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Estimated Annual Burden to the United States

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The Sodexho Foundation (www.helpstophunger.org) is an independent charitable organization that is leading the fight against hunger by supporting initiatives that focus on eliminating the root causes of hunger in the United States. Administrative costs are paid by Sodexho, Inc. (www.sodexhoUSA.com) to ensure that 100 percent of funds raised are directed to those in need. Established in 1999, the Sodexho Foundation has been a leading force in the pursuit of a hunger-free nation with its ongoing efforts to provide support to individuals and families facing poverty, unemployment, lack of education and food insecurity. Since its inception, the Foundation has raised and contributed more than $7.2 million to hunger relief and advocacy organizations nationwide.

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Executive Summary

In recent years the scholarly community has developed methods to measure "cost burdens," which are the direct and indirect societal costs of adverse outcomes associated with a particular problem, practice, or illness. Such studies have examined the total cost to households, communities, businesses and government of problems such as alcohol abuse, smoking and obesity.

This report is the first analysis of the total cost burden of hunger in the United States-- what it costs the American public to tolerate hunger and food insecurity in our nation. Bipartisan efforts in the 1970s led to policies that resulted in significant reductions in hunger; however, since the 1980s hunger has not only became more severe but, according to an annual measure reported by the federal government, has remained at high levels for at least the past decade. Each year around 35 million Americans live in households that do not get enough to eat.

The personal cost of hunger to a child, or to families who cannot afford to feed their children, might be difficult for many to imagine. This personal cost has been analyzed and discussed in numerous academic and lay publications. But what, we might ask, is the *economic* cost to the nation when we permit so many of our fellow citizens to go hungry? What are the costs of the charity that is required to help families get through another day? What are the costs of impaired educational outcomes that scientific research has linked to children not getting enough to eat? And what is the bill for the mental and physical illnesses that are linked to inadequate nutrition? This analysis calculates the cost burden of hunger in the United States at a minimum of $90 billion annually. This means that on average each person living in the U.S. pays $300 annually for the hunger bill. On a household basis this cost is $800 a year or $8,000 over a decade. And because the $90 billion cost figure is based on a cautious methodology, we anticipate that the actual cost of hunger and food insecurity to the nation is higher.

Notably, national experts calculate that federal policymakers could end hunger as a serious national problem by strengthening existing federal nutrition programs by about $10 to 12 billion over current spending. This means that virtually ending hunger in our nation would be far less costly than paying the current annual bill that lets so many people in our country suffer this preventable fate.

Foreword

Only several decades ago, there were millions of people in America suffering from severe malnutrition, some bordering on starvation. Thankfully, our nation mobilized resources and support to greatly reduce this tragedy. Today many people believe that hunger is no longer an issue in America. However, the reality is that in virtually every community there are people who are impoverished and in need, whether they are the working poor, the elderly, or families with children. If we look closely, the face of hunger is all around us, affecting more than 35 million of our fellow citizens. They are not starving, but they do not have the certainty of knowing where, when, or how they will eat their next meal. Many are forced to choose between the daily necessities of life such as paying rent, having adequate health care, or buying food.

The mission of the Sodexho Foundation is to be a driving and creative force that contributes to a hunger-free nation. It is for this reason that we commissioned this ground breaking research project, "The Economic Cost of Domestic Hunger." We believe hunger is a solvable problem and are working to raise the consciousness and the political will of the American people to once again rise to meet the challenge to end it in our country. Hunger in America has a cost far beyond the human suffering. As this research outlines, the cost burden to our country is more than $90 billion, far more than it would take to ensure that no citizen is at risk of hunger. Admittedly, there is more to ending hunger than providing food for those in need. We have a responsibility to address hunger's root causes; to provide employable skills, affordable health care, child care, and affordable housing among many others.

While people may differ on various policy proposals, none would disagree that hunger has no place in our vibrant democracy. We hope that this landmark study will help the nation engage in a more public dialogue about the issue of the true cost of hunger in our midst, and the concrete and measurable steps that we can take to make America a hunger-free nation.

Stephen J. Brady
President
Sodexho Foundation
Gaithersburg, MD

Cost Burden Calculations

For some years now the media has reported on studies that assess the cost to society of adverse outcomes associated with social practices or policies. Often, this takes the form of a 'cost burden' for such outcomes as smoking, alcohol abuse and obesity. A cost burden is the compilation of the known economic costs, both direct and indirect, of a particular problem or practice. The cost burden provides information to policy makers on the magnitude of the problem and the potential savings that could result from eradicating or reducing the identified problem as they consider possible solutions. When the problem is an illness, the type of study is termed "cost of illness." As Dorothy Rice, a pioneer in such studies, noted, they have been widely performed and proved useful to inform resource allocation across such wide ranging areas as biomedical research, public health, and injury prevention (Rice, 2000).

Estimating a cost burden involves the use of systematic methods to calculate the total societal costs of managing the specified problem or practice and its adverse outcomes. Taking a societal viewpoint, cost burdens include both private and public sector spending, counting both direct and indirect costs in each sector. Direct costs are those expenditures incurred as a result of the medical treatment of some illness or problem; indirect costs are the non-medical costs incurred as a result of that illness, such as missed days of work. These expenditures come from a variety of sources including government, public and private organizations and personal pocketbooks.

Alcohol abuse is an example of a substantial cost burden. The annual cost of health care associated with alcohol abuse alone has been calculated at $22.5 billion, but when indirect costs, such as lost productivity are factored in, the total economic burden to the nation has been reported by various scholars to run to nearly $200 billion annually.[1] The costs of undesirable problems like alcoholism frequently are as hidden as they are surprising: costs are not only borne by the user, but their families and society at large. As an example, children of alcoholics are sick more often, are admitted to the hospital 62% more often than other children, and remain in the hospital 29% longer (Rice, 1999). Alcohol abuse significantly elevates the likelihood of traffic accidents, particularly among teenagers, but also among all ages. Alcohol abuse also is linked to increased homicides and other violent crimes, as well as increased drownings and suicides (Rice, 1999).

[1] See sources listed in Table 1

Table 1 below provides a brief summary of scholarly studies that assess the known and quantifiable "cost burden" of several practices. These studies raise a number of notable issues. The first is that the estimated costs are substantial. The cost burdens of single issues or problems range from as low as $79 billion to as high as $500 billion annually, sizable costs in and of themselves. Second, assuming these burdens are independent, the total cost is enormous, perhaps in the range of $1 trillion annually just for the several outcomes listed.

A third factor of note is that several of the studies are older, meaning that with inflation and rising health care costs, the annual cost burdens would be higher today. But perhaps the most compelling implication of cost burden analysis is the potential cost savings to our nation if a problem is prevented.

