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Diet Quality of Farm and Nonfarm Households in the First Half of the Twentieth Century: The Roles of Technological Change and Women's Work

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ABSTRACT

In recent decades, dramatic increases in Americans' obesity rates have led some nutrition activists to call for a return to the dietary norms of earlier times when homemakers spent more time in meal preparation. Using archival data from unique survey records gathered in Upstate New York in 1936 and 1952, we provide descriptive information on the quality of the diets using measures of the variety of foods served and a modified version of U.S. Department of Agriculture's Healthy Eating Index. Our multivariate analyses focus in on the relationships between diet quality and sociodemographics, homemakers' time use, and household technology. We conclude that the typical Upstate New York diet of the 1930s was not of high quality, but improvements had occurred by the early 1950s. Our multivariate analyses reveal that access to modern kitchen technology had a strong, positive association with diet quality while homemakers' time devoted to food-related activities was only weakly linked.

The upward trend in the fraction of American adults who are overweight or obese is one of the foremost public health concerns in the United States today. Between 1960–62 and 2011–12, adult obesity rates in the United States rose from 13.4 percent to 35.3 percent – a 263 percent increase (Fryar, Carroll, and Ogden 2015). This dramatic rise in Americans' weight sparked a growing interest in understanding how energy intake and energy expenditure patterns have changed over time. Food consumption studies done to date have focused on changes over some portion of the last four decades where nationally representative data are readily available (Guthrie, Lin, and Frazao 2002; Kant and Graubard 2006, Smith, Ng, and Popkin 2013; Zick and Stevens 2010). This was also an era in which the time use of married women changed dramatically and as a consequence it has led to research examining what role, if any, women's work has played in the decline in the American diet and the rise in obesity risk (Ben-Shalom 2010; Cutler, Glaeser, and Shapiro 2003; Gomis-Porqueras et al. 2011; Nayga 1996, Park and Capps Jr. 1997).

Insights about factors affecting Americans' diets can also be gleaned by looking further back in time. Indeed, popular author and food journalist, Michael Pollan, has argued that if Americans are to improve their diets, they should not "*eat* anything *your great-grandmother* wouldn't recognize as *food*" (Pollan 2008, p. 148). This food rule implies it could be insightful to trace dietary changes back in time at least 60 to 80 years if we are to understand how they may be underpinning America's obesity epidemic today. The importance of taking a longer historical view on the correlates of diet quality is echoed by nutritionists who have argued that dietary data gathered in the first half of the twentieth century "beg to be recycled into social and historical investigations" (Dirks and Duran 1998, p. 1253).

It is equally important to look beyond women's paid employment time for explanations of dietary change as the work in that domain has found little support for female employment effects (Ben-Shalom 2010; Cutler et al. 2003; Gomis-Porqueras et al. 2011). Other economic, technological, and sociodemographic factors have likely played important roles in dietary shifts. As an example, Cutler and his colleagues argue that mass food production innovations that reduced spoilage risk, preserved flavor, and decreased production costs led to dramatic increases in the availability of, and demand for, processed foods during the twentieth century. In turn, these processed foods have reduced the time costs of food-related activities in the home and promoted greater variety and more food consumption (Cutler et al. 2003).

Three research questions related to historical changes in the family diets are addressed in this study using unique time-use surveys of married women conducted in Upstate New York in 1936 and 1952. First, what did the diet in Upstate New York look like in the first half of the twentieth century? Second, what household factors were linked to the quality of diets during this era? Third, to what extent was homemakers'[1] paid employment and farm work time associated with diet quality? While the geographic constraints of the data limit the generalizability of our study findings, insights from our analyses help to contextualize the findings of diet quality analyses that span the past 40 years.

Background on Diet and Homemakers' Time Use

The Dietary Context

For most of the 1930s, there was approximately 3,300 calories available for consumption by Americans per day (Gortner 1975), which was in keeping with the dietary energy requirements of adult men and women in that era (Williams and Lockwood 1930). Over that decade, the percentage of calories in the American diet obtained from grains fell; the percentage obtained from fruits, vegetables, and meats remained relatively constant; and the percentages obtained from dairy, fats, and oils rose (Slattery and Randall 1988). Neither caloric availability nor diet quality was uniform across the population. Particularly noteworthy for the

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[1]We use the term homemakers to describe the study participants. Both surveys required that the respondent be the primary homemaker in the household, regardless of time spent in farm work and/or paid employment.

current study, researchers found that the diets of farm families were generally better than the diets of nonfarm families (Ziegelman and Coe 2016).

Some of the compositional shifts in diet observed in the 1930s continued through the early 1950s. While the overall availability of calories remained relatively constant (Gortner 1975), the percentage of calories in the American diet attributable to grains continued to fall and the percentage obtained from dairy, fats, and oils continued to rise.[2] But, there were also new trends as the percentage of calories coming from meat, fish, and poultry rose while the percentage of calories coming from fruits and vegetables fell (Slattery and Randall 1988). The relative cost of the American diet also shifted over this historical period. Food was approximately 35 percent of the Consumer Price Index (CPI) in the mid-1930s.[3] By the mid-1950s, food had become somewhat less dominant, dropping to approximately 28 percent of the CPI (Reed 2014).

Several features of the 1930s and 1950s make these eras particularly interesting times in which to examine the American diet. First, the early 1900s was a period where scientific research on nutrition and its impact on health was accumulating rapidly (Elias 2008; Mokyr 2000). U.S. Department of Agriculture (USDA) staff along with Agricultural Experiment Station researchers did much of this early work (Liston 1993; Swan 1986). For example, one study linked the intake of dairy products to dental health (Morey 1933) while others identified the importance of good nutrition for disease prevention (Moser 1935a; Stiebeling 1930). In the general area of diet and nutrition, there were 32 experiment station bulletins published between 1926 and 1930 (Dirks and Duran 1998). In the 1950s, the emphasis on nutrition, food storage, and time-saving food production strategies (e.g., meal planning) continued to grow (Moser 1953; Swan 1986). As an example, Cornell University Cooperative Extension published 18 extension bulletins focusing on food preparation and nutrition in 1950 alone (Biltekoff 2013).

Second, the first half of the twentieth century was an era when nutritional research began to be translated into "best practice" recommendations for individuals and families. Indeed, Mokyr (2000) identifies the advances in nutritional sciences and the dissemination of this new knowledge as one of the three scientific revolutions that altered women's housework in the early part of the twentieth century. In the 1930s, nutrition educators developed the first set of public dietary guidelines for adults (Davis and Saltos 1999). These guidelines were mindful of the economic constraints that households were facing during the Great Depression (Bureau of Home Economics 1930) and consequently, they emphasized how to purchase an adequate diet at a reasonable cost (Bureau of Home Economics 1930; Carpenter and Stiebeling 1936; Reed 2014; Williams and Lockwood 1930). At the same time, "corporate cookbooks" published by processed food and kitchen appliance manufacturers, and recipes published in women's magazines popularized the importance of precise measurement and expanded the homemakers' range of

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[2]Indeed, a review of more than 170 food intake studies conducted between 1920 and 1984 found that fat intake in the American diet as a percent of calories peaked at around 40 percent in the 1950s and early 1960s (Slattery and Randall 1988).

[3]For farm families, food costs would have been a smaller fraction of their total expenditures as research reveals that they grew much of the food they consumed (Cannon 1931; Moser 1935a).

food preparation options. Access to the new, exotic ingredients described in these recipes was assured by improvements in preservation (cold storage) and transportation (trucking) (Elias 2017).

