

A High Energy Diet: The Impact of Lifestyle Changes on Energy Consumption in Food Sales and Food Service

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ABSTRACT

The most recent data on energy consumption in commercial buildings (EIA 2006) indicates that commercial food sales and service account for 11.6 percent of all commercial building energy consumption or the equivalent of 678 trillion Btu of combined site electricity, natural gas, fuel oil, and district steam or hot water in 2003. This figure represents a 45 percent increase over 1995 and EIA projections forecast an additional 20 percent increase by the year 2020.

Moreover, when compared to all other commercial building types, food service buildings have the highest energy intensity (260,000 Btu per square foot). This high level of intensity is roughly 2.8 times the energy intensity of the average commercial building. When measured as a function of hours of operation, the energy intensity of the food service industry exceeds that of all other commercial buildings, averaging more than 50 Btus per square foot per hour.

This paper explores the relationship between shifting demographic patterns and lifestyle change on the one hand and changes in food-related energy consumption on the other. For example, how do changing age structures and household composition correspond to eating patterns and the growth in restaurants? How do urbanization and urban sprawl contribute to the construction of ever-larger supermarkets? Finally, how does the shift toward dual-income families, single-headed households, and changing leisure activities shape time use and food consumption patterns? The answers to these questions are likely to have important implications for energy consumption in food service and food sales.

Introduction

Grocery stores and restaurants are the modern conduits for satiating one of our most basic needs: our need for food. They are the buildings that provide our direct source of nourishment. But this wasn't always the case. Important historical trends have shifted the U.S. population structure from largely rural and self-reliant to predominantly urban and interdependent. In fact, the trend toward urbanization is a worldwide phenomenon. In 2008, the world will experience an unprecedented shift: when (for the first time) more than half the world's people will live in urban areas (Population Reference Bureau 2007). As our nation and our world continue to become more urban and as our labor structure becomes increasingly specialized, individuals become less and less likely to grow their own food. Instead, today's plates are filled with food that has traveled long distances and that has generally been processed, packaged, and stored along the journey. Food service and food sales buildings are one of the last, and most energy intensive stops before our food completes its journey to our homes or directly into our mouths. Unfortunately these buildings currently consume a disproportionately large amount of energy when compared to other commercial buildings. As such, the growth in the number and size of food service and food sales buildings is likely to result in a disproportionate increase in the

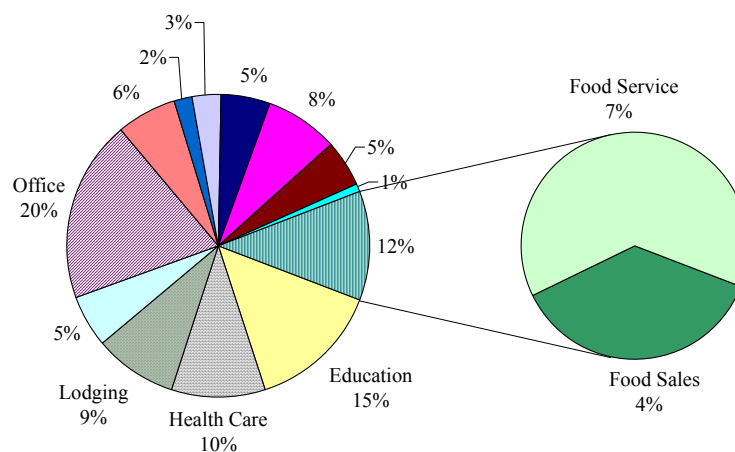
energy intensity of the commercial building sector while the overall industrialization of food continues to make the American diet increasingly energy intensive.

Shifting patterns of urbanization are but one of several important social forces shaping current trends in food production, food processing and food sales and increasing the energy footprint of the food on our plates. This paper attempts to explore the relationship between shifting demographic patterns and lifestyles, changing food consumption patterns, and increased energy consumption in food service and food sales in the United States. We begin by exploring energy consumption trends in food sales and food service and work backwards to understand the factors contributing to these trends including an exploration of the changing composition of food sales and food service establishments; the development of new eating trends, consumption patterns and lifestyles; and important shifts in socio-demographic patterns that have resulted in both smaller households and increasing time constraints. We conclude the paper with a brief summary of our findings and our conclusions.

Energy Trends in Food Sales and Food Service

As shown in Figure 1 below, the most recent data on energy consumption in commercial buildings (EIA 2006) indicate that commercial food sales and service are responsible for a significant proportion of energy consumption in the commercial building sector. In 2003, food sales and food service accounted for nearly 12 percent of all commercial building energy consumption, ranking third behind office buildings and educational facilities. In other words, food sales and food service consumed the equivalent of 678 trillion Btu of combined site electricity, natural gas, fuel oil, and district steam or hot water in 2003. Importantly, historical trends indicate that food sales and service consumed 53 percent more energy in 2003 as compared with similar measures for 1992. And energy consumption in this area is expected to continue to grow – by an additional 20 percent by the year 2020. Also noteworthy, measures for food sales alone indicate that the rate of increase in energy consumption for this sector was among the highest in the commercial building sector, growing by more than 80 percent since 1992.