Table 1
Cost Burden for Selected Outcomes

Outcome	Estimated Annual Cost	Cost Current as of	Sources and Year
Alcohol abuse	$185 billion	1998	Harwood, 2000
Smoking	$138 billion	1995	Rice, 1999
Obesity/overweight	$ 79 billion	1998	Finkelstein et al., 2003
Drug abuse	$161 billion	2000	Office of National Drug Control Policy, 2001
Poverty	$500 billion	2007*	Holzer, 2007

* If not otherwise specified, we have assumed the years' dollars are the same as the publication year

It is well understood in medicine that it is generally better to prevent ill health than it is to treat problems after they develop. Prevention not only eliminates the pain and suffering of the patient, but it also prevents the personal and societal costs of treatment. So commonly accepted is the premise of prevention that it is encoded in various state and federal laws. For example, most states require motorcyclists to wear helmets because of the frequency of serious brain damage associated with not wearing a helmet. In such an instance, legislatures have calculated that the relative loss of personal freedom (choosing to ride without a helmet) is greatly offset by reducing the substantial cost to society of paying for preventable brain injuries. Similarly, childhood vaccinations are generally required as a condition for school entry, and transportation workers may not use illegal drugs and must accept random screening on request to confirm their adherence.

It is notable that such decisions do not extend to all possible adverse outcomes. Society does not, for example, require people to eat only certain foods to avoid the costs to the nation of obesity. Neither is smoking or alcohol use banned altogether, although their public use is now greatly regulated to protect the public good.

A customary social perception of the origins of problems such as smoking, drug and alcohol abuse, and even obesity, is that they result from the consequences of individual choice. Although mounting evidence now suggests that this view is much too simple, individual choice is the result of a complex interaction of factors often external to the individual, such as advertising, social norms, household income, and perhaps genetic factors ultimately it is the individual who either decides or simply succumbs to practices and habits that then burden society with the significant economic costs shown in Table 1. In short, so-called individual decisions force the nation to later pay the costs of each of the practices in aggregate, through both public and private expenditures for medical care, lower productivity, and premature death, each with its own economic costs.

2. The Extent of Hunger in America

We turn now to a significant economic cost borne by society that hardly reflects individual choice at all: hunger in America. People do not choose to skip meals when they are hungry, and parents do not elect to put their children to bed without enough to eat. The cost of hunger is involuntary on the part of its victims, and quite preventable by society as a whole. Hunger also is very costly.

The burden and extent of domestic hunger has been fairly well understood since at least the late 1960s. The nation was galvanized by the report of the Citizens' Board of Inquiry into Hunger and Malnutrition in the U.S. when it reported in 1968 on the widespread occurrence of hungry children, the elderly, even entire families (Citizens' Board of Inquiry into Hunger and Malnutrition, 1967). While the Board, largely comprised of physicians and clergy, was unable to estimate precisely how many individuals were impacted, they placed the number somewhere above 10 million people. Moreover, their field investigations into specific areas of the nation found the problem of hunger to be endemic. Its victims consistently lived without an adequate diet because they did not have the money to buy what they needed to eat. Mothers often watered down the dwindling supply of formula to feed their infants, toddlers seldom got milk to drink, and vegetables and fruits were virtually unknown in many households. This Board report prompted Congressional hearings and significant bipartisan action, resulting in programs that include the national Food Stamp program, the School Breakfast, Elderly Feeding and WIC programs. But it would take years for an authoritative source to make an estimate of the actual extent of hunger nationally.

In 1985, the Harvard-based Physician Task Force on Hunger in America announced the results of its research and field investigations in half the states of the nation (Physician Task Force on Hunger in America, 1985). This group largely comprised of physicians and public health experts had traveled to the states to see the face of hunger. Yet unlike their predecessors, they had the scientific training to calculate an estimate of the size of the problem the nation faced. They reported that the number of Americans afflicted by hunger was more than 20 million. Their report led to significant national news coverage and, as in 1968, Congress took further action to ameliorate the problem.

Although the estimate of 20 million people going hungry was criticized in some quarters, other sources soon weighed in, some offering an estimate beyond the Harvard group's figure. One even suggested that the number was well above 30 million (Bregglio, 1992), a figure later corroborated by the university-based Center on Hunger and Poverty in 1992[2], which had been consulted by Congressional leaders as to the true extent of domestic hunger. In 1995, the federal government implemented a standard measure to evaluate the extent of hunger annually. Over the past ten years, with relatively minor variations, this standard has indicated that about

[2] Communication to Congressman Tony Hall from J. Larry Brown, 1992

35 million Americans live in households with insufficient food. Like the federal poverty rate, which varies annually with changes in job opportunities, wages and the overall economy, the extent of hunger rises and falls each year as well and for similar reasons but the variation is slight. This federal data set consistently indicates that close to 12% of the nation's people lack sufficient nutrition.

The extant standard for tracking hunger and food insecurity is known as the Federal Food Security Module, and it is operationalized cooperatively by the Department of Agriculture and the Bureau of the Census (Bickel et al., 2000). Each year as it conducts census tracking, the Bureau asks a special set of eighteen questions developed by the Department of Agriculture that is applied to a broad national sample of households to determine the adequacy of their diets: do they sometimes not have enough food for their families, do they sometimes have to skip meals because of insufficient income, do they ever have to put their children to bed hungry. The researchers also ask questions about when such occurrences happened and how often over the past year, since the number of positive responses to such outcomes must reflect a repetitive or chronic problem before the household actually is counted as vulnerable.

Unlike the earlier hunger estimates, the federal measure reflects a refined definition of the problem. The governmental report defines hunger as a “painful sensation” in the stomach, and the measure of it reflects a high degree of food deprivation or “insecurity” before a household actually is considered to experience hunger. Some nutritionists and medical experts consider this standard to be too high. Since “pain” is only one of the possible sensations from hunger, many victims of hunger do not actually feel pain as such. Thus, people can be chronically hungry by any common understanding of the term, yet be missed by the federal definition because they do not experience “a painful sensation.”

Alongside the category of “hunger,” the federal measure also includes a new and more encompassing category of nutritional deprivation known as “food insecure.” Households that are not determined to be hungry, as such, may be food insecure if they run out of food or do not know where the next meal is coming from, or if parents have to cut back on the portions of food served, cut down on the types of food categories available to the family, or have to rely on soup kitchens or food pantries to feed their family. While many consider this two-tiered measure hunger and food insecurity to be useful in differentiating degrees of household food deprivation, some experts consider the distinction to be tenuous. They argue that since hunger is more than a pain, and includes inadequate food resources to nourish individuals and families, then food insecurity is hardly different from hunger, if at all.

Whatever the merits of this distinction, it is important to note that the federal government uses the Federal Food Security Module to monitor annual changes in hunger and food insecurity in the nation. As shown in Table 2 the federal government reports that over recent years an average of 35 million people live in households that experience hunger or food insecurity.