In 1941, the first recommended dietary allowances (RDAs) were developed by the Food and Nutrition Board of the National Academy of Sciences (Biltekoff 2013; Welsh, Davis, and Shaw 1992). That was followed by the release of "The Basic 7" dietary guidelines in 1943. These guidelines were developed to help American families deal with the food shortages during World War II. They recommended that Americans eat something from each of the following food groups every day: (1) green and yellow vegetables; (2) oranges, tomatoes, and grapefruit; (3) potatoes and other vegetables and fruits; (4) milk and milk products; (5) meat, poultry, fish, or eggs; (6) bread, flour, and cereals; and (7) butter and fortified margarine (Biltekoff 2013; Welsh et al. 1992).[4] After the war, researchers observed that cardiovascular disease rates had declined presumably because Americans had changed their eating habits in response to food shortages during the war. This observation spurred additional research and led experts to translate the research findings into educational materials designed to motivate more healthful eating (Goldberg 1992). Taken in total, these educational efforts suggest that the average homemaker in 1930s and 1950s was likely aware of the link between a good diet and health.

Finally, the 1930s and 1950s were eras where new household technologies were revolutionizing food preservation and lessening the link between seasonality and diet. Key to the technological revolution was the electrification of rural homes sparked by the creation of the Rural Electrification Administration in 1935 (Nesheim 1986). In 1930, approximately 60 percent of American households had electricity, but by 1940, 79 percent had electric lights (Bryant 1986; Greenwood, Seshadri, and Yorukoglu 2005; Lebergott 2014; Vanek 1974). Electrification continued to climb to more than 90 percent of all homes by 1950. Given these statistics, it is not surprising that fewer than 7 percent of households had an electric refrigerator in 1930, but by 1950, that figure had risen to more than 90 percent (Bryant 1986). Similarly, one study found that only 5 percent of farm families cooked with an electric or gas stove in the late 1920s (Wilson 1929), but a little more than 20 years later, that percentage had grown to 80 percent (Wiegand 1954). Thus, the 1930s was a time of rapid adoption of new technology focused on easing the burden of cooking and food preservation. By the 1950s, the electrification of households coupled with the postwar economic boom, transformed American kitchen technology, as refrigerators with freezers, electric appliances, and even automatic dishwashers entered the scene (Lewis 2014). The 1930s to 1950s was clearly an era of rapid technical change within the American kitchen.

Collectively, these forces may have provided homemakers with an increased awareness of the importance of diet quality while altering the efficiency of meal production. Whether these factors translated into actions that affected diet quality remains an open question, however.

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[4]By 1956, the USDA had revised the Basic 7 recommendations to "The Basic 4" to reduce the complexity of dietary recommendations. These latter guidelines urged individuals to eat the following every day: (1) two or more servings of protein; (2) four or more servings of cereal products; (3) four or more services of fruits and vegetables; and (4) at least one serving of dairy products (Welsh et al., 1992).

Married Women's Time Use

With funding from the 1925 Purnell Act, experiment stations began to support studies of homemakers' time use (Vanek 1974). These studies focused primarily on married women's housework activities because of the view that their homemaking activities were central to the quality of family life and because married women's labor force participation rate was 5.6 percent in 1920 and had climbed to only about 13 percent by 1940 (Roberts 2003). For home economists in this era, research targeting homemaking efficiency, whether it was meal production or laundry and care of clothing, often began by studying homemakers' time use and housework habits. This work utilized scientific principles to analyze household tasks with the goal of improving homemaking efficiency.

A review of the early time-use studies reveals that total housework averaged between 47 and 56.5 hours per week. Farm wives additionally averaged 9 to 11 hours per week doing farm work (Ramey 2009). The largest component of housework in this era was food preparation, baking, and the associated cleanup activities. Bryant (1996) disaggregated homemakers' housework time from surveys conducted from 1924 to 1931. He found that homemakers residing in rural farm families averaged 3.36 hours per day in food-related activities, which was 43 percent of their total housework time. In contrast, homemakers living in large cities averaged only 2.32 hours per day in food-related work, but this was still approximately 35 percent of their total housework time on average (Bryant 1996). An often-cited 1929 Oregon experiment station bulletin reported that the typical farm homemaker in Oregon devoted 3.5 hours per day to food-related activities, which was almost half of all her housework time (Wilson 1929). Similarly, a South Carolina Experiment Station Bulletin that reported on a survey of white and black homemakers living on farms in 1932 noted that white homemakers averaged slightly more than 3 hours per day in food-related activities, while black homemakers averaged 2.26 hours per day (Moser 1935b).[5] Time devoted to food preparation, baking, and cleanup was clearly a major part of the typical woman's daily routine in the 1930s.

Studies of homemakers' time in the 1950s are rare. One historical study using data from 1953[6] noted that the rural homemakers averaged approximately 53 hours per week in housework, with 19 of those hours (36 percent) devoted to food preparation (and presumably cleanup) (Vanek 1974). Nineteen hours per week translates into approximately 2.7 hours per day spent in food-related activities, a decline of roughly .66 hours per day (19 percent) from the 3.36 hours Bryant estimated rural homemakers to have spent in food-related activities in the late 1920s and early 1930s.

Clearly, women were spending large amounts of time in food-related activities in the 1930s and the 1950s, but the time-use trend already appears to have been downward. What did Upstate New York diets look like in this era when almost all meals were eaten at home? Was time spent in meal preparation a factor in diet quality?

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[5]In all these early studies, it is also noted that others, especially minor children if present, typically helped with meal preparation and cleanup.

[6]The source of the 1953 data is not provided in Vanek (1974). She may be referring to the data used in the current analyses, although Elizabeth Wiegand's data collection was done in the spring of 1952 (Wiegand 1954), not 1953.

What role, if any, did kitchen technology play? These are questions we address in the analysis that follows.

Methods

The Household Production Model

In recent years, economists have used household production models (Becker 1965, 1991) to generate and test hypotheses regarding food-related time use (Cawley 2004; Hamermesh 2010, 2008, 2007) and we follow this lead. Two insights are gained from using a household production lens. First, the food-related technology that is available to the homemaker should affect the total price associated with purchasing a diet that is high in variety and/or diet quality. Any technical positive change in the equipment will likely translate into increased demand for diet variety/quality (Swan 1986). Thus, we hypothesize that the presence of more advanced diet-related technology in the home (e.g., an electric refrigerator rather than an icebox) will be associated with greater dietary variety and/or diet quality, holding other factors constant.

The second insight we gain from this model is that the technical relationships between production inputs and the production outputs may affect the demand for time spent in food-related activities along with preferences, technology, prices, and income. Simultaneously, choices about time use may affect the production of household commodities, including diet quality/variety.[7] Thus, to test the hypothesis that food-related time affects diet quality, one should ideally estimate the homemaker's time spent in food-related activities simultaneously with the structural production function. Key to estimating a model that allows for simultaneity is identifying variables that affect the household's utility function that do not affect the technical relationships of the household's food production. Fortunately, the two data sets used in the empirical work include several variables that help with this identification issue.

While our model allows only the homemaker's food-related time to be endogenous with diet quality, we also recognize that the food-related time use of others in the household may be important. We view the food-related time of household helpers (e.g., children washing dishes, a mother or mother-in-law helping with meal preparation) to be exogenous factors that may affect the homemaker's preferences for how she allocates her time. Essentially, we view the homemaker to be the decision maker regarding diet and she adjusts her time use accordingly in light of the help that is available from others in the household.

