

What's for Dinner? Finding and Affording Healthy Foods in New Hampshire Communities

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Access to healthy and affordable food is a basic family need. Yet access to nutritious food has declined in inner cities and rural areas in recent decades, as grocery stores consolidate and close or relocate to other communities. Often the nearest supermarket or full-service grocery store is miles away, leaving residents to rely on “quick stop” gas stations and convenience stores. Lower-income families have been particularly hard hit with additional transportation barriers and costs.

Limited access to quality, affordable groceries makes it hard for families to provide sufficient nutritious food, which has been linked to poor diet and obesity. Both put individuals at risk for chronic disease, such as diabetes and heart disease.¹

Since 1995, the U.S. Department of Agriculture (USDA) has collected information annually on food spending, food access and adequacy, and sources of food assistance. According to the most recent report, released in November 2009, more than 17 million (14.6 percent) American households were “food insecure” in 2008. Food security is defined by the USDA as “consistent, dependable access to enough food for active, healthy living.” Food insecurity indicates that “access to adequate food is limited by a lack of money and other resources.”²

The current levels of food insecurity are the highest since surveys were initiated and may well reflect the consequences of a deteriorating economy and increased unemployment.³ New Hampshire, which consistently has one of the lowest poverty rates in the nation and frequently ranks among the top five healthiest states in national surveys had one of the lowest rates of household food insecurity at nearly 9 percent.⁴ Although the state is doing very well compared with other states, nevertheless, more than 44,000 New Hampshire households do not have adequate access to food.

This brief reports the findings of a study of food access in New Hampshire, focusing on the geographic distribution of grocery stores and other food outlets, a survey of the availability of food among households in the state, and the distribution of dietary-related health conditions.

Key Findings

- More than one in ten New Hampshire households experience food insecurity, and there is considerable variation across the counties in the state. Food insecurity is significantly related to both household income and the distance a household must travel to shop for groceries.
- Approximately 3.5 percent of households live five or more miles from a grocery store. This presents a real challenge, particularly for lower-income families and those without transportation.
- Areas of the state with relatively low access to healthy food also have higher rates of dietary-related health conditions, including obesity, diabetes, and coronary heart disease.
- The distribution of full-service grocery stores is uneven in New Hampshire. They are concentrated in areas of high population density, including the Seacoast, the areas adjacent to Massachusetts, and along major transportation corridors. There is a deficit of grocery stores in the northern parts of the state, as well as in more remote rural areas in the central and western parts of the state.

The Long Reach of Food Insecurity

Lack of sufficient food is a condition of poverty, although not all those living in poverty are food insecure and many food-insecure households have incomes above the poverty level. In 2008, for example, food insecurity was more prevalent in households with annual incomes below 185 percent of the poverty line than in higher-income households; however,

more than half of those with incomes below the official poverty line were food secure.⁵

Several factors beyond annual income can affect a household's food security, including high regional costs for food and housing, job loss, divorce, illness or disability, and other unexpected events that can lead to a decline in income.⁶ Today the fastest growing group reliant on emergency food resources is the working poor. For this group, food insufficiency is associated with low wages, part-time employment, and increasingly high costs of medical care. When times are tough, food costs are among the first reduced. Unlike fixed living expenses, such as mortgage and utility payments, food purchases are elastic and can be cut back to pay the heating bill.

Because lower-cost foods are often less nutritious, such cutbacks may reduce quality as well as quantity. A healthy diet of fresh fruits, vegetables, whole grains, lean cuts of meat, and fish is often more costly than a high-calorie diet, consisting of highly processed foods, refined grains, added sugars, and fats. Such foods are among the lowest-cost sources of dietary energy, in addition to being convenient.⁷

The associated health costs of a nutritionally deficient diet are far reaching; regularly consuming a diet of high calorie, fat-laden foods in order to stretch a food budget increases the risk of obesity.⁸ Obesity rates for U.S. adults have more than doubled in three decades. For children of all ages, rates have more than doubled, and for adolescents, rates have more than tripled.⁹ Overweight and obese individuals are at increased risk for hypertension, coronary heart disease, stroke, diabetes, and certain cancers. The Centers for Disease Control estimate that seven of every ten deaths in the United States stems from such chronic disease.¹⁰

New Hampshire is not immune to the obesity epidemic, despite consistently ranking as one of the healthiest states in the country. Obesity rates in the state climbed from 15 percent to 25 percent between 1995 and 2007. Chronic disease increased during the same time period, with rates of self-reported hypertension increasing from 20 percent to 26 percent and high cholesterol climbing from 27 percent to 39 percent.¹¹

Insufficient nourishment also harms children's physical and mental health, as well as their educational achievement and social interactions. The stress associated with worrying about being able to afford sufficient food has an emotional impact on both parents and children, manifested in anxiety, negative feelings about self-worth, and hostility toward the outside world.¹³ Among the elderly, hunger and malnutrition exacerbate chronic and acute diseases and speed the onset of degenerative diseases.¹⁴ Such effects make it difficult for individuals to interact with their families and their communities and to be productive, contributing members of society.

ABOUT THE RESEARCH

The research used a variety of original and existing data sources on the following:

- Access to food providers, including the types and locations of stores, markets, and programs that sell or give away food, such as food pantries, shelters, and soup kitchens
- Dietary-related outcomes associated with good nutrition, including obesity, diabetes, and heart disease
- Food insecurity, brought about when access to adequate food is limited by a lack of money and other resources

Mapping Food Access

For the geographic distribution of food access in New Hampshire, we map the location of food providers throughout the state. We obtained a list of retail food stores in New Hampshire from InfoUSA Inc., a commercial data provider. Their databases are updated weekly, and selected characteristics of businesses are verified monthly by telephone interviews. Businesses may be excluded from the directory at their request, and refusal rates average 12 percent.

These are the four categories of retail food providers: (1) grocery stores/supermarkets, (2) big-box stores, (3) specialty stores, and (4) convenience stores, as defined by the U.S. Census Bureau. Grocery stores and supermarkets are primarily engaged in retailing a general line of food. Specialty stores are primarily engaged in retailing specialized lines of food, such as fruit and vegetables, fresh meat and/or seafood, specialty cheeses, and health foods. Convenience stores are primarily engaged in retailing a limited line of goods that generally includes milk, bread, soda, and snacks. Big-box stores (also known as warehouse clubs, superstores, and supercenters) are primarily engaged in retailing a general line of groceries in combination with general lines of new merchandise, such as apparel, furniture, and appliances. Food banks are also included as a food source. There is only one food bank in New Hampshire, which is a program of New Hampshire Catholic Charities that distributes donated surplus food to food pantries, soup kitchens, shelters, day care centers, and senior citizen homes. For simplicity's sake, all are referred to here as food banks.

Major bodies of water and the mountainous areas in the northern part of the state are marked on the maps, as these important topographical features affect both population density and the location of food outlets.

