Population and Demand Projections: Background and Methods

If we combine the the U.S. Census Bureau's projections of demographic change over the next two decades with the variations found in food expenditures by household income, age composition, region of residence, race, and diet-health knowledge, the results will show that household food expenditures are also likely to change. Several assumptions and limitations underlying the projected expenditures should be noted. First, the following analysis assumes that the relationships of income and demographics to food expenditures stay the same as those found in the statistical analysis of the 1997-98 CES data, implying that relative prices and alternative opportunities for food choices, as well as tastes and preferences, remain unchanged. Second, as their economic and demographic circumstances change, consumers are assumed to acquire the expenditure patterns of individuals already observed in those circumstances. That is, a household that migrates from the Northeast to the West will acquire the expenditure characteristics of households in the West. Likewise, a 5-year-old in 2020 is assumed to have the same food expenditure pattern as a 5-year-old in 1997-98. Third, the models are driven by projected changes in demographics and projected income growth. Hence, deviations from these projections will result in different expenditure patterns. These assumptions may appear unduly restrictive, but the information required to relax them is either unavailable or unreliable.

Another way to interpret the projections is to view them as scenarios of what would have occurred in 1997-98 if projected demographic changes had already been in place. For example, a relevant question may be as follows: "What would have happened to food expenditures in 1997-98 if the projected changes in the racial mix of the population for 2020 were already in place?" This approach to viewing the projections lessens the potential for misinterpretation by focusing attention on the underlying assumptions noted earlier. Although we feel this alternative interpretation is the most appropriate, we will instead use the term "projections" and draw comparisons between the base year, 2000, and a future period as we discuss our results.

Projections of food expenditures in this report are based on projected changes in the age distribution of the population, future regional population shifts, changes in the racial mix of the population, changes in educational attainment (diet-health knowledge), population growth, and inflation-adjusted income growth. Both the isolated and the combined effects on food expenditures are projected for each of these socioeconomic factors. As noted, food expenditure projections are based on census population projections and an assumed annual income growth of 1 percent and are presented on both a per person and a national basis.

Population, household, and education projections used in this analysis come from the census bureau (Hollman et al.; Day, 1996; Day, 2000). The population series includes projections by single year of age, sex, race, Hispanic origin, and nativity (foreign-born or native) out to the year 2100. Educational attainment projections by sex and race are available to 2028. These projections are not intended as forecasts or predictions but represent the results of assumptions about future trends in population change, household formation, schooling, and the economy at large. In the population series, projections are based on assumptions about fertility, mortality, and immigration. Differing assumptions are made to provide three different projection series, representing high, middle, and low alternatives. Our projections are based on the middle series.

Several modifications and extensions were applied to census projections to enable us to obtain the projections for 2020 used in this report. Census projections for education were published for 2003 and 2028, so our numbers represent interpolations between these two dates.

The current population projections provided by the census bureau are based on the 1990 census, as enumerated, and postcensal estimates up through 1999. The number of people counted in the 2000 census was 6 million more than anticipated by pre-census estimates (281 versus 275 million). Various factors undoubtedly contributed to the higher count, including a more complete census count in 2000 than in 1990 and a likelihood of more duplications in 2000. Any statement about the relative importance of different factors at this point is speculative. It is likely that the level of unauthorized immigration, clearly the most difficult component of the population to tabulate, was significantly higher than expected. To account for these discrepancies, population was multiplied by the ratio of the 2000 census result and the 2000 projection. For example, the 2000 census counted 39.9 million people age 24-29 and the projection was 37.4 million, for a ratio of 1.06. We multiplied projections for that age group to 2020 by 1.06.

For the first time, census filers in 2000 were allowed to identify themselves as members of more than one race, and over 6.8 million Americans chose to do so. This segment represents only 2.5 percent of the total population but a much higher share among the overall minority population. Therefore, an additional modification had to be made to assign these people to one race category. We chose to use ratios derived by research into primary and secondary race identification that allow for a fractional assignment of a multiracial group into its component races (Allen and Turner). Research showed, for example, that 61 percent of those self-identified as Black and White would likely choose Black as their primary race. We divided the total number into the two races according to that percentage.

Projected Age Distribution

The proportion of the U.S. population over age 45 is expected to increase, while the proportion under age 45 is expected to decrease (table 14). In 2000, 34.4 percent of the population was over age 45. By 2020, this age group is expected to account for 41.1 percent of the population. In contrast, the under-45 age group represented 65.6 percent of the total population in 2000. By 2020, this group is expected to represent about 59 percent of the Nation's population.