The 1936 Warren Survey Data

The data used to test our model come from two historical time-use studies. A Cornell University Home Economics PhD student, Jean Warren, undertook the first survey in the spring of 1936. In a subsequent publication, Warren notes that while prior studies of homemakers' time use had been done, "little information is available

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[7]It may be that homemakers who have a strong preference for a healthy diet also have a preference to spend more time in food-related activities. These unobserved preferences may also be a source of simultaneous equations bias.

as yet on causes of variation in the amount of time spent on certain tasks" (Warren 1940). Thus, her goal was to shed light on how homemakers' time use varied by a range of individual and family characteristics. She sampled homemakers living on farms in Genesee County, New York. Three areas within Genesee County were chosen because of they were "good farming areas" and three were chosen because they were "poorer areas" (Warren 1940). There were 1,030 homes visited by enumerators. Of those, 762 met the requirements of actively farming land that they owned or rented, 551 agreed to participate, and 502 had complete records (Warren 1940).

The nine-page survey instrument asked questions about a variety of topics including: (1) the sociodemographic composition of the household and its financial wealth, (2) the presence or absence of certain household technologies (e.g., electric lighting), (3) proximity of market-related substitutes and complements (e.g., distance to the nearest grocery store), and (4) selected housework outputs (e.g., amount of clothing laundered, loaves of bread baked). Most important for the current study, homemakers were asked about the time they spent in various activities yesterday and the time spent by "helpers" in these same activities.[8] All interviews were conducted on Tuesdays through Saturdays and thus the reference day for time-use questions and foods prepared was always a weekday. Questions were also asked about time spent in various homemaking activities on Sundays and their typical time use over the course of a week excluding Sunday. These responses were aggregated to arrive at total weekly time use in the various categories (Warren 1936). For the current analyses, we use the homemaker's responses regarding how she spent her time over the previous 24 hours rather than over the week for two reasons. First, information about the household meals is measured over the same prior 24-hour period, which means that the homemaker's time-use choices are coterminous with the meal information. This is important for the estimation of the production functions. Second, it makes our measure of time use consistent with the way time was measured in the 1952 survey and thus it enhances our ability to make comparisons across the two data sets.

In the case of food-related activities, the 1936 homemakers were explicitly asked about time spent preparing foods and cleaning up dishes after breakfast, the noonday meal,[9] and supper. While grocery shopping, baking, and food preservation (e.g., canning) are also time inputs in the production of a healthy diet, they are not included in our measures of food-related time use in 1936 or 1952.

Our reasons for omitting grocery shopping, baking, and food preservation from our daily measure of the homemaker's food-related time use are part conceptual and part practical. On a conceptual level, these activities are typically *not* done daily.

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[8]The survey instrument included explicit questions about time spent in core homemaking activities (e.g., meal preparation and cleanup, laundry-related activities, general housekeeping) and the enumerator also asked the homemaker about time spent in other tasks yesterday, on Sunday, and over the course of the past seven days. The enumerator then tallied and recorded the total minutes reported over the past 24 hours. The total mean minutes is 1439, the median is 1440 minutes, and the standard deviation is 52 minutes. Thus, the homemakers' average total time is consistent with the fact that there are only 1,440 minutes in a day. However, there is clearly random measurement error in the 1936 time-use data because there was no requirement that the reported times sum to 1,440.

[9]In the 1936 survey, *dinner* was the term used for the noonday meal. In the 1952 survey, *lunch* was the term used for the same meal. To avoid confusion, we refer to both as the *noonday meal*.

And, when they are done, the products that are produced (e.g., loaves of bread, cookies, canned vegetables, meat purchased at a grocery store) are consumed over a longer period than a single day.[10] Thus, conceptually they are predetermined factors that may affect diet quality rather than time-use choices that are made contemporaneously with a specific meal.

On a practical level, while the 1936 survey contains information on baking time, which we use as an exogenous covariate in our estimating models, homemakers were not asked about food preservation or grocery shopping time. In the case of food preservation, this may be because it was a seasonal activity that rarely occurred in the spring (when the 1936 interviews took place). The absence of a question about time devoted to grocery shopping suggests that it was not considered a basic house-keeping task for homemakers living on farms in Upstate New York in 1936. Some survey respondents (i.e., less than 25 percent) listed "going to town" or "shopping" in the section of the survey where they reported on time spent in unlisted tasks, but one cannot ascertain from these broad categories how much time spent "going to town" or "shopping" was devoted to grocery shopping. Thus, in the end, we utilize only baking time in the 1936 analysis.

Other questions in the 1936 survey instrument focused on the number of dishes prepared and the number of people who ate that meal. Although it had not been originally been part of the survey design, the enumerator *usually* hand wrote the foods that were served at each meal next to the question that asked about the number of dishes prepared.

The 1952 Wiegand Survey Data

The second survey was undertaken in the spring of 1952 by a PhD student, Elizabeth Wiegand, who worked under the supervision of then Cornell faculty member, Professor Jean Warren. The goal of her dissertation was to gain an understanding of "the reasons why certain homemakers accomplish more than others." The married women who were surveyed in this study were drawn from three targeted groups: (1) homemakers living on farms, (2) full-time homemakers living in an urban area, and (3) employed homemakers who also lived in an urban area. Like the 1936 survey, the sample of farm wives lived in Genesee County and, indeed, 27 of them had participated in the 1936 survey (Wiegand 1954). The nonfarm sample (i.e., some full-time homemakers and all employed homemakers) resided in Auburn, NY. To be eligible to participate in the survey, a woman had to be married, speak English, and live in a home where there was only one head of household (i.e., there could not be two married couples living in the same structure). In addition, in the case of the farm wives, their husbands' primary occupation had to be farming (Wiegand 1954). No information on the number of homemakers sampled or their cooperation rates were reported by Wiegand. What we know is that 250 married

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[10]For example, one respondent in the 1936 survey reported spending three hours per week baking and her baking activities generated three dozen cookies, five loaves of bread, and one cake. None of this baking was done on the diary day and, in all likelihood, the products she produced were consumed over the course of the entire week.

women completed the interviews. Ninety-five lived on a farm and 155 were residents of Auburn, NY. Of those living in Auburn, 104 were full-time homemakers who worked less than 15 hours per week, and 51 were homemakers who also worked outside the home for pay (Wiegand 1954).

As in the 1936 survey, interviews were done on Tuesdays through Saturdays so that time-use reports for the prior day focused exclusively on weekdays. Unlike the 1936 survey, diary reports had to sum to 1,440 minutes – accounting for all time spent the previous day. The questionnaire also contained time-diary questions for Saturday and Sunday. Unfortunately, these diary questions were blank on the vast majority of survey records. Thus, in the case of the 1952 data, we only have time-diary reports for a single weekday. This is comparable, however, to the timeframe for the 1936 time-use reports used here. The questions asked in the seven-page 1952 survey instrument focused on: (1) the respondent's time use over the previous day; (2) time devoted to specific activities by family member "helpers" on that day; (3) technology that was available for use in housework activities (e.g., refrigerators with freezers), attitudes about housework; (4) the dishes prepared for all meals eaten at home on that day; and (5) sociodemographic characteristics of the family.

Like the 1936 survey, food-related time use in the 1952 data is measured by summing the homemaker's time spent in food preparation and cleanup/dishwashing on the diary day. Mirroring the 1936 survey, this measure omits food preservation, grocery shopping, and baking time. Although questions were asked about time devoted to food preservation in 1952, only eight respondents report spending any time in food preservation. Given this very limited count and the fact that the preservation output produced would likely have been consumed over a relatively long period, we chose to not count food preservation time in our measure of time use.

In the 1952 survey instrument, there is a time-use category labeled "marketing and account-keeping" but as with the 1936 survey instrument, we cannot tease out grocery shopping from this broad category. Moreover, because the respondent's reports are limited to the prior day, 64 percent of the respondents indicated that no time spent in this category. The 1952 survey instrument does not contain any question about baking time.