Mapping Dietary-Related Health Outcomes

Statistics on health status and prevalence of dietary-related morbidity in New Hampshire are available from the Centers for Disease Control's (CDC) Prevention's Behavioral Risk Factor Surveillance System (BRFSS). Data are from 2007; all illnesses are self-reported (CDC 2007). The dietary-related outcomes are mapped for Hospital Service Areas (HSA) because they are the smallest unit of analysis we can use to address both food access and dietary-related illness.

Estimating Food Insecurity

Survey data on food insecurity were collected from a random sample of adult households in the state by the University of New Hampshire Survey Center. Interviews were completed with 719 adults in New Hampshire from a sample of 4,139 randomly selected telephone numbers. The response rate was 35 percent. Of those people who were contacted, 68 percent cooperated. To make comparisons about households and not individuals (consistent with the USDA), the data are weighted by the number of telephone lines in the household to equalize the chances that any one household would be selected for inclusion. The data are also weighted by region of the state. Respondents are mostly female (62 percent), married (60 percent), homeowners (81 percent), and between the ages of 35 and 64 (68 percent).

In addition to standard demographic questions (age, sex, employment, homeownership, income, marital status, number of children and adults in the household, and town of residence), the survey included eighteen questions about food insecurity developed by the USDA. The survey also included ten questions developed by researchers at Iowa State University to examine respondents' perceptions of their local food environments. Questions dealt with perceptions of the adequacy of the number of grocery stores in the community, prices, store locations, transportation, and travel time to grocery stores.¹²

Food Deserts Likely Contribute to Food Insecurity

Food insecurity and its link to health conditions can be exacerbated by food deserts. Food deserts, or areas with limited or no access to fresh and nutritious foods at affordable prices, are a growing problem.¹⁵ People in food deserts must travel farther to buy nutritious foods or else rely on more expensive convenience stores, which typically do not sell fresh foods in sufficient quantity or variety.¹⁶ In rural areas, traveling such distances for nutritious foods may be particularly problematic given the lack of public transportation.

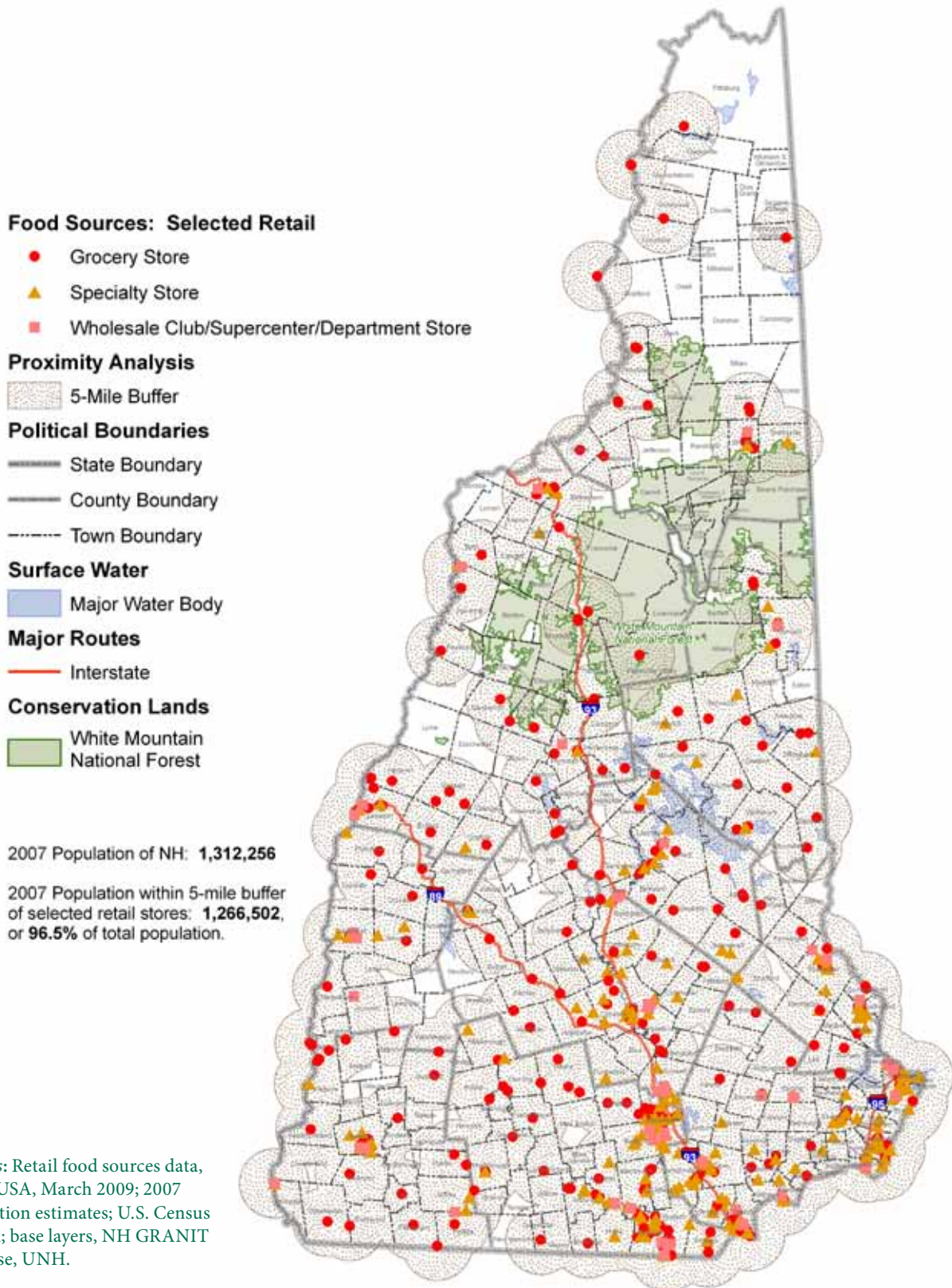
Inequities in food access have been growing for decades, as local or neighborhood grocery stores and supermarkets close and are replaced by convenience stores or big-box stores on the outskirts of metro areas. While this is a problem potentially affecting people at all income levels, low-income rural and urban areas are disproportionately affected. The departure of young families in rural areas, as a result of dwindling economies, exacerbates market pressures on small grocers, while supermarkets in low-income urban areas struggle to compete with giant food retailers located in the suburbs. In city neighborhoods, fast food restaurants and convenience stores are often more common than traditional grocery stores, while rural communities may have an inadequate selection of fresh fruits and vegetables in those remaining local food stores.¹⁷ Research shows that these same neighborhoods frequently have higher rates of dietary-related conditions, such as diabetes and heart disease.¹⁸

Food Access is Uneven in New Hampshire

Figure 1 shows that grocery stores/supermarkets, specialty food stores, and big-box stores in the state are not evenly distributed. These three represent the most comprehensive sources for food purchases. We have marked a five-mile buffer zone around each establishment on the map to give a sense of what these locations mean relative to consumers. Food providers are heavily concentrated on the Seacoast, along the Massachusetts border, and along Interstate 93 in the southern and central parts of the state.