Figure 1: Site Energy Consumption in Food Service and Food Sales



In terms of energy intensity (Btu per square foot), food service buildings top the charts, consuming 260,000 Btu per square foot on average¹. This high level of intensity is roughly 2.9 times the energy intensity of the average commercial building. Moreover, when measured as a function of hours of operation, the energy intensity of the food service industry exceeds that of all other commercial buildings, averaging more than 50 Btus per square foot per hour. (See Table 1.) Also noteworthy is the fact that fast food restaurants are nearly twice as energy intensive as other types of restaurants (EIA 2006).

Table 1: Commercial Building Energy Consumption and Intensity, 2003

Principal Building Activity	All Buildings*			Sum of Major Fuel Consumption		
	Number of Buildings (thousand)	Floorspace (millionsquare feet)	Floorspace per Building (thousand square feet)	Total (trillion Btu)	Percent of Total Commercial Building Energy Consumption	Energy Intensity per Square Foot (thousand Btu)
Education	386	9,874	25.6	820	14%	83.1
Food Sales and Service.....	523	2,909	5.6	678	12%	233.1
Food Sales	226	1,255	5.6	251	4%	199.7
Food Service	297	1,654	5.6	427	7%	258.3
Health Care	129	3,163	24.6	594	10%	187.7
Inpatient	8	1,905	241.4	475	8%	249.2
Outpatient	121	1,258	10.4	119	2%	94.6
Lodging	142	5,096	35.8	510	9%	100.0
Retail (Other Than Mall).....	443	4,317	9.7	319	5%	73.9
Office	824	12,208	14.8	1,134	19%	92.9
Public Assembly	277	3,939	14.2	370	6%	93.9
Public Order and Safety	71	1,090	15.5	126	2%	115.8
Religious Worship	370	3,754	10.1	163	3%	43.5
Service	622	4,050	6.5	312	5%	77.0
Warehouse and Storage	597	10,078	16.9	456	8%	45.2
Other	79	1,738	21.9	286	5%	164.4
Vacant	182	2,567	14.1	54	1%	20.9
Total/Average.....	4,645	64,783	13.9	5,822	100%	89.9

Source: CBECS 2006

While the energy used in food service and food sales is important, we would be remiss if we failed to mention the additional energy-using sectors of the food industry. Before our food reaches restaurants or stores, there are industrial manufacturers who process many of today's food products, and behind them, the agricultural centers, farms and fields. Although it is beyond the scope of this paper to fully describe the life-cycle energy costs of today's food choices, it is

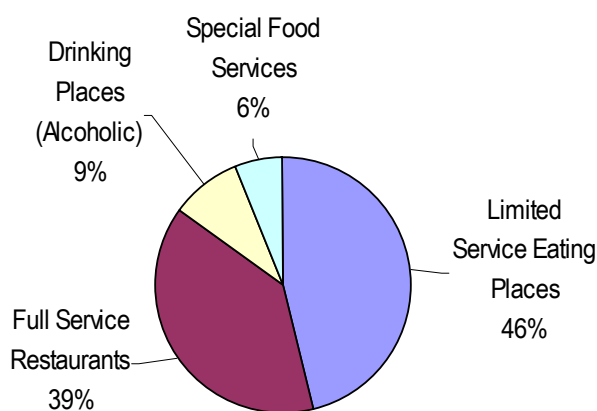
¹ In fact unlike other energy trends in the commercial building sector, energy intensity is significantly higher for newer vintage building than for older vintage buildings. According to CBECS (2005), the energy intensity of food service buildings built before 1990 is around 212,000 Btus per square foot while the energy intensity of building constructed between 1990 and 2003 is around 361 Btus per square foot.

important to keep in mind the various ways in which food production, processing transportation and storage contribute to the energy footprint of our meals.²

Food Sales and Food Service Statistics

Food service. According to U.S. Census data, there were approximately 541,000 food services and drinking establishments in 2005, up from roughly 500,000 in 1998. Importantly, however, not all food service establishments are alike, and the industry typically distinguishes between full-service restaurants (i.e., those with waitress/waiter service) and limited-service eating places (encompassing all manner of restaurants that primarily focus on carry-out, drive-in, or delivery service, including delicatessens and fast food). Interestingly, recent Census Bureau data indicate that limited-service establishments have been growing nearly twice as fast as full service restaurants (17 percent compared to 9 percent growth between 1998 and 2005).