The Samples

The Kroch Library's Division of Rare and Manuscript Collections at Cornell University holds the original 1936 and 1952 surveys (Warren 1936; Wiegand 1952). PDF copies of all the surveys were purchased and data were entered in Microsoft Excel documents. Food dishes prepared are included in the data entry as written. In addition, two quantitative measures of diet quality were derived from the written food records.

The first measure is simply a count of the variety of foods eaten over the course of the day. For example, if a homemaker reported preparing oatmeal and orange juice for breakfast; boiled potatoes, parsnips, fish, and pie for the noonday meal; and then leftover fish and boiled potatoes for supper, the total count for variety would be six items, as the leftover fish and potatoes eaten at supper were not counted again.

The second measure of diet quality is derived from the USDA's 1995 Healthy Eating Index (HEI). We base our measure on the 1995 HEI rather than later

versions because it is less complicated and thus fits well with our somewhat limited dietary information.[11] This index is modified to focus on only the first 5 of the 10 components in the 1995 HEI, as we do not have information on items such as cholesterol or sodium intake. Thus, our scale goes from 0 to 50 rather than 0 to 100, with higher scores indicating more healthy offerings. It should also be noted that the data in these two surveys captures what was offered at meals rather than what was eaten (see the Appendix for further details on the HEI).

In the case of the 1936 surveys, The Kroch Library had 499 of the original 502 surveys in its holdings. For the analyses that follow, observations are omitted from the sample of 499 homemakers if the survey was missing information on (1) the food dishes prepared for two or three of the meals eaten over the course of the day (N = 49), or (2) covariates used in the model (N = 8). Thus, the final sample size for the 1936 survey was 442. The Kroch Library contains all 250 original 1952 surveys. Two observations are eliminated from the current analyses because of missing data on two out of the three meals served the previous day, making the final sample size for the 1952 survey 248.

The 1936 and 1952 surveys provide several advantages for our empirical work. They allow us to do comparative analyses in an era where we know very little about the relationship between diet quality, time use, kitchen technology, and family demographics. At the same time, it was also an era when the use of prepared foods in meals served at home was limited and families rarely ate meals away from home.[12] In addition, both surveys were conducted in Upstate New York in the spring of the year using face-to-face interviews where homemakers were asked about how they had allocated their time on the prior weekday. Thus, any differences we observe are less likely to be attributable to geographic, seasonal, or survey mode effects that could alter respondents' time-use and/or diet reports.

The reader should be mindful, however, of some important differences across the two survey instruments. First, while both surveys asked the homemakers to report on their time use, the 1936 survey did not require that all reported uses of time sum to 1,440 minutes, while the 1952 survey did impose this constraint. On average homemakers' reported time summed to 1,439 minutes per day in the 1936 data, suggesting that reporting errors were likely random. This random error will reduce the precision of the 1936 estimates.[13] Second, sociodemographic questions asked in the two surveys differed somewhat. For example, the 1936 survey instrument included questions about the respondent's educational attainment while the 1952 survey did not. This means that we are limited in the set of independent variables we can control for in the comparative analyses. Finally, the smaller 1952 sample may be somewhat underpowered for statistical analyses relative to the larger 1936 sample.

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[11]For example, the 1995 HEI counts number of grain servings eaten over the course of a day while the HEI-2010 counts "whole grains" and "refined grains" separately (Guenther et al., 2013). The more nuanced detail required to use the HEI-2010 does not exist in either the 1936 or the 1952 data sets.

[12]The first McDonald's franchise, perhaps viewed as the beginning of the trend toward families eating "food away from home," was opened in 1955 (Peterson 2017).

[13]See footnote 8 for further details.

Empirical Models

The system of equations that embodies the hypotheses generated from the household production model is as follows:

$$T_f = t(P, I; Z_f) + e_f \qquad (1)$$

$$D = d(T_f, X_f; G_f) + e_d \qquad (2)$$

where T_f is the time the homemaker spends in food-related activities, P is a vector of market prices, I is household income, Z_f is a vector of predetermined preference shifters that are posited to alter the homemaker's time use, D is the measure of household diet, X_f is the vector of nontime inputs that go in to the diet production function, G_f is a predetermined vector of food-related production technologies in the home, and e_f and e_d are the equations' respective error terms. If we substitute the determinants of D in equation (2) into equation (1), then we see that T_f is a linear function of e_d and hence is correlated with e_d, suggesting that the OLS estimates of equation (2) will be biased.

For both samples, we estimate three different multivariate models with our two different measures of diet quality. First, we estimate a model where the homemaker's time spent in food-related activities is exogenous to diet variety/quality. Second, we estimate an instrumental variables model that allows for the possibility that that time use and diet variety/quality causality run in both directions. In the final formulation, we estimate reduced form models of diet variety/quality. In this last formulation, diet quality is estimated as a function of the technological and other strictly exogenous factors that are posited to affect time use (Greene 1993). Essentially, these latter two approaches assume the hypothesis that time use and diet variety/quality are simultaneously determined is true.

The first step in identifying a preferred model is undertaking tests using the Wu-Hausman *F-statistic* that tests for endogeneity (Baum, Schaffer, and Stillman 2003). Interestingly, the Wu-Hausman tests disclose that for the 1952 data neither the number of different foods served nor the HEI is endogenous with the homemakers' time spent in food-related activities, with *F-statistics* of 0.11 ($p = .87$) and 0.31 ($p = .58$) respectively. Similarly, we find no evidence of endogeneity in the 1936 data as the *F-statistics* associated with the number of different foods (F = .55, $p = .46$) and the HEI (F = .02, $p = .90$) are both insignificant. Consequently, we focus on the OLS estimates in our results section. The instrumental variables and reduced form results appear in the Appendix.

The empirical models are estimated using SAS 9.4 and Stata 13.0. Tests for multicollinearity reveal no issues among the independent variables as assessed by the collinearity diagnostics in SAS.

Results

Descriptive Results

Table 1 presents descriptive information for the two samples of Upstate New York homemakers organized by the groupings described in equations (1) and (2). A third column that presents descriptive information for the subsample of 1952 farm families is also included in the table. We do this to gain some understanding of whether

Table 1. Descriptive statistics for the 1936 and 1952 surveys

Variable	Proportion or Mean (SD)		
	1936 Survey	1952 Survey	1952 Subsample of Farm Families
Dependent Variables			
Homemaker's Hours Spent in Food-Related Activities on Diary Day	2.70 (0.93)	2.54 (1.07)	2.87 (1.07)
Number of Different Foods Prepared for Meals[a]	7.13 (2.32)	12.80 (5.60)	12.79 (2.54)
Modified Healthy Eating Index (range 0–50)[a]	23.25 (5.89)	36.8 (7.54)	38.25 (7.41)
Food-Related Price Input Proxy Measures			
Homemaker Has a Driver License (1 = yes)	0.48	0.66	0.71
Resides in Town[b] (1 = yes)	0.0	0.62	0.0
Interview Took Place in May or June[c] (1 = yes)	0.17	0.54	0.0
Grocery Store Less than 2 Miles Away (1 = yes)	0.33	—[d]	—[d]
Baker's Wagon Comes to Door (1 = yes)	0.77	—[d]	—[d]
Dairy Farm (1 = yes)	0.24	—[d]	—[d]
Homemaker's Hours of Paid Work Diary Day	0.0	1.51 (3.23)[e]	0.0
Homemaker Works on Farm > 2 Hrs/Day	0.16	0.08	0.20
Income Proxy Measures			
Financial Wealth in Lowest Survey Quartile (1 = yes)	0.26	—[d]	—[d]
Number of Rooms in the Home	9.89 (2.71)	7.65 (2.26)	9.15
Production Technology Measures			
Electric Lights (1 = yes)	0.69	1.00	1.00
Refrigerator (1 = yes)	0.13	1.00	1.00
Refrigerator with Freezer (1 = yes)	—[d]	0.38	0.84
Multiple Cooking Fuels (1 = yes)	0.32	—[d]	—[d]
Kitchen Sink with a Drain (1 = yes)	0.86	1.00	1.00
Electric Mixer (1 = yes)	—[d]	0.73	0.74
Pressure Cooker (1 = yes)	—[d]	0.52	0.48
Homemaker Age > 40 (1 = yes)	0.68	0.55	.62
Homemaker's Education > 12 yrs (1 = yes)	0.24	—[d]	—[d]
Time Use Preference Shifters			
Hrs. Spent in Food-Related Activities by Other Family Members on the Diary Day	0.72 (1.02)	0.35 (0.62)	0.43 (0.82)
Baking Time 3+ Hrs./Wk (1 = yes)	0.41	—[d]	—[d]