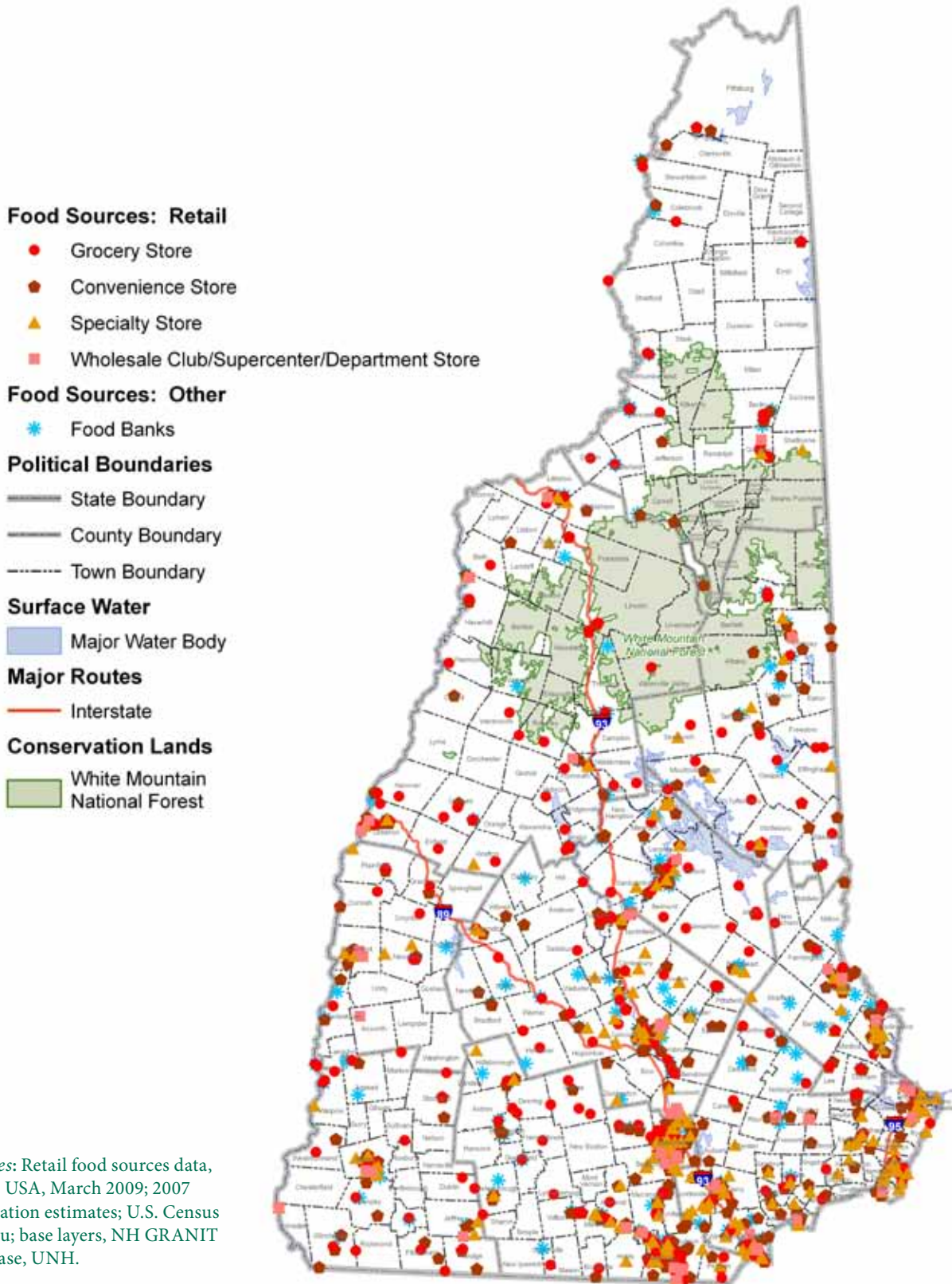
Stores are fairly sparse in the northern part of the state, with no specialty or big-box stores north of Gorham (just north of White Mountain National Forest). It appears there are only three big-box stores north of Plymouth and a handful of specialty stores. There is a clear relationship between the number of grocery stores and population density throughout the state. Using the North Country as an example, Coos County has the largest land area of the state's ten counties but the smallest population. It is also a part of the state where more families must travel five or more miles to shop for food.

FIGURE 1. PROXIMITY TO SELECTED RETAIL FOOD SOURCES: FIVE-MILE BUFFER



Sources: Retail food sources data, INFO USA, March 2009; 2007 population estimates; U.S. Census Bureau; base layers, NH GRANIT database, UNH.

FIGURE 2. FOOD SOURCES: LOCATION OF VARIOUS FOOD RESOURCES AND FOOD BANKS



Sources: Retail food sources data, INFO USA, March 2009; 2007 population estimates; U.S. Census Bureau; base layers, NH GRANIT database, UNH.

There is a great deal of overlap in these five-mile areas. In fact, 96.5 percent of New Hampshire's 2007 population lived within five miles of a grocery, specialty, or big-box store. Unfortunately, we have no way of knowing how far beyond five miles the remaining 3.5 percent live from a full-service grocery store. They may be twenty miles away or only six. Nevertheless, we have deemed them "low-access," since, comparatively, they have the most limited access in the state. These low-access areas are heavily concentrated in northern New Hampshire. There are also several pockets of low-access areas in central and southern New Hampshire, more so to the west than the east.

Figure 2 adds the locations of convenience stores and food banks. Similar to grocery, specialty, and big-box stores, convenience stores and food banks are unevenly distributed throughout the state and in much the same pattern: they are heavily concentrated along the Seacoast and Massachusetts border, especially Nashua and surrounding areas, and along the southern portion of Interstate 93. They are less densely located in the southwestern part of the state. In central New Hampshire, there are far more providers to the east than to the west. North of Plymouth they begin to taper off, with greater distances between any one outlet. North of Gorham, they are sparser still.

Similar to the five-mile buffers shown in Figure 1, we also examined (not shown) a one-mile buffer and found a significant proportion of the state in which residents do not live within one mile of any full-service retail food outlet, convenience store, or food bank. Living farther than one mile from a grocery store may be difficult for anyone without access to a vehicle or public transportation, especially if they are elderly or disabled or have small children in tow. New Hampshire weather, which is highly variable, is certainly another factor to consider for those traveling more than a mile to purchase food.

Although there are relatively few areas of New Hampshire with very limited access to food stores, for some residents

in the state, the only store within five miles is a convenience store. In other cases, there are no food establishments at all. Food pantry locations largely overlap with food stores, so this is not an alternative in most areas of low access. The relative lack of access to food outlets in these areas presents a real challenge, particularly for lower-income families and those without transportation.

Food Access and Health Likely Go Hand in Hand

We also find evidence that people living in regions with low access to healthy foods have higher rates of dietary-related illness. (We cannot, however, say that one causes the other.) We begin with obesity, as it is both directly related to diet and is a mediating factor for other dietary-related illness.

