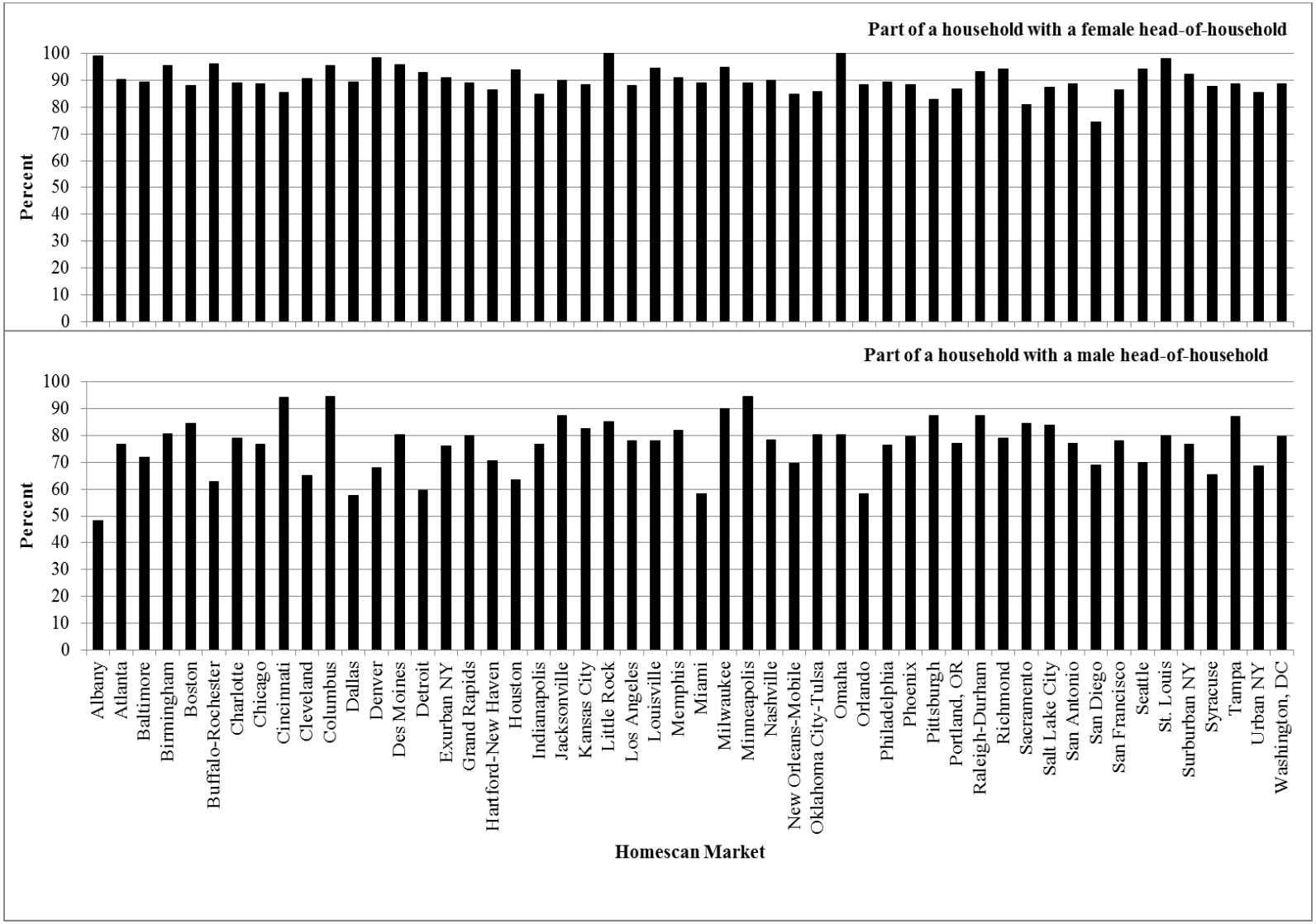
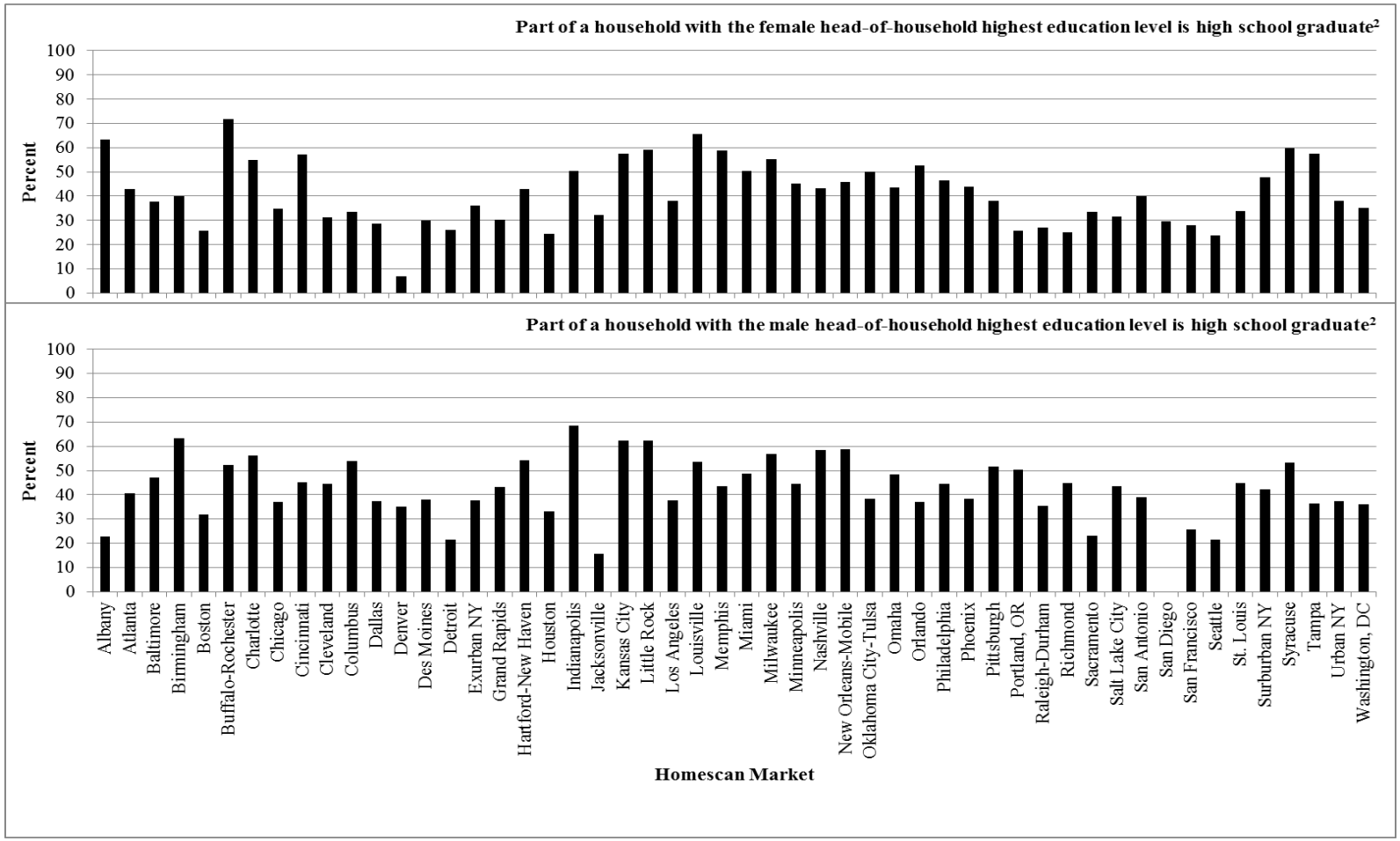
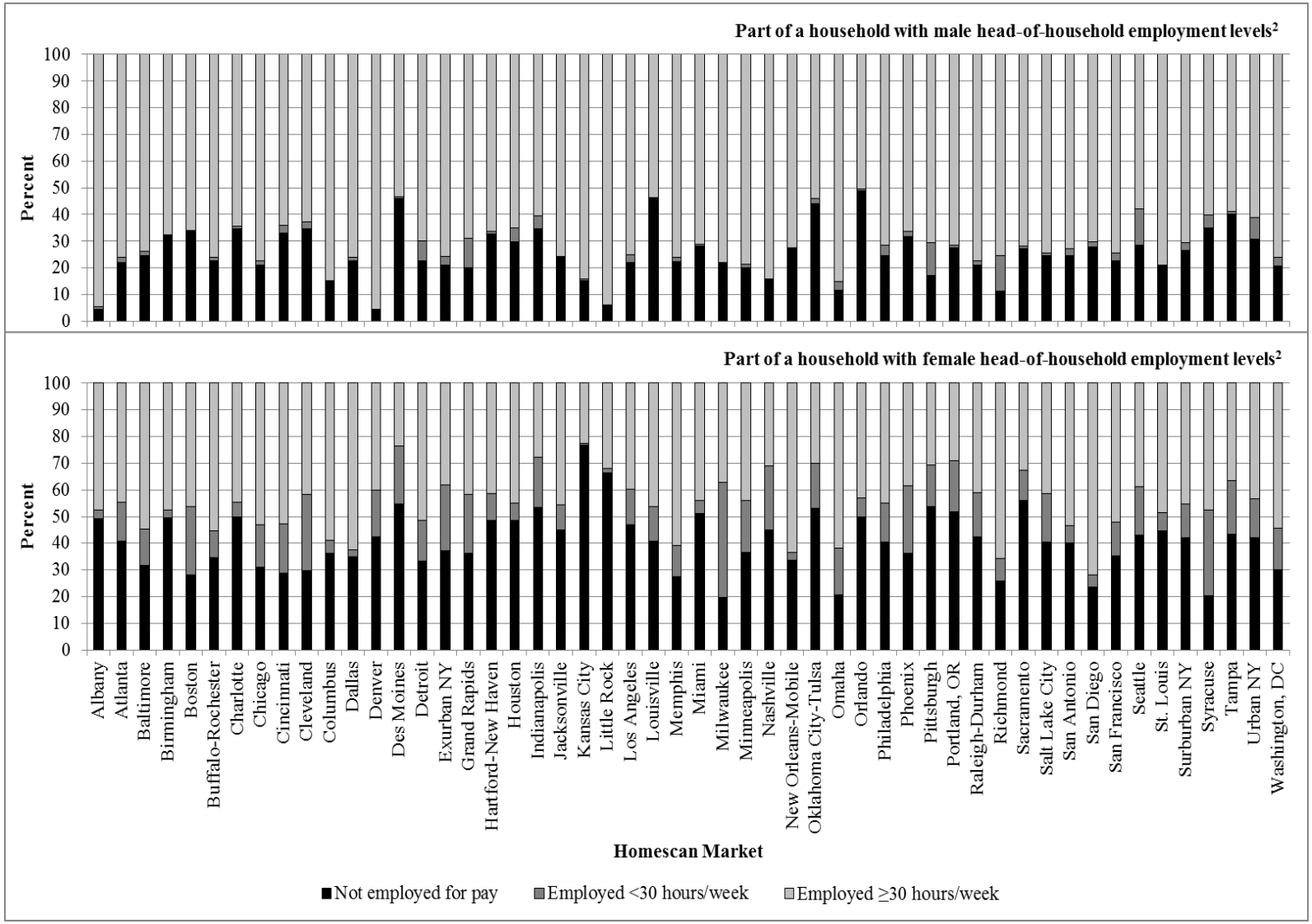


Figure A1 (Continued) Distribution of socio-demographic characteristics among Homescan market population



[2]Among households with a gender-specific head-of-household

Figure A1. (Continued) Distribution of socio-demographic characteristics among Homescan market population



[2]Among households with a gender-specific head-of-household

Figure A1. (Continued) Distribution of socio-demographic characteristics among Homescan market population

Table A2. Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Type: Beverages		
Total Observations:	**2,183,326**	
Food Category	Food Group	# Observations
Fresh Fruit And Vegetable Juice	Apple Cider	5,343
	Fruit/Vegetable Juice	348,500
Milk	Lowfat/Reduced	307,817
	Nonfat/Skim	160,788
	Other Milk	27,337
	Whole	122,747
Other Beverages	Nut Beverages	40,954
	Liquid Baby Formula	1,695
Soda And Sweetened Beverages	Juice Cocktail/Fruit Flavored	269,940
	Soda	672,855
Water/Tea/Coffee	Coffee	7,681
	Tea	60,600
	Water	157,069
Food Type: Fruit/Vegetable		
Total Observations:	**3,912,651**	
Food Category	Food Group	# Observations
Canned/Jarred Other Fruit/Vegetables	Canned/Jarred Beans	102,862
	Canned/Jarred Fruit	226,558
	Capers	1,028
	Cocktail Onion	150
	Fruit Sauce	35,019
	Green Chile Pepper	5,084
	Olive	40,497
	Other Canned/Jarred Vegetables	180,143
	Other Peppers	12,472
	Other Pickled Vegetables	3,093
	Pickled Cucumber	50,835

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Type: Fruit/Vegetable **Total Observations: 3,912,651**		
Food Category	Food Group	# Observations
Canned/Jarred Other Fruit/Vegetables	Pimento Pepper	3,079
	Relish/Chutney	15,783
	Sauerkraut	12,625
Canned/Jarred Tomato	Tomatillo	16
	Tomato	118,126
Dried Fruit/Nuts/Seeds	Dates In A Tray	121
	Nuts	92,007
	Nuts In Cello Wrap	47,297
	Other Dried Fruit	52,056
	Random Weight Fruit/Nuts/Seed	32,887
	Seeds	7,637
Fresh Herbs	Anise	20
	Basil Top	49
	Bunch Of Basil	491
	Bunch Of Cilantro	91
	Bunch Of Dill	121
	Bunch Of Fennel	2
	Bunch Of Mint	77
	Bunch Of Oregano	25
	Bunch Of Other/Mixed Herb	86
	Bunch Of Parsley	34
	Bunch Of Rosemary	39
	Bunch Of Tarragon	15
	Bunch Of Thyme	140
	Cilantro	801
	Dill	164
	Marjoram	25
	Mint	73
	Mixed Herbs	83
	Oregano	49
	Other Herbs	1,211
	Parsley	1,088
	Parsley Root	21

