

Endnotes

Introduction

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Glossary

Affordable Care Act: The U.S. health care law (a.k.a. Obamacare) signed by President Obama in 2010, with one of its main objectives being to improve access to health coverage for low-income Americans.

Americans with Disabilities Act (ADA): The federal law signed by President George H.W. Bush in 1990 prohibiting discrimination and ensuring equal opportunity for persons with disabilities in employment, state and local government services, public accommodations, commercial facilities, and transportation.

Baby Boomers: A generation of Americans born after World War II until the mid-1960s who are now retiring at a rate of 10,000 per day.

Body Mass Index: A measure used for approximating a person's total body fat based on weight in relation to height.

Capacity building: Development assistance specifically designed to build skills and/or technical and management capacity among the beneficiaries.

Cash transfer: A government transfer of cash often based on conditions that promote poverty reduction and long-term self-sufficiency, such as enrolling children in schools, regular medical check-ups, vaccinations, or more nutritious eating.

Child Tax Credit: A non-refundable tax credit provided to parents. The credit may be as much as \$1,000 per qualifying child depending upon the parents' incomes.

Climate change: A change in the state of the climate that can be identified (for example, by using statistical tests) over an extended period, typically decades or longer.

Community benefit requirements: Internal Revenue Service requirements that nonprofit hospitals must meet to maintain their nonprofit status.

Community Health Needs Assessment: A process that assesses the current state or health of a defined community and identifies current health needs necessary for prioritizing health interventions and aligning community benefit activities.

Developed countries: Highly industrialized nations such as the United States, Great Britain, France, Germany, and Japan; also referred to as high-income.

Developing countries: These include low- and middle-income countries, where extreme poverty, hunger and other hardships remain common.

Dietary Guidelines for Americans: The recommendations of the U.S. Departments of Agriculture and Health and Human Services on the foods the U.S. public should be consuming, with one of its goals being to reduce rates of chronic disease.

Double Value Coupon Program: An incentive program that doubles the value of federal nutrition benefits when used at participating farmers' markets to purchase fresh fruits and vegetables.

Early Head Start: The federally funded preschool and early childhood development program for toddlers and children up to the age of 3 from low-income families.

Earned Income Tax Credit (EITC): A federal government program that provides a cash benefit to many low-income working people by refunding a portion of their income taxes.

Epidemiological transition: The replacement of infectious diseases by chronic, noncommunicable diseases as the main cause of death in a population, due mainly to improvements in public health, including reductions in hunger and malnutrition.

Fee for Service: A traditional method of paying for medical services under which doctors and hospitals are paid for each service they provide.

Feed the Future: The U.S. government's global hunger and food security initiative, through which the United States works with host governments, development partners, and other stakeholders to sustainably tackle the root causes of global poverty and hunger.

Food bank: A charitable organization that solicits, receives, inventories, stores and distributes food and grocery products from various sources to charitable organizations.

Food desert: An urban neighborhood or rural town lacking good access to fresh, healthy, and affordable food.

Food insecurity: Uncertain availability or inability to acquire safe, nutritious food in socially acceptable ways.

Food security: Assured access to enough nutritious food to sustain an active and healthy life with dignity.

Food system: The interconnected parts of planning, producing, storing, processing, transporting, marketing, retailing, preparing, eating, and disposing of food at any geographical scale.

Fruit and vegetable prescription program: Prescriptions written by healthcare providers worth a defined amount for low-income patients to redeem at participating farmers markets.

Group of 7 (G-7): The wealthiest industrial countries: Canada, France, Germany, Italy, Japan, United Kingdom, and United States.

Great Recession: The worst economic downturn in the United States since the Great Depression. It started in December 2007 with the bursting of a housing bubble that led to a financial crisis and a steep rise in unemployment.

Green Climate Fund: A fund set up through the United Nations Framework Convention on Climate Change (UNFCCC) with the intent to raise money from developed countries to help developing countries cope with the impacts of climate change.

Greenhouse gas emissions: Gases that trap heat in the atmosphere and are linked to global climate change.

Head Start: The federally funded preschool program for 4-year olds from low-income families.

Health disparities: Differences in health status among distinct segments of the population including differences that occur as a result of gender, race or ethnicity, education or income, disability, or living in various geographic localities.

Healthy, Hunger-Free Kids Act of 2010: The law that reauthorized the federal school meal and child nutrition programs and increased access to healthy food for low-income children.

Hidden hunger: A deficiency in the vitamins, major minerals and trace elements needed for a healthy, balanced diet.

High-income country: Determined by the World Bank as any country that earns an annual income per capita of more than \$12,736 USD or more in 2014.

Human development: An expansion of opportunities resulting from improvements in one's economic, health, and educational wellbeing.

Hunger: A condition in which people do not get enough food to provide the nutrients (carbohydrate, fat, protein, vitamins, minerals and water) for fully productive, active, and healthy lives.

Let's Move!: An initiative launched by First Lady Michele Obama dedicated to addressing the challenge of childhood obesity, including by providing children with healthier foods in schools and helping them to become more physically active.

Low food security: A category of food insecurity for households that report food access problems and reduced diet quality, but typically have reported few, if any, indications of reduced food intake. Prior to 2006, households with low food security were described as "food insecure without hunger."

Low-income country: Determined by the World Bank as any country that earns an annual income per capita of \$1,045 USD or less in 2014.

Malnutrition: An abnormal physiological condition caused by inadequate, unbalanced or excessive consumption of macronutrients and/or micronutrients.

Marginal food insecurity: A category of food insecurity for households that have problems at times, or anxiety about, accessing adequate food, but the quality, variety, and quantity of their food intake were not substantially reduced.

Mass incarceration: A term for describing the high rates of incarceration in the United States.

Medically tailored meals: Meals that are designed for patients with specific medical conditions such as HIV/AIDS, hypertension, or diabetes.

Micronutrients: The vitamins, major minerals and trace elements needed for a healthy, balanced diet.

Middle-income country: Determined by the World Bank as any country that earns an annual income per capita of \$1,046-\$12,735 USD. It is further divided between lower middle income countries, (\$1,046-\$4,125) and upper middle income countries, (\$4,126-\$12,735).

Millennium Development Goals (MDGs): A global agreement officially adopted at the United Nations in the year 2000. The goals served as a road map for development outcomes to be achieved by 2015.

National Health and Nutrition Examination Survey (NHANES): An annual survey conducted by the U.S. Department of Health and Human Services to assess the health and nutritional status of adults and children in the United States.

No Kid Hungry®: A campaign led by anti-hunger organization Share Our Strength to end child hunger in the United States.

Nongovernmental organizations (NGOs): Groups and institutions that are entirely or largely independent of government and that have primarily humanitarian or cooperative rather than commercial objectives.

Obesity: An adult who has a body mass index of 30 or higher is considered obese. See body mass index above.

Older Americans Act (OAA): The federal law that supports a range of home and community-based services, such as Meals on Wheels and other nutrition programs for older individuals.

Overweight: A person who has a body mass index between 25 and 29.9 is considered overweight. See body mass index above.

Paris Declaration on Aid Effectiveness: An international agreement endorsed in 2005 by over one hundred ministers, heads of agencies and other senior officials, committing their countries and organizations to improve harmonization, alignment and management of development aid.

Parish nurse: A registered nurse with additional preparation in holistic ministry who assists members of the congregation to become more aware of their health and serves as a health counselor and facilitator to the health care system.

Plumpy'Nut: A ready-to-use therapeutic food that comes in the form of a fortified peanut paste for treating severely malnourished children

Population health: The health outcomes of a group of individuals, including the distribution of such outcomes within the group.

Poverty: The lack of sufficient money or resources to provide the basic needs of survival for oneself and one's family. The international poverty line is an income equivalent to \$1.90 per day. In the United States, poverty thresholds vary according to family size. In 2015, a family of four is in poverty with an annual income of less than \$24,250.

President's Emergency Plan for AIDS Relief (PEPFAR): A U.S. government initiative to help save the lives of those suffering from HIV/AIDS around the world, and the largest commitment by any nation to combat a single disease internationally.

Public health: Organized measures to prevent disease, promote health, and prolong life among a population as a whole.

Reach Every Mother and Child Act: A bill introduced in 2015 to implement policies aimed at ending preventable maternal, newborn, and child deaths globally.

Robert Wood Johnson Foundation: The largest philanthropic organization in the United States focused on improving health and access to health care for the American public.

Ryan White CARE Act: The most comprehensive federal program providing services exclusively to people living with HIV. Services include delivery of medically tailored meals.

Scaling Up Nutrition (SUN)

movement: An international movement uniting people—from governments, civil society, the United Nations, donors, businesses and researchers—with shared nutrition goals and mobilizing resources to effectively scale up national nutrition programs, with a core focus on empowering women.

School Nutrition Association: A national, nonprofit professional organization representing more than 55,000 members dedicated to providing high-quality, low-cost meals to students across the country.

Social protection: A cash or in-kind transfer to a household to protect against financial hardship resulting from conditions such as disability, old age, poor health, unemployment, care of children or elderly, food insecurity, or lack of housing.

Stunting: A result of chronic malnutrition during the formative years of childhood. The most visible sign is when a child fails to grow to normal height, but may also result in decreased mental capacity and long-term health problems for the rest of a person's life.

Sustainable development:

Development which meets the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainable development goals

(SDGs): A set of 17 international development goals agreed to by 193 countries at the United Nations General Assembly in 2015. The SDGs succeed the Millennium Development Goals (MDGs) as the most prominent international development framework, and they include goals to end hunger and extreme poverty globally by 2030.

Toxic stress: Repeated exposure during childhood to extreme or damaging stress that permanently affects brain chemistry.

Undernutrition: A condition resulting from inadequate consumption of calories, protein and/or nutrients to meet the basic physical requirements for an active and healthy life.

Universal Declaration of Human

Rights: Adopted by the United Nations General Assembly in 1948, it remains the most comprehensive definition of common rights applying to all people in all countries, and in Article 25 states, “Everyone has the right to a standard of living adequate for the health and well-being of himself and his family, including food.”

Very low food security: A category of food insecurity that refers to a reduction in food intake and disruption in normal eating patterns because a household lacks money and other resources for food. Prior to 2006, households with very low food security were described as “food insecure with hunger.”

War on Poverty: An initiative launched by President Lyndon Johnson in 1964 that included the establishment of a set of government programs, including, among others, Head Start, Medicaid and Medicare, the Food Stamp Program, and improvements to Social Security.

World Health Organization (WHO):

A U.N. agency responsible for providing leadership on global health matters, shaping the health research agenda, setting norms and standards, articulating evidence-based policy options, providing technical support to countries, and monitoring and assessing health trends.

Appendix 1:

Federal Nutrition Programs

Supplemental Nutrition Assistance Programs (SNAP)

SNAP (formerly the Food Stamp Program) puts healthy food within reach of millions of people each month via an authorized debit card used to purchase food at most grocery stores. On average, 51 million individuals were eligible for benefits each month in 2013, and 43 million received them. Overall, the program served 85 percent of all eligible individuals in 2013. Through nutrition education partners, SNAP helps clients learn to make healthy eating and active lifestyle choices.