Figure 2. Number of Food Services and Drinking Places by Type, 2005



Source: US Census Bureau, 2005

Food sales. At the national level, the number of food sales establishments has remained relatively steady, growing a mere four percent between 1998 and 2005.³ In terms of supermarkets and grocery stores, the U.S. experienced a small net decline between 1998 and 2005. Interestingly, while nearly half of all states experienced a net loss in the number of food stores, however many of these same states experienced growth in two other types of establishments – warehouse clubs and superstores, and gas stations with convenience stores.

² In fact a recent EPA study found that 40 percent of the value of processed foods is added through the energy-intensive manufacturing processes required to create these food products. Process heating and cooling systems (steam systems, ovens, furnaces, refrigerators) account for 75 percent of the sector's energy use, and are required for food safety. Other energy requirements come from motor-driven systems (12 percent), which are those requiring pumps, mixers, or grinders, and the heating, ventilation and lighting systems (8 percent). Food processing also has the largest transportation demands of all the sectors in this study (EPA, 2007). The processed foods industry includes soybean oil mills, meatpacking, manufacturing of canned and frozen foods, breads, cakes, and other products.

³ Food sales establishments include grocery and convenience stores, specialty food stores, and stores specializing in alcoholic beverages.

The proliferation of “big box” food sales outlets, warehouses, and superstores has significantly inflated the average size of food establishments during the past fifteen years. While Wal-Mart’s supercenters remain above average in total floor space at 187,000 square feet, the Food Marketing Institute reports that the median of the average store size is currently around 48,750 square feet (FMI.org 2007). Warehouse clubs and superstores are also increasing their share of food sales. In 2007 alone, superstore sales grew by 9.4 percent, reaching a record \$325 billion (FMI 2007). And this figure can be expected to continue to grow, as larger retailers continue to pull market share away from traditional and smaller grocery outlets (Stone 1997).⁴

Eating Trends, Consumption Patterns and Lifestyles

The changing lifestyles and consumption patterns of the U.S. population have also resulted in distinct shifts in the relationship between the food sales and food services industries. For example, while restaurants have increased their share of all food sales (48.5% in 2005), supermarkets and grocery stores have adapted by restructuring, consolidating, and by changing the type of products that they sell to meet consumer demand (Martinez 2007).

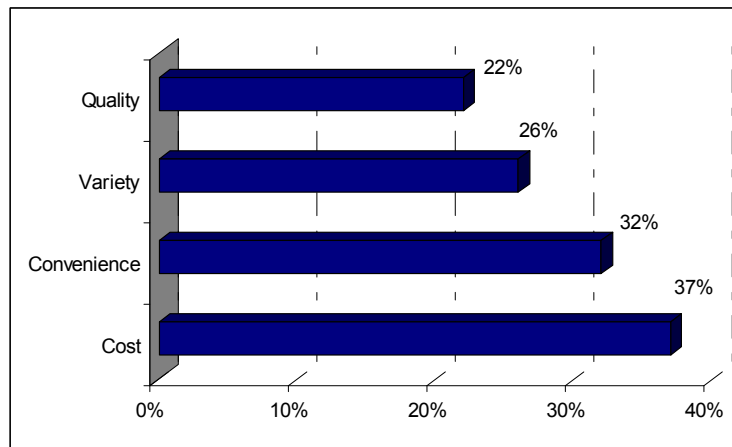
The Convenience Factor

Today’s consumer wants quality food, at affordable prices, in the most convenient form possible. The days of store loyalty may be at an end. A recent Food Marketing Institute study (2007) found that while 61 percent of shoppers still named a traditional supermarket as their primary store, this number represents a decline of six percentage points from 2005 when 67 percent of shoppers fell into this category. In addition, while consumers have historically made two trips per week to their primary grocery store, the 2007 study found that the average number of trips per week had dropped to 1.4, with a growing percentage of shoppers making one trip every two weeks. FMI surmises that the decline in the number of shopping trips is a result of increasing energy prices and the increase in market share of supercenters and warehouse clubs, where customers have an optimized “one-stop-shopping” experience. The new trend is for shoppers to have a “dual primary store strategy,” meaning that they visit one store for fresh foods, and another for non-grocery items. In some cases, these stores may be in the same shopping center (FMI 2007).

One of the driving forces behind changing shopping trends is the shoppers overarching focus on product price (See Figure 3). This conclusion is also reflected in a Nielsen Company study, where 85 percent of consumers stated that they chose their grocery stores based on “good value for the money,” in addition to stores with high-quality brands/products (28 %) and store location (23 %) (Supermarket News 2007).

⁴ In 1988, Wal-Mart opened its first of over 2,000 supercenters, which average approximately 187,000 square feet in floor space and offer 142,000 different items. Wal-Mart became the leading grocery retailer in the United States eight years ago (in 2000) as a result of its supercenters and “Neighborhood Markets,” smaller stores focused on groceries and pharmaceuticals (29,000 items on average). Moreover, most Wal-Mart stores are open twenty-four hours a day, seven days a week (Wal-Mart Web site).