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Fresh Herbs	Potted Other Herb	52
	Random Weight Basil	10
	Random Weight Bay Leaf	1
	Random Weight Cilantro	156
	Random Weight Coriander	2
	Random Weight Dill	17
	Random Weight Ginger	65
	Random Weight Mint	4
	Random Weight Oregano	9
	Random Weight Other Herb	64
	Random Weight Parsley	118
	Random Weight Rosemary	6
	Random Weight Tarragon	1
	Random Weight Thyme	4
	Rosemary	225
	Sage	88
	Tarragon	54
	Thyme	209
	Whole Basil	294
	Whole Cilantro	70
	Whole Dill	139
	Whole Fennel	3
	Whole Marjoram	7
	Whole Mint	124
	Whole Oregano	51
	Whole Other Herb	119
	Whole Parsley	40
	Whole Rosemary	200
	Whole Thyme	139
	Chili Pepper	49
	Random Weight ChilI Pepper	10,363
	Lemons	2,821
	Lemons And Limes Sold Together	1
	Limes	1,026
	Random Weight Lemons	22,891

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Fresh Herbs	Random Weight Lime	13,452
Frozen Fruit/Vegetable	Frozen Corn On The Cob	5,798
	Frozen Fruit	18,677
	Frozen Other Vegetables	169,292
Packaged Fruit/Vegetable	Asparagus Spear	377
	Coconut	3
	Mixed Fruit	4,312
	Mixed Vegetable	5,573
	Other Fruit	4,123
	Other Melon	2,393
	Other Vegetable	56,779
	Packaged Lettuces/Slaw Mix	162,583
	Pepper	391
	Pineapple	2,709
	Random Weight Party Platter/Fruit Salad	6,140
	Rhubarb	2
	Salad Kit	11,152
	Vegetables For Kabobs	3
	Vegetables Sold In Tray	15
	Watermelon In 1/2 Wedge Sold In Fridge Section	28
	Watermelon In 1/4 Wedge Sold In Fridge Section	48
	Watermelon In 1/8 Wedge Sold In Fridge Section	3
	Watermelon Slice	7
Whole Apples	Apples	29,862
	Random Weight Apples	127,997
Whole Banana/Plantain	Banana	13,494
	Plantain	3
	Random Weight Bananas	300,276
Whole Beans/Legumes	Beans	1,602
	Peas	2,395
	Random Weight Green Beans	19,704
	Random Weight Peas	3,085
Whole Berries	Other Berries	36,348

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Whole Berries	Random Weight Blueberries	2,183
	Random Weight Cranberries	507
	Random Weight Other Berries	1,099
	Random Weight Raspberries	773
	Random Weight Strawberries	11,549
	Strawberries	62,766
Whole Carrots	Bunch Of Carrots	25
	Non-Specific Carrots	10,752
	Random Weight Bunch Of Carrots	1,558
	Random Weight Carrots	13,841
	Whole Carrots	17,744
	Whole Unpeeled Baby/Mini Carrots	24,077
Whole Celery	Bunch Of Celery	233
	Celery Branch / Stalk	21,067
	Celery Hearts	7,472
	Non-Specific Celery	4,513
	Random Weight Bunch Of Celery Heart/Stalk	10,243
	Random Weight Celery	14,022
	Whole Celery	1
Whole Cruciferous Vegetables	Broccoli	2,321
	Broccoli Crown/Broccolette	417
	Broccoli Head	148
	Broccoli Rabe	232
	Brocliflower	168
	Brussel Sprout Stalk	9
	Bunch Of Baby Broccoli	112
	Bunch Of Bokchoy	7
	Bunch Of Broccoli	849
	Cabbage Head	120
	Cauliflower	6,647
	Cauliflower Head	3,142
	Kohlrabi	13
	Nappa Cabbage	8
	Other Cruciferous Vegetable	718
	Random Weight Broccoli	48,966
	Random Weight Brussel Sprout	3,348
	Random Weight Cabbage	28,797

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Whole Cruciferous Vegetables	Random Weight Cauliflower	8,215
	Whole Broccoli	232
	Whole Cauliflower	263
Whole Cucumber	Other Cucumber	3,135
	Random Weight Cucumber	61,587
	Whole Cucumber	2,806
	Whole Mini/Baby Cucumber	164
Whole Fresh Leafy Greens	Bunch Of Arugula	81
	Bunch Of Other Dark Leafy Greens	98
	Bunch Of Spinach	4
	Bunch Of Watercress	18
	Butterhead (eg., Boston, Bibb)	657
	Endive Head	42
	Green Leaf	1,532
	Iceberg Lettuce	44,977
	Other Dark Leafy Greens	2,104
	Other Leafy Greens	2,295
	Random Weight Lettuces	68,731
	Random Weight Spinach	5,685
	Red Leaf	889
	Romaine	2,638
	Romaine Hearts	15,810
	Spinach	11,129
	Watercress	29
	Whole Arugula	50
	Whole Endive	17
	Whole Other Dark Leafy Greens	88
Whole Garlic/Onion	Bunch Of Chives	132
	Bunch Of Leeks	4
	Bunch Of Non-Specific Onion	2
	Bunch Of Scallions	139
	Chives	145
	Elephant/Jumbo Garlic	133
	Elephant/Jumbo Garlic Bulb	277
	Elephant/Jumbo Garlic Head	1
	Elephant/Jumbo Whole Garlic	116
	Garlic Braid	4

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Whole Garlic/Onion	Garlic Clove	446
	Leeks	145
	Non-Specific Garlic	1,808
	Non-Specific Garlic Bulb	547
	Onion Bulb	5
	Other Garlic, Onion, And Onion-Like	5,279
	Other Whole Onions	23,546
	Potted Chives	6
	Random Weight Chives	8
	Random Weight Garlic	222
	Random Weight Onion	113,805
	Random Weight Scallions	5,522
	Scallions	375
	Small Garlic Bulb	4
	Sweet Onions (eg., Vidalia)	3,052
	Whole Chives	106
Whole Grape	Grape	6,985
	Random Weight Grape	98,337
Whole Melon	Cantaloupe	945
	Honeydew	302
	Mini/Baby Watermelon	1,449
	Other Melon	14
	Other Watermelon	3,100
	Random Weight Cantaloupe	45,563
	Random Weight Honeydew	6,038
	Random Weight Watermelon	23,941
Whole Mushroom/Fungi	Mushroom	23,915
	Random Weight Mushroom	13,013
	Unknown Mushroom Cap	899
Whole Other Citrus	Grapefruit	4,033
	Orange	15,350
	Other Citrus	8,090
	Pummelo	6
	Random Weight Grapefruit	12,836
	Random Weight Orange	42,155
	Random Weight Tangelo	2,161
	Random Weight Tangerine	7,202

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Whole Other Fruit	Coconut	98
	Tangelo	559
	Mini/Baby Pineapple	8
	Mixed Fruit Sold In Basket	9
	Other Fruit	61
	Papaya	140
	Pineapple	10,603
	Pomegranate	25
	Random Weight Guava	58
	Random Weight Kiwi	7,083
	Random Weight Other Fruit	12,294
	Random Weight Papaya	2,268
	Random Weight Pineapple	7,522
Whole Other Root Vegetable	Bunch Of Beets	13
	Bunch Of Radish	4
	Celery Root	2
	Non-Specific Beets	224
	Other Root Vegetables	445
	Radish	5,165
	Random Weight Parsnip	1,319
	Random Weight Radish	8,905
	Random Weight Turnip	3,598
	Whole Beets	105
Whole Other Vegetable	Bunch Of Asparagus	1,878
	Corn In Unknown State	1,500
	Corn On The Cob	10
	Eggplant	38
	Other Vegetable	1,539
	Random Weight Artichoke	3,698
	Random Weight Asparagus	18,741
	Random Weight Bean Sprout	1,480
	Random Weight Corn	29,669
	Random Weight Eggplant	6,880
	Random Weight Other Vegetable	63,028
	Sprouts	2,045
	Whole Artichoke	862
	Whole Asparagus	147

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Whole Pear	Pear	1,620
	Random Weight Pear	21,443
Whole Potato	Potato	78,659
	Random Weight Potato	47,284
Whole Squash/Gourd	Acorn Squash	5
	Butternut Squash	44
	Delicata Squash	1
	Non-Specific Gourd	22
	Other Squash	49
	Pumpkin	49
	Random Weight Other Squash	15,787
	Random Weight Zucchini	24,517
	Spaghetti Squash	1
	Yellow Squash	62
	Zucchini	385
Whole Stone Fruit	Apricot	53
	Avocado	3,506
	Cherry	1,405
	Mango	637
	Nectarine	592
	Other Stone Fruit	59
	Peach	721
	Plum	795
	Random Weight Apricot	3,159
	Random Weight Avocado	33,857
	Random Weight Cherry	14,938
	Random Weight Mango	11,759
	Random Weight Nectarine	20,032
	Random Weight Peach	38,314
	Random Weight Plum	18,888
Whole Sweet Pepper	Mini Whole Sweet Pepper	336
	Other Sweet Pepper	1
	Random Weight Sweet Pepper	75,035
	Whole Sweet Pepper	3,077
	Whole Sweet Pepper Sold In A Multipack	1,125
Whole Sweet Potato/Yam	Random Weight Sweet Potato Or Yam	30,511
	Sweet Potato Or Yam	1,642

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Whole Tomato	Beefsteak Tomato	522
	Campari Tomato	1,658
	Medium Tomato	3
	Plum/Roma Tomato	3,045
	Random Weight Tomato	130,431
	Small Tomato	29,877
	Tomato Medley	11
	Unknown Tomato	16,182
Food Type: Other		
Total Observations:	**873,971**	
Food Category	Food Group	# Observations
Shell Eggs	Shell Eggs	239,609
Excluded Foods	Alcohol:Alcohol Mixes	6,426
	Alcohol:Spirits	82
	Alcohol:Wine/Sparkling	5,307
	Decorating/Candy Making Kit	663
	Ice	7,493
	Non-Edible Decorations	789
	Not Food/Beverage:Flowers	46
	Not Food/Beverage:Pet Food - Bird	31,808
	Not Food/Beverage:Pet Food - Dog/Cat	570,748
	Not Food/Beverage:Pet Food - Small Animal/Fish	11,000
Food Type: Pantry		
Total Observations:	**2,828,665**	
Food Category	Food Group	# Observations
Baking Supplies	Baking Chips (Eg, Chocolate Chips)	29,579
	Baking Cocoa	2,926
	Decorating/Candy Making Kit	294
	Dessert Shells/Pie Crust	15,562
	Edible Decorations	2,474
	Extracts/Flavorings	10,991
	Extracts/Flavorings Sold As Oil	128
	Extracts/Flavorings Sold As Tablet	26
	Food Coloring	2,058
	Frosting	23,107
	Icing/Gel	2,418

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Baking Supplies	Paste/Fruit/Mincemeat/Pudding Filling	8,362
	Sprinkle/Crystals	2,248
	Stabilizer	27,680
	Whole Wheat/Grain Dessert Shells/Pie Crust	5
Beverage Mixes	Concentrates	2,465
	Instant Cocoa / Cider Mixes	28,633
	Instant Milk/Milk Substitutes	2,909
	Instant Sweetned Juice Drink Mixes	54,912
	Random Weight Tea/Coffee	3,706
	Tea In Bag	59,829
	Tea/Coffee For Individual Servings	4,161
	Tea/Coffee In Can	62,354
	Tea/Coffee In Other Package	59,591
	Tea/Coffee In Pack	477
	Tea/Coffee In Pouch	39
	Powdered Baby Formula	3,537
Butter	Butter	76,768
Condiments	BBQ Sauce	27,060
	Chili/Hot/Pepper Sauce	14,940
	Cocktail/Seafood Sauce	9,644
	Coffee Cream(er)	473
	Condensed/Evaporated Milk	31,543
	Frozen Egg/Dairy Based Condiments	32,954
	Frozen Sauce, Spread, And Other Condiments	550
	Fruit/Nut Butter	64,956
	Glaze	467
	Heavy Cream/Half And Half	46,580
	Honey	11,211
	Hot Dog Sauce	2,175
	Jam/Jellies	52,082
	Ketchup	40,727
	Liquid Seasoning	1,722
	Marinade	9,482
	Mayonnaise	50,778
	Meat/Poultry/Seafood Sauce	8,397
	Molasses	1,684
	Mustard	33,217
	Non Dairy Creamer	19,855

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Condiments	Non Dairy Liquid Creamer	1,177
	Non Dairy Mayonnaise	526
	Other Sauce	36,090
	Other Topping	11,998
	Pasta/Pizza/Bruschetta Sauce	85,820
	Paste	1,026
	Refrigerated And Shelf Stable Sweet Dip/Spread	3,341
	Refrigerated Egg/Dairy Based Condiments	21,919
	Refrigerated Sauce	1
	Refrigerated Sauce, Spread, And Other Condiments	49,161
	Sandwich Spread	1,370
	Shelf Stable Egg/Dairy Based Condiments	92,717
	Shelf Stable Sauce	126
	Shelf Stable Sauce, Spread, And Other Condiments	62,069
	Sour Cream	63,304
	Syrup	51,416
	Whipped Cream	12,523
Cooking Liquids/Oil	Broth/Stock	48,849
	Chili	9
	Clam Juice	463
	Cooking Wine	1,729
	Frozen Broth/Stock	12
	Frozen Gravy	136
	Lard	454
	Lemon/Lime Juice	12,037
	Margarine	116,809
	Oil In Aerosolized Can	26,206
	Olive	18,474
	Other Liquid Oil	39,944
	Refrigerated Broth/Stock	79
	Refrigerated Gravy	166
	Shortening	7,595
	Vinegar	23,330
	Worcestshire Sauce	5,455
Dried Beans, Rice, Noodles, Grains, Cereals	Barley	961

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Dried Beans, Rice, Noodles, Grains, Cereals	Cornmeal/Grits/Polenta	13,891
	Couscous/Quinoa/Bulgar	3,424
	Dried Beans	17,817
	Noodles	147,168
	Other Oats And Cereals	63,500
	Rice	21,851
	Whole Wheat Noodles	6,014
Flour	Other Flour	6,370
	White Wheat Flour	26,763
Herbs/Spices	Bay Leaves	540
	Brown Sugar	17,644
	Cinnamon Sticks	663
	Corn Husks	129
	Crystallized Ginger	90
	Dried Products For Umami	376
	Extracts/Flavorings-Crystals/Powder	282
	Frozen Banana Leaves	6
	Fruit/Vegetable Peel	209
	Liquid	286
	Nutmeg	75
	Onion	6,054
	Other Processed Herbs/Spices	70,680
	Pepper	15,583
	Pickling/Canning Salt	451
	Powdered Sugar	10,539
	Salt And Pepper In Shakers	1,771
	Salt Substitute	1,097
	Specialty Salt	9,879
	Sugar Sold In Bag, Jar, Carton, Canister	61,659
	Sugar/Sweetner Sold As Packets	18,454
	Sugar/Sweetner Sold As Sticks	110
	Sugar/Sweetner Sold As Tablets	278
	Sun Dried Tomato	525
	Sweetners Sold In Bag, Jar, Carton, Canister	7,856
	Table Salt	14,907
	Vanilla Bean	30
	Whole Garlic	35