Table 1. (*Continued*)

Variable	Proportion or Mean (SD)		
	1936 Survey	1952 Survey	1952 Subsample of Farm Families
Number of Minor Children	1.65 (1.78)	1.67 (1.42)	2.01 (1.58)
Adult(s) Other than Homemaker/Spouse Live in Home (1 = yes)	0.53	0.19	0.32
Missing Meal Information			
Missing Breakfast Data (1 = yes)	0.03	0.0	0.0
Missing Noonday Meal Data (1 = yes)	0.10	0.09	0.02
Missing Supper Data (1 = yes)	0.08	0.03	0.02
N	442	248	94

[a]When the 1936 observations where there is missing data for one meal are excluded, the mean number of different foods prepared increases from 7.13 to 7.51. Likewise, the modified HEI increases from 23.3 to 24.2, on average. When the 1952 observations where there is missing data for one meal are excluded the mean number of different foods prepared decreases from 12.80 to 12.46, and the mean HEI increases from 36.8 to 38.0.
[b]All nonfarm homemakers lived in Auburn, NY. Fifty-one of these women were employed while the remaining 104 were full-time homemakers. Thus, the 1952 multivariate models exclude this residential indicator because of collinearity issues between residing in town and employment status.
[c]For the 1936 study, all surveys were completed in March, April, or May. For the 1952 study, surveys were completed in March, April, May, and June. Consequently, this dummy variable takes on a value of 1 for the 1936 respondents if the survey was completed in May (N = 74). For the 1952 respondents, "1" reflects a survey completed in either May (N = 123) or June (N = 11).
[d]Data not available in the survey.
[e]For the subsample of women who were employed outside of the home, the nonzero mean was 7.34 hrs/day with a standard deviation of 2.81 (N = 51).

observed differences are simply a function of comparing a sample of homemakers who all lived on farms in 1936 to a sample that contained both homemakers living on farms and homemakers living in town in 1952.

Focus first on the time homemakers spent in food-related activities. Table 1 suggests that homemakers' meal preparation and cleanup/dishwashing time in Upstate New York changed very little over this 16-year period as measured by these one-day records. Moreover, our 1936 means are approximately 40 minutes per day less than the means reported by Bryant (1996) who likely included baking time in his estimates.[14] They are consistent with the means reported for food preparation and dishwashing/cleanup by Warren (1940) if one focuses only on the weekday columns and excludes baking time. To the extent that past research has shown a decline in food preparation time over this same period (Gershuny and Harms 2016; Vanek 1974), our work suggests that this observed decline may be attributable to (1) differences in the time-use measures (e.g., one 24-hour recall vs. an average over the course of a week), and/or (2) a decline in homemakers' time devoted to baking.

While homemakers' food preparation and cleanup time changed little over this 16-year period, the number of different foods offered at meals over the course of the

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[14]When we generate the daily mean for the homemaker's food-related time use over the week and include baking time, we get 3.32 hrs., a figure that mirrors both Bryant's (1996) and Warren's (1940) descriptive work.

day grew by approximately 80 percent and the quality of the diet, as captured by the HEI, rose by 66.5 percent on average.[15] In the 1952 sample, on average, almost 13 different foods were served over the course of the day and the mean HEI was 36.8. As a point of comparison, in 1994–96, the mean five-item HEI was 32.6 (Bowman et al. 1998). It should also be noted that these differences between 1936 and 1952 hold when we focus on the 1952 subsample of farm families as well. This suggests that the dietary changes observed are unlikely to be attributable to the differences in farm/nonfarm sample composition across the two surveys.

Our proxy measures for food input and time-related prices reveal that between 1936 and 1952, married women in Upstate New York were more likely to have a driver license, which may reduce their time costs of securing processed foods. A larger number of the respondents in the 1952 survey were interviewed in May or June when spring crops in vegetable gardens would also likely reduce the costs of creating a healthy diet. The nature of the sampling differences across the two surveys ensures that there are differences in their probability of working on farm more than two hours per day. Both farm work and paid employment serve to alter the time available for homemakers to engage in food-related activities. For the 1936 respondents only, more than three-quarters of the women reported regular visits from a baker's wagon, while a little more than one-fifth lived on a dairy farm and one-third had a grocery store that was less than two miles away. We posit that these latter three variables may serve to reduce the time costs associated with producing a healthy diet.

Perhaps the least surprising, but most striking differences relate to the differences in meal production technologies across the two surveys. For example, in 1936, only 69 percent of the homemakers surveyed had electricity in their homes, but by 1952, that figure had risen to 100 percent. Likewise, only 13 percent of the 1936 sample had a refrigerator in their kitchen, while 100 percent had a refrigerator in 1952 and more than one-third had a freezer either as part of their refrigerator or as a separate piece of kitchen technology. The homemaker's age and education (1936 only) are included in the grouping of production technology measures as they represent the homemaker's dietary related human capital. As such, we hypothesize that homemakers with more education will produce a higher quality diet than those with less education. The sign prediction for the homemaker's age is less clear as older homemakers may have more food-related experience but they also may have had less exposure to the importance of a nutritious diet given that many of them – especially in the 1936 survey – began their homemaking careers prior to the growth in public health nutrition information. More than two-thirds of the homemakers in the 1936 sample are over age 40 while only 55 percent of the 1952 sample are above age 40. One in four homemakers in 1936 had graduated from high school. Unfortunately, an educational attainment question was not included in the 1952 survey instrument.

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[15]Since the 1936 survey relied on the enumerators' handwritten notes about foods served at meals, we undertook face validity checks by turning to work by Morey (1933). She undertook a study in 1928 of 208 farm families in Upstate New York, where the homemaker provided information regarding foods eaten the previous day. She scored the quality of these families' diets on a 20-point scale and found that the most frequent diet scores were in the 9–11 range (see Morey's table 14). This is very similar to our assessment using the USDA's healthy eating index as applied to the 1936 data where the maximum score is 50 and our average score is 23.3.

Table 2. Counts of types of foods served at meals in the 1936 and 1952 surveys

Number of…	1936 Data				1952 Data			
	Mean	Percent Nonzero	Nonzero Mean	Range	Mean	Percent Nonzero	Nonzero Mean	Range
Fruits	0.32	26.02	1.23	0–3	2.02	91.90	2.20	0–6
Vegetables[a]	1.07	71.13	1.49	0–4	2.19	94.33	2.33	0–6
Potatoes	1.93	96.71	2.00	0–3	0.96	69.11	1.38	0–4
Grains	1.57	91.63	1.71	0–4	4.16	99.19	4.19	0–11
Proteins[b]	2.59	98.19	2.64	0–7	4.79	100.00	4.79	1–13

[a]Counts exclude potatoes.
[b]Counts include meat, fish, eggs, beans, cheese, and milk.