Figure 3. Why Consumers Shop at Stores Other Than Their Primary One



Source: FMI. *Trends in the United States – Consumer Attitudes and the Supermarket*, 2003

Eating: Out or In?

According to the restaurant industry, four out of five consumers think eating away from home is a better use of leisure time than cooking and doing the dishes afterward. And when consumers are not eating out, they are often carrying ready-made food out of restaurants or grocery stores to consume at home. In fact, 38 percent of full-service restaurants anticipate that take-out will make up a larger percentage of total sales in 2007 than eat-in orders (Restaurant.org 2007). Moreover, data from the U.S. Census Bureau and the restaurant industry confirm that Americans are cooking less, that restaurants are capturing a greater share of the food sales market, and that fast food sales experienced dramatic growth between 1960 and 1990.

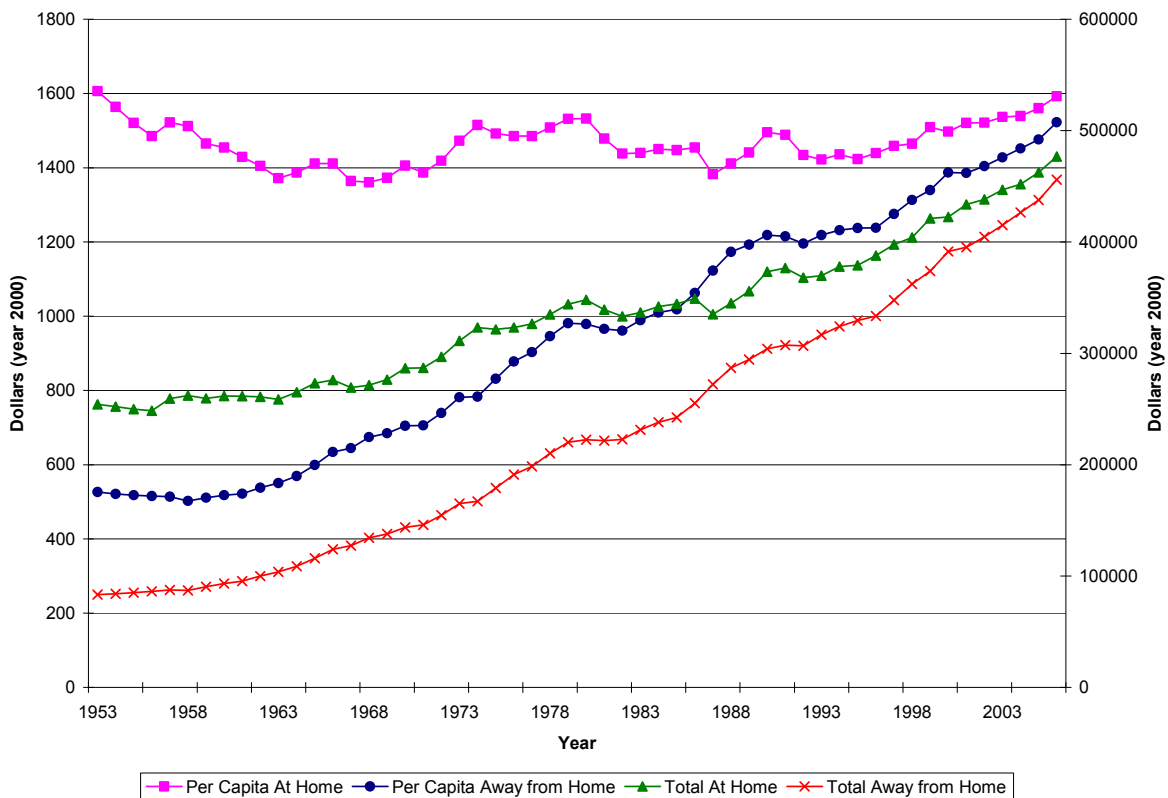
Data collected by the Energy Information Administration's Residential Energy Consumption Survey indicate that Americans cooked less in 2001 than in previous years. For example, households that reported cooking two or more times per day dropped by nearly 4 percentage points from 35.9 percent in 1993 to 32.1 percent in 2001, and households that reported cooking at least once a day at home dropped by a full 4 percent to 40.5 percent of households in the same period. (See Table 2.) So what can we say about those households that are cooking less? The EIA found that single-family home dwellers declined most in terms of home-cooking, while households living in mobile homes cooked most at home. Additionally, the survey found that as the number of people per household increases, so does the number of meals cooked at home per day. Correspondingly, smaller households eat away from home most often, and are eating away from home more now than in previous years (EIA 2002).