Child Nutrition Programs:

Child and Adult Care Food Program (CACFP)

CACFP plays a vital role in improving the quality of day care and making it more affordable for many low-income families. More than 3.3 million children and 120,000 adults receive nutritious meals and snacks each day as part of the day care they receive. CACFP reaches even further to provide meals to children residing in homeless shelters, and snacks and suppers to youths participating in eligible afterschool care programs. The program provides meals to adults who receive care in nonresidential adult day care centers.

Fresh Fruit and Vegetable Program (FFVP)

The FFVP provides free fresh fruits and vegetables in selected low-income elementary schools nationwide. The purpose of the program is to increase children's fresh fruit and vegetable consumption and at the same time combat childhood obesity by improving children's overall diet and create healthier eating habits to impact their present and future health.

National School Lunch Program (NSLP)

School districts and independent schools that choose to take part in the lunch program get cash subsidies and donated commodities from the USDA

for each meal they serve. In return, they must serve lunches that meet Federal requirements, and they must offer free or reduced price lunches to eligible children. Children from families with incomes at or below 130 percent of the poverty level are eligible for free meals. Those with incomes between 130 percent and 185 percent of the poverty level are eligible for reduced-price meals, for which students can be charged no more than 40 cents. In the 2013-2014 school year, the NSLP provided a healthy lunch to more than 30 million children per day, with roughly two-thirds receiving these meals for free or at reduced price.

School Breakfast Program (SBP)

The SBP operates in the same manner as the NSLP. In the 2013-2014 school year, the SBP provided a healthy morning meal for 11.2 million low-income children on an average day.

Special Milk Program (SMP)

Participating schools and institutions receive reimbursement from the USDA for each half pint of milk served. They must operate their milk programs on a non-profit basis. They agree to use the Federal reimbursement to reduce the selling price of milk to all children.

Summer Food Service Program (SFSP)

SFSP is the single largest Federal resource available for local sponsors who want to combine a feeding program with a summer activity program. Nationally, 3.2 million children participated in SFSP on an average day in July 2014. For every 100 low-income children participating in school lunch during the 2013-2014 school year, only 16 were eating summer meals through the SFSP in 2014.

Women, Infants, and Children (WIC)

The Special Supplemental Nutrition Program for Women, Infants, and Children—better known as the

WIC Program—serves to safeguard the health of low-income women, infants, & children up to age 5 who are at nutritional risk by providing nutritious foods to supplement diets, information on healthy eating, and referrals to health care. During Fiscal Year (FY) 2014, the number of women, infants, and children receiving WIC benefits each month reached approximately 8.3 million.

Farmers' Market Nutrition Program (FMNP)

The FMNP provides fresh, unprepared, locally grown fruits and vegetables from local farmers' markets to WIC recipients. During FY 2013, 1.5 million WIC participants received FMNP benefits.

Senior Farmers' Market Nutrition Program (SFMNP)

The SFMNP awards grants to States, United States territories, and federally-recognized Indian tribal governments to provide low-income seniors with coupons that can be exchanged for eligible foods at farmers' markets, roadside stands, and community supported agriculture programs. In Fiscal Year (FY) 2013, 835,795 people received SFMNP coupons.

Food Distribution Programs:

Commodity Supplemental Food Program (CSFP)

CSFP works to improve the health of low-income pregnant and breastfeeding women, other new mothers up to one year postpartum, infants, children up to age six, and elderly people at least 60 years of age by supplementing their diets with nutritious USDA commodity foods. It provides food and administrative funds to States to supplement the diets of these groups. An average of more than 573,000 people each month participated in the program in fiscal year (FY) 2014.

Food Distribution Program on Indian Reservations (FDPIR)

FDPIR is a Federal program that provides commodity foods to low-income households, including

the elderly, living on Indian reservations, and to Native American families residing in designated areas near reservations. Average monthly participation for FY 2014 was 85,400 individuals.

Nutrition Services Incentive Program (NSIP)

NSIP is a nutrition program for the elderly administered by the Department of Health and Human Service's Administration for Community Living. About 5,000 nutrition service providers together serve over 900,000 meals a day in communities all across the United States in congregate settings and for older individuals who are homebound. The program serves individuals who are age 60 or over, and in some cases, their caregivers, spouses and/or persons with disabilities.

The Emergency Food Assistance Program (TEFAP)

Under TEFAP, commodity foods are made available by USDA to States. States provide the food to local agencies that they have selected, usually food banks, which in turn, distribute the food to soup kitchens and food pantries that directly serve the public. In FY 2014, Congress appropriated \$318.15 million for TEFAP—\$268.75 million to purchase food and \$49.401 million for administrative support for State and local agencies. In addition to USDA Foods purchased with appropriated funds, TEFAP distributes 'bonus' foods purchased by USDA to support agriculture markets. In FY 2013, \$228.5 million of such foods were made available to TEFAP.

Sources: U.S. Department of Agriculture, Food and Nutrition Services: Programs and Services: www.fns.usda.gov/programs-and-services; U.S. Department of Health and Human Services, Administration for Community Living, Administration on Aging Nutrition Services: www.aoa.acl.gov/AoA_Programs/HPW/Nutrition_Services/index.aspx; Food Research and Action Center: <http://frac.org/>.

Appendix 2:

Estimating the Health-Related Costs of Food Insecurity and Hunger

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Introduction

Hunger is a health issue. This report is primarily about health-related costs attributable to food insecurity and hunger in the United States in 2014. The report also includes other kinds of costs associated with food insecurity, but its focus is health-related costs. Our charge is to update information on costs of food insecurity in the United States published in 2011,¹ employing the most recently available data on prevalence of food insecurity in 2014 with the most valid estimation procedures available, and to expand on the health-related costs attributable to food insecurity in the United States.

We gratefully acknowledge the research assistance provided by Rainjade Chung for the review of literature; consultations with Dr. Diana Becker Cutts, principal investigator for the Children's HealthWatch Minneapolis site at Hennepin County Medical Center; and the generous contribution of time, information, and communication from Prof. Don Shepard of Brandeis University regarding prior work and reports on this subject.

Executive Summary

Each September the Economic Research Service of the U.S. Department of Agriculture (USDA) reports estimates of the number and prevalence of people living in food insecure households by various demographic characteristics and levels of severity of food insecurity. Data for this report come from the December implementation by the Census Bureau of the Current Population Survey, a nationally representative survey of the U.S. population. In 2014, there were 48.135 million people (15.4 percent of the total population) living in households that were food insecure at some level of severity (Exhibit 1). The number of food-insecure people in the United States in 2014 was

11.906 million higher than in 2007, the year the Great Recession began, and only 0.697 million lower than in 2010. Between 2010 and 2014 the nation's food security situation did not improve appreciably.

The most recent prior estimates of the cost of food insecurity to the nation by researchers at Brandeis University¹ addressed costs within three domains: illness costs, education and related costs, and charity costs. The total illness costs estimated for calendar year 2010 within these three areas was \$130.5 Billion.

We surveyed empirical food security research literature published in

Exhibit 1 Number and percent of people living in food-insecure households in the US, 2007-2014

Year	Total Number of Individuals Food Insecure (1000s)	Percent of Individuals Food Insecure
2007	36,229	12.2%
2008	49,108	16.4%
2009	50,162	16.6%
2010	48,832	16.1%
2011	50,120	16.4%
2012	48,966	15.9%
2013	49,078	15.8%
2014	48,135	15.4%

Source: Coleman-Jensen, et al., 2015².

peer-reviewed academic journals between 2005 and 2015, and based our estimates on relationships identifiable in that literature. Using information from the research literature reviewed, and from the 2011 Brandeis report, *we estimate the health-related costs attributable to food insecurity to be \$160.07 Billion in 2014* (Exhibit 2).

Domains of Costs Addressed in this Report

The cost estimates described in this report address the following domains:

1. Direct costs of treatment of specific disease or health conditions that are plausibly attributable to household food insecurity.
2. Direct costs of special education in public primary and secondary schools plausibly attributable to food insecurity.
3. Indirect costs of lost work productivity resulting from:
 - a. Workers' own illnesses or other health problems attributable to food insecurity,
 - b. Workers providing care to a family member whose illness is attributable to food insecurity.

Methods

To estimate the direct health-related costs attributable to food insecurity in 2014, we reviewed empirical research literature published in peer-reviewed journals from approximately 2005 to 2015, searching for quantitative findings of associations between food insecurity and health outcomes. We specifically searched for quantitative findings that involved either odds ratios (most often), likelihood ratios, or relative risk ratios expressing the differences in likelihood of a person living in a food-insecure household having a disease or disease condition compared to a person living in a food-secure household (food security status is the exposure variable).

Those probability ratios were then translated into population attributable fractions (PAFs) expressing the proportion of the total prevalence of the disease in the population attributable to food insecurity (i.e., the excess fraction attributable to food insecurity). As noted above, this process requires the assumption that food insecurity is causally related to the disease conditions.

In case-control studies, if adjusted odds ratios (ORs) are available, they can be transformed into relative risk ratios using formula 1 below³:

1. $RR = OR / [(1 - Po) + (Po * OR)]$,
 where RR is the relative risk ratio,
 OR is the odds ratio, and
 Po is the proportion of the unexposed (food secure) who develop the outcome, or become cases.

This adjustment is desirable since, though the OR is an acceptable estimate of the Relative Risk ratio (RR) in case-control studies, and approaches RR in the situation of rare diseases in which very few of the unexposed develop the disease, the higher the prevalence of the disease in the unexposed popu-

Exhibit 2 Estimated Costs Attributable to Food Insecurity and Hunger in the US, 2014

Source of Cost	Costs (\$Billion 2014 Dollars)
Direct health-related costs in 2014 based on new research evidence	\$29.68
Non-overlapping direct health-related costs reported by Brandeis researchers in 2011, continued in 2014 and expressed in 2014 dollars	\$124.92
Indirect costs of lost work time due to workers' illnesses or workers providing care for sick family members based on new research evidence	\$5.48
Total direct and indirect 2014 health-related costs	\$160.07
Indirect costs of special education in public primary and secondary schools, based on new research evidence	\$5.91
Total costs of dropouts reported by Brandeis researchers in 2011, continued in 2014 and expressed in 2014 dollars	\$12.94
TOTAL ESTIMATED COSTS	\$178.93

Sources described in document text.

lation (e.g., the food-secure population), the greater the deviation of the RR from the OR.

With the relative risk ratios thus calculated (or if they are available), they can be used to calculate estimates of the excess population attributable fractions (PAF) of the diseases arising due to exposure to the predictor, food insecurity, using formula 2 below⁴:

1. $PAF = Pe (RR - 1) / [Pe (RR - 1) + 1] * 100\%$, where

PAF is the excess population attributable fraction of disease in the population considered to result from the presence of the exposure variable or condition (i.e., food insecurity),

RR is the relative risk ratio calculated as above, and

Pe is the proportion of controls (those who do not have the outcome or disease) who were exposed (live in a food-insecure household).