New Hampshire's obesity rate is 25 percent, which ranks the state sixteenth in the nation.²⁰ Figure 3 shows that obesity rates in New Hampshire's HSAs range from 12 percent to 38 percent. Rates are higher in the northern and western parts of the state and along the Massachusetts border. Franklin stands out as the HSA with the highest obesity rate.

Diabetes is another chronic condition affected by diet. New Hampshire's 2007 reported rate of Type 2 diabetes was 7 percent, a fairly low ranking (at fifteenth overall).²¹ Figure 4 shows that among the highest prevalence rates, Berlin, Haverhill, and Claremont HSAs, in the darkest shade of orange, were well above the state average. Berlin had the highest rate.

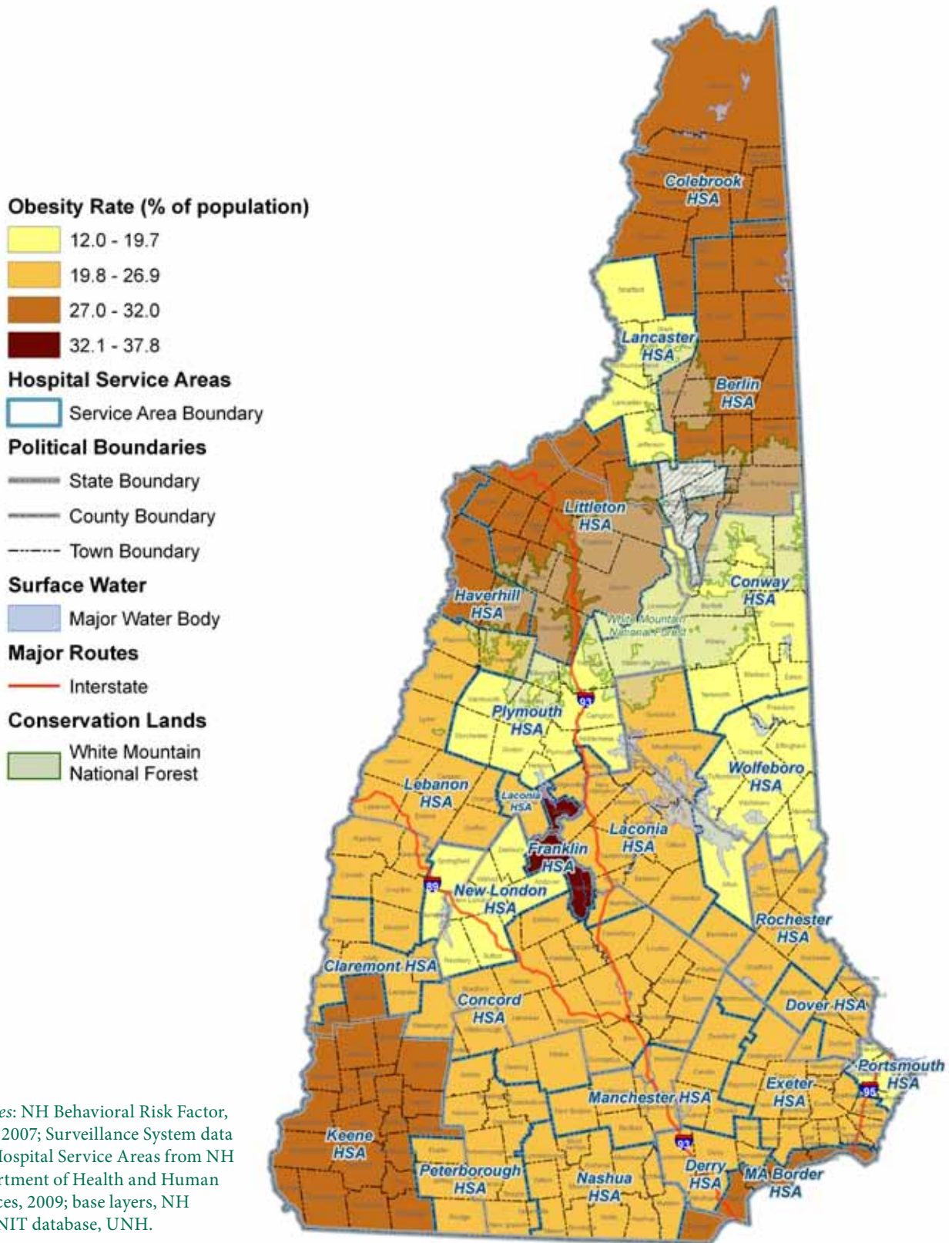
Finally, New Hampshire ranked twenty-seventh overall in coronary heart disease in 2007, with a prevalence rate of just over 4 percent. The highest incidence occurred in the Colebrook, Berlin, Lebanon, Franklin, and Claremont HSAs. Colebrook had the highest rate (see Figure 5).

In addition to the above dietary-related illnesses, we also examined high blood pressure, high cholesterol, myocardial infarction, and stroke (seven in total) and found that they follow a similar trend in their distribution. In sum, the most striking pattern is that the highest prevalence rates for all seven dietary-related illnesses are in the northern portion of the state. The three HSAs with the highest average ranks are Berlin, Haverhill, and Colebrook.²² There are exceptions to this, but the pattern is noteworthy. The northern part of the state suffers from a relative deficit of affordable, healthy food sources as well—although we cannot say with certainty that food access is leading directly to these health issues.