A second noteworthy trend is that every year, restaurants are capturing a greater share of the food sales market. While consumers spent approximately \$170 billion on food away from home in 1986, this figure rose to \$286 billion in 1996 (Price 1997). Moreover, the restaurant industry projects sales for 2008 will reach \$558 billion. (See Figure 4.) In order to meet the needs of busy customers, some full-service restaurants are even installing drive-through service in addition to take-out, which comprised 10 percent of total sales in 2004, and is growing twice as fast as the rate of total sales (Martinez 2007).

Table 2: Number of Meals Cooked in the Home by Type of Home, 2001, (Percent of U.S. Households)			
	----- Type of Home -----		
Number of Meals Cooked at Home	Single Family	Apartment	Mobile Home
Two or more per day	32.4	28.8	40.7
One per day	41.7	38.4	36.3
A few per week	19.6	23.5	15.6
One per week or less	6.3	9.4	7.3

Source: EIA 2002: based on data from the 2001 Residential Energy Consumption Survey.

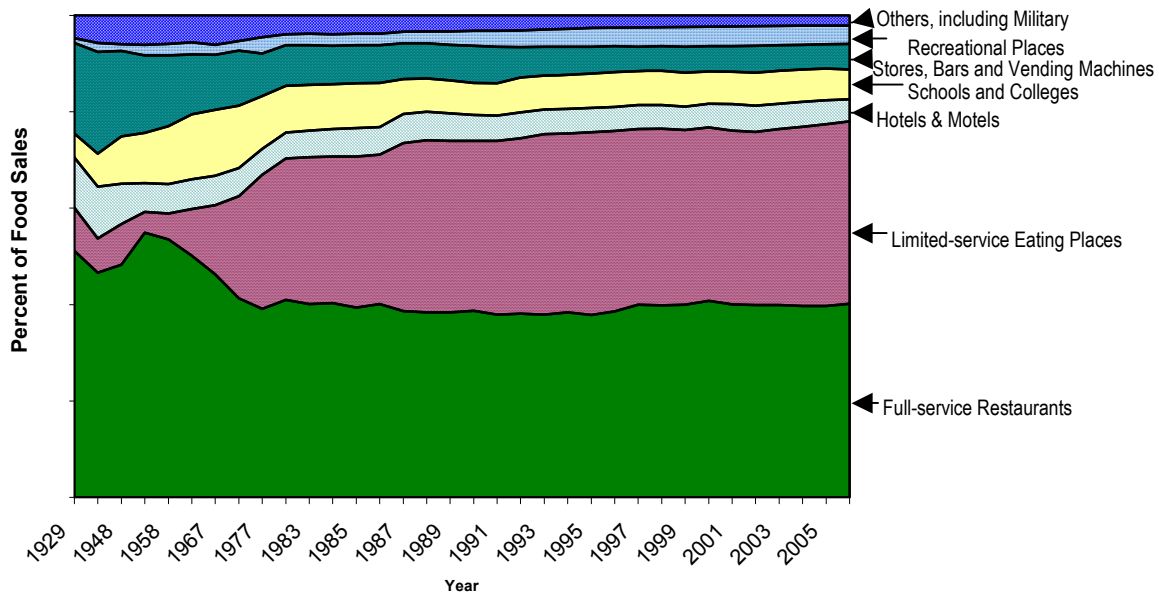
Figure 4: Expenditures on Food Away from Home versus Food at Home



Sources: Authors' calculations based on ERS Food CPI, Prices and Expenditures, 2007
<http://www.ers.usda.gov/Briefing/CPIFoodAndExpenditures/Data/> (Table 15)

Among different types of restaurants, sales at fast food restaurants expanded most dramatically between 1960 and 1990, as shown in Figure 5. In fact, during the late 1980s, fast food sales overtook those of traditional restaurants and continued to grow through the mid-90s. In 1996, fast food sales accounted for approximately 63 percent of all food service sales, thanks to the newfound popularity of chains such as Boston Market (then owned by McDonald's Corp.). Although traditional full-service restaurants have since regained dominance, fast food retains a large proportion of the market, and the number of fast-food and other limited-service restaurants is increasing at a higher rate than that of traditional full-service establishments. Additionally, some restaurant chains have begun opening locations within retail stores, such as Wal-Mart, a trend known as "channel blurring."