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Mixes And Kits	Boxed Potatoes And Stuffing	54,965
	Condiment Mix (Eg., Broth, Sauce, Spreads)	84,669
	Cookie Mix	6,491
	Flour Mix (Eg, Masa, Pizza Crust, Bread)	39,125
	Instant Rice	12,781
	Meal Kits	21,469
	Mousse/Gelatin/Pudding	67,774
	Other Sweet Baked Good Mix (Eg., Cake)	99,787
	Soup	64,603
	Specialty Sweet Baked Good Kits (Eg., Microwavable Cake)	2,008
	Vegetarian/Vegan Condiment Mix	55
Other Pantry Items	Bread Crumbs And Coating	20,230
	Crouton	15,910
	Ice Cream Cones	7,118
	Matzo Meal	577
	Nixtamal	5
	Rice Paper	4
	Salad Toppings	9,649
	Seaweed Wrapper	252
	Whole Bean Coffee	14,136
	Egg Substitute	1,054
	Liquid Eggs	13,969
Food Type: Processed		
Total Observations:	**8,319,164**	
Food Category	Food Group	# Observations
Bread Products And Food Wrappers	Dark Bagels	24
	Dark Bread	25,296
	Dark Buns / Rolls	95
	Dark Food Wrappers	13
	Other Types Of Bagels	35,909
	Other Types Of Biscuit	360
	Other Types Of Bread	373,145
	Other Types Of Bread Products	207
	Other Types Of Bread Stick	662
	Other Types Of Buns / Rolls	151,489
	Other Types Of English Muffin	39,853

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Bread Products and Food Wrappers	Other Types Of Food Wrapper	1,118
	Other Types Of Pita	3,674
	Other Types Of Taco Shells	9,976
	Other Types Of Tortillas	51,923
	Random Weight Baguette	1,979
	Random Weight Bially	444
	Random Weight Club Hard Rolls	10,537
	Random Weight Dark Bagels	383
	Random Weight Dark Bread	5,907
	Random Weight Dinner Rolls	3,844
	Random Weight Kaiser Rolls	8,129
	Random Weight Other Assorted Rolls	1,649
	Random Weight Other Types Of Bagel	18,706
	Random Weight Other Types Of Bread	40,240
	Random Weight Other Types Of English Muffin	297
	Random Weight Other Types Of Rolls	17,716
	Whole Wheat/Grain Bagels	2,296
	Whole Wheat/Grain Bread	76,682
	Whole Wheat/Grain Buns / Rolls	2,478
	Whole Wheat/Grain English Muffin	2,075
	Whole Wheat/Grain Food Wrapper	325
	Whole Wheat/Grain Pita	2,377
	Whole Wheat/Grain Tortillas	4,495
Candy/Chocolate	Candy Sold As A Strip	547
	Candy Sold In Rolls	6,028
	Candy Sold In Rolls And In Packs	1,239
	Candy With Liquid	460
	Chocolate Bark	404
	Chocolate Bars	135,528
	Chocolate Covered Cherries	3,081
	Chocolate Cubes	32
	Chocolate Cups	1,432
	Chocolate Miniatures	67,235
	Chocolate Square	2,290
	Chocolate Truffle/Balls	3,231
	Gum	32,111

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Candy/Chocolate	Lollipops	12,509
	Miniature Candy	7,283
	Mint	9,679
	Mint Pellet Singles	4,513
	Mint Sold As A Strip	937
	Mint Sold As Rolls In Package	1,849
	Mint Sold As Rolls In Unknown Package	807
	Other Candy	179,642
	Other Candy Sold As Individual Pieces	2,801
	Other Chocolate	172,887
	Random Weight Candy	10,015
	Random Weight Chocolate	5,705
	Random Weight Gum	193
	Random Weight Mints	526
	Sugar Free Gum	55,103
	Sugarless/Diet Candy Sold As A Strip	16
	Sugarless/Diet Candy Sold As Pack	113
	Sugarless/Diet Candy Sold In Unknown Packaging	9,524
	Sugarless/Diet Chocolate	2,082
	Sugarless/Diet Chocolate Bars	8,015
	Sugarless/Diet Chocolate In Unknown Packaging	9,345
	Sugarless/Diet Chocolate Sticks	108
	Sugarless/Diet Chocolate Truffle/Balls	227
	Sugarless/Diet Mint Sold In Packs	53
	Sugarless/Diet Mint Sold In Unknown Packaging	2,282
	Sugarless/Diet Mint Sold On A Strip	3
Cereals And Granola	Cereal	357,031
	Granola	8,972
Cheese/Yogurt	Cheese	542,814
	Random Weight Cheese	113,686
	Yogurt	311,413
	Yogurt Drink	25,068
Crackers, Chips, And Savory Snacks	Corn/Potato Chips	313,189
	Cracker	129,843
	Dark Crackers	46
	Matzo	1,911
	Other Snacks (Eg., Party Mixes)	78,977
	Oyster Cracker	3,960

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Crackers, Chips, And Savory Snacks	Popcorn	20,427
	Pretzels	66,569
	Pumpernickel/Rye Cracker	1,205
	Rice Cracker	1,165
	Rice/Popcorn Cakes	11,962
	Tortilla Chips	98,491
	Whole Wheat Cracker	16,289
Ice Cream/Novelties	Frozen Yogurt	8,144
	Ice Cream And Other Dairy Desserts Sold As Bars	51,227
	Ice Cream And Other Dairy Desserts Sold As Bites/Nuggets/Bonbon	3,246
	Ice Cream And Other Dairy Desserts Sold As Cake	800
	Ice Cream And Other Dairy Desserts Sold As Cannoli	2
	Ice Cream And Other Dairy Desserts Sold As Cup/Cone	17,482
	Ice Cream And Other Dairy Desserts Sold As Sandwich	18,884
	Ice Cream And Other Dairy Desserts Sold As Tube	67
	Ice Cream And Other Dairy Desserts Sold As Variety Pack	392
	Ice Cream And Other Dairy Desserts Sold In Non-Specific Package	215,619
	Non-Dairy Frozen Desserts Sold As Bars	24,890
	Non-Dairy Frozen Desserts Sold As Bon Bon/Nugget	2
	Non-Dairy Frozen Desserts Sold As Cup/Cone	3,229
	Non-Dairy Frozen Desserts Sold As Mini Sandwich	469
	Non-Dairy Frozen Desserts Sold As Sandwich	1,051
	Non-Dairy Frozen Desserts Sold As Shell	85
	Non-Dairy Frozen Desserts Sold As Tube	587
	Non-Dairy Frozen Desserts Sold In Non-Specific Package	6,139
	Other Ice Cream And Other Dairy Desserts	401
Needs Preparation	Canned/Jarred/Boxed (Eg., Soup, Pasta, Flavored Rice, Flavored Beans)	601,937

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Needs Preparation	Complex Breakfast Foods (Eg., Toaster Pastries)	51,627
	Complex Meat Based Foods (Eg., Beef Stew, Spam, Corned Beef)	28,157
	Fresh Other Types Of Shells/Crust	2,015
	Frozen Breakfast Sandwiches	59
	Frozen Cooked Shrimp	6,795
	Frozen Corn Dog	4,564
	Frozen Crab Cake	1,146
	Frozen Crepe	6
	Frozen Dark Bagels	2
	Frozen Dark Bread	2
	Frozen Deviled Egg	20
	Frozen Egg Roll Of Unknown Size	4,419
	Frozen Food Wrappers	7,310
	Frozen Foods That Use Biscuits	5,303
	Frozen Fruit Filled Phyllo	10
	Frozen Hashbrowns	1,869
	Frozen Mini Pastries	1,037
	Frozen Non-Specific Appetizer	360
	Frozen Or Refrigerated Bacon	8,147
	Frozen Or Refrigerated Clam	30
	Frozen Or Refrigerated Sausage/Hot Dog	148,519
	Frozen Other Cake	8,355
	Frozen Other Sweet Baked Goods	6,149
	Frozen Other Types Of Bagels	7,293
	Frozen Other Types Of Batter	78
	Frozen Other Types Of Biscuit/Roll Dough	11,068
	Frozen Other Types Of Biscuit/Rolls	3,098
	Frozen Other Types Of Bread	19,057
	Frozen Other Types Of Bread Dough	1,257
	Frozen Other Types Of Pastry Dough	386
	Frozen Other Types Of Pita	462
	Frozen Other Types Of Pizza Dough	174
	Frozen Oysters	8
	Frozen Pancakes, Waffles, French Toast	52,287
	Frozen Pie	16,838
	Frozen Pizza Bites	12,366

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Needs Preparation	Frozen Pretzels	4,328
	Frozen Sweet Baked Goods Dough	688
	Frozen Whole Wheat/Grain Bagels	36
	Frozen Whole Wheat/Grain Biscuit/Roll Dough	7
	Frozen Whole Wheat/Grain Biscuit/Rolls	40
	Frozen Whole Wheat/Grain Bread	139
	Frozen Whole Wheat/Grain Pancakes, Waffles, French Toast	2,040
	Non-Specific Egg Roll Wrapper	275
	Non-Specific Other Types Of Food Wrappers	426
	Other Frozen Or Refrigerated Manufactured Processed Food	820,775
	Popcorn	55,515
	Random Weight Precooked Bacon	888
	Random Weight Precooked Beef	2,538
	Random Weight Precooked Chicken	2,629
	Random Weight Precooked Duck	13
	Random Weight Precooked Ground Beef	433
	Random Weight Precooked Ground Chicken	11
	Random Weight Precooked Ground Lamb	1
	Random Weight Precooked Ground Pork	20
	Random Weight Precooked Ground Turkey	42
	Random Weight Precooked Ground Veal	2
	Random Weight Precooked Lamb	24
	Random Weight Precooked Organs/Parts	103
	Random Weight Precooked Ostrich	2
	Random Weight Precooked Other Poultry	10
	Random Weight Precooked Pork	15,668
	Random Weight Precooked Seafood	11,337
	Random Weight Precooked Turkey	2,786
	Random Weight Precooked Veal	49
	Random Weight Precooked Whole Chicken	1,948
	Random Weight Precooked Whole Cornish Hens	15
	Random Weight Precooked Whole Duck	12
	Random Weight Precooked Whole Turkey	123
	Refrigerated Chicken Of Unknown Type	9,264
	Refrigerated Filled Buns	1
	Refrigerated Foods Described As Dinner	195

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Needs Preparation	Refrigerated Foods With Mashed Potato	142
	Refrigerated Fresh Pasta	4,885
	Refrigerated Fried Chicken Of Unknown Type	347
	Refrigerated Ham	207
	Refrigerated Kolache	566
	Refrigerated Lau Lau	5
	Refrigerated Meat Sold In Fajita Style	563
	Refrigerated Or Frozen Chicken Wing	5,317
	Refrigerated Or Frozen Sandwiches	55,353
	Refrigerated Or Frozen Seafood	2,415
	Refrigerated Or Frozen Stuffed Mushrooms	449
	Refrigerated Or Frozen Tamales	1,635
	Refrigerated Other Sweet Baked Goods	312
	Refrigerated Other Types Of Biscuit/Rolls	46,313
	Refrigerated Other Types Of Bread	2,465
	Refrigerated Other Types Of Pizza Dough	301
	Refrigerated Other Types Of Shells/Crust	2,844
	Refrigerated Pizza	4,194
	Refrigerated Popcorn Chicken	54
	Refrigerated Pork Loin	18
	Refrigerated Pork Ribs	1,422
	Refrigerated Pot Roast	53
	Refrigerated Potatoes	9,832
	Refrigerated Pulled/Shredded Meat	1,696
	Refrigerated Quiche	401
	Refrigerated Sweet Baked Goods Dough	32,369
	Refrigerated Turkey Breast	56
	Refrigerated Whole Chicken	252
	Shelf Stable Frozen Treats	3,578
	Store Prepared Food	50,876
	Refrigerated Or Frozen Vegetarian/Vegan	28,201
	Tofu/Tempeh	5,113
Other Ready-To-Eat	Candied Apples	1,902
	Fruit Parfait	1,143
	Fruit Snacks	19,042
	Fruit Snacks-6'S	14,826
	Fruit Snacks-No Bag Size	2,719
	Fruit Tube	70

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Other Ready-To-Eat	Gelatin	17,710
	Graham Cracker	19,238
	Marshmallow	15,180
	Other Lunch Kits	30,985
	Other Ready-To-Eat Products	109
	Other Snacks (Eg., Party Mixes)	1,231
	Pickled Eggs	26
	Pudding	27,607
	Pudding And Fruit Cup	2
	Refrigerated Cranberry Sauce	11
	Refrigerated Pudding	23,778
	Refrigerated Salad	28,398
	Refrigerated Sandwiches	3,928
	Refrigerated Sushi Combo	220
	Refrigerated Sushi Roll	3,421
	Refrigerated Sushi Roll Kit	15
	Sandwich Lunch Kits	228
	Store Prepared Food	309,272
	Store Prepared Food Unknown Type	4
	Vegetable/Fruit With Dip	2,939
	Other Baby Food	65,103
	Energy/Meal Replacement Bars	63,589
	Granola Bar/Fruit Bar/Snack Bar	65,651
	Other Frozen Savory Dip/Spread	1
	Other Refrigerated Savory Dip/Spread	31,526
	Other Savory Dip/Spread	29,097
	Salsa In Glass	39,800
	Salsa In Plastic	2,603
	Vegetarian/Vegan Strips/Piece	1,644
Ready-To-Eat Meat/Poultry/Seafood	Cold Cuts/Lunch Meat	187,350
	Dried Meat Sold In A Bag	8,959
	Dried Meat Sold In A Can	46
	Dried Meat Sold In A Pouch	4,814
	Meat (Eg., Vienna Sausages, Beef Jerky)	38,022
	Pork (Eg., Deviled Ham, Pickled Pork Parts)	3,556
	Poultry (Eg., Canned Chicken, Ready-To-Eat Chicken Strips)	13,034