Table 2

Annual Levels of Hunger and Food Insecurity

Year	Number of Households	Percent of Households	Number of Individuals	Percent of Individuals
2000	11.1 million	10.5	33.2 million	12.1
2001	11.5 million	10.7	33.6 million	12.2
2002	12.1 million	11.1	34.9 million	12.5
2003	12.6 million	11.2	36.3 million	12.7
2004	13.5 million	11.9	38.2 million	13.2
2005	12.6 million	11.0	35.1 million	12.1

Source: Department of Agriculture, *Household Food Security in the United States*, 2005 (ERR-29), November, 2006.

To analyze the cost burden of domestic hunger, we treat the extent of food deprivation in the nation as being the more encompassing number combining both hunger and food insecurity. Two factors support this treatment of the data. One, mentioned above, is that even households that are considered to be food insecure actually experience hunger (people don't eat enough to satisfy their needs, and are forced to cut back in terms of satisfying their nutritional requirements). The other factor supporting this decision is the scholarship in the field of hunger and food security. For more than a decade now, scores of studies and analyses have shown that even the most elementary forms of food insecurity have detrimental effects on its victims. See, for example, Murphy et al (1998); Sahyoun and Sasiotis (2000), and Kleinman et al. (1998). People who go without enough to eat are sick more often and miss work more frequently. Children who live in food insecure households (not necessarily categorized as hungry) are sick more frequently, miss school more often, and do more poorly in school. The research shows that food insecure children are more susceptible to cognitive impairment (mental dysfunction), more likely to engage in anti-social behaviors, and more in need of both medical and mental health interventions (Center on Hunger and Poverty, 2002). In short, there are significant "cost burdens" when people are hungry or food insecure. Hence, we treat the burden of hunger and food insecurity as a unified problem or cost center.

Before assessing the actual economic costs associated with hunger, it is worth one further note regarding the issue raised in the previous chapter, notably, whether hunger is due to individual behavior. A significant amount of research on the part of scholars at various academic institutions sheds light on this matter. Households typically do not go hungry due to choice or bad habits. Certainly there is individual pathology that occasionally results in some families falling victim to hunger, but this appears to be the unusual indeed, highly rare case. Rather household food insufficiency is known to be associated with low wages, part-time jobs, loss of employment, and the high costs of housing and medical care for low-income households. Indeed, the single fastest growing group of people having to rely on food banks and emergency

feeding programs for meals is the working poor: households where both parents may be working, or where one is holding down one or more low-wage jobs. The pay they receive for their hard work is inadequate to meet household needs. Expenses like rent, utilities and medical care are fixed, but food purchases are elastic or expendable. The rent must be paid and heating oil must be bought, but for food, families “choose” to do without, or sharply cut back to try to get by.

For this reason, the problem of hunger is somewhat different from that of other outcomes for which cost burdens have been estimated. Hunger is not typically associated with individual pathology or bad judgment, but exists due to external factors, both economic and political in nature, which leave a significant portion of people deprived of one of our most basic needs, enough food to eat--a basic *right* according to the United Nations. For this problem there exist both individual and collective costs. This is an analysis of the latter: how much the nation pays annually for extensive hunger in our midst.

3. Charity: The Cost to Individuals, Organizations and Communities

Charity is what we practice when things do not work out as they should. A home burns down and we console the family with lodging or other forms of care. We realize that our aid is not a meaningful long-term solution to the loss of housing, but we respond as we can for the interim. When a family loses income due to a job loss, we provide food to help them get by. Here too, we realize that this is only a temporary fix because they will be hungry again tomorrow. But we aid them as we can in the hope that a more lasting, structural solution will enable them to again be on their feet.

It is in this respect that the charitable community has faced a crisis in domestic hunger since the early 1980s (Physician Task Force on Hunger in America, 1985). Charities have to play an immediate mitigation role to address the needs of families that go hungry today. At the same time, the charitable community has been called upon to play a role in finding lasting public policy solutions to hunger by preventing its root causes. Because charity is a short-term response and not a basic solution, the charitable community has had to develop both immediate and longer-term strategies to address the problem.

This charitable role has been elevated to a sophisticated art form. With about 35 million Americans consistently living in households that struggle each year to get enough to eat,[3] the charitable response has shifted from individual in nature to largely an institutional one. And while the charitable institutions that now exist are among the first to proclaim that their job should not exist—hand-outs are not the preferred way to feed families in a wealthy democracy—charitable efforts are needed until economic opportunity and public policy combine to strengthen family economic security. In the meantime, America arguably has become a soup kitchen nation. Tens of thousands of "emergency" feeding programs now dot the landscape of the nation, so many in fact that if they were evenly distributed, about one thousand would exist in *each* state of the fifty states. (Cohen, 2006).

The largest domestic hunger relief organization is America's Second Harvest, an umbrella organization that represents a network of more than 200 food banks and food rescue organizations across the country that serve the smaller emergency programs mentioned above.[4] Located in every state, these entities collect canned, boxed and sometimes fresh foods from industry and other sources, and then distribute it to a variety of local programs to feed the hungry with actual meals or periodic bags of groceries. Another 50 or so food banks exist

[3] See Table 2, herein, for annual fluctuations since the year 2000.

[4] Headquartered in Chicago, IL, America's Second Harvest, The Nation's Foodbank Network is one of the largest charities in the United States.

outside the Second Harvest system [5] meaning that the nation has an average of five food banks for each state (though not actually so distributed).

These 250-plus food banks exist to provide food pantries that typically reside in church basements and social service agencies. These facilities usually bag the food products to distribute weekly to families depending on household size. The banks also service soup kitchens, establishments where individuals and families can come for a sandwich or even a hot meal. America's Second Harvest reports that its food banks alone service more than 40,000 food pantries and soup kitchens across the nation. In 2005, these Second Harvest programs fed more than 24 million people (Cohen, 2006). When non-Second Harvest food banks and other programs are factored in, the number of people fed through charitable efforts in the nation is substantially higher.

It is the nature of charity that it typically is a donation: a family is hungry and is given soup. But the soup itself is not free. Somewhere along the line it was bought and paid for. Even the act of giving the soup was not free. To get it to the family in need required personal or volunteer time and institutional overhead, both of which have calculable economic costs.
In this sense, America's huge charitable enterprise, developed largely over the past twenty-five years, is not free. In fact, its price tag, its economic investment to feed the hungry, is more than $14 billion each year. (Appendix A describes the methodology for estimating charitable costs and other burdens described in this report and Appendix B lists the literature reviewed). Table 3 provides details about costs for charity only; other costs associated with hunger in America are addressed in subsequent sections.