Figure 5. Sales of Meals and Snacks Away From Home by Type of Outlet



Source: ERS Food CPI, Prices and Expenditures, 2007 <http://www.ers.usda.gov/Briefing/CPIFoodAndExpenditures/Data/>

Fresh... but Still Processed

We may be eating more fast food, but we are also eating more fruits and vegetables. Consumption of these two food groups per capita grew 24 percent between 1970 and 1997 (French 2001). Americans are eating more fresh produce due to increased income, and thanks to changes in transportation technology that allow for shipping of produce long distances without a decrease in quality. Despite these trends, studies show that the fruits and vegetables that consumers choose to eat are those that are either naturally convenient (i.e. bananas) or those made to be convenient (fruit juice). Increasingly, however, convenient also means processed. A 2001 study showed that vegetable consumption in the United States is largely comprised of frozen, dried or canned vegetables, while fruit consumption is generally in the form of juice. Even fresh vegetables are increasingly consumed in the form of baby-cut carrots and pre-washed, bagged salads (Regmi 2001). Interestingly, the consumption of frozen foods is not currently expanding, however certain niche segments of the market are showing a significant rise in market share. These are mainly frozen entrees, pizzas, and convenience foods labeled “natural” or otherwise marketed as healthy options (Ginsburg 2004).

Overall, the trend in food sales reflects a focus on convenience, whether it comes as take-out from a consumer’s favorite restaurant or as a ready-to-eat or quickly-prepared food options from the local grocery store, convenience store, or Costco warehouse club. As the economic downturn continues to play out over the coming months or years, consumers will also be looking for products that tax their wallets the least, while maintaining the convenience factor. As discussed more fully below, current demographic trends indicate that the demand for processed food is likely to continue to increase in the coming years, leading to an increase in energy consumption in the food manufacturing industry of an estimated 19 percent between 1997 and 2020 (EPA 2007).

Socio-Demographic Patterns and Their Implications for Food and Energy

The changing food consumption patterns described above are the result of a combination of socio-demographic changes that have both contributed to and been reinforced by new patterns of food sales and food service. As will be discussed in more detail below, the growth in urban centers and the industrialization of agriculture have evolved together to form a complex food system that is rooted in the process of increased social specialization. Similarly, the trend toward larger numbers of dual-income families and single-headed households combined with the shrinking size of U.S. households has resulted in new lifestyle trends, an emphasis on convenience, and a dramatic expansion of our reliance on prepared foods whether from restaurants, grocery stores, or other establishments.

This section will briefly describe the role of four key socio-demographic trends affecting food consumption patterns and food-related energy demand: 1) urbanization and large scale agriculture, 2) globalization, monocultures and the industrialization of agriculture, 3) changing household demographics, and 4) changing lifestyles and leisure activities. Whether directly or indirectly, each of these factors is closely associated with the growth in the energy demands of the food service and food sales industries.

Urbanization, Urban Sprawl, and Large Scale Agriculture

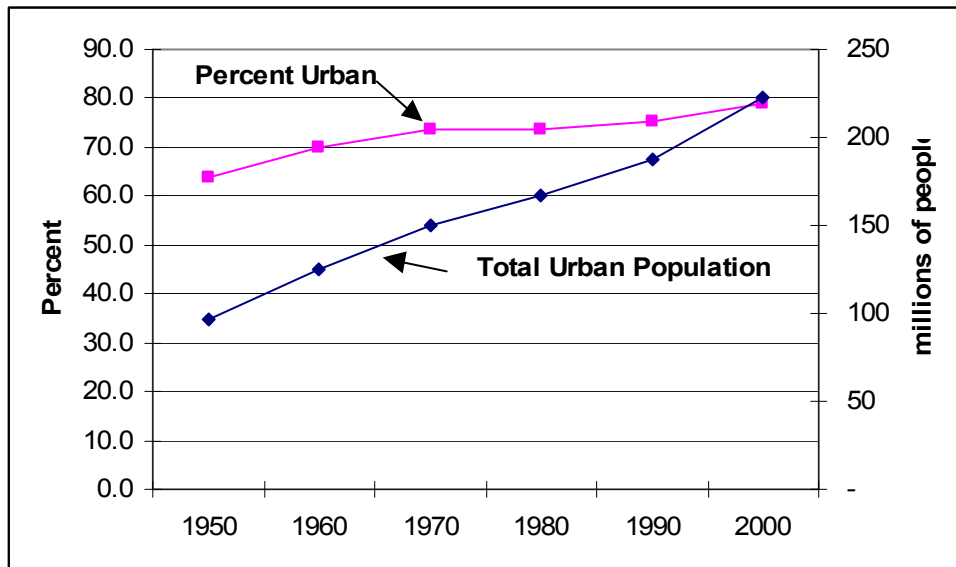
Over the course of the past half century the US population has grown dramatically and also become increasingly urban. Between 1950 and 2000, the *total* U.S. population grew by approximately 86 percent from about 151 million to 281 million. According to data collected in the 2000 census, nearly 80 percent of the U.S. population currently lives in urban areas. Historical census data indicate that between 1950 and 2000 alone, the *urban* population increased by roughly 130 percent (Census Bureau 2004). (See Figure 6) In terms of absolute numbers, the combination of population growth and the expansion of urban centers resulted in a dramatic expansion of the number of people living in U.S. cities from just under 100 million in 1950 to more than 200 million 50 years later. In absolute terms, the urban population grew by approximately 125 million people. In recent decades, suburban areas have grown even faster and are currently home to a full 50 percent of the U.S. population. Interestingly, urban populations tend to use more energy resources for a variety of reasons. In terms of the focus of this paper, urban populations tend to be less self-sufficient in food, tend to rely more heavily on grocery stores as their source of food, and are also more likely to eat more meat and more processed foods associated with a high energy diet (IFPRI 1996, Regmi 2001).