A complete table of all the conditions for which we found new studies providing the information needed to calculate attributable fractions can be found in Appendix Exhibit A1. For most of the health conditions, the attributable fraction (AF) is relatively small, 10 percent or less. For a few conditions we found research results leading to more than one AF for a condition. In those cases, we either used the average of the AFs, or used the one which was more reliable for the specific age group and condition under consideration. And for a few conditions, we were either unable to find data on the prevalence and number of people in the relevant sub-population with the condition, or data on the cost of treating cases of the condition. In those few instances, we were unable to estimate the disease burden or the costs. This was particularly true when the condition was failure to receive recommended or prescribed treatment, or treatment foregone due to inability to pay as a result of food insecurity.

For a couple of conditions (e.g., PEDS concerns; parents report of developmental concerns about their child), we had to add an additional link to the chain of logic such as obtaining positive predictive value of the indicator (PEDS concerns) and the outcome (special

education). With a few conditions for which we could not find needed prevalence data, we relied on data from the U.S. Census Bureau on relationships between reported health status and health services utilization.⁵

Using the information in Exhibit 1A, together with data from the Agency for Healthcare Research and Quality's Medical Expenditure Panel Survey (MEPS, or other national survey data) on the number of cases of each disease condition in the population in 2014 (when available), we estimated the fraction (proportion) of cases of each health condition attributable to food insecurity. Combining the results of these calculations with data on annual expenditures for treatment of individuals with the condition (from MEPS or other national health surveys), we estimated the total annual direct costs of treatment for all individuals with the condition.

Data on numbers of hospitalizations, and average costs of hospital stays were obtained from the Agency for Healthcare Research & Quality's Healthcare Cost & Utilization Project public access data obtained via the HCUPnet online query system (<http://hcupnet.ahrq.gov/>). Data were obtained from both the HCUP National Inpatient Database and the HCUP Kids' Inpatient Database. Several price index series were used to adjust the price of various healthcare services. These price indices were taken from the Bureau of Labor Statistics' online databases (<http://www.bls.gov/cpi/>). Resulting estimated costs for each condition are presented in Appendix Exhibit 2.

The Brandeis researchers estimated the cost of the private food assistance system at \$17.8 Billion in 2010 (\$19.52 Billion in 2014 dollars), and we calculated the total cost of the public food assistance system to be \$103.55 Billion in 2014. However discussions with healthcare colleagues and others led us to the position that the costs of these two complementary food assistance systems are more accurately viewed as the costs of prevention of food insecurity, not as a cost of food insecurity itself. The costs of these two food assistance systems are the costs of the vaccine that prevents food insecurity and hunger from occurring in the nation's households, families and children. Thus the costs of these two systems are not included as costs attributable to food insecurity.

Background and Context

A Note on Hunger

Hunger is probably a more complex phenomenon than most people imagine. The term is used to mean several different things, and its scope varies depending on its intended meaning. First, hunger is part of humans' "creatureliness," arising from our nature as living systems that require regular intake of food to live, act, grow, develop, and be healthy. We all experience hunger every day; we know when we are hungry, and we can tell someone how hungry we are; i.e., we can "self-report" our hunger and its severity.⁶

At its most basic level, hunger is a neurochemical feedback loop: a reinforcing feedback loop that leads to more food intake the hungrier we are. The hunger feedback loop involves transmission of information to the brain as the stomach empties and its biochemical state changes. The time required for this emptying process is approximately 2-4 hours, depending on the contents of the stomach, activity levels, and other factors. It coincides generally with humans' customary schedule of eating three meals per day. When a person's normal pattern of food intake is interrupted by a lack of food, she becomes hungry. If she doesn't eat, she becomes even hungrier.⁶

Hunger can be described and measured in several ways. It is a drive to find and consume food, and the intensity of this drive depends partly on the amount of food eaten during, and length of time since, the last episode of food intake. Hunger also is a state, with physical and mental components; it is the opposite of satiety. When we are hungry, and food is readily available, and accessible, we eat until we are sated, or no longer hungry, and normally then we stop eating. Satiety is also a neurochemical feedback loop; a balancing feedback loop that leads to less food intake as the stomach fills and sends neurochemical signals to the brain causing the feeling of satiety to increase, and the feeling of hunger to decrease. Healthy people, with no eating issues, stop eating when they become sated.

But the "processes" of hunger and satiety are neither mechanistic nor completely regular. And they are not isolated within an individual. They occur within and are strongly influenced by social contexts, because humans

are social beings. Each of us is a set of body systems living and acting within concentrically larger and more complex social systems. And we experience hunger as both a personal and a social condition. Our very earliest social interactions involve being fed, and nurtured. And as we grow, food, hunger, eating together, sharing food, being fed, nourished and nurtured, and nourishing and nurturing others, are fundamental social processes through which we learn to trust, respect, and care for each other.

We learn through social interactions around hunger, food, and eating that we depend on others, and that others depend on us. We learn etiquette: basic social rules that form a foundation on which we build ethics, and moral values. We celebrate important life-cycle events, such as birthdays, graduations, marriages, religious and civil holidays, and deaths, by enjoying and sharing food. Food and satisfying hunger are at the base of Maslow's hierarchy of needs,⁷ and until their food and hunger needs are met, humans cannot fulfill other higher-order needs. But food and hunger are also social, and they permeate our social lives. We employ food and hunger, and satisfying hunger, in pursuit of higher-order needs.

So hunger is an individual set of feelings and sensations, grounded in individuals' neurochemical feedback loops, but it is even more a set of social feelings and sensations, grounded in humans' social nature. We live in relationships, some intimate, some casual, some formal, some informal, but all fundamental to our nature as social beings. Hunger is both an individual and a social process, experienced and responded to in social contexts through social interactions and processes. And when hunger cannot be satisfied, for whatever reasons, it affects our social beings, our social lives, social relationships, and social interactions.

Hunger becomes problematic when it cannot be reduced, or when we cannot respond to it appropriately, because we lack the wherewithal or resources necessary to obtain and consume food in socially acceptable ways. The reinforcing feedback loop of hunger can become out of control, and cause the system to collapse, literally, if the balancing feedback loop of satiety is not able to operate. But neither of these feedback loops operates

in isolation; both also are social processes operating within social contexts. And they involve and depend on social interactions to reestablish balance.

Hunger becomes a social policy issue when the social context, and all the social relationships it involves, fail to provide socially acceptable ways for individual or family systems to obtain the food needed to address hunger in socially acceptable ways. When this occurs, those systems are placed at risk for toxic stresses. And toxic stress, intense acute stress or less intense chronic stress, can be very corrosive and destructive. It damages both child and adult health, and is especially pernicious in young children. Toxic stress can damage the architecture of children's developing brains^{8,9} and place significant constraints on their human capital development, impairing the trajectories of their entire lives.¹⁰

The toxic stress of socially ignored or tolerated hunger damages physical and mental health, but it also erodes basic trust in and respect for social relationships, institutions, and the people within them. Our health, well-being, and prosperity depend on a strong functional base of trust, respect, and compassion in all our relationships. These are the glue that binds the public together and makes it healthy and strong. And without a healthy, strong public, none of us can really be healthy and strong or prosperous, either as individuals or in relationships. Humans are social, inter-dependent beings, and our health, strength, well-being and prosperity depend on the public welfare and strong public infrastructure. As trivial as it can sometimes sound, we very literally are all in this together. There is no “us” and “them,” there is only us. And when some of us experience food insecurity or hunger, it harms and diminishes us all.

Food Insecurity and Hunger

“Food security—access by all people at all times to enough food for an active, healthy life—is one of several conditions necessary for a population to be healthy and well nourished.”¹¹ Food insecurity and hunger are measured in the US with a household survey administered each December by the U.S. Census Bureau. The U.S. Food Security Survey Module and the Food Security Scales it contains were developed in the 1990s under the Food Security Measurement Study, a multi-agency

collaborative effort involving scientists and academics, government analysts and policy experts, and individuals from for-profit and not-for-profit private entities.⁶ The primary food security scale development activities were implemented through a competitive contracting process sponsored and overseen by the USDA and the National Center for Health Statistics (NCHS), with Abt Associates, Inc. as the prime contractor.

The food security and hunger scales developed by the Abt team were incorporated into the ongoing national Current Population Survey (CPS) implemented by the Census Bureau annually. Data from administration of the scales in the CPS are delivered by the Census Bureau to the USDA Economic Research Service (ERS) for summary analysis, estimation of prevalence in different socio-demographic subgroups, tabulation and reporting in its annual reports on food security in the US.

A Note on Causality

Establishing causation is correctly the ideal of all scientific endeavor, but it is seldom achieved, especially in the health and social sciences. The experimental design considered by most scientists, and many non-scientists, to be the “gold standard” for determining causality is the randomized controlled trial or “RCT,” in which randomization can “control for” unobserved potentially confounding factors that might lead researchers to erroneously infer causation in relationships, by rendering those confounders random in the studied samples. Yet as good as they are, RCTs are not perfect, nor are they immune from various kinds of error.¹²

Moreover, many of the phenomena and conditions of interest in both health sciences and social sciences are not amenable to randomization. It would be unethical, for example, to randomly assign subjects to conditions of food insecurity or hunger, or to randomly assign food-insecure households to receive or not receive food assistance or other interventions. Consequently, food security research almost always relies on creative quasi-experimental designs, and efforts to control for unobserved confounders statistically.

Thus, conclusive, unassailable evidence that food insecurity causes the multitude of illnesses and adverse health conditions that a very large body of research liter-

ature indicates it is strongly related to most likely cannot be produced. Yet, as with the relationships between smoking tobacco and lung, throat, and mouth cancers, the evidence of relationships between food insecurity and these health outcomes is so strong, and the expected consequences of not treating the relationships as causal are so grave that we are justified in acting on strong evidence even if it is not absolutely conclusive and unassailable.

A Groundbreaking Study Helps Provide A Path Forward

An extremely important recent study of the relationships between food insecurity and health care costs in Ontario, Canada, where health insurance is universally available, achieves a major breakthrough toward providing conclusive evidence of causal relationships between food insecurity and adverse health outcomes. Since health insurance is universally available in Ontario, the intractable obstacle of adverse selection bias is virtually eliminated in this study. Successfully merging administrative data on health services utilization and costs in Ontario with data on food security status of Ontario households from the Canadian Community Health Survey, the researchers come closer than any yet to demonstrating that food insecurity causes bad health outcomes.