Projected Regional Population Distribution

Based on census projections, the Northeast and North Central are expected to lose population while the South and the West are expected to grow (table 15). The Northeast is expected to decline from 19.0 percent to 17.4 percent from 2000 through 2020. At the same time, the share of the population residing in the North Central is expected to decline from 22.9 percent to 21.1 percent. The South is expected to increase from 35.6 percent to 36.3 percent during 2000-2020, while the West is expected to increase from 22.5 percent to 25.2 percent.

Projected Population of the United States

The U.S. population is expected to increase about 18 percent from 2000 to 2020, from 281.4 million to 331.9 million (table 16).

Projected Racial Distribution

The proportion of the U.S. population that is Black will increase from 12.8 percent of the total population in 2000 to 13.8 percent in 2020.

Projected Educational Attainment

Changes in educational attainment will be applied to the diet-health knowledge equation to determine the effect of these changes on diet-health knowledge and food expenditures. The proportion of the U.S. population with a high school diploma is expected to decline between 2000 and 2020, from 35.2 percent to 32.6 percent. At the same time, the proportion of the population with some college education will increase from 24.1 percent to 27.0 percent, while the share with a college degree or higher will increase from 23.5 percent to 26.4 percent.

Table 14—Projected percentage of population by age group

Age group (years)	Share of population				
	2000	2005	2010	2015	2020
	Percent				
0-4	6.8	6.6	6.7	6.7	6.7
5-9	7.3	6.8	6.6	6.6	6.7
10-14	7.3	7.2	6.7	6.5	6.6
15-19	7.2	7.3	7.2	6.7	6.5
20-29	13.5	13.7	14.0	14.0	13.3
30-44	23.5	21.3	19.4	18.9	19.2
45-64	22.0	24.6	26.2	25.9	24.6
65-74	6.5	6.3	7.0	8.3	9.6
Over 74	5.9	6.0	6.0	6.1	6.9

Source: U.S. Department of Commerce, U.S. Census Bureau.

Table 15—Projected percentage of population by region

Year	Share of population			
	Northeast	North Central	South	West
	Percent			
2000	19.0	22.9	35.6	22.5
2005	18.8	22.3	35.8	23.1
2010	18.4	21.9	36.0	23.7
2015	18.1	21.4	36.1	24.4
2020	17.4	21.1	36.3	25.2

Source: U.S. Department of Commerce, U.S. Census Bureau.

Table 16—Projected U.S. population, percentage of population that is Black, and educational attainment

Age group (years)	Population	Blacks in population	Educational attainment		
			High school	Some college	College
	Millions	—————————————————*Percent*—————————————————			
2000	281.4	12.8	35.2	24.1	23.5
2005	294.0	13.1	34.5	24.8	24.2
2010	306.4	13.3	33.9	25.5	24.9
2015	319.1	13.6	33.2	26.3	25.7
2020	331.9	13.8	32.6	27.0	26.4

Source: U.S. Department of Commerce, U.S. Census Bureau.

Method of Projections Based on Diet-Health Knowledge and Tobit Models

Consumer demand for food commodities was projected to the year 2020 at 5-year intervals, beginning with the base year 2000. The projections were developed using knowledge about the existing structure of demand from the estimated Tobit expenditure models and the diet-health knowledge equation described earlier. The projections combine the projections of demographic characteristics of the U.S. population and projected income growth with the demand response parameters estimated for the per capita food expenditure and diet-health knowledge models.

In this report, we first simulated age, region, race, diet-health knowledge, and income separately. We then combined age, region, race, diet-health knowledge, and income to make a sixth projection. All six of these projections are per capita. We derived a seventh projection by taking the combined per capita projection and adjusting it by the projected U.S. population estimates. Income is assumed to increase 1 percent per year, which is slightly below historical growth rates but implies an increase in purchasing power of about 23 percent between 2000 and 2020.

We developed per capita projections by evaluating the estimated Tobit models using the average projected demographic characteristics of the population and the assumed annual growth rate for income. Several variables in the Tobit models do not directly enter into the projections and therefore were held constant in all projection scenarios. The dummy variable for 1998 was set equal to its mean value of 0.498. In addition, dummy variables for season were also set to their mean values. Household size was also held constant at its sample average. All variables in the diet-health knowledge equation were set equal to their mean values except those for educational attainment.

Because the Tobit model is nonlinear, the best measure of average expenditures would be developed by projecting expenditures for each possible household type (size, age composition, race, region, and income level) and computing a weighted average of expenditures using weights proportional to the number of households of each type. However, the detailed data required for such a procedure far exceed what is available. As a pragmatic alternative, we estimated average expenditures by evaluating the model for a typical consumer. Like the empirical simulations reported earlier, the diet-knowledge equation was first evaluated and an index value derived. This value was then recursively entered into the appropriate food expenditure equation. The projections are expressed as a percentage of the base year (2000) for ease of interpretation and to minimize any bias introduced by using population averages rather than the entire distribution.