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Ready-To-Eat Meat/Poultry/Seafood	Random Weight Cold Cuts/Lunch Meat	183,296
	Seafood (Eg., Smoked Salmon, Canned Seafood, Cooked Shrimp)	113,270
Sweet Baked Goods	Angel Food Cake	506
	Assorted Cheesecake With Unknown Size	394
	Bread Pudding	38
	Brownie With Other Known Size	163
	Brownie With Unknown Size	11,082
	Cheesecake With Unknown Size	2,208
	Cinnamon Buns / Rolls	4,355
	Cobbler	1,830
	Cookie	292,336
	Crescent	28
	Crisp	43
	Croissant	1,446
	Crumbcake	1,451
	Cupcake	12,906
	Danish	7,389
	Donut And Donut-Like	32,955
	Donut Holes	9,350
	Honey Bun	8,876
	Horn	963
	Kringla	9
	Mexican Pastry	38
	Mini Cinnamon Buns / Rolls	15
	Mini Croissant	184
	Mini Pie	163
	Muffin And Muffin-Like	15,048
	Non-Specific Pastry	372
	Other Sweet Baked Goods/Pastries	10,882
	Other/Non-specific Types Of Cake	15,883
	Pie	24,573
	Random Weight Brownie	1,328
	Random Weight Cake	20,196
	Random Weight Cinnamon Buns	3,267
	Random Weight Cookie	11,500
	Random Weight Croissant	4,571
	Random Weight Cupcake	1,231

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Sweet Baked Goods	Random Weight Danish	5,426
	Random Weight Donut	21,631
	Random Weight Muffin	9,733
	Random Weight Other Sweet Baked Goods/Pastries	16,198
	Random Weight Pie	12,161
	Scone	536
	Slice Of Cheesecake	197
	Snack Cakes	70,084
	Strudel	548
	Sweet Empanada	6
	Turnover	1,093
	Twirlies	1,908
Food Type: Raw Meat/Poultry/Seafood		
Total Observations:	**1,034,242**	
Food Category	Food Group	# Observations
Ground Meat/Poultry	Fresh Ground Beef	14,329
	Fresh Ground Beef In Patty Form	737
	Fresh Ground Chicken	998
	Fresh Ground Other Meat	540
	Fresh Ground Other Poultry	1,106
	Fresh Ground Pork	605
	Fresh Ground Turkey	8,494
	Frozen Ground Beef	10,303
	Frozen Ground Chicken	63
	Frozen Ground Turkey	3,834
	Frozen Or Refrigerated Sausage/Hot Dog	50,438
	Ground Other Meat Sold In An Unknown State	26
	Ground Other Poultry Sold In An Unknown State	10
	Ground Pork Sold In An Unknown State	40
	Ground Veal Sold In An Unknown State	28
	Random Weight Fresh Ground Beef	134,113
	Random Weight Fresh Ground Chicken	608
	Random Weight Fresh Ground Lamb	1
	Random Weight Fresh Ground Pork	3,714
	Random Weight Fresh Ground Turkey	9,684

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Ground Meat/Poultry	Random Weight Fresh Ground Veal	507
	Random Weight Frozen Ground Beef	3,620
	Random Weight Frozen Ground Chicken	45
	Random Weight Frozen Ground Pork	122
	Random Weight Frozen Ground Turkey	475
	Random Weight Frozen Ground Veal	10
	Random Weight Sausage/Hot Dog	27,812
Intact Meat	Beef Sold In Unknown State	1,297
	Fresh Beef	110
	Fresh Half Of Ham	53
	Fresh Organs And Non-Standard Parts	1,221
	Fresh Pork	3,972
	Frozen Or Refrigerated Bacon	79,377
	Organs And Non-Standard Parts Sold In Unknown State	1,021
	Pork Sold In An Unknown State	163
	Random Weight Fresh Bacon	5,293
	Random Weight Fresh Beef	2,009
	Random Weight Fresh Lamb	106
	Random Weight Fresh Non-Specific Beef	197,171
	Random Weight Fresh Non-Specific Lamb	9,306
	Random Weight Fresh Non-Specific Pork	129,209
	Random Weight Fresh Non-Specific Veal	3,665
	Random Weight Fresh Organs And Non-Standard Parts	2,051
	Random Weight Fresh Pork	2,279
	Random Weight Fresh Veal	36
	Random Weight Frozen Bacon	80
	Random Weight Frozen Beef	35
	Random Weight Frozen Non-Specific Beef	5,353
	Random Weight Frozen Non-Specific Lamb	301
	Random Weight Frozen Non-Specific Pork	4,674
	Random Weight Frozen Non-Specific Veal	99
	Random Weight Frozen Organs And Non-Standard Parts	409
	Random Weight Frozen Pork	70
	Random Weight Frozen Veal	2

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Intact Meat	Veal Sold In An Unknown State	1
Poultry Parts	Fresh Chicken Drummette	8
	Fresh Chicken Leg	1,841
	Fresh Chicken Parts	1,719
	Fresh Chicken Wing	468
	Fresh Poultry Organs And Non-Standard Parts	773
	Fresh Turkey Parts	324
	Frozen Chicken Breast	9,665
	Frozen Chicken Parts	9,627
	Frozen Poultry Organs And Non-Standard Parts	36
	Frozen Turkey Parts	846
	Non-Specific Fresh Chicken	271
	Non-Specific Fresh Duck	40
	Non-Specific Fresh Ostrich	8
	Non-Specific Turkey Parts	1
	Random Weight Chicken Parts Sold In Unknown State	2
	Random Weight Fresh Chicken	123,166
	Random Weight Fresh Poultry Organs And Non-Standard Parts	1,803
	Random Weight Fresh Turkey Parts	13,912
	Random Weight Frozen Chicken	9,151
	Random Weight Frozen Poultry Organs And Non-Standard Parts	301
	Random Weight Frozen Turkey Parts	3,095
	Random Weight Non-Specific Fresh Chicken	6,749
	Random Weight Non-Specific Fresh Duck	53
	Random Weight Non-Specific Fresh Ostrich	3
	Random Weight Non-Specific Fresh Other Poultry	228
	Random Weight Non-Specific Frozen Chicken	825
	Random Weight Non-Specific Frozen Duck	9
	Random Weight Non-Specific Frozen Other Poultry	165
	Random Weight Non-Specific Frozen Turkey	483
Seafood	Frozen Other Fish	9,340
	Frozen Salmon Fillet	1,543
	Frozen Shrimp	6,791

Table A2. (Continued) Name and number of observations in each Food Group created to represent unique characteristics of food observations reported by households participating in Homescan from 2004 to 2006

Food Category	Food Group	# Observations
Seafood	Frozen Tuna Steak	163
	Random Weight Fresh Fish	44,179
	Random Weight Fresh Shellfish/Mollusc	15,464
	Random Weight Frozen Fish	7,199
	Random Weight Frozen Shellfish/Mollusc	6,254
	Refrigerated Seafood	215
Whole Poultry	Fresh Cornish Hens	340
	Fresh Other Poultry	1
	Fresh Whole Chicken	300
	Frozen Cornish Hens	741
	Frozen Quail	7
	Frozen Whole Duck	1
	Random Weight Fresh Whole Chicken	23,604
	Random Weight Fresh Whole Duck	98
	Random Weight Fresh Whole Turkey	1,820
	Random Weight Frozen Whole Chicken	2,334
	Random Weight Frozen Whole Duck	182
	Random Weight Frozen Whole Turkey	5,179
	Random Weight Non-Specific Fresh Cornish Hens	741
	Random Weight Non-Specific Frozen Cornish Hens	548
	Random Weight Non-Specific Whole Chicken	1

Table A3. Description of data used to estimate incorrectly reported *Measurement-Weight* units of observations in *Beverage Mixes*, Homescan 2004-2006

Package type	Brand	Data Source	*Measurement-weight*								Ounce to Fluid Ounce Ratio	Average Ounce to Fluid Ounce Ratio
			Retail package				Standardized units					
			Dry		Liquid*		Dry		Liquid*			
			Amount	Unit	Amount	Unit	Amount	Unit	Liquid	Unit		
Can	Kool Aid	[1]	20	oz	8	qts	20	oz	256	floz	0.08	0.04
	Nestea	[2]	45.1	oz	20	qts	45.1	oz	640	floz	0.07	
Envelope	Kool-Aid	[3]	0.1	oz	2	qts	0.1	oz	64	floz	0.002	
	Kool-Aid	[4]	0.2	oz	2	qts	0.2	oz	64	floz	0.003	
Pouch	Gatorade	[5]	21	oz	2.5	gln	21	oz	320	floz	0.07	
	Gatorade	[6]	51	oz	6	gln	51	oz	768	floz	0.07	
To go	Kool Aid	[7]	0.6	oz	16.9	floz	0.6	oz	16.9	floz	0.03	
	Wyler's	[8]	1.6	gm	16.9	floz	0.1	oz	16.9	floz	0.006	

Note: ounce = oz, gram = gm, gln = gallon, qts = quarts, floz = fluid ounce

*Manufacturer determined quantity

[1] http://www.amazon.com/Kool-Aid-Twists-Drink-Raspberry-Lemonade/dp/B00I8GEK1S/ref=sr_1_2?ie=UTF8&qid=1429221289&sr=1-2&keywords=kool+aid

[2] http://www.amazon.com/Nestea-Sweet-Tea-Lemon-45-1/dp/B00IAE886G/ref=pd_sim_prpa_4?ie=UTF8&refRID=14RMFAMSY7FJGHWEXXZ1

[3]http://www.amazon.com/Kool-Aid-Cherry-Unsweetened-0-13-Ounce-Envelopes/dp/B00391V20E/ref=sr_1_4?s=grocery&ie=UTF8&qid=1429220534&sr=1-4&keywords=kool+aid

[4]http://www.amazon.com/Kool-Aid-Raspberry-Unsweetened-Drink-Packets/dp/B00HXYR69O/ref=sr_1_6?s=grocery&ie=UTF8&qid=1429220436&sr=1-6&keywords=kool+aid

[5]http://www.amazon.com/Gatorade-Powder-Pouch-Orange-21-Ounce/dp/B005K4PZRY/ref=sr_1_5?s=grocery&ie=UTF8&qid=1429221040&sr=1-5&keywords=gatorade+pouch

[6]http://www.amazon.com/GATORADE-FRUIT-PUNCH-POWDER-51oz/dp/B0063W96I6/ref=pd_sim_sbs_gro_5?ie=UTF8&refRID=13EQKQZ0MZ88608CP3NT

[7]http://www.amazon.com/Kool-Aid-Singles-16-9-Ounce-Bottles-12-Count/dp/B001FA1MW4/ref=sr_1_1?s=grocery&ie=UTF8&qid=1429220587&sr=1-1&keywords=kool+aid+to+go

[8]http://www.amazon.com/Wylers-Light-Singles-Peach-packets/dp/B005LURBFQ/ref=pd_sim_gro_1?ie=UTF8&refRID=1290BYS5R8GFA6P9FQX9

Table A4. Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Beverages								
Other Beverages	Liquid Baby Formula	38	2	2	Package	33.28	FG	
Food Type: Fruit/Vegetable								
Canned/Jarred Other Fruit/Vegetables	Other Peppers	2	6	6	Package	12.75	FG	
	Other Pickled Vegetables	4	1	1	Package	25.00	FG	
	Pickled Cucumber	177	1	2	Package	24.00	FG	
Fresh Herbs	Anise	20	1	1	Package	0.75	FC	
	Basil Top	49	1	1	Package	0.75	FC	
	Bunch Of Basil	202	1	1	Package	0.63	FG	
	Bunch Of Cilantro	56	1	1	Package	1.00	FG	
	Bunch Of Dill	14	1	1	Package	0.63	FG	
	Bunch Of Fennel	2	1	1	Package	0.75	FC	
	Bunch Of Mint	5	1	1	Package	0.63	FG	
	Bunch Of Oregano	1	1	1	Package	0.67	FG	
	Bunch Of Other/Mixed Herb	1	1	1	Package	0.63	FG	
	Bunch Of Parsley	13	1	1	Package	1.00	FG	

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Fruit/Vegetable								
Fresh Herbs	Bunch Of Rosemary	3	1	1	Package	0.58	FG	
	Bunch Of Tarragon	1	1	1	Package	0.50	FG	
	Bunch Of Thyme	4	1	1	Package	0.63	FG	
	Cilantro	760	1	1	Package	0.50	FG	
	Dill	21	1	1	Package	0.67	FG	
	Marjoram	10	1	1	Package	0.67	FG	
	Mint	21	1	1	Package	0.67	FG	
	Mixed Herbs	27	1	1	Package	0.67	FG	
	Oregano	8	1	1	Package	0.67	FG	
	Parsley	923	1	1	Package	0.04	FG	
	Parsley Root	8	1	1	Package	16.00	FG	
	Potted Other Herb	37	1	1	Package	1.00	FG	
	Rosemary	39	0.5	1	Package	0.67	FG	
	Sage	36	1	1	Package	0.50	FG	
	Tarragon	18	1	1	Package	0.67	FG	
	Thyme	51	1	1	Package	0.58	FG	
	Whole Basil	40	1	1	Package	1.00	FG	
	Whole Cilantro	28	1	1	Package	2.50	FG	

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Fruit/Vegetable								
Fresh Herbs	Whole Dill	17	1	1	Package	0.75	FG	
	Whole Fennel	3	2	2	Package	0.75	FC	
	Whole Marjoram	1	1	1	Package	0.71	FG	
	Whole Mint	17	1	1	Package	0.75	FG	
	Whole Oregano	2	1	1	Package	0.66	FG	
	Whole Other Herb	3	1	1	Package	0.75	FG	
	Whole Parsley	31	1	1	Package	0.67	FG	
	Whole Rosemary	12	1	1	Package	0.66	FG	
	Whole Thyme	10	1	1	Package	0.67	FG	
Fresh Herbs	Lemons	394	1	12	Package	2.50	*	Report: 09150, Lemons, raw, without peel
	Limes	1	6	6	Package	2.36	*	Report: 09159, Limes, raw
Frozen Fruit/ Vegetable	Frozen Corn On The Cob	5,795	3	36	Unit	48.00	FG	
Packaged Fruit/ Vegetable	Asparagus Spear	266	1	1	Package	36.00	FG	
	Coconut	1	1	1	Package	7.00	FG	
	Mixed Fruit	4	3	12	Package	24.00	FG	