Results from this path-breaking research show a monotonic dose-response relationship between severity of food insecurity and total health care costs per person, after adjusting for a number of potential confounders known to be social determinants of health, even after excluding prescription drug costs which are only covered for a subset of the population.¹³ Moreover,

food insecurity was strongly and significantly related to healthcare costs, whereas income quintile of patients' neighborhood was not.¹³

While this study does not connect food insecurity causally with specific diseases, results are described as consistent with findings from other research of strong associations between food insecurity and poorer self-reported health status, increased likelihood of chronic disease diagnoses, poorer management of disease, and increased healthcare costs. The study's authors also note that "the extreme levels of material deprivation associated with household food insecurity, and severe food insecurity in particular, have been associated with extensive dietary compromise, higher levels of stress, and compromises across a broad spectrum of basic needs, all of which diminish individuals' abilities to manage health problems and potentially increase the need for health care."¹³

So while the presence of causal relationships between food insecurity and specific diseases and adverse health outcomes remains to be conclusively established, this study comes closer than any previous research to establishing conclusive causal relationships between food insecurity and higher health services utilization and health related costs. It is, therefore, a breakthrough, and provides strong support for the cost estimates produced in this current study.

Updating the October 2011 Hunger in America Cost Estimates

In October 2011, researchers at Brandeis University published a set of estimates of national-level costs

Exhibit 3 Estimated costs of food insecurity and hunger in the US, 2007 and 2010.

	2007 (\$Billions)	2010 (\$Billions)	Amount of Change, 2007- 2010 (\$Billions)	Percent Change, 2007-2010
Illness Costs	\$98.4	\$130.5	\$32.1	33%
Education and Related Costs	\$13.9	\$19.2	\$5.3	38%
Charity Costs	\$13.2	\$17.8	\$4.6	35%
Total Hunger Bill	\$125.5	\$167.5	\$42.0	33%

Source: Recreated from Shepard, et al., 2011¹.

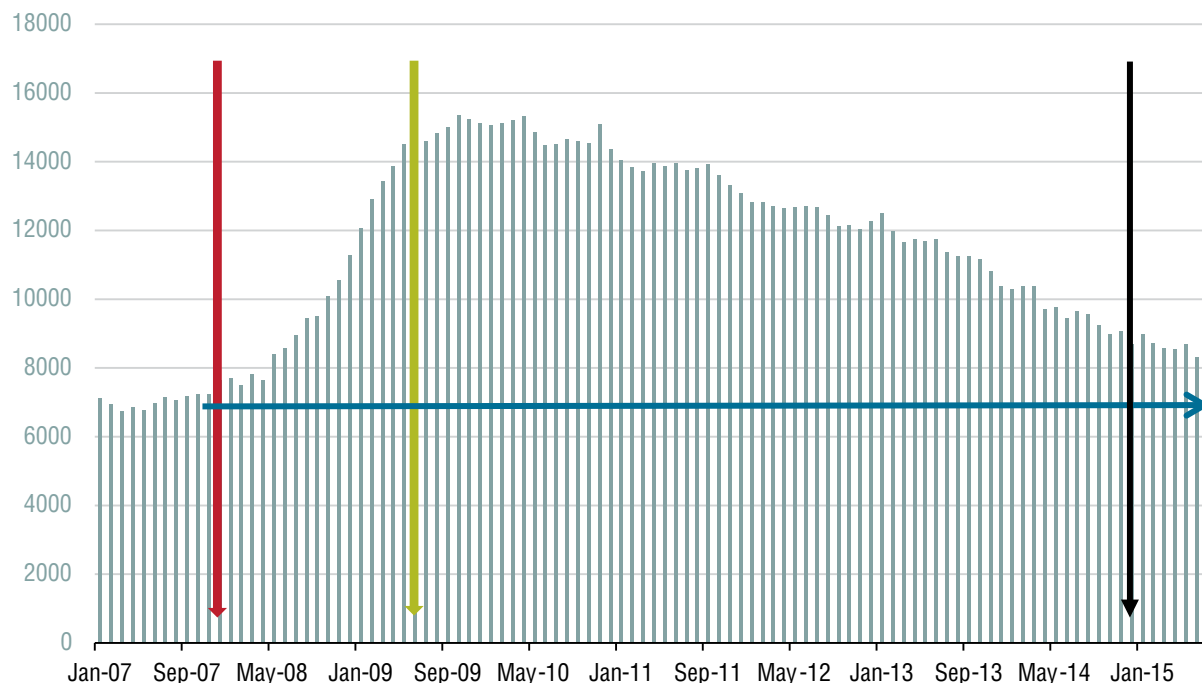
attributable to food insecurity and hunger in 2010.¹ Those estimates (Exhibit 3) comprised an update of an earlier set published in 2007.¹⁴ The authors concluded that costs attributable to food insecurity and hunger in 2010 conservatively amounted to a total of \$167.5 Billion spread over illness-related costs, education-related costs, and charity costs (Exhibit 3). The costs estimates produced for 2010 ranged from 33 percent to 38 percent higher than the 2007 estimates across these categories. As described in the remainder of this section, there is little evidence that economic conditions in 2014 were sufficiently better than those in 2010 to suggest significant reductions in the costs attributable to food security over that period.

Over the period 2007-2010, food insecurity increased dramatically, mainly due to the Great Recession and the massive increases in unemployment during the recession and after it officially ended (Exhibit 4). In Exhibit 4, the red vertical arrow indicates the month the Great Reces-

sion began (December 2007), and the green vertical arrow the month it was determined by the National Bureau of Economic Research (NBER) Business Cycle Dating Committee to have ended (June 2009). The horizontal blue arrow marks the level of unemployment in the month before the recession began (November 2007). As the chart shows, the number unemployed in January 2013 was above 12.3 million, but declined steadily throughout the year, ending at just over 10.3 million. However, more than six years after the end of the recession (July 2015), the number of unemployed people in the U.S. labor force had not returned to its pre-recession level.

In July 2015 there were still more than a million more unemployed workers than in the month prior to the start of the recession (November 2007). Unemployment more than doubled during the recession, going from 7.24 million in November 2007 to 14.71 million in June 2009, the month the recession ended. And it continued to increase, surpassing 15 million in September 2009 and

Exhibit 4 Number of unemployed workers in the US labor force by month, from January 2007 through July 2015.



Source: US Bureau of Labor Statistics (http://data.bls.gov/pdq/SurveyOutputServlet;jsessionid=AE49BA7CEF85EEB690DE95D4FC5D758F:tc_instance5).

staying above 15 million until May 2010. The recovery of jobs since the recession ended has been extraordinarily slow, with ups and downs as Exhibit 4 shows.

Among the most harmful aspects of the very high unemployment levels during and after the Great Recession was the unparalleled expansion of the number of long-term unemployed, workers who had been unemployed for 27 weeks or longer. The number of long-term unemployed reached a record high of 6.7 million, 45.1 percent of all the unemployed in the second quarter of 2010. In addition, the proportion of unemployed workers who had been unemployed for 52 weeks or longer reached a record high of 31.9 percent in the second quarter of 2011, and the proportion who had been unemployed for 99 weeks or longer reached a record high of 15.1 percent in the fourth quarter of 2011.¹⁵ And while all three of these measures of long-term employment have declined over the past several years, they remain high by historical standards.

Another extraordinary characteristic of the very slow job recovery from the Great Recession has been the large numbers of people withdrawing from the labor force; some for non-economic reasons, but others because they could not find suitable work, or any work at all. Between the end of the recession in June 2009, and December 2010, nearly 6 million people (5.999 million) withdrew from the labor force. By the end of 2013, an additional 6.6 million had withdrawn. Workers have continued to withdraw from the labor force since the end of 2013, but the rates of withdrawal have slowed and been nearly offset by new entrants. Even so, in July 2015, there were 12.6 million more workers not in the labor force than when the recession ended in June 2009.¹⁶

Among the 12.6 million people who withdrew from the labor force since the recession ended, nearly half chose to attend or return to school, or to engage in other non-labor force activities voluntarily. However, just over half reported they were available to work and wanted a job, but were not finding any. In addition to these labor-force leavers, the number of so-called “discouraged workers,” who had looked for work sometime within the past year, but recently stopped looking because they believed there were no jobs available for them, went from 363,000 to 793,000 during the recession,

and reached 1.318 million by December 2010. The number of “discouraged workers” remained close to 1.0 million over 2012-2014, but had declined to 668,000 by July 2015, still nearly double the number when the recession began.

In addition to the very large increases in numbers of unemployed, long-term unemployed, and those who withdrew from the labor force for economic reasons, the Great Recession also led to major increases in the number of “involuntary part time workers,” people who wanted to be working full time but were only able to find part-time work. From November 2007, the month before the recession began, to when it ended in June 2009, the number of involuntary part-time workers doubled,¹⁶ increasing from 4.494 million to 9.024 million. And as with unemployment, this number remained little changed through December 2010 when it was 8.935 million. By the end of 2013 the number of involuntary part time workers had fallen to 7.776 million, and in July 2015, at 6.325 million it was still 41 percent higher than in the month before the recession began.¹⁶

Thus in terms of labor market conditions, the unprecedented high levels of unemployment during and following the Great Recession have slowly declined over the past six years, but labor markets and the employment situation has by no means returned to normal, unless this is the “new normal.” While the number of unemployed per month over the period January 2008 to December 2010 averaged 12.683 million workers, during the period January 2011 to December 2013, most of the period over which we are updating the estimates of costs attributable to food insecurity and hunger (indicated by the black vertical arrow in Exhibit 4), the average number of unemployed each month was 12.563 million, less than 1.0 percent lower (0.95 percent) than the average over 2008-2010. Thus on the basis of unemployment, under-employment, long-term unemployment, labor force withdrawals, and other labor force conditions, there is no reason to expect food insecurity, or its costs, to be significantly lower in 2014 than in 2010, and several reasons to expect them to be higher.

While the recovery has been very robust in terms of growth in GDP and corporate profits, with GDP growing at an average annual rate of 3.28 percent, and

corporate profits increasing by an average of nearly 10 percent per year over the period 2010-2014 in the non-financial sector of the economy (which includes manufacturing, transportation, utilities, wholesale and retail trade, and information), average weekly earnings for workers in private non-agricultural industries only increased in real (inflation-adjusted) terms over that period, by an average of 0.08 percent per year. The unavoidable implication of these numbers is that many people who have been able to find jobs during the recovery are earning less and less in real, inflation-adjusted terms, while corporate profits have increased at unprecedented rates.¹⁷ These stagnant weekly earnings resulted in median annual income levels in real 2014 dollars for households declining from 2007-2010 by -6.7 percent. And while median income levels did not decline further from 2010-2014, they only increased

by 0.28 percent, i.e., by less than three tenths of a percentage point in real 2014 dollars over the five years. It is worth noting that these trends in real average weekly earnings and real median income are unprecedented in the history of the U.S. economy since the Great Depression ended.

The unprecedented increase in food insecurity during the first year of the Great Recession is apparent in the data on food insecurity levels and prevalence in Exhibit 5, as is the persistence of high prevalence of all levels of severity of household food insecurity throughout the period 2008-2010, as well as 2011-2014. The economic context underlying the dramatic increases in food insecurity prevalence at all levels of severity was characterized primarily by massive increases in job losses and unemployment.* The economic context underlying the persistence of resulting

Exhibit 5 Numbers and percents of people in the United States living in Food-Insecure households by food security status of the household, 2007-2014.