ABOUT THE MAPS

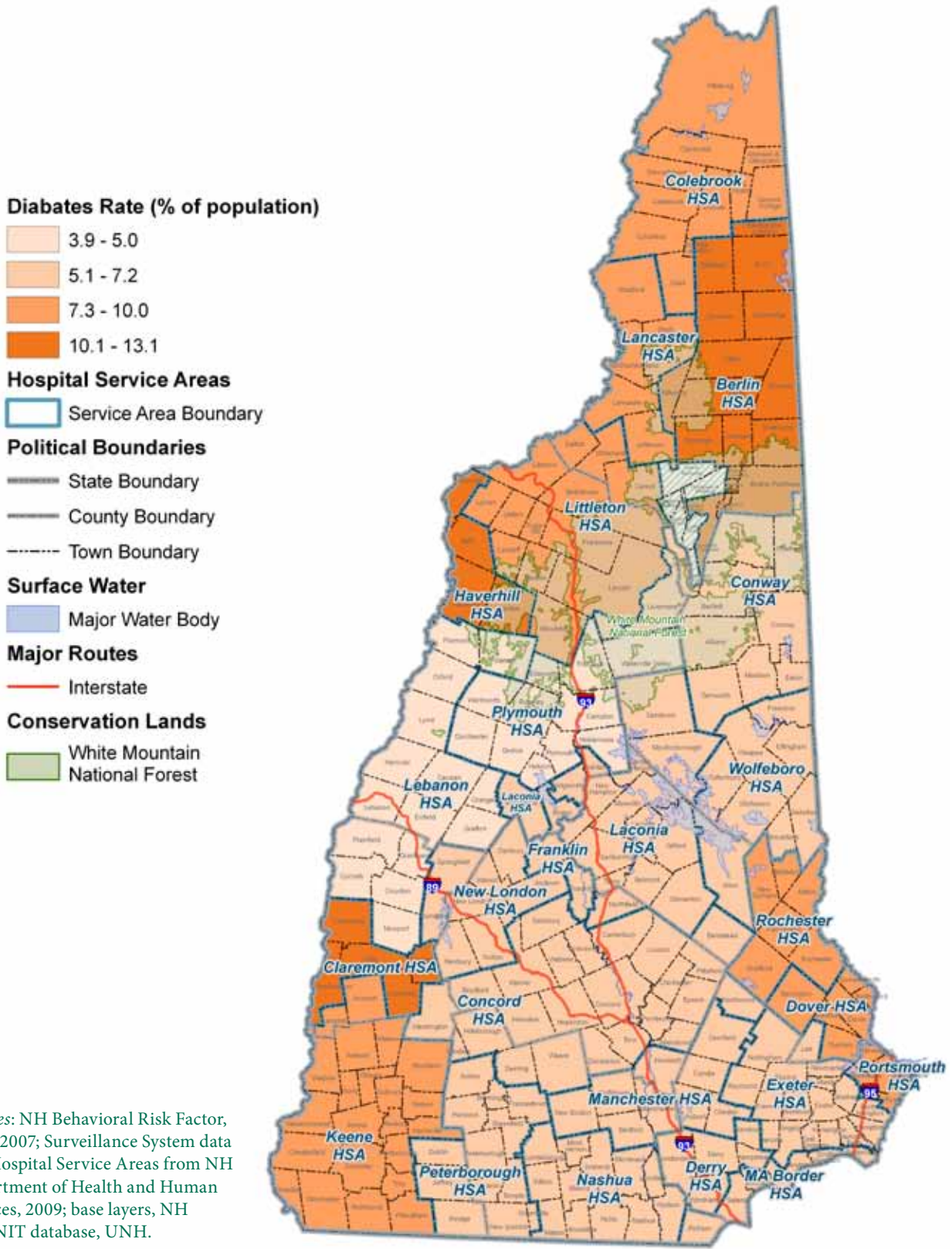
To maintain uniformity, data are presented in four categories, with color shades ranging from lightest, which represent lower rates of illness, to darkest, which represent higher rates. Categories are defined according to "natural breaks in the data." This is a classification scheme widely used within geographic information system (GIS) packages, known as variance-minimization classification. Breaks are typically uneven and are selected to separate values where large changes in value occur. The lowest and highest data points represented in each map category are the start and end points of 2007's actual rates for each condition.¹⁹

FIGURE 3. PERCENT OBESE BY HOSPITAL SERVICE AREA



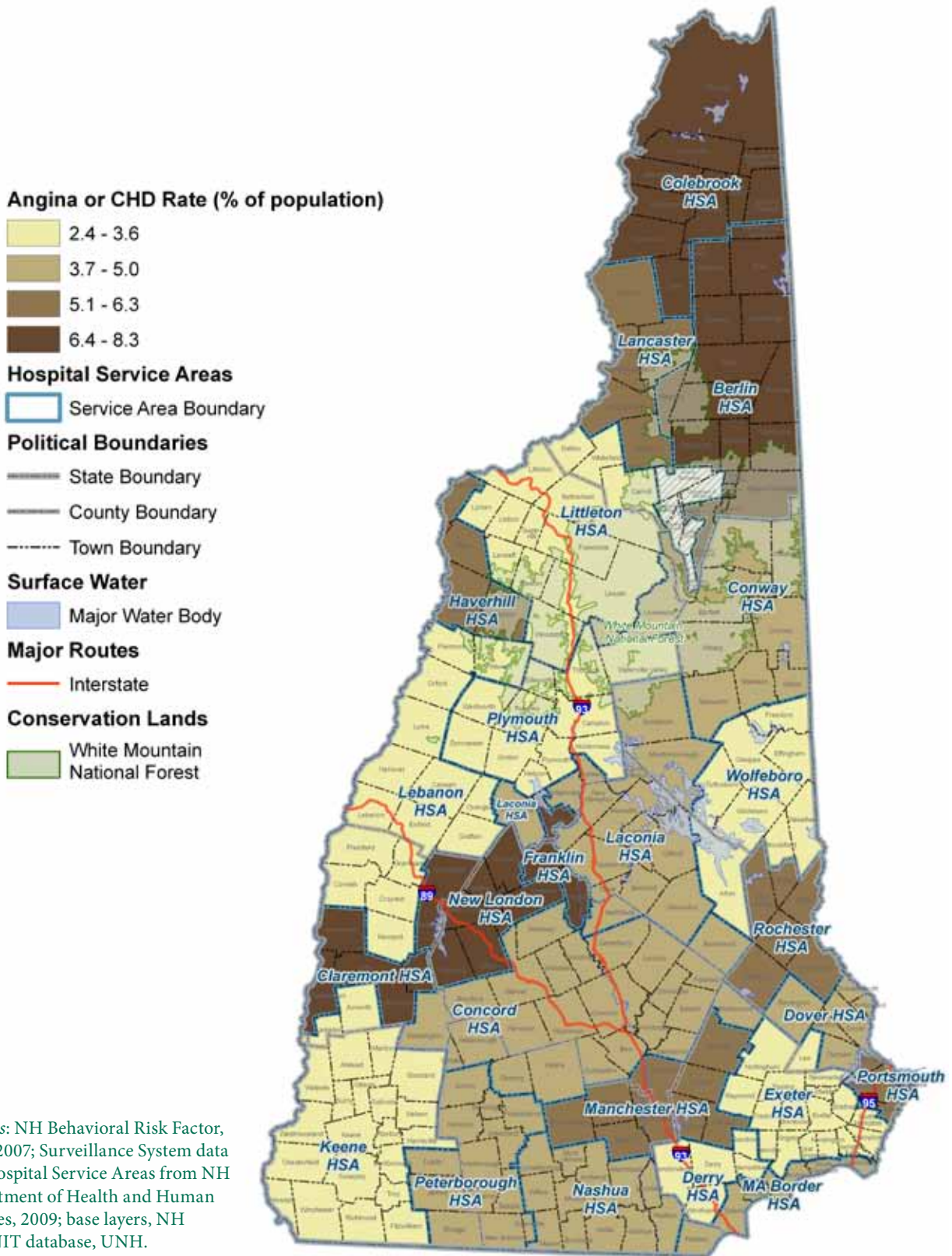
Sources: NH Behavioral Risk Factor, 2005, 2007; Surveillance System data and Hospital Service Areas from NH Department of Health and Human Services, 2009; base layers, NH GRANIT database, UNH.