Moreover, growing urban populations are reflective of an agricultural system that is increasingly mechanized and industrialized, and a place in which small family farmers find it increasingly difficult to make a living⁵ (Harper and Le Beau 2003). As the U.S. has moved from a system of farming to a system of commercial agribusiness, the purpose has shifted from sustenance to business and profit. As such, farming has been transformed from a means of meeting the family's nutritional needs to a means of generating an income and a profit. And, as the average farm size continued to grow through the consolidation of farm land into ever larger farms, farming became "more scientific ... more dependent on agribusiness, more specialized (monocropping) and potentially more threatening to the land water table as a cause of erosion

⁵ According to Harper and Le Beau (2003:108) the profit margin for a typical Iowa farm has decline from 35 percent in 1950 to 9 percent in 2003.

and pollution, and more expensive” (Harper and Le Beau 2003:101). This system has led to waves of rural-urban migration and unprecedented growth in urban and suburban populations; the same populations that rely more and more heavily on supermarkets and restaurants to meet their demands for food.

Figure 6. Urbanization Trends in the United States 1950-2000



Globalization, Monocultures and the Industrialization of Agriculture

Similar agricultural trends are occurring around the world, as large-scale monocultures gradually become the norm in less developed countries (Shiva 2000; Vandermeer and Perfecto 2005). Monocultures are both antithetical to local food production systems and essential to modern, industrial agriculture (Shiva 2000). A county or state devoted to the exclusive production of sugar, corn or soybeans will far exceed local demand and will therefore require sales in more distant markets. Nevertheless mechanized agriculture relies on large plots of single crops that are easily planted and harvested using large-scale mechanized farm equipment and minimal amounts of labor (Harper and Le Beau 2003). Furthermore, the transition to a monoculture-based system requires the consolidation of land and the investment of capital, reducing the number of farms and the availability of rural livelihoods (Harper and Le Beau 2003). Ultimately people end up in urban centers, severely constrained in their ability to grow their own food and reliant on an expanding system of monoculture-based agriculture – a system that also severs one’s ability to understand the consequences of everyday consumption decisions (Barndt 2002). Industrialized agricultural systems tend to be very successful in increasing agricultural yields. As food supplies burgeon, food becomes a commodity to be sold in international markets to the highest bidder (often populations of more developed countries). Nevertheless, profit margins on primary agricultural commodities tends to be minimal, and companies seek to add value through further processing of food products (Norberg-Hodge et al. 2002).

In terms of energy consumption, the industrialization of agricultural systems demands a vast increase in the use of fossil fuels to fuel the tractors, irrigate the fields, produce chemical fertilizers and pesticides, and process and ship products to their ultimate destinations which tend to be more distant than those of local food systems (Norberg-Hodge et al. 2002). The result is

lower prices for basic commodities and the expanded production of value-added goods. Meanwhile, as the availability of food products has multiplied, more and more shelf space and larger and larger grocery stores are increasingly the norm.

Household Demographics

As U.S. agriculture has become increasingly industrialized and the U.S. population increasingly urban, household demographics have also changed in important ways. In general households are smaller (Census Bureau 2003) and are more likely to be headed by single parents (Census Bureau 2003) or comprised of dual income families (BLS 2007). For example, during the 56 years between 1950 and 2006 the size of U.S. households has declined by nearly 24 percent from 3.38 people per household in 1950 to 2.57 people per household in 2006 (Census Bureau 2003). During the same period, the percentage of families with children headed by single parents nearly quadrupled from 7.3 percent to just under 29 percent in 2006 (Census Bureau 2006). Among married couples, the number of dual income households grew from less than one-third in the 1960s to 55 percent in 2006. Among married couples with children under 18 years of age, nearly two-thirds relied on income from both partners in 2006 (Census Bureau 2006 and Waite and Nielsen 1999).