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Fruit/Vegetable								
Packaged Fruit/ Vegetable	Mixed Vegetable	15	12	12	Package	12.00	FG	
Packaged Fruit/ Vegetable	Other Melon	9	1	1	Package	16.00	FG	
	Pepper	1	2	2	Package	16.00	FG	
	Pineapple	152	1	4	Package	12.00	FG	
	Rhubarb	2	1	1	Package	16.00	FC	
	Vegetables For Kabobs	1	3	3	Package	15.00	FG	
	Vegetables Sold In Tray	1	1	1	Package	16.00	FG	
	Watermelon In 1/2 Wedge Sold In Fridge Section	28	1	1	Package	79.69	*(a)	Report: 09326, Watermelon, raw
	Watermelon In 1/4 Wedge Sold In Fridge Section	25	1	1	Package	39.84	*(a)	Report: 09326, Watermelon, raw
	Watermelon In 1/8 Wedge Sold In Fridge Section	3	1	1	Package	19.92	*(a)	Report: 09326, Watermelon, raw
	Watermelon Slice	7	3	3	Package	16.00	FC	
Whole Apples	Apples	268	1	12	Unit	5.78	*	Report: 09003, Apples, raw, with skin

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Fruit/Vegetable								
Whole Carrots	Bunch Of Carrots	20	1	4	Package	16.00	FG	
	Non-Specific Carrots	4	7	7	Package	16.00	γ	***Bunch Of Carrots***
	Whole Unpeeled Baby/Mini Carrots	3	1	1	Package	0.44	*	Report: 11960, Carrots, baby, raw
	Whole Carrots	1	1	1	Package	16.00	γ	***Bunch Of Carrots***
Whole Celery	Celery Hearts	3,617	1	4	Package	16.00	FG	
	Bunch Of Celery	233	1	1	Package	16.00	γ	***Bunch Of Carrots***
	Non-Specific Celery	4,513	1	12	Package	16.00	γ	***Bunch Of Carrots***
	Whole Celery	1	1	1	Package	16.00	γ	***Bunch Of Carrots***
	Celery Branch / Stalk	21,067	1	6	Unit	1.42	*	Report: 11143, Celery, raw
Whole Cruciferous Vegetables	Broccoli	2,321	1	1	Package	21.45	*	Report: 11090, Broccoli, raw
	Broccoli Crown/Broccolette	44	1	1	Package	22.24	FC	
	Broccoli Head	27	1	1	Package	14.00	FG	
	Broccoli Rabe	217	1	1	Package	12.00	FG	
	Brocliflower	168	1	1	Package	14.00	γ	***Broccoli Head***

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Fruit/Vegetable								
Whole Cruciferous Vegetables	Brussel Sprout Stalk	9	1	1	Package	32.00	δ	Brussel Sprouts. University of Georgia College of Agricultural and Environmental Sciences. Retrieved 2007-09-21. (Obtained from Wikipedia: Brussel Sprouts)
	Bunch Of Baby Broccoli	112	1	1	Package	12.00	γ	***Broccoli Rabe***
	Bunch Of Bokchoy	7	1	1	Package	12.00	γ	***Broccoli Rabe***
	Bunch Of Broccoli	846	1	1	Package	21.45	*	Report: 11090, Broccoli, raw
	Cabbage Head	114	1	16	Package	88.00	FG	
	Cauliflower	6,643	1	1	Package	19.91	*	Report: 11135, Cauliflower, raw
	Cauliflower Head	3,142	1	1	Package	19.91	*	Report: 11135, Cauliflower, raw

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Fruit/Vegetable								
	Kohlrabi	13	1	1	Package	5.29	δ	Bailey, L. H., (1912, republished in 1975). Kohlrabi for stock-feeding. Encyclopedia of American Agriculture: Vol. II--crops. Macmillan Publishing, New York. p. 389-390. ISBN 0-405-06762-3. Google Book Search. Retrieved on June 15, 2008. (obtained from Wikipedia: Kohlrabi)
	Nappa Cabbage	8	1	1	Package	29.63	*	Report: 11116, Cabbage, chinese (pak-choi), raw
	Whole Broccoli	216	1	1	Package	21.45	*	Report: 11090, Broccoli, raw
	Whole Cauliflower	263	1	1	Package	19.91	*	Report: 11135, Cauliflower, raw
Whole Cucumber	Other Cucumber	3,135	1	1	Package	10.62	*	Report: 11205, Cucumber, with peel, raw
	Whole Cucumber	2,628	1	7	Package	10.62	*	Report: 11205, Cucumber, with peel, raw
	Whole Mini/Baby Cucumber	19	5	5	Package	5.57	*	Report: 11206, Cucumber, peeled, raw

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Fruit/Vegetable								
Whole Fresh Leafy Greens	Bunch Of Arugula	34	1	1	Package	4.00	FG	
	Bunch Of Other Dark Leafy Greens	97	1	1	Package	16.00	FG	
	Bunch Of Spinach	4	1	1	Package	11.99	*	Report: 11457, Spinach, raw
	Bunch Of Watercress	14	1	1	Package	2.50	FG	
	Butterhead (eg., Boston, Bibb)	657	1	2	Package	5.75	*	Report: 11250, Lettuce, butterhead (includes boston and bibb types), raw
	Endive Head	42	1	1	Package	18.10	*	Report: 11213, Endive, raw
	Green Leaf	1,532	1	1	Package	12.70	*	Report: 11253, Lettuce, green leaf, raw
	Iceberg Lettuce	44,977	1	3	Package	19.02	*	Report: 11252, Lettuce, iceberg (includes crisphead types), raw
	Other Dark Leafy Greens	890	1	9	Package	16.00	FG	
	Other Leafy Greens	2,212	1	3	Package	5.00	FG	
	Red Leaf	889	1	1	Package	10.90	*	Report: 11257, Lettuce, red leaf, raw
	Romaine	2,638	1	2	Package	22.08	*	Report: 11251, Lettuce, cos or romaine, raw
	Romaine Hearts	15,810	1	6	Package	22.08	*	Report: 11251, Lettuce, cos or romaine, raw

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Fruit/Vegetable								
Whole Fresh Leafy Greens	Spinach	175	1	1	Package	10.00	FG	
	Watercress	16	1	1	Package	3.60	FG	
	Whole Arugula	1	1	1	Package	7.00	FG	
	Whole Endive	15	1	1	Package	18.10	*	Report: 11213, Endive, raw
	Whole Other Dark Leafy Greens	1	1	1	Package	16.00	FG	
Whole Garlic/Onion	Bunch Of Chives	3	1	1	Package	0.63	FG	
	Bunch Of Leeks	4	1	1	Package	9.42	*(d)	Report: 11246, Leeks, (bulb and lower leaf-portion), raw ; # leeks in a bunch: http://www.cooksinfo.com/leeks
	Bunch Of Non-Specific Onion	2	1	1	Package	17.28	FC	
	Bunch Of Scallions	35	1	2	Package	3.71	*(d)	Report: 11291, Onions, spring or scallions (includes tops and bulb), raw ; # scallions in a bunch: http://www.howmuchisin.com /produce_converters/green-onion
	Chives	45	1	1	Package	0.67	FG	

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Fruit/Vegetable								
Whole Garlic/Onion	Elephant/Jumbo Garlic	133	1	4	Package	8.00	δ	http://www.thegarlicstore.com/categories/Planting-Stock/Elephant-Garlic/
	Elephant/Jumbo Garlic Bulb	277	1	2	Package	8.00	δ	http://www.thegarlicstore.com/categories/PlantingStock/Elephant-Garlic/
	Elephant/Jumbo Garlic Head	1	2	2	Package	8.00	δ	http://www.thegarlicstore.com/categories/Planting-Stock/Elephant-Garlic/
	Elephant/Jumbo Whole Garlic	104	1	6	Package	3.00	FG	http://www.thegarlicstore.com/categories/PlantingStock/Elephant-Garlic/
	Garlic Braid	2	1	1	Package	28.00	FG	
	Garlic Clove	261	1	7	Package	0.11	*	Report: 11215, Garlic, raw
	Leeks	145	1	1	Package	3.14	*	Report: 11246, Leeks, (bulb and lower leaf-portion), raw
	Non-Specific Garlic	1,168	1	6	Package	16.00	FG	
	Non-Specific Garlic Bulb	455	1	6	Package	2.27	δ	http://aces.nmsu.edu/pubs/_h/H234/Source:FilareeFarm, Okanogan, Washington, 1993 (Table 1)
	Onion Bulb	5	3	3	Package	3.88	*	Report: 11282, Onions, raw

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Fruit/Vegetable								
Whole Garlic/Onion	Other Whole Onions	101	1	3	Package	3.88	*	Report: 11282, Onions, raw
	Potted Chives	6	1	1	Package	1.00	γ	***Potted Other Herb***
	Scallions	375	1	1	Package	0.53	*	Report: 11291, Onions, spring or scallions (includes tops and bulb), raw
	Small Garlic Bulb	4	2	2	Package	2.27	δ	http://aces.nmsu.edu/pubs/_h/H234/Source:Filaree Farm, Okanogan, Washington, 1993 (Table 1)
	Sweet Onions (eg., Vidalia)	228	1	3	Package	11.68	*	Report: 11294, Onions, sweet,raw
	Whole Chives	3	1	1	Package	0.75	FG	
Whole Melon	Cantaloupe	939	1	3	Package	21.25	*	Report: 09181, Melons, cantaloupe, raw
	Honeydew	302	1	1	Package	40.21	*	Report: 09184, Melons, honeydew, raw
	Mini/Baby Watermelon	1,449	1	2	Package	80.00	δ	http://sfp.ucdavis.edu/files/144001.pdf
	Other Melon	14	1	1	Package	32.61	*€	Report: 09183, Melons, casaba, raw ; Report: 09451, Horned melon (Kiwano)
	Other Watermelon	3,096	1	1	Package	159.37	*	Report: 09326, Watermelon, raw

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Fruit/Vegetable								
Whole Mushroom/ Fungi	Unknown Mushroom Cap	17	6	12	Package	6.00	FG	
Whole Other Citrus	Grapefruit	84	1	40	Package	9.27	*	Report: 09111, Grapefruit, raw, pink and red and white, all areas
	Orange	15,350	1	50	Package	4.83	*	Report: 09200, Oranges, raw, all commercial varieties
	Pummelo	1	1	1	Package	21.50	*	Report: 09295, Pummelo, raw
	Tangelo	8	1	1	Package	48.00	FG	
Whole Other Fruit	Coconut	98	1	1	Package	14.00	*	Report: 12104, Nuts, coconut meat, raw
	Kiwi	48	1	20	Package	2.73	*€	Report: 09148, Kiwifruit, green, raw/Report: 09445, Kiwifruit, gold, raw
	Mini/Baby Pineapple	8	1	1	Package	31.92	*	Report: 09266, Pineapple, raw, all varieties
	Mixed Fruit Sold In Basket	5	1	1	Package	84.00	FG	
	Papaya	140	1	1	Package	16.54	*	Report: 09226, Papayas, raw
	Pineapple	10,556	1	1	Package	31.92	*	Report: 09266, Pineapple, raw, all varieties

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Fruit/Vegetable								
Whole Other Fruit	Pomegranate	5	1	6	Package	9.95	*	Report: 09286, Pomegranates, raw
Whole Other Root Vegetable	Bunch Of Beets	13	1	1	Package	10.12	*(d)	Report: 11080, Beets, raw/# beets in a bunch: http://www.howmuchisin.com/produce_converters/beet
Whole Other Vegetable	Bunch Of Radish	4	1	1	Package	10.00	δ	http://extension.uga.edu/publications/detail.cfm?number=C780. Avg of range
	Celery Root	2	1	1	Package	16.00	δ	http://www.cooksinfo.com/celery-root
	Non-Specific Beets	224	1	1	Package	2.89	*	Report: 11080, Beets, raw
	Radish	139	1	11	Package	0.18	*	Report: 11429, Radishes, raw
	Whole Beets	14	1	3	Package	2.89	*	Report: 11080, Beets, raw
	Bunch Of Asparagus	4	1	1	Package	28.00	δ	http://extension.uga.edu/publications/detail.cfm?number=C780. Average of range
	Corn In Unknown State	1,122	3	24	Package	3.67	*€	Report: 11900, Corn, sweet, white, raw/Report: 11167, Corn, sweet, yellow, raw

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Fruit/Vegetable								
Whole Other Vegetable	Corn On The Cob	10	24	24	Package	3.67	*€	Report: 11900, Corn, sweet, white, raw/Report: 11167, Corn, sweet, yellow, raw
	Eggplant	37	1	2	Package	19.33	*	Report: 11209, Eggplant, raw
	Sprouts	122	1	1	Package	4.00	FG	
	Whole Artichoke	690	1	6	Package	5.11	*	Report: 11007, Artichokes, (globe or french), raw
	Whole Asparagus	107	1	1	Package	28.00	δ	http://extension.uga.edu/publications/detail.cfm?number=C780
Whole Pear	Pear	165	4	12	Package	6.54	*	Report: 09252, Pears, raw
Whole Potato	Potato	1,026	1	5	Package	8.84	*	Report: 11352, Potatoes, flesh and skin, raw
Whole Squash/Gourd	Acorn Squash	5	1	1	Package	15.20	*	Report: 11482, Squash, winter, acorn, raw
	Butternut Squash	17	1	1	Package	40.00	δ	http://extension.uga.edu/publications/detail.cfm?number=C780
	Delicata Squash	1	1	1	Package	40.00	δ	http://extension.uga.edu/publications/detail.cfm?number=C780. Average Small Size Winter Squash.