FIGURE 4. PERCENT REPORTING DIABETES BY HOSPITAL SERVICE AREA



Sources: NH Behavioral Risk Factor, 2005, 2007; Surveillance System data and Hospital Service Areas from NH Department of Health and Human Services, 2009; base layers, NH GRANIT database, UNH.

FIGURE 5. PERCENT REPORTING CORONARY HEART DISEASE BY HOSPITAL SERVICE AREA



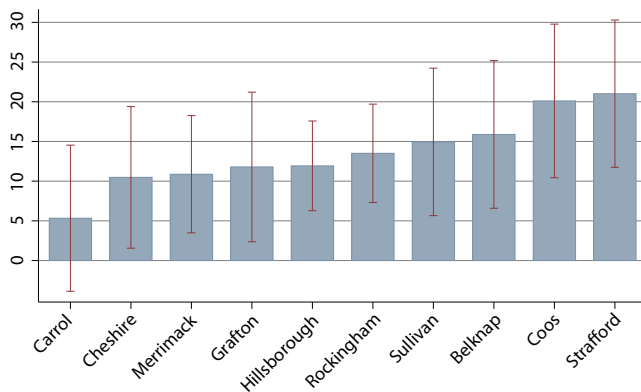
Sources: NH Behavioral Risk Factor, 2005, 2007; Surveillance System data and Hospital Service Areas from NH Department of Health and Human Services, 2009; base layers, NH GRANIT database, UNH.

More than One in Ten New Hampshire Households are Food Insecure

On the basis of our survey, we find that that 13 percent of New Hampshire households were food insecure in 2009 (reporting three or more food insecure conditions). This estimate is substantially higher than the USDA's 2008 estimate and probably reflects the continued economic downturn of the past year. This estimate is also based on data collected in one year (2009) rather than the three-year average reported by the USDA (2006, 2007, 2008).²³ More than one in ten households in New Hampshire are challenged to provide adequate food for family members, and there is reason to believe that the rate of food insecurity has increased since 2008.

In addition to the overall state estimate, we find variations across the state that USDA data do not reveal. Figure 6 presents the percentage experiencing food insecurity by county. The rates vary from a high of more than 20 percent in Strafford County to a low of less than 5 percent in Carroll County. The counties with the highest rates (15 percent or above) include Strafford, Coos, Belknap, and Sullivan, two just north of the more urbanized portion of the state, and two more rural counties.²⁴

FIGURE 6. PERCENT OF HOUSEHOLDS REPORTING THREE OR MORE FOOD INSECURE CONDITIONS, BY COUNTY



Note: Margins of error indicated in red, 95 percent confidence level

Comparing these county estimates with data on the location of full-service grocery stores and other food outlets (see Figure 1), it is clear that food insecurity is only moderately associated with the location of food outlets because even in areas with full-service grocery stores families can experience food insecurity. Other factors, such as income, must be considered to fully understand the source of food insecurity.

Household Level Predictors of Food Insecurity

To better understand the predictors of food insecurity, we analyzed demographic and socioeconomic characteristics of households, the proximity of the household to grocery stores and transportation availability, and the county location of the household given the variations across the ten counties in the availability of affordable food.

Demographic variables include the following:

- Number of adults in the household
- Age of the respondent
- Education level of the respondent
- Household income
- Marital status of the respondent
- Whether the home is rented or owned

Variables measuring proximity to grocery stores include the following:

- Number of minutes traveled for grocery shopping
- Perception of whether there are sufficient affordable grocery stores in close proximity
- Typical mode of transportation used for shopping (car versus some other mode of transportation)
- County of residence

The results summarized here are from a multivariate regression analysis and should be interpreted as the effect of each variable, net of the others included in the model.

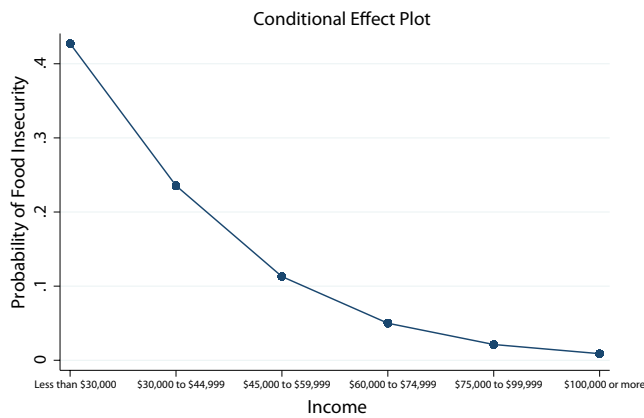
Demographics and Food Insecurity

Demographic factors are key predictors of food insecurity. In particular, for households with the same income, those with more adults are more likely to meet the USDA criterion for food insecurity than smaller households with the same income. Younger respondents are more likely to report food insecure conditions than older respondents. Not surprisingly, income is a significant predictor across the board, despite such things as food stamps and the Women, Infants, and Children Nutrition Program (WIC), which are targeted to the low-income population. The effect of income on food insecurity, holding all other factors constant, is presented in Figure 7.

Distance, Transportation, and Food Insecurity

The farther a household resides from a grocery store, net of other variables in this analysis, the more likely it is to experience food insecurity, as we have measured it (see Figure 8). Distance is particularly problematic for those households without access to transportation for grocery shopping. For example, among those with a car, the impact of distance increases the proportion experiencing food insecurity from 10 percent to 21 percent. Among those without a car, the increase is from 32 percent to 54 percent.²⁵

FIGURE 7. THE EFFECT OF INCOME ON FOOD INSECURITY



County of Residence and Food Insecurity

Households in Strafford, Belknap, Coos, Hillsborough, and Rockingham counties are more likely to experience food insecurity. Although we cannot directly link food insecurity to the location of grocery stores, geography is clearly a predictor of the lack of adequate food in New Hampshire.²⁶

Summary and Policy Implications

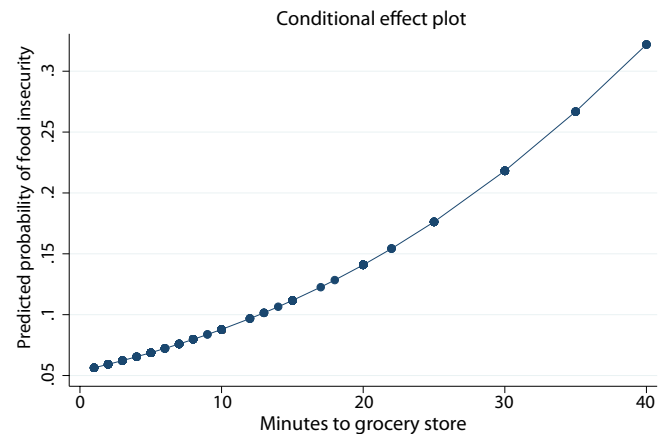
Most residents of New Hampshire have a range of choices for grocery shopping. Nonetheless, there are pockets where there are no retail establishments, and our estimate is that 5 percent of New Hampshire residents live in areas that lack adequate access to food within five miles.