We next turn to the four time-use preference shifters. These variables were selected because we hypothesize that they are associated with homemaker's food-related time but not the quality of the diet. Time spent by other family members in food-related activities in Upstate New York averaged almost 45 minutes per day in 1936 but declined to an average of about 20 minutes per day by 1952.[16] The most prominent demographic difference is the decline in the percentage of respondents who had an adult other than the homemaker or spouse living with them in 1952 compared to 1936. In contrast, there was virtually no difference across the two samples in the number of minor children present. Despite the fact that these are not nationally representative samples, this similarity in mean number of children is still somewhat surprising given that 1952 is in the middle of the birth years for the baby boomers.

Finally, at the bottom of table 1, we note the fraction of respondents who had missing information for a particular meal. Recall that observations with two or more meals missing are deleted from these samples. In both the 1936 and 1952 data, the noonday meal is most likely to have missing data while breakfast is the least likely meal to have missing data.

Table 2 presents detailed information about the foods served at breakfast, the noonday meal, and supper by the homemaker. In the 1936 survey, only about one in four homemakers had served any fruit as part of a meal. This may reflect the seasonality of their diets as the 1936 interviews were conducted in March, April, and May when fresh fruits would have been in very limited supply. Approximately 28 percent of the homemakers served no vegetables, excluding potatoes, over the course of the three meals. In contrast, grains were commonly served at least once during the day while potatoes and proteins were served twice during the day on average in almost all households.

Turning to the 1952 dietary information contained in table 2, we see that both fruits and vegetables were served, on average, twice during the day in more than

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[16]While one might think that the time of others should be related to diet quality, most of the helping time was devoted to cleanup activities rather than meal preparation (e.g., on average 13 minutes of the 20 minutes is devoted to dishwashing in 1952).
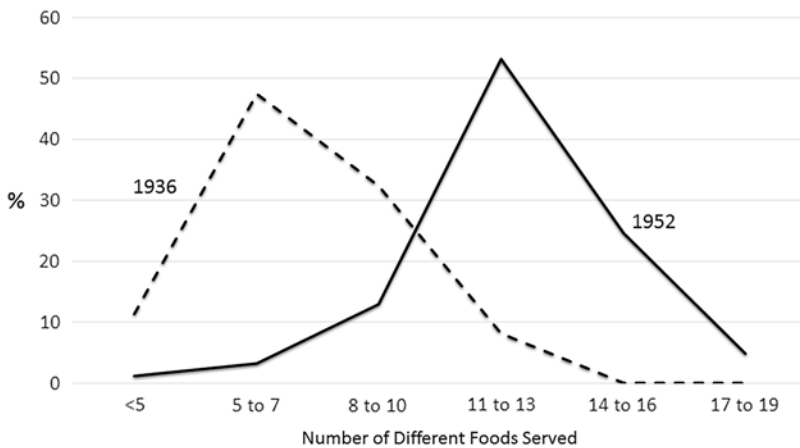
Figure 1. Frequency distribution of the number of different foods served.

90 percent of the households surveyed. Grains and proteins were each served, on average, more than four times during the day. The one type of food that appears to have declined in serving frequency over the 16 years is potatoes. In the 1952 survey, more than 30 percent of the homemakers reported serving no dishes that included potatoes, and among those who did serve potatoes, the nonzero mean was 1.38, while in 1936 it was 2.01. The relatively greater frequency of fruits, vegetables, grains, and proteins in 1952, along with the decline in the relative frequency of potatoes, are the source of the shift in the overall distribution of both the variety of foods served and the HEI that are depicted in figures 1 and 2. While our observation of an increase in fruits, vegetables, and proteins is consistent with other work, the increase in grains is not (Slattery and Randall 1988).[17]

Multivariate Results

Tables 3 and 4 show the 1936 and 1952 OLS results for the homemaker's food-related time-use equations along with the two diet-quality equations where the number of different foods served and HEI are the dependent measures. Focus first on the time-use regressions.

We observe some evidence of proxy price effects in both years. Specifically, if the homemaker has a driver license, she spends less time in food preparation and cleanup activities in both years. This supports the argument that a driver license may reduce the time costs of securing processed foods that, in turn, reduce food preparation and cleanup time. We also observe that farm work crowds out food-related time use for those 1936 homemakers who work more than two hours per

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[17]Slattery and Randall (1988) report that grains, as a percentage of calories contributed by major food groups, declined from the early 1900s through 1970. Our counterdescriptive information may be a function of the fact that we are counting the number of grains served over the course of the day while Slattery and Randall are looking at consumption data. Our data do not allow us to ascertain how many servings of a specific food were consumed.
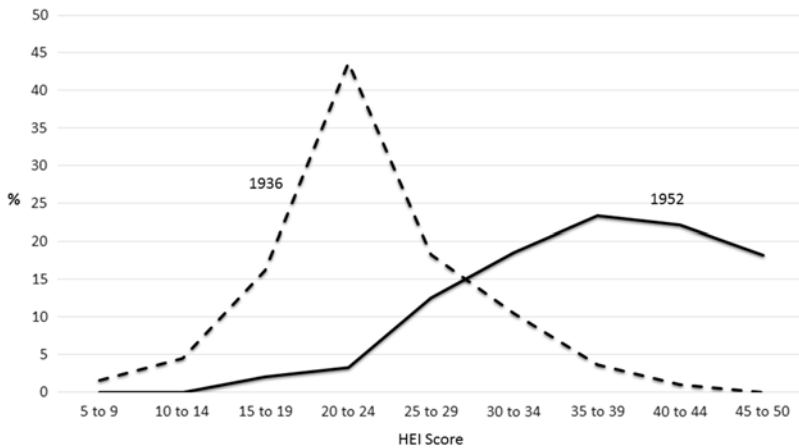
Figure 2. HEI frequency distribution.

day on the farm. In contrast, in 1952, there is no significant relationship between farm work and homemakers' food-related time. However, we observe a small, marginally significant crowding-out effect of time spent in paid employment in 1952. The estimated coefficient suggests that a homemaker who works eight hours per day for pay spends approximately 14 minutes less in food-related activities compared to an otherwise comparable homemaker who does not work outside the home for pay.

While financial wealth is unrelated to homemakers' food-related time use in 1936, the number of rooms in the house is positively linked to her food time, although the effect size is quite modest. In 1952, number of rooms is unrelated to homemakers' food time.

We observe limited evidence that our technical measures of the diet production process impact homemakers' time spent in food preparation and cleanup. In 1936, homemakers whose houses had electric lights spent about 17 more minutes per day (i.e., .28hrs*60min/hr) in food-related activities. Those who had a sink with a drain in their kitchen spent 15 minutes less, holding other factors constant. In 1952, only the presence of a pressure cooker is linked to homemakers' food-related time, and then the relationship is tentative.

Finally, as hypothesized, our preference shifters are consistently linked to homemakers' time use in both years. For every hour of food-related help the homemaker has in 1936, she reduced her food-related time by approximately 23 minutes. And, the estimated relationship is very similar in 1952 with a reduction of about 25 minutes of the homemaker's food-related time for every hour of help received. Likewise, if household members, in total, spend more than three hours per week baking in 1936, the homemaker spends significantly less time in food preparation and cleanup. In contrast, an increase in the number of children in the home and the presence of other adults (beyond the homemaker and spouse) serve to increase the homemaker's time in food preparation and cleanup significantly in both years.