Table 3
Annual Cost Burden of Charitable Efforts to Feed Hungry Americans

Charitable Activities	Estimated Cost 2005
Food Banks: products, operations and depreciation	$ 3.8 billion
Local Feeding Programs: food pantries and soup kitchens	7.5 billion
Volunteer Support: volunteer hours and expenses (1. and 2.)	1.1 billion
Other National Feeding Programs (non-food bank related)	0.7 billion
Unaffiliated Local Programs	1.4 billion
Total costs	$ 14.5 billion

Source: Authors' calculations. See Appendix A and Appendix B

Critics might question counting the cost of food as a cost of hunger, since the users would have to obtain food somewhere. While this is true, due to their restricted hours and limited locations, Food Banks and local feeding programs impose time and travel costs on their users—a

[5] Authors' telephone and email discussions with America's Second Harvest representatives, June, July, 2006

component that we have not factored in. Overall, we believe that the estimate of $14.5 billion to feed hungry households each year somewhat under-represents total charitable costs. This is particularly so since conservative assumptions and prudent standards were utilized in constructing this analysis. Nevertheless, even if the actual figure is somewhat higher, the significance of spending $14.5 billion annually to feed the hungry through charitable efforts is striking when compared to the projected cost of actually ending hunger in the nation.

Various scholars, as well as some of the nation's leading national hunger organizations,[6] have estimated that Congress could essentially end hunger in the nation by expanding existing programs (Food Stamps, Child Nutrition and Elderly Feeding) by $10-12 billion over current program expenditures (Brown, 2006; National Anti-Hunger Organizations, 2004). Hence, it is notable that were such a public policy solution adopted to ending hunger, it actually would represent a savings over what is now spent on annual charitable efforts. In short, it would be far more cost effective to eliminate hunger as a serious national problem than to continue to mount these expensive charitable efforts each year.

[6] Membership in the National Anti-Hunger Organizations (NAHO) includes: Bread for the World, Share Our Strength, MAZON, America's Second Harvest, Center on Hunger and Poverty, World Hunger Year, Food Research and Action Center, Congressional Hunger Center, RESULTS, Center on Budget and Policy Priorities, and others.

4. Illness: The Costs of Mental Health and Medical Care

The extensive prevalence of hunger in the nation exacts other costs as well. Some of these costs are immediate, such as missed days of school, while others are more long-term, such as the cost of a lifetime of lowered productivity. We turn now to those costs of hunger that are unrelated to charitable initiatives. In this section we evaluate and summarize the economic costs of poorer health, illness, increased utilization of psychological services, and other psychosocial outcomes that are shown by research to be associated with not enough to eat

An extensive body of scholarly research shows that hunger, even in its milder form of food insecurity, is directly linked to adverse outcomes that are harmful to the individual and costly to society. While much of the relatively recent research about the impact of hunger on the individual has focused on the pediatric population, it is now considered that there is no "safe" level of involuntary hunger at any age. Hunger born of insufficient resources is harmful to the human body and the cognitive function of the brain (Center on Hunger and Poverty, 2002). In a survey of relevant scholarly work for example, researchers reported in *Scientific American* that, "Undernutrition triggers an array of health problems… weight loss, stunted growth, weakened resistance to infection… [and] hinders mental development." (Brown and Pollitt, 1996). Basing their conclusion on work conducted both in the United States and abroad, the authors noted that, "Prevention of malnutrition remains the best policy, not only on moral grounds but on economic ones as well… billions of dollars in education goes to waste when children appear at the school door crippled from undernutrition." (Brown and Pollitt, 1996). Numerous scholarly findings reported in scientific journals over the past decade have linked hunger or food insecurity with a variety of adverse health outcomes (See Appendix B). While there are variations in the findings, this growing body of evidence indicates that even relatively mild food deprivation poses a variety of threats to the body. These include outcomes that can range from minor to more severe in nature, such as chronic headaches, stomach aches, and weakened physical conditions that involve greater susceptibility to disease and generally poorer health status. Hunger and food insecurity also are associated with more doctor visits, higher rates of hospitalization and other preventable medical care. In general, the scholarly literature now links hunger with many factors associated with poor health outcomes, although it bears remembering that the outcomes are not always statistically significant, or necessarily to the same degree.

Members of food-deprived groups, for example, often have higher rates of various adverse conditions:
Higher rates of iron deficiency anemia (1.66 times more likely)[7]
Frequent headaches (1.92)
More stomach aches (2.16)
Greater frequency of colds (1.54)
More activity-limiting health impairments (2.95)
Specific nutrient deficiencies (2.85 to 4.39)
More hospitalizations and longer in-patient stays (1.3)
Poorer overall health status (2.9)

Whenever possible, we selected multivariate risk ratios or odds ratios of these adverse outcomes from the literature. This choice increases our confidence that the associations of adverse outcomes with hunger or food insecurity remain after controlling statistically for other explanatory factors for the households under study.

In addition to physical well-being, hunger is also linked to adverse mental health and psychosocial outcomes. Lack of food, or the depletion of dietary energy maintained by the body, can induce changes in both mental function and stability (Center on Hunger and Poverty, 2002). These changes typically are more noted in children for a variety of factors, but extend to the adult population including the elderly. The elevated rates of mental and behavioral outcomes associated with hunger and food insecurity, based on a number of recent studies, include these examples:

Anxiety and irritability (1.95 times as likely)
Depression (3.50)
Withdrawn behavior (1.74)
Psychosocial dysfunction (7.0)
Suicidal thoughts and behaviors (5.00)
Need for special education (2.07)
Need for mental health services (1.93)

Table 4 summarizes calculable costs in the areas for which the scientific literature provides likelihood odds ratios (elevated outcomes) for people who experience hunger and food insecurity. The total cost from a societal perspective for mental health services and ill health, assuming these outcomes are independent, comes to $66.8 billion annually, in 2005 dollars. It is to be noted, however, that for technical reasons this cost estimate is believed to be quite

[7] The odds ratio of 1.66, for instance, means that members of food insecure households are 1.66 times more likely to be iron deficient than members of food secure households. The increased prevalence rates used in sections 4 and 5 of this report were obtained from many individual studies (see Appendix B). The mean odds ratio was used where multiple studies were available for a single topic.

conservative. For some outcomes associated with insufficient food, such as attention deficit hyperactivity disorder (ADHD), we concluded that the existing likelihood ratio for excess outcomes was insufficient to rely on. For yet other outcomes such as iron deficiency, hospitalizations, and excess costs of fair and poor health status, we were able to compute direct costs but not indirect costs because available data did not provide a basis for estimating indirect costs. The fact that these and other costs were not fully attributed suggests that while our estimate of $66.8 billion is appropriately conservative from a research perspective, the full cost of hunger probably is not captured in the table below. (The procedures behind these calculations and those in the next chapter are described in the section on methodological approach in Appendix A.)