We find no consistent pattern in the prevalence of diet-related health conditions, but the North Country often has higher prevalence rates of dietary-related conditions. There is some overlap here with food access, but the correspondence is far from perfect.

From the survey data, we know that approximately 13 percent of those surveyed meet the criterion of food insecurity used by the USDA. This is a higher estimate than the most recent data provided by USDA and probably reflects the worsening economic context. We also know that there are regional variations in food insecurity, indicated by variations across the ten counties. The important individual predictors of food insecurity include the size of the household, age of the respondent, household income, and proximity to a grocery store. This establishes a link between food access and food insecurity, although household income is also a key factor in food insecurity.

There are several implications from these findings for policy makers and others interested in food security, access, and health in New Hampshire. While New Hampshire does not have food deserts by conventional standards, there

FIGURE 8. THE EFFECT OF DISTANCE FROM GROCERY STORE ON FOOD INSECURITY



are certainly areas in the state where access to affordable, adequate food is limited. It is a challenge for retail establishments to operate profitably in very small towns, and it is in these locations where we find a deficit of choice among New Hampshire residents. Economic development efforts and incentives could encourage food outlets to locate in, or remain in areas where there is a deficit. In addition, convenience stores, small grocers, and local communities could collaborate to increase the number of moderately priced, high-quality foods they offer and preemptively help smaller outlets to survive the entry of big-box stores into the market. The “eat local” movement offers other strategies as well. Relying more on locally produced food, including seasonal food and root crops with a longer shelf life, could help alleviate food insecurity and increase the variety of healthful foods. Local communities and state policy makers could also develop fuel subsidies or incentives to distributors to deliver a regular supply of fresh fruits and vegetables.²⁷

Just as this brief was going to press, the Healthy Food Financing Initiative was introduced into the U.S. Senate. Provisions of this initiative would help local communities to build new or renovated grocery stores, small corner markets, and farmers’ markets in underserved communities. Such public-private initiatives are promising mechanisms to improve access to healthy foods.

Because income is a significant predictor of food insecurity, strategies to both improve the chances for upward mobility and to mitigate the negative consequences of low income are needed, even more so in the face of the economic downturn, perhaps especially so at the community level. Local leaders, armed with information about their own community’s needs, could implement stop-gap measures to assist needy residents.

Although not definitive given our small sample size, those who live greater distances from a grocery store and who do

not have their own means of transportation seem particularly vulnerable to food insecurity. In areas where access is an issue, special attention should be paid to the availability of transportation, or programs and policies to assist those without their own cars (for example, car loan and food delivery programs).

Healthy, affordable food is a fundamental family need. New Hampshire is fortunate in being a state with low food insecurity. But as this research has documented, issues of limited access to healthy, affordable food and related food insecurity affect a substantial number of New Hampshire residents. Food access can be improved, either through efforts to encourage businesses or through public food programs targeted to locations where there is a demonstrated need. The business community, the state, nonprofit organizations, and foundations should collaborate to develop targeted efforts to alleviate the food access challenges faced by some New Hampshire families.

Further Reading

Allagretto, Sylvia. 2005. "Basic Family Budgets: Working Families' Incomes Often Fail to Meet Living Expenses Around the US." Briefing Paper. Washington, DC: Economic Policy Institute. <http://www.epi.org/publications/entry/bp165/>, retrieved December 10, 2009.

Centers for Disease Control and Prevention. 2007. "Behavioral Risk Factor Surveillance System. Prevalence and Trends Data." Atlanta: CDC. <http://apps.nccd.cdc.gov/brfss/index.asp>, retrieved March 18, 2008.

———. 2007. "Behavioral Risk Factor Surveillance System: Prevalence and Trends Data, Overweight and Obesity 1995–2008." <http://apps.nccd.cdc.gov/brfss/index.asp>, retrieved March 18, 2008.

———. 2007. "Behavioral Risk Factor Surveillance System: Prevalence and Trends Data, High Blood Pressure 1995–2008." <http://apps.nccd.cdc.gov/brfss/index.asp>, retrieved March 18, 2008.

———. 2007. "Behavioral Risk Factor Surveillance System: Prevalence and Trends Data, High Cholesterol 1995–2008." <http://apps.nccd.cdc.gov/brfss/index.asp>, retrieved March 18, 2008.

———. 2009. "Division for Heart Disease and Stroke Prevention: Heart Disease Fact Sheet." http://www.cdc.gov/dhdsplibrary/fs_heart_disease.htm, retrieved September 1, 2009.

———. July 2009. "CDC Weight of the Nation Press Briefing." Press briefing transcripts: unedited. <http://www.cdc.gov/media/transcripts/2009/t090727.htm>, retrieved December 10, 2009.

John Hopkins Medicine. 2005. "Health Alerts: Diabetes Special Report: Why Obesity Contributes to Type II Diabetes." Baltimore: Johns Hopkins University. <http://www.johnshopkinshealthalerts.com/reports/diabetes/60-1.html>, retrieved March 24, 2008.

New Hampshire Department of Health and Human Services. 2009. "Healthy New Hampshire 2010: Improving Health and Quality of Life for the People of New Hampshire." Concord, NH: Department of Health and Human Services. <http://www.dhhs.nh.gov/DHHS/DPHS/LIBRARY/Program+Report-Plan/healthynh-2010-report.htm>, retrieved March 24, 2008.

U.S. Bureau of Economic Analysis. 2007. Regional Economic Data, Local Area Personal Income, Table CA1-3, Personal income, population, per capita personal income: 1996–2007. <http://www.bea.gov/regional/reis/>, retrieved December 12, 2009.