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Fruit/Vegetable								
Whole Squash/Gourd	Non-Specific Gourd	22	1	8	Package	27.20	*	Report: 11218, Gourd, white-flowered (calabash), raw
	Pumpkin	49	1	8	Package	360.00	δ	http://extension.uga.edu/publications/detail.cfm?number=C780. Average of range (pie and jack o lantern)
	Spaghetti Squash	1	1	1	Package	144.00	δ	http://extension.uga.edu/publications/detail.cfm?number=C780. Average Medium Size Winter Squash.
	Yellow Squash	59	2	5	Package	7.49	*	Report: 11641, Squash, summer, all varieties, raw
	Zucchini	183	2	5	Package	7.49	*	Report: 11477, Squash, summer, zucchini, includes skin, raw
Whole Stone Fruit	Apricot	12	9	9	Package	1.23	*	Report: 09021, Apricots, raw
	Avocado	1,377	1	6	Package	7.09	*	Report: 09037, Avocados, raw, all commercial varieties
	Mango	497	1	12	Package	11.85	*	Report: 09176, Mangos, raw. fruit without refuse
	Peach	423	9	10	Package	5.99	*	Report: 09236, Peaches, raw

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Fruit/Vegetable								
Whole Sweet	Mini Whole Sweet Pepper	6	3	3	Package	2.61	*	Report: 11821, Peppers, sweet, red, raw
	Whole Sweet Pepper	1,831	1	6	Package	4.20	*	Report: 11821, Peppers, sweet, red, raw
Whole Sweet	Whole Sweet Pepper Sold In A Multipack	332	2	6	Package	4.20	*	Report: 11821, Peppers, sweet, red, raw
Whole Tomato	Beefsteak Tomato	405	2	6	Package	6.42	*	Report: 11529, Tomatoes, red, ripe, raw, year round average
	Plum/Roma Tomato	486	1	9	Package	2.19	*	Report: 11529, Tomatoes, red, ripe, raw, year round average
	Small Tomato	206	1	1	Package	0.60	*	Report: 11529, Tomatoes, red, ripe, raw, year round average
	Unknown Tomato	7,665	1	20	Package	3.16	*	Report: 11529, Tomatoes, red, ripe, raw, year round average
Food Type: Other								
Shell Eggs	Shell Eggs	239,600	6	180	Package	1.77	*	Report: 01123, Egg, whole, raw, fresh

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Pantry								
Baking Supplies	Decorating/Candy Making Kit	33	1	2	Package	45.76	FG	
	Edible Decorations	342	1	48	Unit	2.47	FG	
	Extracts/Flavorings Sold As Oil	1	2	2	Unit	0.13	FG	
	Extracts/Flavorings Sold As Tablet	26	48	48	Unit	0.02	Δ	http://www.amazon.com/4-pack-Almond-Amaretto-Flavor/dp/B0001GZ6F2/ref=pd_sim_325_2?ie=UTF8&refRID=0XDBNGPD9HAMQWTHCFSJ&dpID=41R8P0C5F6L&dpSrc=sims&preST=_AC_UL160_SR160%2C160_
	Food Coloring	4	2	8	Package	1.04	FG	

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Pantry								
Baking Supplies	Icing/Gel	8	4	4	Unit	4.25	FG	http://www.amazon.com/Krusteaz-Alpine-Apple-Cider-pouches/dp/B004AJNTTG ; http://www.amazon.com/Cocoa-Regular-0-73-Packet-Packets/dp/B00O2G74O8/ref=sr_1_2?s=grocery&ie=UTF8&qid=1443803156&sr=1-2&keywords=cocoa+packets ; http://www.amazon.com/Nestle-Cocoa-Chocolate-Count-Packets/dp/B00281PIBA/ref=sr_1_1?s=grocery&ie=UTF8&qid=1443803156&sr=11&keywords=cocoa+packets http://www.amazon.com/Lipton-Pyramid-Bags-Spiced-Cinnamon/dp/B00I8GOMZW/ref=pd_sim_467_5?ie=

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Pantry								
Beverage Mixes	Instant Cocoa / Cider Mixes	9	3	48	Unit	0.73	Δ	UTF8&refRID=0H1AABJZC149HRAJ08ZV&dpID=51d9VCb4h-L&dpSrc=sims&preST=_AC_UL160_SR156%2C160_ ; http://www.amazon.com/Twinings-Variety-Pack-Flavors-Count/dp/B00PSD42PS/ref=sr_1_3?ie=UTF8&qid=1443805072&sr=1-3&keywords=tea+bag ; http://www.amazon.com/Numi-Organic-Collection-Assorted-Teasan/dp/B00PS87KCA/ref=pd_sbs_467_6?ie=UTF8&refRID=0H1AABJZC149HRAJ08ZV&dpID=51Xses4pDnL&dpSrc=sims&preST=_AC_UL160_SR102%2C160_

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Pantry								
Beverage Mixes	Tea In Bag	59,829	1	312	Unit	0.07	Δ	http://www.amazon.com/Dunkin-Donuts-K-Cups-Original-Flavor/dp/B00MUZ15HU/ref=pd_sim_325_2?ie=UTF8&refRID=0QRNXTX76K7DH5HPMCY7&dpID=51BcNIjqKOL&dpSrc=sims&preST=_AC_UL160_SR160%2C160_ ; http://www.amazon.com/dp/B00GB5DW3K?psc=1 ; http://www.amazon.com/dp/B00MBW09MO?psc=1
	Tea/Coffee For Individual Servings	4,153	1	108	Package	0.34	Δ	http://www.amazon.com/Krustea z-Alpine-Apple-Cider-pouches/dp/B004AJNTTG ; http://www.amazon.com/Cocoa-Regular-0-73-Packet-Packets/dp/B00O2G74O8/ref=sr_1_2?s=grocery&ie=UTF8&qid=1443803156&sr=1-2&keywords=cocoa+packets ; http://www.amazon.com/Nestle-Cocoa-Chocolate-Count-Packets/dp/B00281PIBA/ref=sr_1_1?s=grocery&ie=UTF8&qid=1443803156&sr=1-1&keywords=cocoa+packets

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Pantry								
Beverage Mixes	Tea/Coffee In Can	1	1	1	Package	13.00	FG	
	Tea/Coffee In Pack	7	10	10	Unit	0.63	Δ	http://www.walmart.com/ip/Folgers-Classic-Roast-Medium-Coffee-Filter-Packs-10ct/17747579
	Tea/Coffee In Pouch	2	42	42	Unit	1.50	FG	
Butter	Butter	3	1	1	Unit	16.00	FG	
Herbs/Spices	Bay Leaves	22	15	20	Unit	0.25	FG	
	Cinnamon Sticks	22	5	16	Unit	1.00	FG	
	Extracts/Flavorings-Crystals/Powder	260	10	40	Package	2.00	FG	
	Nutmeg	23	2	14	Unit	1.50	FG	
	Onion	14	1	1	Package	3.25	FG	
	Salt And Pepper In Shakers	19	2	2	Package	11.00	FG	
	Sugar Sold In Bag, Jar, Carton, Canister	2	1	1	Package	80.00	FG	

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Pantry								
Herbs/Spices	Sugar/Sweetner Sold As Packets	16,982	5	2,500	Unit	0.13	Δ	http://www.amazon.com/SGR827749-Sugar-Raw-Packets/dp/B0014DPIPO/ref=sr_1_5?ie=UTF8&qid=1443121556&sr=8-5&keywords=sugar+packets ; http://www.amazon.com/DOMINO-SUGAR-PACKETS-3-54g-Packs/dp/B0005ZXKX4/ref=sr_1_1?ie=UTF8&qid=1443133118&sr=8-1&keywords=sugar+packets ; http://www.amazon.com/Genuine-Joe-GJO02390-0-10-Ounce-Packets/dp/B009MQJI42/ref=sr_1_11?ie=UTF8&qid=1443133118&sr=8-11&keywords=sugar+packets

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Pantry								
Herbs/Spices	Sugar/Sweetner Sold As Sticks	66	25	40	Unit	0.13	δ	http://www.amazon.com/SGR827749-Sugar-Raw-Packets/dp/B0014DPIPO/ref=sr_1_5?ie=UTF8&qid=1443121556&sr=85&keywords=sugar+packets;http://www.amazon.com/DOMINO-SUGAR-PACKETS-3-54g-Packs/dp/B0005ZXKX4/ref=sr_1_1?ie=UTF8&qid=1443133118&sr=81&keywords=sugar+packets ; http://www.amazon.com/Genuine-Joe-GJO02390-0-10-Ounce/Packets/dp/B009MQJI42/ref=sr_1_11?ie=UTF8&qid=1443133118&sr=811&keywords=sugar+packets

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Pantry								
Herbs/Spices	Sugar/Sweetner Sold As Tablets	248	100	1,000	Unit	0.13	δ	http://www.amazon.com/SGR827749-Sugar-Raw-Packets/dp/B0014DPIPO/ref=sr_1_5?ie=UTF8&qid=1443121556&sr=85&keywords=sugar+packets ; http://www.amazon.com/DOMINO-SUGAR-PACKETS-3-54g Packs/dp/B0005ZXKX4/ref=sr_1_1?ie=UTF8&qid=1443133118&sr=81&keywords=sugar+packets ;http://www.amazon.com/Genuine-Joe-GJO02390-0-10-Ounce-Packets/dp/B009MQJI42/ref=sr_1_11?ie=UTF8&qid=1443133118&sr=8-11&keywords=sugar+packets
	Table Salt	1	1	1	Package	26.00	FG	
	Vanilla Bean	25	1	2	Unit	0.12	δ	http://www.ndali.net/ndali-vanilla-products.html

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Pantry								
Herbs/Spices	Whole Garlic	1	4	4	Package	8.00	FG	
Other Pantry Items	Ice Cream Cones	7,118	5	72	Unit	1.52	*€	Report: 18272, Ice cream cones, sugar, rolled-type ; Report: 18271, Ice cream cones, cake or wafer-type
	Seaweed Wrapper	1	10	10	Unit	0.88	FG	
Food Type: Processed								
Bread Products And Food Wrappers	Dark Bread	25	1	1	Package	16.00	FG	
	Dark Buns / Rolls	1	12	12	Unit	1.34	*	Report: 18349, Rolls, french
	Other Types Of Bagels	395	1	13	Unit	2.92	*	Report: 18003, Bagels, egg
	Other Types Of Biscuit	30	6	12	Unit	2.06	*	Report: 18016, Biscuits, plain or buttermilk, prepared from recipe
	Other Types Of Bread	806	1	3	Unit	20.00	FG	
	Other Types Of Bread Stick	20	8	8	Unit	0.25	*	Report: 18080, Bread sticks, plain
	Other Types Of Buns / Rolls	736	1	24	Unit	1.34	*	Report: 18349, Rolls, french
	Other Types Of English Muffin	11	6	12	Unit	2.01	*	Report: 18264, English muffins, wheat

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Bread Products And Food Wrappers	Other Types Of Food Wrapper	7	5	12	Unit	1.87	δ	http://www.flatoutbread.com/products/flatout-wraps/flatout-light/light-italian-herb/
	Other Types Of Pita	24	6	20	Unit	1.55	*	Report: 18041, Bread, pita, white, enriched
	Other Types Of Taco Shells	9,975	1	50	Unit	0.46	*	Report: 18360, Taco shells, baked
	Other Types Of Tortillas	51,833	5	200	Unit	1.73	*	Report: 18970, Tortillas, ready-to-bake or -fry, flour, shelf stable
	Whole Wheat/Grain Bagels	17	6	6	Unit	2.92	*	Report: 18003, Bagels, egg
	Whole Wheat/Grain Bread	8	1	1	Package	24.00	FG	
	Whole Wheat/Grain Buns / Rolls	16	8	8	Unit	1.34	*	Report: 18349, Rolls, french
	Whole Wheat/Grain Pita	1	4	4	Unit	1.55	*	Report: 18041, Bread, pita, white, enriched
	Whole Wheat/Grain Tortillas	4,495	5	24	Unit	1.73	*	Report: 18970, Tortillas, ready-to-bake or -fry, flour, shelf stable

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Candy/ Chocolate	Candy Sold As A Strip	2	1	1	Package	10.00	FG	
	Candy Sold In Rolls	77	1	75	Unit	1.50	FG	
	Candy Sold In Rolls And In Packs	143	1	1	Package	0.90	FG	
	Candy With Liquid	2	1	3	Package	0.70	FG	
	Chocolate Bark	1	1	1	Package	24.00	FG	
	Chocolate Bars	28	1	96	Unit	1.76	FG	
	Chocolate Covered Cherries	1	1	1	Package	8.00	FG	
	Chocolate Cubes	31	1	1	Package	0.40	δ	http://www.amazon.com/Alberts-Chocolate-Ice-Cubes-100/dp/B00A4BRAE4
	Chocolate Cups	7	1	1	Package	8.00	FG	
	Chocolate Miniatures	70	1	120	Unit	0.35	δ	http://www.amazon.com/Hersheys-Miniatures-Chocolate-Bars-Ounce/dp/B0034UHCZO; http://www.amazon.com/gp/product/B005K6ZLSK/ref=pd_lpo_sbs_dp_ss_2?pf_rd_p=1944687762&pf_rd_s=lpo-top-stripe-1&pf_rd_t=201&pf_rd_i=B0034UHCZO&pf_rd_m=ATVPDKIKX0DER&pf_rd_r=15ACFQDRQP8B71KWPHK9

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Candy/ Chocolate	Chocolate Square	1	1	1	Package	2.75	δ	http://www.ashers.com/milk-chocolate-s-mores.html
	Chocolate Truffle/Balls	155	1	1	Package	0.43	δ	http://www.lindtusa.com/shop/chocolates/lindor-truffles/milk-chocolate-lindor-truffles-75-pc-bag? utm_source=brand-page&utm_medium=banner&utm_content=milk&utm_campaign=lindor-brand-page
	Gum	32,111	1	9,900	Unit	0.32	*	Report: 19163, Chewing gum
	Lollipops	181	1	48	Unit	0.81	δ	http://www.amazon.com/Fun-Express-5-1432-Swirl-Pops/dp/B0046EAXDK/ref=sr_1 keywords=lollipop;http://www.amazon.com/YumEarth-Organic-Lollipops Ounce/dp/B000X3TPHS/ref=sr_1_2?s=grocery&ie=UTF8&qid=1443371442&sr=12& keywords=lollipop;http://www.amazon.com/Lindas-Lollies-Gourmet-Lollipops-Assorted/dp/B00JOK1VBE/ref=sr_1_6?s=grocery&ie=UTF8&qid=1443371442&sr=16)

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Candy/ Chocolate	Miniature Candy	3	1	120	Unit	0.35	δ	http://www.amazon.com/Hersheys-Miniatures-Chocolate-Bars-Ounce/dp/B0034UHCZO ; http://www.amazon.com/gp/product/B005K6ZLSK/ref=pd_lpo_sbs_dp_ss_2?pf_rd_p=1944687762&pf_rd_s=lpo-top-stripe-1&pf_rd_t=201&pf_rd_i=B0034UHCZO&pf_rd_m=ATVPDKIKX0DER&pf_rd_r=15ACFQDRQP8B71KWPHK9
	Mint	3,256	1	160	Unit	0.03	δ	http://www.amazon.com/doTERRA-Peppermint-Beadlets-125-ct/dp/B007TYXYF8 ; http://www.myfitnesspal.com/food/calories/flirt-blitz-mints-1600249 ; http://www.wrigley.com/global/brands/eclipse.aspx#panel-3