Year	Total Number of Individuals Food Insecure (1000s)	Percent of Individuals Food Insecure	Number of Individuals In Households With Low Food Security (1000s)	Percent of Individuals In Households With Low Food Security	Number of Individuals in Households with Very Low Food Security (1000s)	Percent of Individuals in Households with Very Low Food Security
2007	36,229	12.2%	24,287	8.2%	11,942	4.0%
2008	49,108	16.4%	31,824	10.6%	17,284	5.8%
2009	50,162	16.6%	32,499	10.8%	17,663	5.9%
2010	48,832	16.1%	32,777	10.8%	16,055	5.3%
2011	50,120	16.4%	33,232	10.9%	16,888	5.5%
2012	48,966	15.9%	31,787	10.3%	17,179	5.6%
2013	49,078	15.8%	31,974	10.3%	17,104	5.5%
2014	48,135	15.4%	30,922	9.9%	17,213	5.5%

Source: Coleman-Jensen, et al., 2015².

*The bursting of the housing bubble and collapse of the financial institutions whose unfettered speculative gambling with contrived “bundled instruments” of questionable legality was responsible for the subprime mortgage debacle, and ultimately for both the housing bubble and its bursting, led to unprecedented losses of wealth held in the form of owner-occupied residential real estate. That huge loss of wealth together with the large debt loads many homeowners had accumulated through “equity lines of credit” supported by the homes whose mortgages they were no longer able to afford, and the massive devaluation of residential real estate that followed bursting of the bubble, all contributed to the complex, multi-faceted market failures accompanying the financial market collapse. And all these market failures worked to shut down activities that had been employing millions of workers, thus playing a major role in initiation of the Great Recession. While the “too big to fail” banks and other financial institutions who were propped up and bailed out with public revenues quickly recovered and are among the corporations now earning unprecedented profits, the millions of homeowners, and other people who lost their homes, their wealth and their jobs are still struggling to recover. And they are among the millions of Americans still suffering from food insecurity. However, as relevant, interesting and important as this larger story is, its telling is beyond the scope of this project.

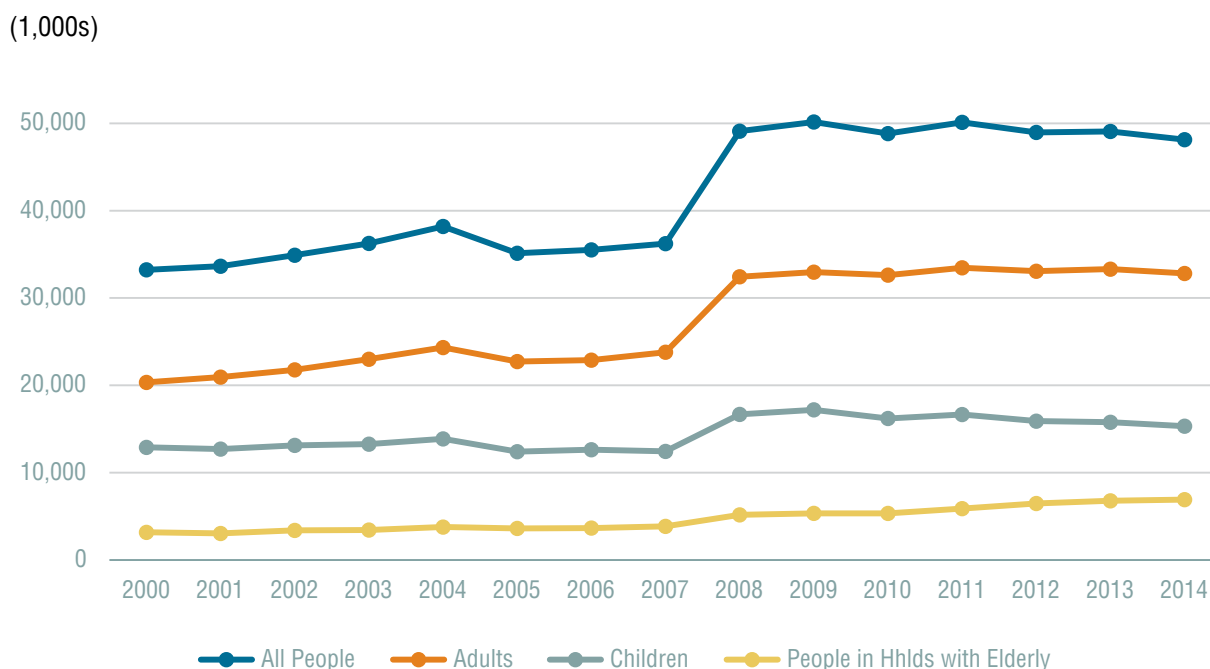
high prevalence of food insecurity in the years since the recession ended was one of declining weekly earnings, declining then stagnant real median income levels, major increases in the numbers of people engaging in involuntary part-time work, extraordinary numbers of workers withdrawing from the labor force for economic reasons, mainly because they could not find jobs, and the large increase and persistence of high numbers of long-term unemployed and “discouraged workers” over these two periods. Unfortunately there are few reasons to expect these conditions to change for the better in the near term.

The effects of these labor market dynamics on food insecurity are depicted graphically in Exhibits 6 and 7. While the increase in household food insecurity was rapid and extensive for adults and children, it was less pronounced among people living in households with elderly (Exhibit 6). However, while the number of food insecure adults stabilized at its higher level over the

period 2010-2014, and the number of food-insecure children declined slightly from its peak in 2009, the number of food-insecure people in households with elderly continued to increase throughout the period 2010-2013, offsetting the decline in the number of food-insecure children. The net result of these subgroup changes was a fairly stable plateau of the total number of people living in food-insecure households at a level 12-14 million higher than its pre-recession level. Most notably, in spite of the supposed recovery from the recession, and significant declines in the total number of people unemployed over the period 2010-2013, economic conditions persisted that prevented food insecurity from declining.

Though the absolute numbers are comparatively smaller, the number of people living in households with very low food security, or severe food insecurity (previously food insecurity with hunger), increased in a pattern very similar to low food security (Exhibit 6). A notable difference between the trends in low food

Exhibit 6 Numbers of people in the United States living in food-insecure households by age group, 2000-2014.



Source: Coleman-Jensen, et al., 2015². (People in households with elderly can be of any age.)

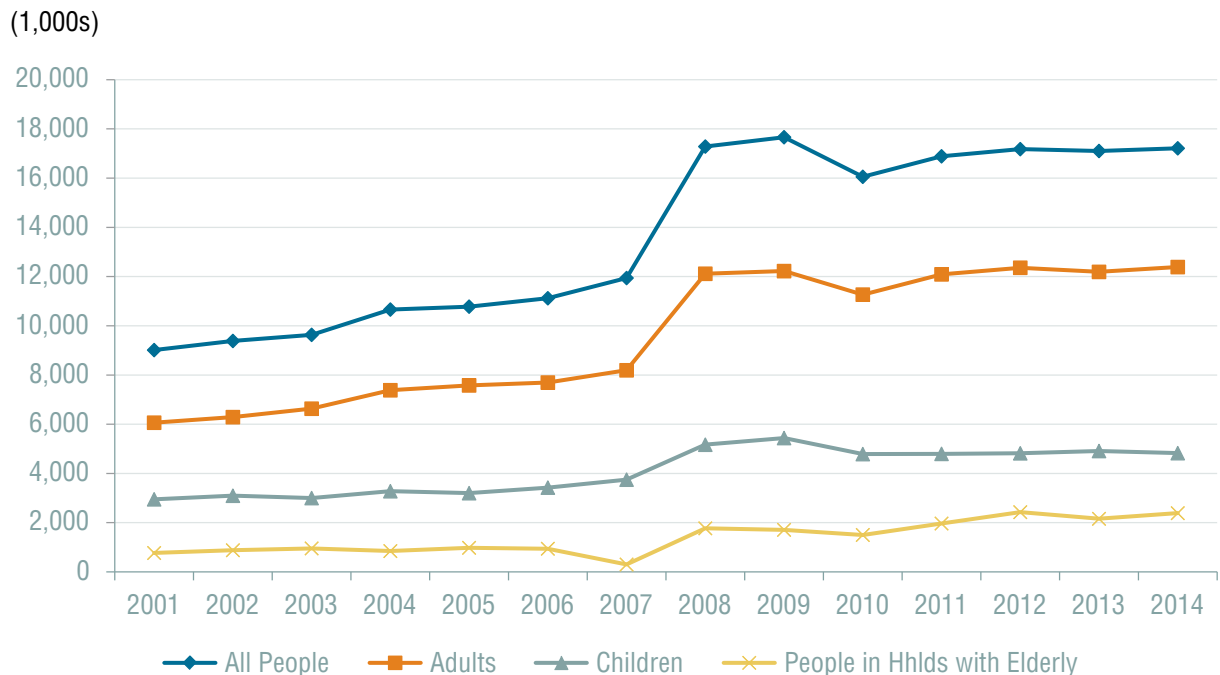
security (Exhibit 6) and those for very low food security (Exhibit 7) is that the prevalence of very low food security had been on an upward trajectory since 2000, especially among adults, but also to a lesser degree among children.

The fall in prevalence of very low food security over 2009-2010 (Exhibit 7) partially reflects the across the board 13 percent increase in SNAP (Supplemental Nutrition Assistance Program) benefits and enhanced eligibility for single adults who had lost jobs, instituted under the American Recovery and Reinvestment Act (ARRA).¹⁸ SNAP is the largest federal food assistance program, and also an entitlement program, making it the most important “counter-cyclical” support program the United States has. Since it is an entitlement, SNAP must be provided to all eligible applicants. Therefore in economic downturns that occur periodically as part of the usual business cycle, when jobs are lost and unemployment increases, more families and individuals

become eligible for SNAP, and SNAP enrollment increases. When a recovery gets underway and jobs are created, unemployment falls, and the number of families eligible for SNAP, and SNAP enrollment decline. That makes this food assistance program the only real counter-cyclical program in the United States. Relative to low food security, very low food security appears to have responded more noticeably to the higher SNAP benefit levels.

The persistence of high levels of food insecurity into 2014 is thus largely due to underlying weakness in the recovery from the Great Recession of 2007-2009, especially the extraordinarily slow recovery of jobs in the economy. It is also the result of changes in the structure of labor markets, work, and job stability. Emergence of “contingent labor,” companies ability and willingness to rely on contract labor and temporary jobs that do not provide benefits, and to adjust their demand for labor practically in real time by notifying workers on

Exhibit 7 Numbers of people in the United States living in households with very low food insecurity on the adult or household scale, 2000-2013.



Source: Coleman-Jensen, et al., 2014¹¹. (People in households with elderly can be of any age.)

a daily basis as to whether they are needed, all have made work, earnings, and income less stable. Volatility in earnings for wage workers may be the “new normal,” and its effects can be seen in persistent poverty and food insecurity (Exhibit 8).