Table 4

Annual Societal Cost Burden of Hunger-Related Illness and Psychosocial Dysfunction

Adverse Outcome	2005 Direct and Indirect Costs	
Migraines	$ 1.7	billion
Colds	0.4	
Iron deficiency	0.2	
Depression	15.6	
Anxiety	9.2	
Suicide	6.4	
Upper gastrointestinal tract disorders*	2.5	
Other hospitalization*	7.1	
Excess cost of other fair or poor health status*	23.7	
Total costs	$ 66.8	billion

* Direct cost only (indirect costs are not available).
Source: Authors' calculations. See Appendix A and Appendix B

5. Limited Learning: The Costs of Lowered Economic Productivity

In recent years some of the more remarkable findings about the consequences of food insufficiency pertain to its impact on cognitive function, the capacity of the brain to perform optimally as children and adults engage in their educational, social and work environments. For many years the medical research community believed that underfed children sustained brain impairments only if there was structural damage (morphological change) to the brain itself (Pollitt et al., 1996). Anything less, and particularly what is now called mild under-nutrition, was considered to pose little threat to brain function. It is now known that even mild forms of hunger or food insecurity are not safe, as even relatively small exposures to hunger can impair cognitive function, particularly in children.

When faced with insufficient dietary intake, the human body engages in a form of triage by directing limited energy to be used for its most important functions. Chief among these is maintaining critical organ function. If enough dietary energy remains after allocation to key bodily organs, the second priority is body health, which in children means normal height and weight gain. The final priority, depending on the availability of energy, is the individual's interaction with the social environment—playing with peers, interacting with parents and siblings, and awareness and participation in school. Hungry children haven't the capacity for normal learning and play; while their bodies are in the classroom they lack the dietary fuel required to engage meaningfully with those around them. As a result, their cognitive abilities deteriorate not because of changes in brain structure, but due to the seemingly more "benign" cause of insufficient dietary energy.

This deterioration, directly linked to food insufficiency, impairs cognitive function and the impact can last a lifetime. Hungry children do less well on tests of mental ability and school performance, and are more likely to fail, be held back, and drop out. They require more educational services and mental health interventions, as noted in the previous chapter, and also do significantly more poorly on standardized outcome measures such as academic performance, standardized testing and completion of school. As an example of many such studies, see Kleinman et al. (1998).

According to a number of recent studies (see Appendix B), children from food insecure households are more likely than their non-food insecure peers to experience higher rates of various forms of educational trauma:
Missed days of school (1.6 times more likely)
School suspensions (1.95)
Repeating a grade (1.44)

These and related outcomes are linked to an increased likelihood of school failure, including dropping out of school. In their adult years, children so affected will face greater likelihood of limited employability, lessened workforce productivity, and poorer judgment and job performance. It is in this way that hunger exacts a significant monetary cost to the nation, as the value of educational investments is squandered when children are unable to learn. Having experienced hunger as children, those entering the workforce as adults represent two cost burdens: a more limited lifetime earning potential, and lowered workforce productivity. Table 5 estimates the cost burden. This estimate is conservative because the available data do not permit us to quantify all the mechanisms by which hunger may lower productivity.

Table 5

Annual Societal Cost Burden of Less Education and Lower Productivity

Adverse Outcome	2005 Direct and Indirect Costs
Absenteeism	$ 4.2 billion
Grade retention (drop out)	$ 5.0 billion
Total costs	$ 9.2 billion

Source: Authors' calculations. See Appendix A and Appendix B.

6. The Bill: The Total Cost Burden of Hunger in America

We have developed attributable costs to capture the burden of hunger based on the variables for which scholarly evidence reveals excess (higher than for the general population) rates of adverse outcomes among the 35 million persons who live in households that do not get enough to eat. Table 6 below summarizes the cost of domestic hunger, totaling more than $90 billion annually, based on the outcomes discussed in the three previous sections.

Table 6
Minimum Total Cost Burden of Hunger in America

Cost Burden by Outcome	2005 Direct and Indirect Costs	
Charity	$	14.4 billion
Illness and psychosocial dysfunction		66.8
Less education and lowered productivity		9.2
Total costs	$	90.4 billion

Source: Authors' calculations. See Appendix A and Appendix B

This is a substantial bill, one that comes to both the taxpayers of our nation as well as to those who go hungry. But as with any cost burden estimates, the actual total cost can be somewhat uncertain. The scholarly literature in the field of outcomes associated with inadequate nutrition is fairly recent. Moreover, the plethora of studies that do exist sometimes provide no values, or even conflicting values, for particular outcomes. In numerous instances we made our most objective judgment as to how to treat the available data, and often relied on scholars in particular fields to help us. In some instances, we developed mean values when various studies suggested different prevalence rates for adverse outcomes among the population of food insecure households. And we always excluded outcomes for which available data were too sparse or varied widely. It is known, for example, that attention deficit hyperactivity disorder (ADHD) is higher among children who experience hunger. But the research in this field is too recent to yield a prevalence rate in which we had confidence. Hence, we discarded our effort to calculate the cost burden of hunger as it impinges on this and several other outcomes associated with hunger.

Because we were conservative in our approach, declining to calculate costs for some outcomes as noted above, we believe that our estimate of the true cost of hunger for the nation is actually somewhat higher than $90 billion. This estimate is based on exclusion of some components for which adequate data were entirely absent, and the counting of only direct costs for other components when we unable to develop estimates of indirect costs. For conditions for which indirect costs were available, they were generally higher than the direct costs. It is noteworthy, for example, that the calculation for the costs of illness and psychosocial dysfunction ($66.8 billion) in Table 6 was based on *direct* linkages between food insecurity and hunger and each outcome derived from the scholarly literature. Yet the calculation of educational and productivity costs in the same table ($9.2 billion) had to be based on the *indirect* cost associated with dropping out of school, thereby attenuating the impact significantly. While more research is

desirable with respect to the direct costs of lowered education and productivity, we estimate that the actual costs are far more than $9.2 billion annually.

Aside from this cost burden estimate of hunger in America being at the lower bound of its likely effects, stands the significance of the bill itself. What, we might ask, does it mean to pay more than $90 billion each year to let hunger exist in our nation? No doubt there are numerous ways to consider this matter. Distributed on an individual basis, it means that on average each person residing in the U.S. pays $300 annually for the hunger bill. Distributed on a household basis, it means that the annual cost is closer to $800 each year. And calculated on a lifetime basis, each individual's bill for hunger in the nation is nearly $22,000.

The payments we each make to pay for the existence of hunger in our nation typically are not direct. Usually we pay our bill through higher taxes to cover the costs of outcomes that the victims of hunger suffer, we pay through charitable contributions we make, and we pay indirectly for things such as lowered productivity and loss of U.S. competitiveness in the international arena.