Turning to the diet quality equations, the estimates indicate that a homemaker's time spent in food-related activities is associated with greater variety in foods served

Table 3. 1936 OLS homemaker's food time and diet quality parameter estimates (t ratios in parentheses)

Independent Variables	Homemaker's Hrs/Day Spent in Food-Related Activities	Number of Different Foods Prepared for Meals	Modified Healthy Eating Index
Intercept	2.74 (11.73)**	5.55 (8.83)**	21.55 (13.01)**
Homemaker's Hours Spent in Food-Related Activities on Diary Day	—	0.25 (2.20)**	0.52 (1.74)*
Homemaker Has a Driver License	−0.15 (−1.72)*	−0.32 (−1.50)	−1.14 (−2.01)**
May Interview	0.09 (0.81)	0.43 (1.64)*	1.24 (1.69)*
Grocery Store Less Than 2 Miles Away	−0.13 (−1.52)	−0.05 (−0.23)	0.59 (1.02)
Baker's Wagon Comes to Door	−0.10 (−1.03)	0.36 (1.50)	0.65 (1.01)
Dairy Farm	0.23 (2.39)**	−0.53 (−2.20)**	−0.73 (−1.15)
Homemaker Works on Farm > 2 Hrs/Day	−0.41 (−3.76)**	−0.43 (−1.52)	−1.02 (−1.37)
Financial Wealth in Lowest Survey Quartile	−0.00 (−0.00)	−0.64 (−2.74)**	−1.34 (−2.18)**
Number of Rooms	0.03 (1.99)**	0.06 (1.51)	−0.04 (−0.38)
Electric Lights	0.28 (3.08)**	−0.01 (−0.03)	0.22 (0.36)
Refrigerator	−0.07 (−0.53)	0.99 (3.08)**	1.45 (1.72)*
Multiple Cooking Fuels	−0.02 (−0.20)	0.20 (0.92)	0.14 (0.25)
Kitchen Sink with a Drain	−0.25 (−2.11)**	0.66 (2.18)**	1.82 (2.27)**
Homemaker Age > 40	0.05 (0.57)	−0.25 (−1.07)	−1.43 (−2.35)**
Homemaker's Education > 12 yrs	−0.14 (−1.48)	0.60 (2.47)**	0.63 (0.98)
Hrs/Day Spent in Food-Related Activities by Other Household Members	−0.37 (−8.72)**	—	—
Baking Time 3+ Hrs./Wk	−0.21 (−2.36)**	—	—
Number of Minor Children	0.09 (3.62)**	—	—

Table 3. (*Continued*)

Independent Variables	Homemaker's Hrs/Day Spent in Food-Related Activities	Number of Different Foods Prepared for Meals	Modified Healthy Eating Index
Adult(s) Other Than Homemaker/Spouse Live in Home	0.17 (1.88)*	—	—
Missing Breakfast	0.52 (2.13)**	−2.91 (−4.68)**	−6.86 (−4.18)**
Missing Noonday Meal	−0.23 (−1.71)*	−1.34 (−4.04)**	−3.88 (−4.43)**
Missing Supper	−0.07 (−0.46)	−1.41 (−3.80)**	−3.31 (−3.38)**
Adjusted-R^2	0.21	0.19	0.13
F Statistic	6.70**	6.10**	4.30**

*$p < .10$ **$p < .05$

and higher HEI in 1936, although both estimated effects are relatively small. Specifically, for every additional hour spent in food-related activities there is a 0.24 increase in the number of different foods served ($p < .05$). The estimated relationship is somewhat weaker for the HEI equation where a one-hour increase in her time is linked to a 0.53 increase in the HEI ($p < .10$). The 1952 estimates provide similar results although the coefficient associated with the homemaker's food-related time use does not reach conventional levels of statistical significance.

We find very limited evidence that our proxies for the prices of inputs are linked to diet quality in either 1936 or 1952. If the 1936 interview was done in May rather than earlier in March or April, it was associated with a marginally significant positive effect on variety and HEI. May is a time when home gardens start to produce early crops and thus the estimated coefficients may be suggestive of some seasonality to these farm diets. This seasonal effect is not evident in 1952, however. Those living on dairy farms in 1936 have less variety in their diet than otherwise similar farm families, but there is no difference in their HEI score. If the homemaker has a driver license in 1936, their HEI is significantly lower than if she does not. This finding is not replicated with the 1952 data. Finally, we do observe that paid work time is inversely related to the household's HEI in 1952. For each hour that the homemaker works for pay, the HEI declines by 0.28. This suggests that if a homemaker entered the labor force and worked eight hours per day, this would translate into a 2.24 decline in the HEI.

We observe significant income/wealth effects in 1936. As hypothesized, households in the lowest financial wealth quartile have less variety and a lower HEI than their otherwise similar counterparts who have more financial wealth. While number of rooms has no effect on diet quality in 1936, it is linked to a statistically significant increase in the HEI in 1952.

There is evidence that household technology was linked to both the variety of foods served and the HEI in both 1936 and 1952. In 1936, the presence of a refrigerator and having a kitchen sink with a drain both have statistically significant

Table 4. 1952 OLS homemaker's food time and diet quality parameter estimates (t ratios in parentheses)

Independent Variables	Homemaker's Hrs/Day Spent in Food-Related Activities	Number of Different Foods Prepared for Meals	Modified Healthy Eating Index
Intercept	3.04 (8.16)**	10.06 (9.42)**	30.49 (11.31)**
Homemaker's Hours Spent in Food-Related Activities on Diary Day	—	0.37 (2.28)**	0.63 (1.56)
Homemaker Has a Driver License	−0.17 (−1.27)	0.36 (1.02)	0.80 (0.89)
Lives in Town[a]	−0.58 (−2.01)**	0.02 (0.03)	2.54 (1.36)
May/June Interview	0.18 (0.76)	0.34 (0.56)	−0.21 (−0.14)
Homemaker's Hours of Paid Work on Diary Day	−0.04 (−1.74)*	−0.06 (−0.99)	−0.28 (−1.88)*
Homemaker Works on Farm > 2 Hrs/Day	−0.02 (−0.07)	−0.16 (−0.26)	−0.31 (−0.20)
Number of Rooms	0.01 (0.30)	0.06 (0.75)	0.39 (1.86)*
Refrigerator with Freezer	−0.21 (−1.07)	1.06 (2.13)**	2.86 (2.27)**
Electric Mixer	0.08 (0.54)	0.53 (1.44)	1.68 (1.80)*
Pressure Cooker	−0.21 (−1.67)*	0.34 (1.07)	1.97 (2.43)**
Homemaker Age > 40	−0.12 (−0.91)	−0.72 (−2.19)**	−3.76 (−4.52)**
Hrs/Day Spent in Food-Related Activities by Other Family Members on the Diary Day	−0.42 (−4.01)**		
Number of Minor Children	0.13 (2.68)**		
Adult(s) Other Than Homemaker/Spouse Live in Home	0.35 (2.15)**		
Missing Noonday Meal	−0.54 (−2.26)**	−3.12 (−5.10)**	−9.37 (−6.08)**
Missing Supper	−1.22 (−3.34)**	−2.68 (−2.82)**	−7.65 (−3.19)**
Adjusted-R^2	0.22	0.25	0.38
F Statistic	5.72**	7.32**	11.24**

*$p < .10$ **$p < .05$

[a]All homemakers who lived in town were interviewed in May or June. Thus, the month of interview dummy could not be included in this model if the town residence dummy was included. The estimated coefficient associated with the town residence variable thus reflects both proximity to town services (e.g., grocery stores) and the impact of a later spring season interview.

positive effects on diet quality. The homemaker's education has a positive association with the variety of foods served in 1936 while her age is inversely related to the HEI. In 1952, the presence of a refrigerator/freezer, electric mixer, and pressure cooker, are all positively associated with the HEI. The presence of a refrigerator/freezer is also positively linked to the variety of foods served. As with the 1936 data, there is an inverse relationship between the homemaker's age and diet quality in 1952.