Effects of efforts to reduce or eliminate SNAP benefits, and other social infrastructure that provide support for U.S. working families are likely reflected in the reductions in both the number of people receiving SNAP and the average SNAP benefits per person from 2013 to 2014 (Exhibit 9). These declines in SNAP benefits and participation are, in turn, likely a factor in the persistence of high food insecurity levels from 2013 to 2014.

Conclusion

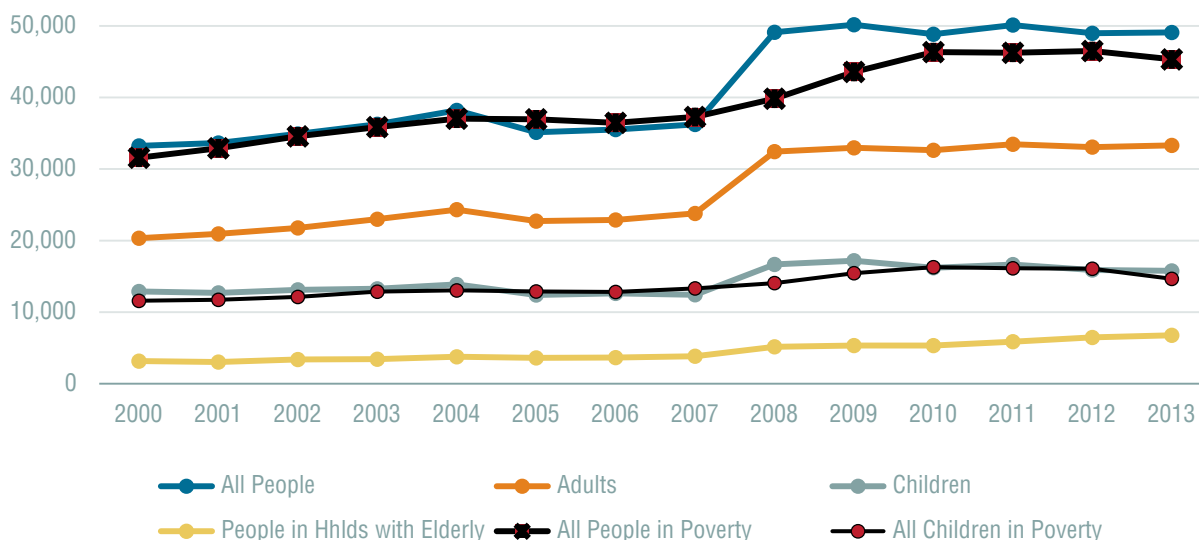
Food insecurity in the US was at an unacceptably high level in 2010, and remained so through 2014. The costs attributable to food insecurity are also unacceptably high. The extraordinarily slow recovery of employment from the Great Recession is a key factor in

persistent food insecurity in the United States, however changes in labor market structures and practices also play a role.

The health-related costs associated with food insecurity are clearly high. Though we estimated costs related to several disease conditions that are plausibly attributable to food insecurity, there are others that we did not find sufficient evidence to estimate. What is clear is that the health-related costs of food insecurity and hunger are high, and are likely to increase unless addressed. The Affordable Care Act has provided several windows of opportunity for the healthcare system to engage with and contribute to viable solutions to food insecurity and hunger, and these need to be implemented and supported.

The public and private social infrastructures that have emerged in response to food insecurity and hunger in the United States have very large associated costs, but it is important to acknowledge that both the public and private food assistance systems meet multiple objectives, some of which are not directly related to reducing food insecurity. SNAP is our largest and

Exhibit 8 Numbers of people in the United States living in food-insecure households by age group, with the numbers of all people and children in households with incomes below poverty, 2000-2013



*Though data on poverty in the US in 2014 will be released by the Census Bureau later this month, they are currently only available through 2013.

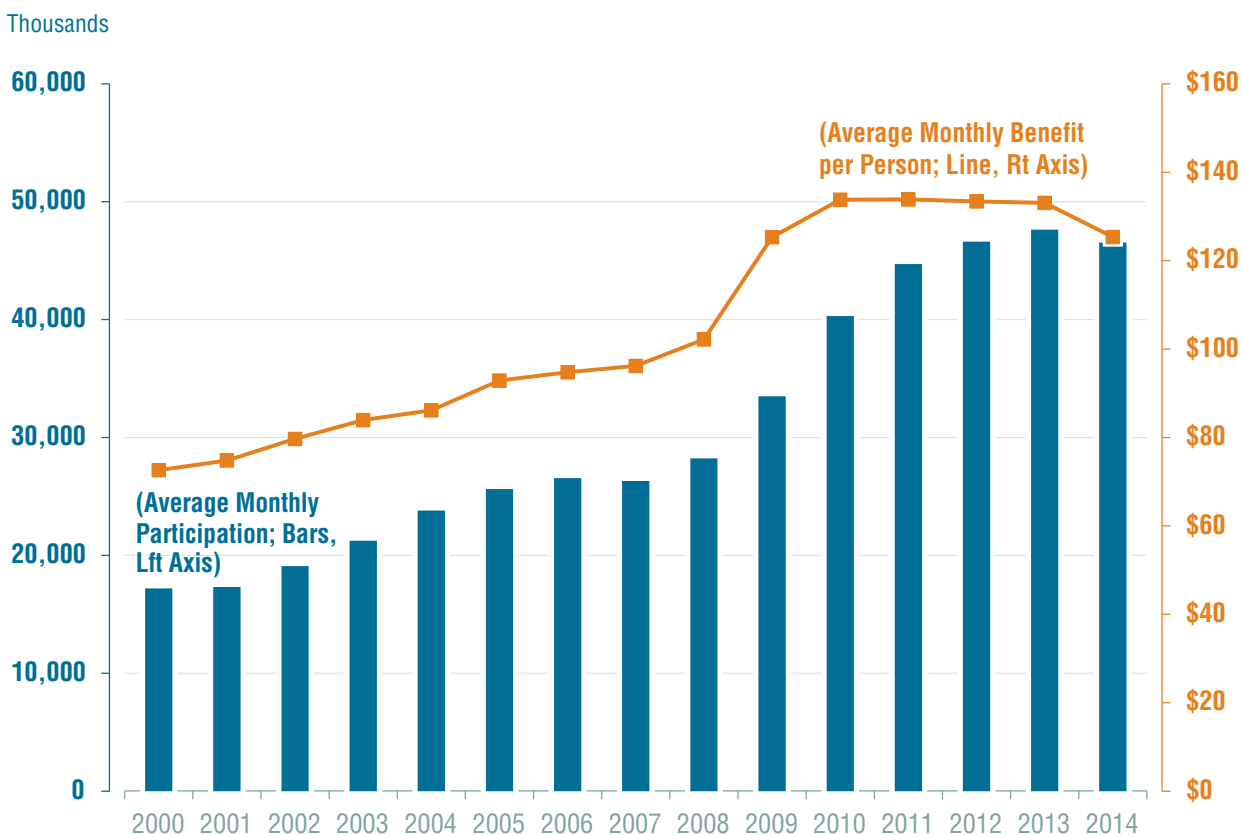
most effective counter-cyclical program to offset the inevitable downturns in economic activity and availability of jobs that is systemically built into the U.S. economy. WIC provides nutrition education and medical services in addition to food targeted specifically to pregnant and lactating mothers, and infants and children.

In addition to providing much needed food and other services for low-income and food-insecure families and individuals, the private food assistance system also provides opportunities for corporations to remove unprofitable product from their inventories, reduce their tax burdens, and improve public perceptions of their degree of social responsibility. In addition, both

the public and private food assistance systems provide much-needed jobs, many of which pay very well.

It is also extremely important to note that the public and private food assistance systems comprise complementary systems for dealing with food insecurity and hunger, with overlap and interaction between the two systems. And it is necessary to state the obvious fact that the two systems combined are still far from adequate solutions to the problems of food insecurity and hunger. Food insecurity and hunger, like poverty, their main proximal cause, are systemic problems that result from numerous market, policy, and leadership failures. And they will not be eliminated until those systemic failures are acknowledged, addressed, and resolved.

Exhibit 9 Average monthly number of SNAP participants, and average monthly per person benefit level, 2000-2014.



Source: USDA Food and Nutrition Service; SNAP program data (<http://www.fns.usda.gov/pd/supplemental-nutrition-assistance-program-snap>)

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Exhibit A1 Health conditions for which information was available to calculate population attributable fractions indicating the proportion of cases in the population attributable to food insecurity.

	Relationship	AOR*	RR*	AF*	Source
1)	HFI & Child non-perinatal hospitalization (yes-no):	1.31	1.23	4.55%	Cook, et al., J Nut, 2004 ¹⁹
2)	HHLD FI & Caregivers' report of child health status fair/poor:	1.90	1.73	12.47%	Cook, et al., J Nut, 2004 ¹⁹
3)	HFI & Caregivers' report of PEDS 1 concerns:	1.76	1.60	10.87%	Rose-Jacobs, et al., Peds, 2008 ²⁰
4)	HHLD FI & Caregivers' report of PEDS 2 concerns:	1.46	1.43	9.09%	Cook, et al., Adv Nut, 2013 ²¹
5)	CFI & Iron deficiency Anemia:	2.40	2.01	8.25%	Skalicky, et al., J MCH, 2006 ²²
6)	HFI & Caregivers' self-reported health status fair/poor:	2.28	1.91	6.81%	Cook, et al., Adv Nut, 2013 ²¹
7)	HFI & Caregivers' self report of Positive Depressive Symptoms:	3.06	2.28	10.96%	Cook, et al., Adv Nut, 2013 ²¹
8)	HFI + PDS & Caregivers' report of child health status fair/poor:	2.45	2.12	8.45%	Black, et al., Arch Ped Adoles Med, 2012 ²³
9)	HFI + PDS & Child non-perinatal hospitalization (yes-no):	1.35	1.25	2.10%	Black, et al., Arch Ped Adoles Med, 2012 ²³
10)	HFI + PDS & Caregivers' report of PEDS 1.	2.49	2.26	9.83%	Black, et al., Arch Ped Adoles Med, 2012 ²³
11)	HVLFS % Adults' Depression	3.42	2.97	31.69%	Leung, et al., J Nutr, 2015 ²⁴
12)	FI (based on subset of 4 of the 18 USFSSM questions) & failure of children, 3-5 yrs & 11-17 yrs, to receive recommended well-child visits (postponed recommended care)	1.40	1.09	7.44%	Ma, et al., Ambul Pediatr, 2008 ²⁵
13)	FI (based on subset of 4 of the 18 USFSSM questions) & failure of children, 3-5 yrs & 11-17 yrs, to receive needed health care (foregone needed care)	1.61	1.58	17.66%	Ma, et al., Ambul Pediatr, 2008 ²⁵
14)	FI (based on subset of 4 of the 18 USFSSM questions) & failure of children, 3-5 yrs & 11-17 yrs, to receive prescribed medication (foregone needed care)	2.48	2.42	34.07%	Ma, et al., Ambul Pediatr, 2008 ²⁵
15)	FI and iron deficiency in pregnant women ages 13-54 yrs, based on Ferritin <12 ug/L reported in a 24 hr dietary recall and a 30-day supplement question; NHANES 1999-2010.	2.9	2.05	12.90%	Park; Eicher-Miller J Acad Nutr Diet, 2014 ²⁶
16)	FI, based on 1 ad lib question; "When you were growing up, were there times your family didn't have enough to eat?", and Rheumatoid arthritis (self-reported with any current or past DMARD (disease modifying antirheumatic drugs) use and bilateral swelling, or steroid use and bilateral swelling, in the absence of another autoimmune disease), in women 35-74 yrs old.	1.50	1.49	4.33%	Parks, et al., Ann Rheum Dis, 2013 ²⁷
17)	MFS & LDL cholesterol in males & females 18-50 yrs; NHANES 1999-2002	1.85	1.30	3.68%	Tayie; Zizza Prev Med, 2009 ²⁸
18)	MFS & TRG/HDL ratio in males & females 35-50 yrs; NHANES 1999-2002	1.98	1.33	4.05%	Tayie; Zizza Prev Med, 2009 ²⁸
19)	H LFS & Triglycerides in males & females 35-50 yrs; NHANES 1999-2002	1.91	1.31	3.64%	Tayie; Zizza Prev Med, 2009 ²⁸
20)	H Severe FI (6-10 Adult Scale items affirmed) & Diabetes in Adults ages >20 yrs, NHANES 1999-2002.	2.20	1.89	7.89%	Seligman, et al., J Gen Inter Med, 2007 ²⁹
21)	HFI & poor Diabetes Control in adults ages >21 yrs w DM, from clinics in Boston.	1.97	1.40	5.00%	Berkowitz, et al, Diabetes Care, 2014 ³⁰
22)	FI w/o Hunger (HLFS) & Major Depressive Disorder in Women 20-39 yrs old in a subsample of NHANES 1999-2004 receiving MDD measurement.	2.76	2.43	10.32%	Beydoun; Wang J Affect Disord, 2010 ³¹