Through whatever lens we seek to view the cost of hunger and grapple with how we pay the bill for its existence, one thing is paramount: *The nation pays far more by letting hunger exist than it would if our leaders took steps to eliminate it.*

If, even at the high end, it would cost $12 billion over current spending for Congress to expand existing programs to nearly end hunger, this is about 13% of what our country is now paying for tolerating hunger. In other words, we pay more than $90 billion annually to let people go hungry in America. Yet we can virtually end hunger in our nation for an additional $10-12 billion over current expenditures (Brown, 2006; National Anti-Hunger Organizations, 2004).

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Appendix A: Methodological Approach

Researchers bear the burden of ensuring the quality of their work, and describing their methodology in a manner sufficient for others to replicate or refute the outcomes. This latter responsibility includes highlighting assumptions made during the course of data analysis so that others can concur or challenge them and readers can decide the reasonableness of researchers' decisions and findings. The remainder of this appendix is designed to fulfill these obligations as they pertain to the estimation of the cost burden of hunger in America.

Definitions of key concepts

In 1995 the federal government adopted a standardized measure for both food insecurity and hunger. Known as the Federal Food Security Module, this measure has been applied each year to a national representative sample of U.S. households as part of the U. S. Census Bureau's annual *Current Population Survey*. The outcome, the number of people living in households that experience food insecurity and/or hunger, is reported jointly each year by U. S. Census Bureau and the U. S. Department of Agriculture.

The federal definition of food insecurity is "The limited or uncertain availability of nutritionally adequate and safe foods, or limited or uncertain ability to acquire acceptable foods in socially acceptable ways." (Bickel et al., 2000) In lay language, we would consider people to be food insecure if they don't know where their next meal will come from, haven't sufficient money or food on hand to provide for their families' nutritional needs, or have to go to soup kitchens or food pantries to eat. Each year since 1995, the federal government has reported between 33 and 38 million people living in households that experience food insecurity, a number much larger than those experiencing hunger per se.

The federal definition of hunger is "The uneasy or painful sensation caused by lack of food, [or] the recurrent and involuntary lack of access to food. Hunger may produce malnutrition over time…" (Bickel et al., 2000). The governmental distinction that is made between people who don't get enough to eat and/or don't have access to an adequate diet (the condition that is called food insecurity) and those whose stomachs ache due to the condition defined as hunger, is an item of debate in the health and policy communities. But these are the existing definitions used by the federal government, based on definitions adopted by nutritionists and published by the Life Sciences Research Office of the Federation of American Societies for Experimental Biology in 1994 (Bickel et al., 2000).

While the title of our analysis refers to the cost burden of hunger to the nation, we actually have assessed what the federal government refers to as food insecurity, which includes the above definition in addition to hunger. This is because existing research reveals that food insecurity, not simply a painful sensation, is associated with adverse outcomes in children and adults.

Occasionally research articles have adopted similar but somewhat different definitions from food insecurity and hunger, the most recurrent one being food insufficiency. Food insufficiency is a non-specific term, but operationally used in a manner similar to food insecurity to characterize the condition of a person, family or population group not having sufficient money for and/or

access to a nutritious diet. Another term, often heard by the public but typically not used as a standard in U.S.-based research, is malnutrition. Literally meaning "bad nutrition," the term usually is associated with quite extreme dietary deficiencies more prevalent in very low-income nations.

Measurement and reporting of food insecurity and hunger in the U.S.

In each year that the decennial (ten-year) census is not conducted, the Census Bureau conducts a survey by sampling thousands of American households. Called the *Current Population Survey (CPS),* it characterizes the well-being of the population on a number of variables, including income and health. In 1995, the Bureau added a supplement to its on-going survey at the request of Congress and the Department of Agriculture. Called the CPS Food Security Supplement, and known as the Federal Food Security Module, the supplement annually reports on the number of people who live in households without enough to eat.

The food security survey questionnaire has eighteen items, each designed to ascertain key aspects of household nutritional adequacy. Sample questions include: "In the last 12 months did you or other adults in the household ever cut the size of your meals or skip meals because there wasn't enough money for food?" or "In the last 12 months did any of the children ever skip a meal because there wasn't enough money or food?" or "In the last 12 months did any of the children not eat for a whole day because there wasn't enough money for food?" (Nord et al., 2005).

Survey results, based on the eighteen-item scale, are quite stringent. It is not sufficient for a respondent to answer yes to any one or two questions to be identified as food insecure. Based on survey experience and subsequent revisions before the procedure was officially adopted in 1995, no single factor makes a household food insecure. Affirmative answers to combinations of conditions, experience and behaviors, often entailing five or more positive answers, are required before a household is categorized as food insecure.

Analysis of study quality and consistency

To perform this analysis we first conducted a literature review of the consequences of food insecurity. We identified approximately 50 studies (see Appendix B), most conducted between 1996 and 2005, after the Federal Food Security Module went into effect. Limiting the research to this time frame lent more consistency to the analysis since researchers generally rely on the federal definitions. In the few instances where researchers used a definition such as "food insufficiency" rather than "food insecurity," we evaluated the similarity between the terms, and eliminated any studies whose operational definitions were not similar.

As a further control we relied primarily on scholarly studies published in peer-reviewed journals such as (but not limited to) the *American Journal of Public Health*, the *Journal of Nutrition, Pediatrics*, and the *Journal of Health Economics*. We further ensured that proper controls were used by the researchers to prevent confusion between food insecurity and its socio-economic correlates.

We also faced occasional inconsistency in study findings. One study, for example, might report that the prevalence of an outcome stemming from food insecurity as 2.7 times that of the population in general, while another might report this risk ratio at 4.3. If we had more than one estimate, we reviewed each study to ensure that the definitions of food insecurity, consequences, and controls met appropriate standards. We retained the studies that met these standards, and for all studies we included, we calculated the mean of the outcomes (3.5 for the example above).

Using studies that report outcomes for children or adults, but not for both

Research to determine adverse health and educational outcomes associated with food insecurity includes both adults and children, with a stronger focus on the latter. From a research perspective this emphasis makes sense because adults feel a deeper sense of responsibility for children, given their dependent status and their sometimes greater susceptibility to negative outcomes if they are deprived of enough to eat. But the focus on children also occurs because monitoring their health status, particularly height and weight gain, is an easy way to pick up negative trends associated with an inadequate diet.

In instances wherein the research literature addressed children but not adults, we sometimes elected not to extrapolate the outcomes for a particular finding to the adult population. Moreover, for some outcomes, particularly linked to grade retention, dropping out of school and academic achievement, the outcomes are so child-specific that, once again, no extrapolation was made to adults. In all such instances, omitting the adult population will tend to make our cost-related findings too conservative, meaning that there are costs associated with hunger that we do capture in our analysis.