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Candy/ Chocolate	Mint Pellet Singles	2	1	1	Package	1.00	δ	http://www.amazon.com/tic-Freshmint-Singles-Ounce-Pack/dp/B00DB7VGY8
	Mint Sold As A Strip	937	15	72	Unit	0.01	δ	http://www.amazon.com/Cool-Listerine-Pocketpacks-Breath-Strps/dp/B00O5A7FOK
	Mint Sold As Rolls In Package	4	1	1	Package	0.06	δ	http://www.amazon.com/Breath-Savers-Mints-Peppermint-0-75-Ounce/dp/B000WKZPPS/ref=sr_1_1?ie=UTF8&qid=1443374857&sr=8&keywords=breath+savers+roll
	Mint Sold As Rolls In Unknown Package	7	1	1	Package	0.75	FG	
	Other Candy	164	10	165	Unit	0.50	*€	Report: 19382, Candies, taffy, prepared-from-recipe ; Report: 19107, Candies, hard ; Report: 19106, Candies, gumdrops, starch jelly pieces)
	Other Candy Sold As Individual Pieces	604	1	8	Package	6.50	FG	

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Candy/ Chocolate	Other Chocolate	68	12	36	Unit	0.50	γ	***Other Candy***
	Other Chocolate Sold As Individual Pieces	287	1	6	Package	7.00	FG	
	Sugar Free Gum	55,102	1	226	Unit	0.32	*	Report: 19163, Chewing gum
	Sugarless/Diet Candy Sold As A Strip	16	18	24	Unit	0.01	δ	http://www.amazon.com/Cool-Listerine-Pocketpacks-Breath-Strps/dp/B00O5A7FOK
	Sugarless/Diet Candy Sold In Unknown Packaging	2	25	25	Unit	0.01	δ	http://www.amazon.com/doTERRA-Peppermint-Beadlets-125-ct/dp/B007TYXYF8
	Sugarless/Diet Chocolate Bars	10	24	24	Unit	1.40	FG	
	Sugarless/Diet Chocolate In Unknown Packaging	2	1	1	Package	3.50	FG	
	Sugarless/Diet Chocolate Sticks	42	1	1	Package	8.50	FG	
	Other Candy	164	10	165	Unit	0.50	*€	Report: 19382, Candies, taffy, prepared-from-recipe ; Report: 19107, Candies, hard ; Report: 19106, Candies, gumdrops, starch jelly pieces)

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Candy/ Chocolate	Other Candy Sold As Individual Pieces	604	1	8	Package	6.50	FG	
	Other Chocolate	68	12	36	Unit	0.50	γ	***Other Candy***
	Other Chocolate Sold As Individual Pieces	287	1	6	Package	7.00	FG	
	Sugar Free Gum	55,102	1	226	Unit	0.32	*	Report: 19163, Chewing gum
	Sugarless/Diet Candy Sold As A Strip	16	18	24	Unit	0.01	δ	http://www.amazon.com/Cool-Listerine-Pocketpacks-Breath-Strps/dp/B00O5A7FOK
	Sugarless/Diet Candy Sold In Unknown Packaging	2	25	25	Unit	0.01	δ	http://www.amazon.com/do TERRA-Peppermint-Beadlets-125-ct/dp/B007TYXYF8
	Sugarless/Diet Chocolate Bars	10	24	24	Unit	1.40	FG	
	Sugarless/Diet Chocolate In Unknown Packaging	2	1	1	Package	3.50	FG	
	Other Candy Sold As Individual Pieces	604	1	8	Package	6.50	FG	
	Sugarless/Diet Chocolate Bars	10	24	24	Unit	1.40	FG	
	Sugarless/Diet Chocolate In Unknown Packaging	2	1	1	Package	3.50	FG	
	Sugarless/Diet Chocolate Sticks	42	1	1	Package	8.50	FG	

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Candy/ Chocolate	Sugarless/Diet Chocolate Truffle/Balls	16	1	1	Package	1.00	δ	http://www.shopwell.com/pure-de-lite-truffle-bar-milk-chocolate-peanut-butter/snack-bars/p/1208800094
	Sugarless/Diet Mint Sold In Packs	27	60	60	Unit	0.01	δ	http://www.walgreens.com/store/c/altoids-smalls-smalls-sugar-free-mints-cinnamon/ID=prod6204438-product
	Sugarless/Diet Mint Sold In Unknown Packaging	224	32	60	Unit	0.01	δ	http://www.walgreens.com/store/c/altoids-smalls-smalls-sugar-free-mints-cinnamon/ID=prod6204438-product
	Sugarless/Diet Mint Sold On A Strip	3	24	24	Unit	0.01	δ	http://www.amazon.com/Cool-Listerine-Pocketpacks-Breath-Strips/dp/B00O5A7FOK
Ice Cream/ Novelties	Ice Cream And Other Dairy Desserts Sold As Bars	51,227	1	50	Unit	1.76	*	Report: 01237, Ice cream, bar or stick, chocolate covered

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Ice Cream/ Novelties	Ice Cream And Other Dairy Desserts Sold As Bites/Nuggets/Bonbon	3,245	4	60	Unit	0.93	δ	http://www.traderjoes.com/ fearless-flyer/article/1635 ; http://www.traderjoes.com/ digin/post/pumpkin-pie-mochi-ice-cream ; https://www.drumstick com/nestle/dibs.aspx)
	Ice Cream And Other Dairy Desserts Sold As Cake	10	4	8	Unit	56.50	FG	
	Ice Cream And Other Dairy Desserts Sold As Cannoli	2	1	1	Package	2.00	δ	http://business.highbeam.com/ 436991/article-1G1-107544472/ larosa-famous-ice-cream-cannoli-vanilla-manufacturer
	Ice Cream And Other Dairy Desserts Sold As Cup/Cone	17,180	1	36	Unit	3.40	*	Report: 01240, Ice cream cone, chocolate covered, with nuts, flavors other than chocolate
	Ice Cream And Other Dairy Desserts Sold As Sandwich	18,801	1	36	Unit	2.47	*	Report: 01238, Ice cream sandwich
	Ice Cream And Other Dairy Desserts Sold As Tube	67	1	30	Unit	2.47	*β	Report: 01238, Ice cream sandwich

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Ice Cream/ Novelties	Ice Cream And Other Dairy Desserts Sold As Variety Pack	392	16	50	Unit	2.54	*	Report: 01237, Ice cream, bar or stick, chocolate covered ; Report: 01240, Ice cream cone, chocolate covered, with nuts, flavors other than chocolate ; Report: 01238, Ice cream sandwich
	Ice Cream And Other Dairy Desserts Sold In Non-Specific Package	18	1	36	Unit	58.24	FG	
	Non-Dairy Frozen Desserts Sold As Bars	24,890	1	100	Unit	1.76	*	Report: 01237, Ice cream, bar or stick, chocolate covered
	Non-Dairy Frozen Desserts Sold As Bon Bon/Nugget	2	20	30	Unit	0.93	δ	http://www.traderjoes.com/fearless-flyer/article/1635 ; http://www.traderjoes com/digin/post/pumpkin-pie-mochi-ice-cream ; https://www.drumstick.com/ nestle/dibs.aspx)
	Non-Dairy Frozen Desserts Sold As Cup/Cone	3,229	1	32	Unit	3.40	*	Report: 01240, Ice cream cone, chocolate covered, with nuts, flavors other than chocolate
	Non-Dairy Frozen Desserts Sold As Mini Sandwich	469	1	24	Unit	2.47	*	Report: 01238, Ice cream sandwich

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Ice Cream/ Novelties	Non-Dairy Frozen Desserts Sold As Sandwich	629	1	8	Unit	2.47	*	Report: 01238, Ice cream sandwich
	Non-Dairy Frozen Desserts Sold As Shell	85	1	12	Unit	3.10	δ	http://islandwaysorbet.com/list/?family-pack
	Non-Dairy Frozen Desserts Sold As Tube	587	1	30	Unit	3.67	δ	http://www.samsclub.com/sams/icee-freeze-squeeze-up-variety-30-ct/108897.ip ;http://www.shopwell.com/minute-maid-lemonade-soft-frozen-variety-pk-squeeze-tubes-4-oz/ice-cream-popsicles/p/2500003557 ; http://www.prnewswire.com/news-releases/ritas-to-launch-a-new-take-home-frozen-dessert-treat-on-may-2nd-66762867.html
	Non-Dairy Frozen Desserts Sold In Non-Specific Package	22	1	6	Unit	16.64	FG	
Other Ready-To-Eat	Candied Apples	1,585	1	8	Unit	9.01	FG	Other Ready-To-Eat
	Fruit Snacks-6'S	143	1	1	Package	5.40	FG	
	Fruit Snacks (No Bag size)	57	10	10	Unit	0.75	FG	

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Other Ready-To-Eat	Pickled Eggs	3	1	1	Package	16.00	FG	
	Pudding	2	1	1	Package	3.50	FG	
	Refrigerated Pudding	4	1	1	Package	4.00	FG	
	Refrigerated Salad	1,510	1	6	Package	16.00	FG	
	Refrigerated Sandwiches	531	1	3	Package	8.40	FG	
	Refrigerated Sushi Combo	25	12	22	Unit	0.78	δ	https://www.google.com/search?q=sushi+whole+foods&biw=911&bih=445&source=lnms&tbm=isch&sa=X&ved=0CAYQ_AUoAWoVChMItOaAma6YyAIVkwSCh0L3wdz&dpr=1.5#imgrc=Gle_IpMf4GnXAM%3A
	Refrigerated Sushi Roll	6	6	12	Unit	0.78	δ	https://www.google.com/search?q=sushi+whole+foods&biw=911&bih=445&source=lnms&tbm=isch&sa=X&ved=0CAYQ_AUoAWoVChMItOaAma6YyAIVkwSCh0L3wdz&dpr=1.5#imgrc=Gle_IpMf4GnXAM%3A

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Other Ready-To-Eat	Refrigerated Sushi Roll - Package	2	1	1	Package	7.00	δ(z)	https://www.google.com/search?q=sushi+whole+foods&biw=911&bih=445&source=lnms&tbm=isch&sa=X&ved=0CAYQ_AUoAWoVChMItOaAma6YyAIVkwSCh0L3wdz&dpr=1.5#imgrc=Gle_IpMf4GnXAM%3A; 9 pieces in a personal sized sushi package (from pictures)
	Sandwich Lunch Kits	1	1	1	Package	14.00	FG	
	Salsa In Plastic	15				64.00	FG	
	Energy/Meal Replacement Bars	4	24	24	Unit	1.70	δ	http://www.amazon.com/CLIF-Luna-Bars-Variety-Pack/dp/B00CYTNFZ2

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Other Ready-To-Eat	Granola Bar/Fruit Bar/Snack Bar	44	1	40	Unit	1.38	δ	http://www.amazon.com/Nature-Valley-Almond-Dark-Chocolate/dp/B005VOOOM0/ref=sr_1_1?s=hpc&ie=UTF8&qid=1443393982&sr=11&keywords=granola+bar ; http://www.amazon.com/Vega-Snack-Chocolate-Nuts-Count/dp/B00IZO6CUA/ref=sr_1_1?ie=UTF8&qid=1443394385&sr=81&keywords=B00IZO6CUA%7CB00IZO6DT0%7CB00IZO6EQ2%7CB00IZO6FL6%7CB00IZO6GC4 ; http://www.amazon.com/Thats-Fruit-Variety-Pack/dp/-B00AEW142C/ref=sr_1_1?ie=UTF8&qid=1443394868&sr=8-1&keywords=fruit+bar
Ready-To-Eat Meat/Poultry /Seafood	Dried Meat Sold In A Bag	4	1	1	Package	4.00	FG	
	Dried Meat Sold In A Can	24	1	1	Package	0.32	FG	
	Dried Meat Sold In A Pouch	12	1	1	Package	1.25	FG	

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Ready-To-Eat Meat/Poultry /Seafood	Meat (Eg., Vienna Sausages, Beef Jerky)	8	1	1	Package	5.00	FG	
	Seafood (Eg., Smoked Salmon, Canned Seafood, Cooked Shrimp)	2	1	1	Package	6.00	FG	
Sweet Baked Goods	Angel Food Cake	14	1	1	Package	11.99	*	Report: 18086, Cake, angelfood, commercially prepared
	Assorted Cheesecake With Unknown Size	4	12	12	Unit	2.82	*	Report: 18147, Cheesecake commercially prepared
	Bread Pudding	1	1	1	Package	21.00	FG	
	Brownie With Other Known Size	1	1	1	Package	28.35	*(a)	
	Brownie With Unknown Size	38	1	24	Unit	1.98	*	Report: 18151, Cookies, brownies, commercially prepared
	Cheesecake With Unknown Size	4	1	1	Package	17.00	*	Report: 18147, Cheesecake commercially prepared
	Cinnamon Buns / Rolls	72	4	12	Unit	2.12	*	Report: 18356, Sweet rolls, cinnamon, commercially prepared with raisins
	Cookie	328	1	30	Unit	0.79	*	Basic Report: 18177, Cookies, molasses

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Sweet Baked Goods	Crescent	12	4	4	Unit	2.50	δ	http://www.amazon.com/dp/B00CHTX5B8?SubscriptionId=AKIAIZEZXAQU5DMYFIFA&tag=ean-data20&linkCode=sp1&camp=2025&creative=165953&creativeASIN=B00CHTX5B8
	Crisp	1	1	1	Package	21.00	FG	
	Croissant	45	1	12	Unit	1.71	*	Report: 18239, Croissants, butter
	Crumbcake	5	2	18	Unit	19.00	FG	
	Cupcake	56	1	12	Unit	4.00	δ	Amount of cupcake that fits into a standard size muffin tin typically used for cupcakes (https://en.wikipedia.org/wiki/Cupcake)
	Danish	37	2	12	Unit	2.85	*	Report: 18244, Danish pastry, cinnamon, enriched
	Donut And Donut-Like	529	1	15	Unit	3.00	*	Report: 18256, Doughnuts, yeast-leavened, with jelly filling
	Donut Holes	4	15	30	Unit	0.49	*	Report: 18248, Doughnuts, cake-type, plain (includes unsugared, old-fashioned)