The trend toward smaller households, single-parent families and dual-income households has coincided with the dramatic growth in demand for pre-prepared foods and easy-to-prepare meals. As stated earlier, this demand is reflected in the proliferation of restaurants (particularly chain restaurants) and the growing size of grocery stores that continue to expand their floor space in order to provide a greater variety of processed, frozen, and ready-to-eat products. Notably, data from the Commercial Buildings Energy Consumption Survey (2003) indicate that fast food restaurants consume more than twice the amount of energy per square foot compared with other types of restaurants. Similarly, fast food restaurants are more likely to use a greater quantity of pre-processed food products in the preparation of their meals, adding to the amount of embodied energy associated with the meal. Finally, restaurant chains (of any type) are more likely to buy their ingredients in bulk to maintain product consistency and then distribute these products to their store locations. This type of arrangement precludes restaurants from having the flexibility to buy from local producers and thereby reinforces the industrial system of agriculture.

Lifestyles and Leisure

Over the course of the past few generations, U.S. society has experienced important changes in lifestyles and leisure activities as documented through ongoing time use research that has captured a variety of important trends. Not surprisingly these changes hold their own set of implications for energy consumption in food service and food sales. Several studies (Yen 1993, Lee and Brown 1986, and Kinsey 1983) note that food preparation and consumption occupy scarce time such that households in which members are highly active outside of the household are likely to have different patterns of food preparation and consumption than those with fewer activities. More specifically, a recent study (Tashiro 2007) found that households in which women worked more than four hours per day significantly *reduced* time spent on preparing food at home. This trend was even more evident for households with children under the age 18. Conversely, time spent on family care (in households with children under the age of 18) was found to *increase* food preparation at home, as was time spent on socializing, relaxing, and leisure. Interestingly, highly educated men were found to spend *more* time on food preparation

at home than those with a high school education but no diploma. In general the results indicate that dual-career families are spending less time preparing food at home. However this trend is offset by lifestyles in which a) the respondent spent more time on family care, b) the respondent spent more time at home socializing and relaxing, and c) more highly educated men were more active in food preparation responsibilities.

Related studies on children’s time use indicate that the amount of free time, play time, and time for unstructured outdoor activities has declined significantly since 1981 (Hofferth and Sandberg 2000) as has the amount of family time (Putnam 2000). According to Hofferth between 1981 and 1997 kids lost an average of 12 hours per week of free time and three hours per week of play time. Similarly, household conversation dropped by 34 percent while family meal time declined by nearly an hour per week (from 9 to 8 hours per week).

In conjunction with these changes in lifestyles and leisure, food-away-from-home expenditures have increased much more rapidly than food-at-home expenditures during the past five decades as shown in Table 3. Moreover, there has been a marked increase in the consumption of fast food products which are among the most energy intensive.

The socio-demographic trends described above have occurred concurrently with changing food consumption patterns in the United States – food consumption patterns that also correspond with rising energy consumption in food sales and food services. Increased urbanization has emerged along side of large-scale mechanized agriculture, resulting in the reduced ability of people to provide their own food resources. Similarly the global expansion of monoculture-based systems of production have created agricultural systems that by definition must service more distant markets and that therefore require more complex, and energy dependent, systems of production, processing, transportation, and sales. Moreover, as U.S. households continue to shrink in size and the number of dual-income and single-headed households continues to rise, U.S. households have become increasingly dependent on the availability of processed and pre-prepared food products. Not surprisingly, this reliance is also related more specifically to women’s increased labor force participation as well as the increase in the amount of time that children are spending in structured activities outside the home – both of which have reduced the amount of time available for food preparation in the home.

Table 3. Percent Change in Per Capita and Total Food Expenditures by Location

Year	Per Capita		Total	
	At Home	Away from Home	At Home	Away from Home
1960-1970	-3.4%	36.0%	9.5%	54.2%
1970-1980	9.0%	38.9%	21.4%	54.8%
1980-1990	-2.4%	24.5%	7.2%	36.7%
1990-2000	0.1%	13.8%	13.2%	28.7%
2000-2006	6.4%	9.8%	12.9%	16.5%

Source: adapted from U.S. Department of Agriculture, Economic Research Service data on food and alcoholic beverages

Summary and Conclusions

This paper attempts to explore the complexities of our current food system, the socio-demographic patterns that underlie it, and their relationships to food sales and food service by approaching the topic from a systems perspective.

Our exploratory research found that there has been an increase in energy consumption in food sales and food services within the commercial buildings sector. This increase in energy use corresponds to documented shifts in food consumption patterns and purchasing trends, including an increased demand for ready-to-eat meals (whether in restaurants or food outlets), the growth in super stores, the growth in fast food restaurants, and the increased consumption of meat and processed foods. Similarly, changing food consumption patterns correspond to changing socio-demographic trends including increased urbanization, the rise in dual income families and single headed households, changing time use patterns, and the expansion of large-scale, industrialized agricultural production.

While our research begins to paint a picture of the interconnectedness of these many aspects of food sales and food service, more research is needed to fully understand the nature of the relationships explored in this paper and to make recommendations as to ways of reducing what has become a “high energy diet.”

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