In other instances where more data exist on the pediatric than the adult population, we elected to apply the child prevalence rate to the adult population. This decision is consistent with a number of outcomes where there is strong evidence to assume similar rates across age ranges. Again, doing so also tends to make our analysis a bit conservative, as rates in the adult population for certain outcomes are likely to be higher than for children. An example of this is the higher degree of psycho-social insult among food insecure children. If hungry children experience greater anxiety than non-hungry children, it is likely that hungry adults experience greater anxiety as well. Parents carry the weight of fear and anxiety about food availability for themselves and their family as well.

As we made decisions about deleting outcomes in the adult population from our analysis or extrapolating child prevalence rates to adults, we also sought expert advice from researchers in various fields. All in all, we believe that the decisions we made, while certainly open to discussion and review by others, tend to make our overall analysis of costs associated with hunger more conservative than they actually are.

Distinction between food insecurity and poverty

A typical responsibility in research is to control for so-called confounding variables. If a researcher found, for example, that people eating a certain type of food had higher rates of parasitic disease or infectious disease, it could be highly erroneous to assume that the food itself *caused* the disease. Rather, the cause might not be the food itself but the way it is prepared. Or it might not be the food at all, but the fact that it typically is consumed with some other food whose ingredients are tainted.

When evaluating the negative impacts that hunger has on its victims, one might ask, how we know it is hunger that causes the adverse consequences rather than poverty itself. After all, one might argue, most people who haven't enough to eat are likely to be poor, and the research shows that this is precisely the case. In each year since 1995, there are about 30-35 million people living below the federal poverty line in the US, and about the same number who live in households that are food insecure. How, therefore, do we know we are measuring the outcomes of hunger rather than poverty?

One answer is that even though similar numbers of people are poor and hungry, they are not always the same people. Some poor households, for example, are not food insecure because they might live in a warm climate and have a year-round garden. Others might supplement their diets by hunting and fishing. At the same time, a non-poor household might, in fact, be food insecure because their incomes are just above the poverty threshold, but they have exceptionally high medical bills or heating costs. Because they haven't sufficient income to apply to their food budget, they often go hungry to scrape by.

But the more fundamental explanation is that researchers "control" for income and other variables that could be associated with the outcome of hunger. In this instance, a careful research design can determine whether it is poverty or hunger itself that is associated with lower test scores for children, or more hospitalizations among adults or the elderly.

Attributing cost burden to food insecurity: the case of direct linkages

For the health consequences of food insecurity, the literature revealed a direct linkage between experiencing food insecurity and a higher rate of adverse consequences for which an economic cost was known. For example, national data on food insecurity found the prevalence of depression was 13.2% in 2005, our target year. The literature on consequences of food insecurity showed that people with food insecurity had 3.5 times the risk of depression compared to those without food insecurity. The literature on depression showed that the one-year prevalence of the condition was 9.3%, and that the annual economic cost of depression in the US in 2005 was $67.8 billion (see Appendix B).

To derive the portion of this cost of depression attributable to food insecurity, we considered the US population as a mixture of two groups: those with food insecurity and those who are food secure. We then needed to estimate the probabilities of the consequence (i.e., depression) among the food insecurity and non-food insecure, consistent with all existing data. As the

relationships were non-linear, we wrote an algorithm for this purpose using Matlab computer simulation algorithm. From the solution, we calculated the incremental probability of the consequence (depression) in the U.S. population as the prevalence of food insecurity times the difference in the conditional probability of the consequence in the food insecurity group compared to non-food insecure group. We next calculated a "universal" cost of the consequence as the hypothetical annual cost burden if everybody in the U.S. were affected by this consequence (i.e., if the entire US population were depressed). The attributable cost of the consequence was finally calculated as the incremental probability of the consequence times this universal cost.

The tragedy of suicide, as shown on Table 4, represents a different type of health consequence. It is a lifetime event rather than an annual condition, such as depression. To use the literature appropriately, we pro-rated the risk of suicide over the period of risk, which we based on the age range of 10 to 25 years.

Attributing cost burden to food insecurity: the case of indirect linkages

The available literature on consequences of food insecurity linked this problem to cost burdens on learning only through intermediate outcomes. Specifically, the literature review found that food insecurity was associated with higher rates of school absenteeism and grade retention (repeating a grade in school), and lower scores on standardized tests. We considered each of these as intermediate outcomes. We found no economic literature, however, that could assign a valid economic consequence to these intermediate outcomes. We found instead, food insecurity literature that linked the first two intermediate outcomes (absenteeism and retention) to a final outcome for which an economic value could be calculated—dropping out of school. Furthermore, the food insecurity literature provided the appropriate partial contribution of each intermediate outcome while controlling for the other intermediate outcome. While we found no literature independently linking scores on standardized tests to dropping out, we assumed that the impact of test scores was already captured in the analysis of school retention. Our procedure, which entailed summing these two partial contributions, ensured that we did not double count consequences in case the two intermediate outcomes were associated.

Next, we needed to adjust for the fact that the final outcomes in learning—school dropout—were lifetime events, while most adverse consequences in health were annual conditions. The available educational literature showed relationships for only a single year, but we expected that drop out was affected by several years of absence and retention. Based on the cross-sectional literature of the effect of food insecurity on school children of different ages, we assumed an exponential decay for longitudinal correlations on the intermediate outcomes across years with a half-life of 3 years.

Finally, we used our simulation algorithm in two stages. In the first stage, we estimated the incremental probabilities of absenteeism and school retention due to food insecurity. In the second stage, we calculated and summed the partial contributions of each of the incremental probabilities to dropping out of school to obtain the overall increment in dropping out as a function of food insecurity. We multiplied this incremental probability by the hypothetical universal cost of dropping out to estimate the annual cost of food insecurity on learning.

Our assumption that all of the impacts of food insecurity on learning were captured in the two intermediate outcomes is quite conservative. Given the adverse impact of food insecurity on test scores, it is plausible that food insecurity has depressed the skills or energy of children who complete secondary school. If they progressed less successfully in their subsequent education and careers, these unmeasured adverse consequences, as well as their cost, could be extremely large.

Calculating the costs of charity

The charitable cost burden was determined through different means than those described above for outcomes such as elevated rates of ill health, psycho-social problems and educational and workforce under-performance. America's Second Harvest (A2H), the umbrella organization for more than 200 member food banks, provided detailed economic data for the value of donated food, assets, annual depreciation, volunteer hours donated and other costs related to its work for the year 2005. We compared these data with A2H's submission of Form 990 to the Internal Revenue Service for the years 2004 and 2005. To broaden our analysis, we also conducted a representative sample of twenty A2H food bank members and six non-A2H food banks to assist us in extrapolating annual costs of all food bank goods and services.