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Sweet Baked Goods	Honey Bun	25	6	6	Unit	2.68	*	Report: 18255, Doughnuts, yeast-leavened, glazed, enriched (includes honey buns)
	Horn	3	3	3	Unit	8.00	FG	
	Mexican Pastry	1	10	10	Unit	1.85	*	Report: 18955, Bread, pan dulce, sweet yeast bread ; Report: 18958, Pan Dulce, LA RICURA, Salpora de Arroz con Azucar, cookie-like, contains wheat flour and rice flour
	Mini Cinnamon Buns / Rolls	10	6	6	Unit	0.88	*	Report: 21388, Fast foods, miniature cinnamon rolls
	Mini Croissant	1	15	15	Unit	0.99	*	Report: 18239, Croissants, butter. Mini
	Mini Pie	1	1	1	Package	5.00	FG	
	Muffin And Muffin-Like	78	1	12	Unit	3.55	*	Report: 18274, Muffins, blueberry, commercially prepared (Includes mini-muffins)
	Non-Specific Pastry	7	4	48	Unit	3.03	*	Report: 18959, Pastry, Pastelitos de Guava (guava pastries)
	Other Sweet Baked Goods/Pastries	2	2	2	Package	10.00	FG	

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Sweet Baked Goods	Other/Non-specific Types Of Cake	8	1	1	Package	12.00	FG	
	Pie	221	1	4	Package	35.27	*	Report: 18301, Pie, apple, commercially prepared, enriched flour
	Scone	33	4	6	Unit	1.48	*β	Report: 18128, Cake, snack cakes, creme-filled, sponge
	Slice Of Cheesecake	7	1	3	Unit	2.82	*	Report: 18147, Cheesecake commercially prepared
	Snack Cakes	195	1	24	Unit	1.48	*	Report: 18128, Cake, snack cakes, creme-filled, sponge
	Strudel	10	5	24	Unit	2.50	*	Report: 18354, Strudel, apple
	Sweet Empanada	1	6	6	Unit	3.03	*	Report: 18959, Pastry, Pastelitos de Guava (guava pastries)
	Turnover	29	2	4	Unit	3.03	*	Report: 18959, Pastry, Pastelitos de Guava (guava pastries)
	Twirlies	10	1	4	Unit	8.00	δ	http://www.specialtybakers.com/frenchtwirls.html

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Raw Meat/Poultry/Seafood								
Poultry Parts	Fresh Chicken Drummette	8	40	60	Unit	4.69	*	Report: 05066, Chicken, broilers or fryers, drumstick, meat and skin, raw
	Fresh Chicken Leg	8	2	6	Unit	12.13	*	Report: 05075, Chicken, broilers or fryers, leg, meat and skin, raw
	Fresh Chicken Wing	1	1	1	Package	3.77	*	Report: 05100, Chicken, broilers or fryers, wing, meat and skin, raw
	Frozen Chicken Breast	1	1	1	Package	6.14	*	Report: 05057, Chicken, broilers or fryers, breast, meat and skin, raw
	Non-Specific Fresh Chicken	21	1	12	Package	27.07	FG	
Seafood	Frozen Salmon Fillet	1	1	1	Package	13.97	*	Report: 15076, Fish, salmon, Atlantic, wild, raw
	Frozen Shrimp	25	14	60	Unit	0.21	*	Report: 15149, Crustaceans, shrimp, mixed species, raw

Table A4. (Continued) Unit measured by Count, estimated *Measurement-Weight*, and source of estimated *Measurement-Weight* for every observation that meets the criteria for *Measurement-Weight* estimation by Food Group among food observations reported to Homescan food datasets from 2004-2006

Food Category	Food Group	Observations reported as *Count*				Imputed purchase-weight (oz)	Data source	Notes[1]
		#	Range		*Count* measures			
			Min	Max				
Food Type: Processed								
Seafood	Frozen Shrimp - Bag	1	1	1	Package	20.00	δ	http://www.walmart.com/ip/Aqua-Star-Colossal-Raw-Shrimp-1-lb/23772732 ; http://www.walmart.com/ip/Cooked-Extra-Large-Shrimp-12-oz/22700528 ; http://www.samsclub.com/sams/daily-chef-cooked-jumbo-shrimp-32-oz/prod4900229.ip?navAction=push
Whole Poultry	Frozen Tuna Steak	7	1	2	Package	14.00	FG	Report: 05307, Chicken, cornish game hens, meat and skin, raw
	Fresh Cornish Hens	325	1	1	Package	11.85	*	
	Fresh Whole Chicken	11	1	1	Package	53.23	*	Report: 05109, Chicken, roasting, meat and skin and giblets and neck, raw

[1] The specific reports, online websites, and tables used to estimate the purchase-weight of each observation reported as Count
FC = Median household-weighted purchase-weight of observations in the corresponding Food Category
FG = Median household-weighted purchase-weight of observations in the corresponding Food Group
* = Food items that have the average item-weight reported in the National Nutrient Database for Standard Reference, Release 28 (http://ndb.nal.usda.gov/ndb/foods) that correspond to the item reported by *Count*

Table A5. Range of population-weighted maximum total annual *Purchase-Weight* (pounds), to which individuals are exposed, of foods purchased at grocery stores, by Food Category

Food Type	Food Category	Range of household annual *Purchase-Weight* (pounds)					
		Minimum	Population-weighted			Maximum	Inter-quartile range
			Lower Quartile	Median	Upper Quartile		
Beverages	Fresh Fruit And Vegetable Juice	0.36	27	69	142	1,829	115
	Milk	0.52	96	208	387	2,924	291
	Other Beverages	0.46	3	8	33	691	30
	Soda And Sweetened Beverages	0.54	184	390	730	10,040	546
	Water/Tea/Coffee	0.42	31	98	272	5,056	241
Fruit/Vegetable	Canned/Jarred Other Fruit/Vegetables	0.06	27	51	88	788	61
	Canned/Jarred Tomato	0.18	4	10	20	364	16
	Dried Fruit/Nuts/Seeds	0.05	3	7	15	2,336	12
	Fresh Herbs	0.002	1	3	6	234	5
	Frozen Fruit/Vegetable	0.06	5	14	36	702	31
	Packaged Fruit/Vegetable	0.04	4	10	20	491	16
	Whole Apples	0.09	6	13	28	565	22
	Whole Banana/Plantain	0.01	9	23	47	905	38
	Whole Beans/Legumes	0.05	1	2	5	112	4
	Whole Berries	0.15	3	6	12	183	10
	Whole Carrots	0.13	2	5	10	505	8
	Whole Celery	0.01	1	2	4	245	3
	Whole Cruciferous Vegetables	0.07	3	7	15	743	12
	Whole Cucumber	0.06	1	4	9	178	7
	Whole Fresh Leafy Greens	0.04	3	8	17	708	13
	Whole Garlic/Onion	0.01	4	10	20	287	16
	Whole Grape	0.21	4	8	17	243	13
	Whole Melon	0.03	6	15	33	1,271	27

Table A5. (Continued) Range of population-weighted maximum total annual *Purchase-Weight* (pounds), to which individuals are exposed, of foods purchased at grocery stores, by Food Category

Food Type	Food Category	Range of household annual *Purchase-Weight* (pounds)					
		Minimum	Population-weighted			Maximum	Inter-quartile range
			Lower Quartile	Median	Upper Quartile		
Fruit/Vegetable	Whole Mushroom/Fungi	0.04	0.9	2	4	65	3
	Whole Other Citrus	0.10	5	11	23	754	19
	Whole Other Fruit	0.08	2	4	9	440	7
	Whole Other Root Vegetable	0.02	1	2	5	259	4
	Whole Other Vegetable	0.01	2	6	13	322	11
	Whole Pear	0.20	2	3	8	179	6
	Whole Potato	0.27	15	32	60	508	45
	Whole Squash/Gourd	0.14	2	4	8	552	6
	Whole Stone Fruit	0.12	3	8	18	714	15
	Whole Sweet Pepper	0.09	2	4	7	181	6
	Whole Sweet Potato/Yam	0.17	2	5	10	175	8
	Whole Tomato	0.04	3	7	15	290	12
Other	Shell Eggs	0.66	11	20	34	428	23
Pantry	Baking Supplies	0.01	3	5	11	173	8
	Beverage Mixes	0.02	5	11	23	782	18
	Butter	0.19	2	5	11	109	9
	Condiments	0.13	43	75	116	676	73
	Cooking Liquids/Oil	0.20	14	28	48	699	34
	Dried Beans, Rice, Noodles, Grains, Cereals	0.11	10	20	38	1,076	27
	Flour	0.41	5	10	20	469	15
	Herbs/Spices	0.01	8	20	43	1,090	35
	Mixes And Kits	0.02	10	20	35	572	26

Table A5. (Continued) Range of population-weighted maximum total annual *Purchase-Weight* (pounds), to which individuals are exposed, of foods purchased at grocery stores, by Food Category

Food Type	Food Category	Range of household annual *Purchase-Weight* (pounds)					
		Minimum	Population-weighted			Maximum	Inter-quartile range
			Lower Quartile	Median	Upper Quartile		
Pantry	Other Pantry Items	0.02	1	3	6	205	5
Processed	Bread Products And Food Wrappers	0.28	36	63	101	2,327	65
	Candy/Chocolate	0.03	10	21	39	410	30
	Cereals And Granola	0.04	10	23	42	288	32
	Cheese/Yogurt	0.06	23	43	75	753	52
	Crackers, Chips, And Savory Snacks	0.06	14	27	48	445	34
	Ice Cream/Novelties	0.11	18	41	80	908	61
	Needs Preparation	0.13	97	167	263	2,029	165
	Other Ready-To-Eat	0.05	16	35	66	2,179	50
	Ready-To-Eat Meat/Poultry/Seafood	0.02	12	22	37	452	25
	Sweet Baked Goods	0.09	15	30	59	858	44
Raw Meat/Poultry/ Seafood	Ground Meat/Poultry	0.29	12	26	51	458	39
	Intact Meat	0.14	16	39	77	969	62
	Poultry Parts	0.23	12	27	52	828	40
	Seafood	0.10	3	6	14	819	11
	Whole Poultry	0.20	10	18	30	485	20

**The range of each Food Category is among households that report ≥1 observation categorized in the Food Category only*

Data source: Responses from observations of food purchases reported to Homescan food datasets by 21,124 households that participated in Homescan from 2004 to 2006.

Note: Population-weighting was determined by multiplying household size and household-specific random-weight projection factor for each year a household participated in Homescan

Table A6. Number and percent of Homescan population and United States population with socio-demographic characteristics

Socio-demographic characteristic	Homescan variable	Level	Homescan Population		United States population
			#	%+	%+
Household					
Socio-economic status (SES)	Household income and size	Poverty	92,602,892	14	13
		Above poverty	550,608,639	86	87
Race	Race	White	464,273,490	72	78
		Asian	22,162,983	3	5
		Black	93,882,800	15	13
		Other	62,892,258	10	4
Household size	Household size	≤2 persons	230,950,644	36	36
		>2 persons	412,260,887	64	64
Presence of children	Persons ≤18 years	Yes	321,074,872	50	--[1]
		No	322,136,659	50	
WIC*	Currently or ever participated in WIC[2]	Yes	39,381,299	18	--[3]
		No	179,574,317	82	
Head-of-Household					
Head-of- household (HOH) gender	Head-of-household (HOH) gender	Male head-of-household	577,270,313	90	75
		Female head-of-household	488,845,620	76	86
Employment	Hours worked per week	No work for pay	141,191,691	22	20
		Work for pay	340,781,442	53	57
		1 HOH works for pay & 1 HOH does not work for pay	161,238,398	25	23
Household makeup	Household makeup	Female only	154,365,911	24	25
		Male only	65,941,218	10	14
		Male and female	422,904,402	66	61

Table A6. (Continued) Number and percent of Homescan population and United States population with socio-demographic characteristics

Socio-demographic characteristic	Homescan variable	Level	Homescan Population		United States population
			#	%+	%+
Head-of-Household (Continued)					
Education	Highest level of education	HOH did not graduate from high school	15,882,992	2	--[1]
		All HOH graduated from high school	579,567,827	90	
		1 HOH did not graduate from high school & 1 HOH graduated from high school	47,760,712	7	
Environmental					
Rurality	--[4]	Rural areas	1,598,476	<1	2
		non-rural areas	234,398,123	99	98

Data source: Homescan population: Responses from observations of food purchases reported to Homescan food datasets by 21,124 households that participated in Homescan from 2004 to 2006. US population estimates: ***SES****- 2004: http://www.census.gov/prod/2005pubs/p60-229.pdf, 2005: http://www.census.gov/prod/2006pubs/acs-02.pdf, 2006: https://www.census.gov/prod/2007pubs/p60-233.pdf;* ***Race****- http://quickfacts.census.gov/qfd/states/00000.html;* ***household size*** *(extrapolated to populations living in households of different sizes) - https://www.census.gov/hhes/families/data/households.html (Table HH-1);* ***presence of persons <18 years****-http://www.census.gov/hhes/families/data/families.html (Table FM-1);* ***Household makeup and Head-of-Household gender*** *- http://www.census.gov/hhes/families/data/cps2012AVG.html (Table AVG-1). Distribution calculated as the proportion of each group divided by the population living in a household of each type which is calculated as: Male and Female - Married couple family type * Mean household size;* ***Male head-of-household*** *- Male householder (among family types) * mean household size + male householder (among non family types * mean household size);* ***Female head-of- household*** *- Female householder (among family types) * mean household size + female householder (among non family types * mean household size);* ***Employment*** *- 2005 (http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_13_1YR_S2302&prodType =table);* ***Rurality*** *- http://webarchives.cdlib.org/sw1wp9v27r/http:/ers.usda.gov/Briefing/Rurality/RuralUrbCon/*

Note 1: An average of 2004-2006 estimates is used to calculate US population estimates when historical data was available, otherwise the most recently available year that is closest to 2006 is used

Note 2: Homescan sample was extrapolated to the Homescan population by multiplying household size and household-specific random-weight projection factor for each year a household participated in Homescan

+Variable may not sum to 100% due to rounding

*Women, Infants, Children

[1]The data is not publically available.

[2]Only collected for 2006.

[3]Participation in WIC is reported by USDA as current participation. The WIC variable used in this study is current or past participation in WIC which is not publically available. The % of population that participated in WIC in 2006 compared to estimates published in the WIC Participant and Program Characteristics :
2006 Final Report (http://www.fns.usda.gov/sites/default/files/pc2006.pdf) is 1.9% vs 2.7% of the population, respectively. The 2006 estimate of the US population living in a household that participates in WIC is calculated from the 2006 Final report as the population living in a household that has a woman that participates in WIC weighted to the distribution of the household size of WIC participating women. This does not account for households that are not composed of females, but have children who receive WIC benefits.

[4]Rural and non-Rural designations categorized by rural-to-urban codes described in the 2003 USDA-ERS rural to urban continuum dataset (http://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx). Rural descriptions were "Completely rural or less than 2,500 urban population, adjacent to a metro area" and "Completely rural or less than 2,500 urban population, not adjacent to a metro area".

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