	Relationship	AOR*	RR*	AF*	Source
23)	HFI & Birth Defects (NTD, Orofacial Clefts, Conotruncal Heart Defects) in newborns.	1.41	1.12	1.11%	Carmichael, et al., J Nutr, 2007 ³²
24)	HFI, SES, & Dental Caries in Children 5-17 yrs in the NHANES, 2007-2008.	2.51	2.01	15.34%	Chi, et al., Am J Public Health, 2014 ³³
25)	VLFS & T2D in Latina Women, 35-60 yrs old	3.33	1.61	7.79%	Fitzgerald, et al., Ethn Dis, 2011 ³⁴
26)	MFS & MDE in Mothers age >18 yrs in the Fragile Families data, 1998-2000.	1.40	1.32	5.53%	Whitaker, et al., Pediatrics, 2006 ³⁵
27)	FI & MDE in Mothers age >18 yrs in the Fragile Families data, 1998-2000.	2.20	1.88	9.10%	Whitaker, et al., Pediatrics, 2006 ³⁵
28)	MFS & GAD in Mothers age >18 yrs in the Fragile Families data, 1998-2000.	1.70	1.66	11.13%	Whitaker, et al., Pediatrics, 2006 ³⁵
29)	FI & GAD in Mothers age >18 yrs in the Fragile Families data, 1998-2000.	2.30	2.20	13.93%	Whitaker, et al., Pediatrics, 2006 ³⁵
30)	MFS & Either MDE or GAD in Mothers age >18 yrs in the Fragile Families data, 1998-2000.	1.40	1.32	5.46%	Whitaker, et al., Pediatrics, 2006 ³⁵
31)	FI & Either DME or GAD in Mothers age >18 yrs in the Fragile Families data, 1998-2000.	2.20	1.86	8.70%	Whitaker, et al., Pediatrics, 2006 ³⁵
32)	MFS & Aggression in 3-yr-old Children of Mothers age >18 yrs in the Fragile Families data, 1998-2000.	1.50	1.45	7.53%	Whitaker, et al., Pediatrics, 2006 ³⁵
33)	FI & Aggression in 3-yr-old Children of Mothers age >18 yrs in the Fragile Families data, 1998-2000.	1.90	1.68	8.11%	Whitaker, et al., Pediatrics, 2006 ³⁵
34)	MFS & Anxiety/Depression in 3-yr-old Children of Mothers age >18 yrs in the Fragile Families data, 1998-2000.	1.80	1.68	10.75%	Whitaker, et al., Pediatrics, 2006 ³⁵
35)	FI & Anxiety/Depression in 3-yr-old Children of Mothers age >18 yrs in the Fragile Families data, 1998-2000.	2.20	1.99	10.97%	Whitaker, et al., Pediatrics, 2006 ³⁵
36)	MFS & Inattention/Hyperactivity in 3-yr-old Children of Mothers age >18 yrs in the Fragile Families data, 1998-2000.	1.60	1.53	8.89%	Whitaker, et al., Pediatrics, 2006 ³⁵
37)	FI & Inattention/Hyperactivity in 3-yr-old Children of Mothers age >18 yrs in the Fragile Families data, 1998-2000.	1.90	1.77	9.29%	Whitaker, et al., Pediatrics, 2006 ³⁵
38)	MFS & Any of the Three Behavior Problems in 3-yr-old Children of Mothers age >18 yrs in the Fragile Families data, 1998-2000.	1.60	1.45	7.12%	Whitaker, et al., Pediatrics, 2006 ³⁵
39)	FI & Any of the Three Behavior Problems in 3-yr-old Children of Mothers age >18 yrs in the Fragile Families data, 1998-2000.	2.10	1.77	8.01%	Whitaker, et al., Pediatrics, 2006 ³⁵
40)	FI & Poor Glycemic Control in Adult Diabetics in the Immigration, Culture & Healthcare Study, San Francisco, CA, 2008-2009.	1.46	1.27	10.17%	Seligman, et al., J Gen Inter Med, 2007 ²⁹
41)	FI & severe obesity in pregnant women ≤400% poverty level in the Pregnancy, Infection, and Nutrition (PIN) cohort in NC, 2001-2005.	2.97	2.07	7.17%	Laraia, et al, J Am Diet Assoc, 2010 ³⁶
42)	HFI and poor glycemic control among diabetics ≥20 yrs old in the NHANES 1999-2008.	1.53	1.42	4.16%	Berkowitz, et al., Diabetes Care, 2013 ³⁷
43)	HFI and poor LDL control among diabetics ≥20 yrs old in the NHANES 1999-2008.	1.86	1.32	2.37%	Berkowitz, et al., Diabetes Care, 2013 ³⁷

*Abbreviations: AOR=Adjusted Odds Ratio; CFI=Child food insecurity; DMARD=Disease modifying antirheumatic drugs; DM=Diabetes mellitus; HDL=High-density lipoprotein; GAD=Generalized anxiety disorder; HFI=Household food insecurity; HVLFS=Household very low food security; LDL=Low-density lipoprotein; LFS=Low food security; MDD=Major depressive disorder; MDE=Major depressive episode; MFS=Marginal food security; NHANES=National Health and Nutrition Examination Survey; NTD=Neural tube defects; PAF=Population attributable fraction; PEDS=Parents' evaluation of developmental status; PDS=Positive depression screen; RR=Relative risk; SES=Socio-economic status; T2D=Type two diabetes; TRG=Triglycerides; USFSSM=US Food Security Survey Module; VLFS=Very low food security.

Exhibit A2 Detailed description of costs attributable to food insecurity by condition

Sources of Costs, 2014 Report	Costs Based on New Evidence (\$Billions 2014 Dollars)	Types of Costs, 2010 Report	Costs From 2010 Report (\$Billion 2010 Dollars)	Costs From 2010 Report Inflated to 2014 Dollars (% Change in CPI-U for medical care, 1010-2014=9.674%)	TOTAL
Cost of additional non-neonatal hospital stays among children ages <18 years	\$1.82	Hospitalizations	\$16.10	\$17.66	(Estimate based on new evidence was used)
Cost of additional hospital stays among adults ages 18+ years	\$8.19				
Cost of additional ambulatory visits among people all ages	\$1.51				
		Migraine	\$2.20	\$2.41	(Estimate based on new evidence was used)
Cost of additional dental care visits among people all ages	\$0.79				
		Colds	\$0.80	\$0.88	
Cost or treatment of mental health problems in children ages <18 years	\$1.22				
		Depression	\$29.20	\$32.03	
Cost of treatment of mental health problems in adults ages 18-64 years	\$4.75				
		Anxiety	\$17.40	\$19.08	
Cost of treatment of anemias and other deficiencies in people all ages	\$0.85	Iron Deficiency	\$0.50	\$0.55	
		Suicide	\$19.70	\$21.61	
Treatment of osteoarthritis and other inflammation in joints among adults	\$3.37				
		Upper GI Disorders	\$5.70	\$6.25	
Treatment of diabetes mellitus in people all ages	\$4.90				
		Health Status	\$38.90	\$42.66	
Treatment of hyperlipidemia	\$1.41				
Treatment of endocrine system problems related to poor control of diabetes mellitus	\$0.81				
Treatment of congenital defects and complications of pregnancy and birth	\$0.06				
Indirect costs of lost work time due to workers' illnesses or workers providing care for sick family members	\$5.48				
TOTAL health costs	\$35.16			\$124.92	\$160.07
Expenditures for special education in public primary and secondary education	\$5.91	Special Education	\$6.40	\$7.02	(Estimate based on new evidence was used)
		Dropout due to Retention	\$6.00	\$6.58	
		Dropout due to Absenteeism	\$5.80	\$6.36	
TOTAL education & food assistance	\$5.91			\$12.94	\$18.85
TOTAL health, education & food assistance					\$178.92

Millennium Development Goals: Progress Chart to Date

This chart provides an overview of progress on the eight Millennium Development Goals. Progress or lack of progress differs in every state, so regional overviews provide a snapshot at an aggregated level. In some instances, trends are driven by high performance or lack of performance by one or a small group of countries.