To calculate estimated expenditures for charities outside the food bank system(s), we examined IRS Form 990 (2005) for the eleven largest such charities, including Feed the Children, Farm Aid, Food for the Hungry and Freedom from Hunger. In addition to these charities, we reviewed IRS Form 990 (2005) submissions and other budget materials for national hunger organizations, including entities such as Share Our Strength, MAZON, and Bread for the World. Whenever possible, we used submissions of data for 2005. For assets (e.g., buildings and vehicles), we calculated an annualized cost based on the real 3% discount rate recommended for economic analyses in health (Gold et al., 1996). At points of discretion, we utilized the more conservative (lower) costs. Costs are expressed in 2005 dollars.

NOTE: Readers who wish to receive further information or review the technical analyses that form the basis of this narrative report, may contact the authors. For information on the prevalence of hunger and food insecurity in the nation, as well as its impact on key population groups as reflected in the scientific literature, email Dr. J. Larry Brown at lbrown@hsph.harvard.edu. For an explanation of the technical analyses that constitute the basis of all cost calculations, email Prof. Donald S. Shepard at shepard@brandeis.edu.

Appendix B: Literature Reviewed in Estimating Burden by Outcome Category

1. Charity -

America's Second Harvest, (2005), Annual Report.

America's Second Harvest, (2006), Hunger in America 2006.

America's Second Harvest, Network Activity Report, (2004, 2005), Value of Donated Products.

America's Second Harvest, Network Activity Report, (2004, 2005), Member Balance Sheet Assets.

America's Second Harvest, Network Activity Report, (2004, 2005), Member Operating Expenses (Percentages).

Internal Revenue Service, Schedule A, Form 990 (2004, 2005), reviewed for America's Second Harvest and a sample of member and non-member food banks.

Internal Revenue Service, Schedule A, Form 990, (2004, 2005), reviewed for national hunger charities such as Feed the Children, Farm Aid, Food for the Hungry, Freedom from Hunger, and other organizations.

Internal Revenue Service, Schedule A, Form 990, (2004, 2005), reviewed for national hunger policy organizations such as Share Our Strength, MAZON, and other organizations.

2. Mental Health and Psycho-Social Behavior (Depression, Anxiety, Suicide)

Alimo K, Olsen C, Frongillo J. (2001) Food Insufficiency and American School-aged Children's Cognitive, Academic and Psycho-social Development. *Pediatrics* 108:44-53.

Alimo K, Olson C, Frongillo E. (2002) Family Food Insufficiency, But Not Low-Income, Is Positively Associated with Dysthymia and Suicide Symptoms in Adolescents. *Journal of Nutrition* 132:719-775.

Berto P, D'Ilario D, Ruffo P, DiVirgilio R, Rizzo F. (2005) Depression: Cost-of-Illness Studies in the International Literature, a Review. *Journal of Mental Health Policy and Economics* 3:3-10.

DuPont R, Rice D, L M, Shiraki S, Rowland C, Harwood H. (1996) Economic Costs of Anxiety Disorders. *Anxiety* 2(4):167-172.

Grantham-McGregor S, Walker S, Chang S. (2000) Nutritional Deficiencies and Later Behavioural Development. *Proceedings of the Society for Nutrition* 59:47-54.

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Liu J, Raime A, Venables P, Mednick A. (2004) Malnutrition at Age 3 Years and Externalizing Behavior Problems at Ages 8, 11 and 17 Years. *American Journal of Psychiatry* 161:2005-2013.

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Pollitt E, Golub M, Gorman K, Grantham-McGregor S, Levitsky D, Schurch B, et al. (1995) The Relationship between Undernutrition and Behavioral Development in Children. *Journal of Nutrition* 125:2211.

Pollitt E, Golub M, Gorman K, Grantham-McGregor S, Levitsky D, Schurch B, et al. (1996) A Re-conceptualization of the Effects of Undernutrition on Children's Biological, Psychosocial and Behavioral Development. *Social Policy Report* 10:1-21.

Rice D, Miller L. (1998) Health Economics and Cost Implications of Anxiety and Other Mental Disorders in the United States. *British Journal of Psychiatry* 34:4-9.

Stormer A, Harrison G (November, 2003) Does Household Food Security Affect Cognitive and Behavioral Development of Kindergarteners? Institute for Research on Poverty

Ward D. (2002) The Role of Nutrition in the Prevention of Infection. *Nursing Standard* 16:47-52.

3. <u>Physical Health</u> (Health Status, Hospitalizations, Iron Deficiency, Migraines, Colds)

Alimo K, Olsen C, Frongillo J, Briefel R. (2001) Food Insufficiency, Family Income and Health in U.S. Pre-School and School-aged Children. *American Journal of Public Health* 91:781-786.

Biros M, Hoffman P, Resch K. (2005) The Prevalence and Perceived Health Consequences of Hunger in Emergency Department Patient Populations. *Academy of Emergency Medicine* 12:310-317.

Casey P, Szeto K, Lensing S, Bogle M, Weber J. (2001) Children in Food Insufficient Low-Income Families: Prevalence, Health and Nutritional Status. *Archives of Pediatric Adolescent Medicine* 155:508-514.

Casey P, Szeto K, Robbins J, Stuff J, Connell C, Gossett J, et al. (2005) Child Health-Related Quality of Life and Household Food Security. *Archives of Pediatric and Adolescent Medicine* 159:51-56.

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Lipton R, Stewart W, Diamond S, Diamond M, Reed M (2001) Prevalence and Burden of Migraine in the United States: Data From the American Migraine Study II *Headache: The Journal of Head and Face Pain* 41:646-57.

Lozoff B, Jiminez E, Wolff A. (1991) Long-Term Developmental Outcomes of Infants with Iron Deficiency. *New England Journal of Medicine* 325:687-694.

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Stewart W, Ricci J, Chee E, Morganstein D, Lipton R. (2003) Lost Productive Time and Cost Due to Common Pain Conditions in the US Workforce *Journal of the American Medical Association* 290:2443-2454.

Skalicky A, Meyers A, Adams W, Yang Z, Cook J, Frank D. (2006) Child Food Insecurity and Iron Deficiency Anemia in Low-Income Infants and Toddlers. *Maternal and Child Health Journal* 10:177-185.

Stuff J, Casey P, Szeto K, Gossett J, Robbins J, Simpson P, et al. (2004) Household Food Insecurity is Associated with Adult Health Status. *Journal of Nutrition* 134:2330-2335.

Trazuk V. (2001) Household Food Insecurity with Hunger is Associated with Women's Food Intakes, Health and Household Circumstances. *Journal of Nutrition* 131:2670-2676.

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4. Academic Achievement and Workforce Productivity (Absenteeism, Retention, Drop-Out)

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