Endnotes

1. Nicole Larson, Mary Story, and Melissa Nelson, "Neighborhood Environments: Disparities in Access to Healthy Foods in the U.S.," *American Journal of Preventive Medicine*, 36 (2009): 74–81.e10; Lisa Feldstein, "Linking Land Use Planning and the Food Environment," *Smart Growth Online* (Washington, DC: International City/County Management Association, 2005), <http://icma.org/sgn/newsdetail.cfm?nfd=2666&id>, retrieved March 26, 2008.
2. Mark Nord, Margaret Andrews, and Steven Carlson, "Household Food Security in the United States, 2008" (Washington, DC: Economic Research Service, USDA, 2009), <http://www.ers.usda.gov/publications/err83/>, retrieved November 19, 2009; Although the authors feel that *food insecurity* is not an ideal term, the traditional label of "hunger" implies a subjective feeling rather than the more precise lack of food. We therefore follow the lead of the USDA and use the terms *food security* and *food insecurity* in this brief.
3. Nord, "Household Food Security."
4. New Hampshire Department of Health and Human Services, "Healthy New Hampshire 2010: Improving Health and Quality of Life for the People of New Hampshire," <http://www.dhhs.nh.gov/DHHS/DPHS/LIBRARY/Program+Report-Plan/healthynh-2010-report.htm>, retrieved March 24, 2008).
5. Nord, "Household Food Security."
6. Nord, "Household Food Security."
7. Adam Drewnowski and Nicole Darmon, "The Economics of Obesity: Dietary Energy Density and Energy Cost," *American Journal of Clinical Nutrition*, 82 (2005): 265S–73S; Angela Liese, et al., "Food Store Types, Availability, and Cost of Foods in a Rural Environment," *Journal of the American Dietetic Association*, 107 (2007): 1916–1923; Pablo Monsivais and Adam Drewnowski, "The Rising Cost of Low-Energy-Density Foods," *Journal of American Dietetic Association*, 107 (2007): 2071–2076.
8. Bread for the World, "Obesity and Hunger" (Washington, DC: Bread for the World, 2006), <http://www.bread.org/learn/us-hunger-issues/obesity-and-hunger.html>, retrieved March 21, 2008.
9. Cynthia L. Ogden, et al., "Prevalence of Overweight and Obesity in the United States, 1999–2004," *Journal of American Medical Association* (JAMA), 295 (2006): 1549–1555, <http://jama.ama-assn.org/cgi/content/abstract/295/13/1549>, retrieved April 15, 2010.
10. Centers for Disease Control and Prevention, "Chronic Diseases and Health Promotion," <http://www.cdc.gov/nccdphp/overview.htm>, retrieved March 18, 2008.
11. JAMA, "Prevalence of Overweight and Obesity."
12. Steven Garasky, Lois W. Morton, and Kimberly Greder, "The Food Environment and Food Insecurity: Perceptions of Rural, Suburban, and Urban Food Pantry Clients in Iowa," *Family Economics and Nutrition Review*, 16 (2004): 2, 41–48.
13. John Cook and Karen Jeng, "Child Food Insecurity: The Economic Impact on Our Nation" (Chicago: Feeding America, 2009), available at <http://feedingamerica.org/SiteFiles/child-economy-study.pdf> (retrieved August 20, 2009); Food Research and Action Center, "Health Consequences of Hunger" (Washington, DC: Food Research and Action Center), available at http://www.frac.org/html/hunger_in_the_us/health.html (retrieved March 20, 2008).
14. Food Research and Action Center, "Health Consequences of Hunger" (Washington, DC: Food Research and Action Center), available at http://www.frac.org/html/hunger_in_the_us/health.html (retrieved March 20, 2008).
15. The conventional definition of a food desert is a geographical area with "limited access to affordable and nutritious food." There is a range of specific distances cited in the literature. In their study, Troy Blanchard and Thomas Lyson use ten miles from a grocery store to denote a food desert. For more information, see Troy Blanchard and Thomas Lyson, "Retail Concentration, Food Deserts, and Food Disadvantaged Communities in Rural America" (Mississippi State, MS: Southern Rural Development Center, 2003), <http://srdc.msstate.edu/focusareas/health/fa/02recipients.htm>, retrieved March 18, 2008. A recent report to Congress, however, argues that any particular distance is somewhat arbitrary, given that without a car, any distance beyond a mile could be unacceptably far. For a review of the literature on defining food deserts, see Michele Ver Ploeg, et al., "Access to Affordable and Nutritious Food—Measuring and Understanding Food Deserts and Their Consequences: Report to Congress" (Washington, DC: Economic Research Service, USDA, 2009), <http://www.ers.usda.gov/Publications/AP/AP036/>, retrieved June 30, 2009.
16. Anne Short, Juie Guthman, and Samuel Raskin, "Food Deserts, Oases, or Mirages? Small Markets and Community Food Security in the San Francisco Bay Area," *Journal of Planning Education and Research*, 26 (2007): 352–364.
17. Lois Wright Morton and Troy C. Blanchard, "Starved for Access: Life in Rural America's Food Deserts," *Rural Realities*, 1 (4) (2007), <http://www.ruralsociology.org/pubs/RuralRealities/Issue4.html> (retrieved March 24, 2008); Karen Smoyer-Tomic, John Spence, and Carl Amrhein,

“Food Deserts in the Prairies? Supermarket Accessibility and Neighborhood Need in Edmonton, Canada,” *Professional Geographer*, 58 (3) (2006): 307–326; Feldstein, “Linking Land Use Planning”

18. Feldstein, “Linking Land Use Planning”; Larson, et al, *Neighborhood Environments: Disparities in Access to Healthy Foods in the U.S.*; WHY, “How to End Hunger in the USA and Reduce Obesity and Diet-Related Diseases” (Washington, DC: WHY: Finding Answers for Hunger and Poverty, 2007), available at <http://www.whyhunger.org/about-why/the-american-dream/619-how-to-end-hunger-in-the-usa-and-reduce-obesity-and-diet-related-diseases.html> (retrieved January 5, 2008).

19. Michael deSmith, Michael Goodchild, and Paul Longley, *Geospatial Analysis: A Comprehensive Guide to Principles, Techniques and Software Tools* (Troubador Publishing, 2007), <http://www.spatialanalysisonline.com/>.

20. Obesity of adults is determined by calculating an individual’s body mass index (BMI) or relation of body weight to healthy weight for the person’s height. If a person’s BMI is between 25 and 29, they are considered overweight; if their BMI is 30 or over, they are considered obese.

21. About 95 percent of people with diabetes have Type 2, which is most often associated with older age, obesity, family history of diabetes, previous history of gestational diabetes, physical inactivity, and certain ethnicities. About 80 percent of people with Type 2 diabetes are overweight.

22. These rates have not been age adjusted. Since there are differences in the percent of the population over age 64 across counties (from a low of 11 percent to a high of nearly 20 percent), and since age is related to some dietary-related illnesses, caution is required in interpreting the link between access to food and the distribution of the health indicators. See <http://www.census.gov/popest/estimates.html>.

23. The USDA estimate includes two years prior to the economic downturn, so the three-year average reflects this.

24. The sample sizes for the less populous counties are small (50 or 60 cases). Therefore, the margins of error are larger for the smaller counties. The county-level estimates should be interpreted cautiously given the smaller sample sizes. Nonetheless, the relative incidence of food insecure conditions across the ten counties is revealing.

25. In this sample, the number of respondents who are far from a grocery store and who do not have a car is very small (ten), so caution is called for in drawing definitive conclusions. It makes logical sense, though, that the effect of distance would be greater for those without access to a car, with implications for both food and transportation policies. More research is needed on this important link.

26. It is clear that rates of food insecurity do not line up perfectly with county poverty rates. Such overall county rates obscure a great deal of variation within counties, such as deep pockets of poverty. In addition, as the survey results show, food insecurity is only partially a function of income. It is, importantly, also affected by access to grocery stores. The results reported in this paragraph are different from the county-level estimates in Figure 6. Other variables have been controlled in the multivariate analysis reported here, while Figure 6 does not control for these other predictors of food insecurity.

27. For a comprehensive discussion of strategies to increase access to healthy foods, see Sarah Treuhaft and Allison Karpyn, “The Grocery Gap: Who Has Access to Healthy Food and Why It Matters” (Oakland, CA: PolicyLink, 2010), <http://www.policylink.org/>, retrieved April 16, 2010.

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