Goals and Targets	Africa		Asia				Oceania	Latin America and the Caribbean	Caucasus and Central Asia
	Northern	Sub-Saharan	Eastern	South-Eastern	Southern	Western			

GOAL 1 | Eradicate extreme poverty and hunger

Reduce extreme poverty by half	low poverty	very high poverty	low poverty	moderate poverty	high poverty	low poverty	—	low poverty	low poverty
Productive and decent employment	large deficit	very large deficit	moderate deficit	large deficit	large deficit	large deficit	very large deficit	moderate deficit	small deficit
Reduce hunger by half	low hunger	high hunger	moderate hunger	moderate hunger	high hunger	moderate hunger	moderate hunger	moderate hunger	moderate hunger

GOAL 2 | Achieve universal primary education

Universal primary schooling	high enrolment	moderate enrolment	high enrolment	high enrolment	high enrolment	high enrolment	high enrolment	high enrolment	high enrolment
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GOAL 3 | Promote gender equality and empower women

Equal girls' enrolment in primary school	close to parity	close to parity	parity	parity	parity	close to parity	close to parity	parity	parity
Women's share of paid employment	low share	medium share	high share	medium share	low share	low share	medium share	high share	high share
Women's equal representation in national parliaments	moderate representation	moderate representation	moderate representation	low representation	low representation	low representation	very low representation	moderate representation	low representation

GOAL 4 | Reduce child mortality

Reduce mortality of under-five-year-olds by two thirds	low mortality	high mortality	low mortality	low mortality	moderate mortality	low mortality	moderate mortality	low mortality	low mortality
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GOAL 5 | Improve maternal health

Reduce maternal mortality by three quarters	low mortality	high mortality	low mortality	moderate mortality	moderate mortality	low mortality	moderate mortality	low mortality	low mortality
Access to reproductive health	moderate access	low access	high access	moderate access	moderate access	moderate access	low access	high access	moderate access

GOAL 6 | Combat HIV/AIDS, malaria and other diseases

Halt and begin to reverse the spread of HIV/AIDS	low incidence	high incidence	low incidence	low incidence	low incidence	low incidence	low incidence	low incidence	low incidence
Halt and reverse the spread of tuberculosis	low mortality	high mortality	low mortality	moderate mortality	moderate mortality	low mortality	moderate mortality	low mortality	moderate mortality

GOAL 7 | Ensure environmental sustainability

Halve proportion of population without improved drinking water	high coverage	low coverage	high coverage	high coverage	high coverage	high coverage	low coverage	high coverage	moderate coverage
Halve proportion of population without sanitation	moderate coverage	very low coverage	moderate coverage	low coverage	very low coverage	high coverage	very low coverage	moderate coverage	high coverage
Improve the lives of slum-dwellers	low proportion of slum-dwellers	very high proportion of slum-dwellers	moderate proportion of slum-dwellers	moderate proportion of slum-dwellers	moderate proportion of slum-dwellers	moderate proportion of slum-dwellers	moderate proportion of slum-dwellers	moderate proportion of slum-dwellers	—

GOAL 8 | Develop a global partnership for development

Internet users	moderate usage	low usage	high usage	moderate usage	low usage	high usage	low usage	high usage	high usage
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The progress chart operates on two levels. The text in each box indicates the present level of development. The colours show progress made towards the target according to the legend below:

- Target met or excellent progress.
- Good progress.
- Fair progress.
- Poor progress or deterioration.
- Missing or insufficient data.

For the regional groupings and country data, see mdgs.un.org. Country experiences in each region may differ significantly from the regional average. Due to new data and revised methodologies, this Progress Chart is not comparable with previous versions.

Sources: United Nations, based on data and estimates provided by: Food and Agriculture Organization of the United Nations; Inter-Parliamentary Union; International Labour Organization; International Telecommunication Union; UNAIDS; UNESCO; UN-Habitat; UNICEF; UN Population Division; World Bank; World Health Organization—based on statistics available as of June 2015.

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www.cofchrist.org

Covenant World Relief is an effective and efficient humanitarian aid ministry of the Evangelical Covenant Church with a 60-year history. Covenant World Relief collaborates with partners around the world to provide relief, rehabilitation, and transformational community development. These partnerships empower local ministries, increase local involvement, reduce overhead and facilitate an immediate response to disaster and human suffering. Our charge is to love, serve and work together with the poor, the powerless, and the marginalized.

Covenant World Relief/Evangelical Covenant Church
8303 West Higgins Road
Chicago, Illinois 60631
Phone: (773) 784-3000
www.covchurch.org/cwr
Blog: <http://blogs.covchurch.org/cwr>
Facebook: <http://www.facebook.com/covenantworldrelief>

Evangelical Lutheran Church in America World Hunger is the anti-hunger program of the Evangelical Lutheran Church in America. It responds to hunger and poverty in the United States and around the world by addressing root causes. Through a comprehensive program of relief, development, education, and advocacy, people are connected to the resources they need to lift themselves out of poverty. The international work of ELCA World Hunger is carried out through ELCA companion relationships as well as through trusted partners like Lutheran World Relief (LWR) and The Lutheran World Federation (LWF). Because of these long-held connections to partners around the world, ELCA World Hunger efforts are efficient and effective. The domestic work of ELCA World Hunger is carried out primarily through the Domestic Hunger Grants Program (relief, development, and community organizing projects).

8765 W. Higgins Road
Chicago, IL 60631-4190
Phone: (800) 638-3522, ext. 2709
www.elca.org

Food and Agriculture Organization (FAO) of the United Nations was founded with a mandate to raise levels of nutrition and standards of living, improve agricultural productivity and better the condition of rural populations. FAO is also a source of knowledge and information, helping developing countries and countries in transition modernize and improve agriculture, forestry and fisheries practices.

Viale delle Terme di Caracalla
00153 Rome, Italy
Phone: +39 06 57051
www.fao.org

Foods Resource Bank is a Christian response to world hunger. Its goal is for hungry people to know the dignity and hope of feeding themselves by making it possible for them, through sustainable smallholder agricultural programs, to produce food for their families with extra to share, barter or sell. Foods Resource Bank endeavors to build networks with various agricultural communities in “growing projects” in the United States, allowing participants to give a gift only they can give. These volunteers grow crops or raise animals, sell them in the United States and the resulting money is used by implementing members (denominations and their agencies) to establish food security programs abroad.

4479 Central Avenue
Western Springs, IL 60558
Phone: (312) 612-1939
www.FoodsResourceBank.org

Presbyterian Hunger Program provides a channel for congregations to respond to hunger in the United States and around the world. With a commitment to the ecumenical sharing of human and financial resources, the program provides support for the direct food relief efforts, sustainable development and public policy advocacy. The Presbyterian Hunger Program helps thousands of Presbyterian Church (USA) congregations become involved in the study of hunger issues, engage with the communities of need, advocate for just public policies and business practices, and move toward simpler corporate and personal lifestyles.

100 Witherspoon Street
Louisville, KY 40202
Phone: (502) 569-5832
Fax: (502) 569-8963
www.pcusa.org/hunger

Sisters of Charity of the Incarnate Word is an international congregation of women religious. Who we are and what we do is grounded in a dynamic belief that our loving God became fully human in the person of Jesus. In this act of becoming human, God invites all creation to share in Divine Life. This belief compels us to act to make God's love real in the world by promoting human dignity, especially among the most vulnerable.

4503 Broadway Street
San Antonio, Texas 78209
Phone: (210) 828-2224
www.amormeus.org

United Church of Christ (National) supports 1.2 million members in congregations and other settings of the United Church of Christ in developing relationships with the greater church community that are global, multiracial and multicultural, open and affirming, and accessible to all. Programs of United Church of Christ national setting include Volunteer Ministries and National Disaster Ministries, as well as ministries of Refugee & Immigration, Health & Wholeness Advocacy, and One Great Hour of Sharing and Neighbors In Need special mission offerings.

700 Prospect Avenue
Cleveland, Ohio 44115
Phone: 216-736-2100
<http://ucc.org>

United Methodist Committee on Relief is the not-for-profit global humanitarian aid organization of the United Methodist Church. UMCOR is working in more than 80 countries worldwide, including the United States. Our mission, grounded in the teachings of Jesus, is to alleviate human suffering—whether caused by war, conflict or natural disaster, with open hearts and minds to all people. UMCOR responds to natural or civil disasters that are interruptions of such magnitude that they overwhelm a community's ability to recover on its own. We partner with people to rebuild their communities, livelihoods, health, and homes. In times of acute crisis, we mobilize aid to stricken areas—emergency supplies, fresh water, and temporary shelter—and then stay, as long as it takes, to implement long-term recovery and rehabilitation.

475 Riverside Drive, Room 330
New York, NY 10115
Phone: (212) 870-3808
umcor@gbgm-umc.org
www.umcor.org

World Relief serves the most vulnerable, regardless of religion, race, ethnicity or gender. In 20 countries and 20 locations in the United States, World Relief's innovative ministries focus on economic development, health and social development, and refugee care. World Relief equips churches to minister to people's physical, emotional and spiritual needs. Since 1944, World Relief has been empowering churches to serve the world's most vulnerable.

7 E. Baltimore Street
Baltimore, MD 21202
Phone: (443) 451-1900
www.WorldRelief.org

Friends:

(Donations under \$5,000)

Allegheny Franciscan Ministries
www.afmfl.org

Christian Church (Disciples of Christ)
www.disciples.org

Church of the Brethren, Global Food Crisis Fund
www.brethren.org

Church World Service
www.churchworldservice.org

Congressional Hunger Center
www.hungercenter.org

Cooperative Baptist Fellowship
www.thefellowship.org

Episcopal Church
www.episcopalchurch.org

Lutheran World Relief
www.lwr.org

Nazarene Compassionate Ministries
www.ncm.org

Salvation Army National Corporation
www.salvationarmyusa.org

Wesleyan Church
www.wesleyan.org

Women's Missionary Society of the African Methodist Episcopal Church
www.wms-amec.org

World Hope International
www.worldhope.org

World Renew
www.worldrenew.net

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Acronyms

AARP	American Association of Retired Persons	HPHS	Health Professions High School
ACA	Affordable Care Act	IMF	International Monetary Fund
ADA	Americans with Disabilities Act	IOM	Institute of Medicine
ARRA	American Recovery and Reinvestment Act of 2009	IRS	Internal Revenue Service
BMI	Body Mass Index	MCC	Millennium Challenge Corporation
CACFP	Child and Adult Care Food Program	MDGs	Millennium Development Goals
CCDM	Community-based, chronic disease management	MEANS	Matching Excess And Need for Stability
CDC	Centers for Disease Control and Prevention	MOWA	Meals on Wheels America
CFAN	Climate Forecast Applications Network	NFP	Nurse-Family Partnership
CHNA	Community Health Needs Assessment	NGO	Nongovernmental organization
CHRs	Community health representatives	NHANES	National Health and Nutrition Examination Survey
CO2	Carbon dioxide	OAA	Older Americans Act
COPE	Community Outreach & Patient Empowerment	PEPFAR	President's Emergency Plan for AIDS Relief
DI	Social Security Disability Insurance	SDGs	Sustainable Development Goals
FAO	Food and Agriculture Organization of the United Nations	SNAP	Supplemental Nutrition Assistance Program
FFD	Financing for Development	SSI	Supplemental Security Income
FINI	Food Insecurity Nutrition Incentive program	SUN	Scaling up Nutrition
FVRx	Fruit and vegetable prescription program	TANF	Temporary Assistance for Needy Families
GAO	Government Accountability Office	TB	Tuberculosis
GDP	Gross Domestic Product	USAID	United States Agency for International Development
HBCUs	Historically Black Colleges and Universities	USDA	U.S. Department of Agriculture
HELP	U.S. Senate Committee on Health, Education, Labor, and Pensions	UUSC	Unitarian Universalist Service Committee
HHC	Health and Hospitals Corporation	WHO	World Health Organization
HHS	U.S. Department of Health and Human Services	WIC	Special Supplemental Nutrition Assistance for Women, Infants, and Children