Finally, it is worth noting the coefficients on the missing meal dummies in tables 3 and 4. Recall that these dummies are included in the estimation as nuisance variables to control for the fact that some respondents in both surveys had missing information on one meal of the day (see table 1).[18] Thus, the statistical significance of the associated coefficients is not surprising, but the magnitude of the coefficients may be communicating important dietary information. In 1936, both the number of different foods and HEI equations, the coefficients are largest for the dummy variable that takes on a value of "1" if breakfast information is missing. This suggests that, on Upstate New York farms in the mid-1930s, breakfast was a meal that typically had the greatest variety and nutritional value followed by the noonday and, finally, the evening meal.

The coefficients associated with the two dummy variables for missing information on the noonday meal or supper for the 1952 estimates are once again negative and statistically significant. Missing information on the noonday meal leads to relatively larger declines in diet quality for both outcomes than does missing information on supper. Again, this is suggestive that the noonday meal may have been more important than the evening meal.

Discussion

What did Upstate New York diets look like in the first half of the twentieth century? For farm families in the mid-1930s, variety appears to be somewhat limited and the overall quality of the average diet, as measured by the HEI, would probably get no better grade than a "C." Our assessment of its nutritional adequacy mirrors other assessments made at that time (Morey 1933; Moser 1935a; Stiebeling 1941). For example, Stiebeling (1941) uses national data from 1935–36 and concludes that fully 75 percent of Americans had diets that fall in the "fair" or "poor" categories with only 25 percent judged to be "good." It has been argued that the average diet of American farm families was of higher quality than that of their urban counterparts during the 1930s (Ziegelman and Coe 2016). If that is true, then the descriptive picture of the diet painted by our data may be an overly generous one.

By the early 1950s, our analyses suggest that the quality of the average Upstate New York diet had improved markedly. Fruits, vegetables, grains, and proteins were playing a more prominent role while the importance of potatoes had declined. The variety of what was served over the course of the day also grew – doubling on average when comparing our 1952 sample to their 1936 counterparts.

What factors were linked to the quality of Upstate New York diets during this historical period? Our descriptive and our multivariate analyses suggest that access

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[18]Recall that respondents missing data on more than one meal are excluded from the sample.

to modern kitchen technology played a key role. In the 1936 survey, only 13 percent of the homemakers reported that they had a refrigerator. The remainder kept perishables in a cellar (45 percent), icebox (18 percent), pantry (6 percent), or some combination of those three options (18 percent). In addition, 14 percent of the homemakers in 1936 did not have a sink with a drain in their kitchens. Both factors were linked to diet quality in the 1936 analyses. By 1952, all the respondents reported that they had a refrigerator as well as a sink with a drain.

The 1936 survey instrument did not ask about kitchen technology such as a pressure cooker, electric mixer, or refrigerator with a freezer because these items were rare or nonexistent in the 1930s.[19] Yet, their presence in 1952 kitchens was somewhat common. Our multivariate analyses suggest that these items likely further fueled the trend toward a more healthy diet by altering the technical parameters associated with producing variety and nutritious foods. Admittedly, these technology effects may be capturing both technical efficiency and household income effects. First adopters of household technology are more likely to be affluent than are late adopters for two reasons; they can better afford the initial high prices of new technology and they can better cope with the risk involved with the purchase in case the new technology does not deliver what was promised.

Likewise, the technical abilities homemakers brought to these tasks also appear to have played a role. We interpret the coefficients associated with the homemaker's education and age as proxies for cooking skills. Homemakers in 1936 who had at least a high school education prepared significantly more food variety than did their lesser educated counterparts, holding other factors constant. In contrast, education level had no relationship to HEI in the 1936 data. Instead, the analyses indicate that there was a statistically significant inverse relationship between HEI and the homemaker's age in 1936. And, this relationship continues to exist in the 1952 data, but this time the age dummy is inversely related to the variety of foods served and the HEI. The age dummy has the potential to be capturing two opposing effects. First, older homemakers should have a greater stock of diet-related human capital because of their accumulated experience in preparing meals. Second, older birth cohorts may be less likely than younger birth cohorts to have acquired nutritional knowledge during adolescence and early adulthood when food habits are often formed, as insights from nutritional science only became prevalent in schools and the popular press beginning in the early 1920s. The inverse relationship we observe between homemaker's age and diet quality suggest this latter cohort effect likely dominates the relationship between age and diet quality.

Beyond household technology, there is evidence that the homemaker's food-related time played a role in shaping the American diet during this era, although the link is stronger for variety of foods served than for HEI in both 1936 and 1952. It is not surprising that more time spent in food-related activities associated with a larger variety of foods served as clearly preparing multiple dishes for a meal likely reduces (time) economies of scope.

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[19]Home refrigerators with separate freezer compartments were introduced in the 1940s (Sandvik 2018). The KitchenAid mixer was introduced in 1936 and Sunbeam's first hand-held mixer was sold in 1952 (Vaunt Design Group 2005). The first pressure cooker designed for home use was introduced in the late 1930s (National Presto Industries, Inc. 2007).

We found very little evidence that our proxy input price measures were linked to diet quality in 1936. This result is not too surprising as one study conducted in the early 1930s found that farm families typically obtained more than half the food they consumed from their farms (Cannon 1931) while another study found that the diet components derived from farm-raised food comprised more than 80 percent of the money value of the average farm family's diet (Moser 1935a). In the 1952 analyses, it appears that the role of women's paid work outside of the household had a modest impact on diet. The variable that measures time spent in paid employment contains two potentially opposing effects. On the one hand, if the homemaker increases her time in paid work, the income of the household increases. This, in turn, should improve the quality of the household diet. At the same time, an increase in the homemaker's time devoted to paid work may reduce the time she could devote to diet-related activities that are not captured by our food-related time-use measure (e.g., grocery shopping, meal planning), and this in turn would be associated with a decline in diet quality. We find an inverse association between time spent in paid employment and the HEI (p = .07), suggesting that in the early 1950s in Upstate New York, the latter effect likely dominated.

Before drawing conclusions from our investigation, it is important to identify the study limitations. First, the data used in this study were drawn exclusively from New York farm families in 1936 and from New York families living on farms or in a medium-size town in 1952. While both surveys were conducted in the same region of the country, the findings should not be generalized to families living in urban locations and/or other regions of the country. Second, measures of food variety and food quality were based on recall information from a single day of meals prepared on a weekday. Our descriptive information on diet variety and quality may be downwardly biased to the extent that meals prepared on Saturdays or Sundays were of higher quality. Third, we do not have measures of portion sizes or calories consumed and consequently we cannot draw conclusions about historical energy intake relative to today. The rise in Americans' obesity rates is likely a function of a complex set of factors that have influenced energy intake and energy expenditures, with the range of foods offered at meals being only one component. Fourth, grocery-shopping time is omitted from our measure of homemakers' food-related time use. If grocery shopping was an infrequent activity (e.g., done once a week, like baking in the 1936 survey), it's omission from our measure of homemakers' food-related time use may have minimal impact on our results given that our analyses focus on time use over a single day. If grocery shopping was a frequent activity, however, then its omission may have biased our results. Finally, our measures of prices for inputs used in meal production were weak proxies. Ideally, we would have been able to control for both household income and the price of food in our estimation models. The absence of valid and reliable measures for these factors may have created omitted variables bias in the estimation.[20]

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[20]Although, it is noteworthy that the coefficients on the kitchen equipment variables remain statistically significant in the reduced form estimation where we controlled for the relative wealth of the household in 1936 (table 3). Nevertheless, if homemakers with better kitchen technology also purchased better inputs, the coefficients on household equipment may reflect some purchased input effects.

Conclusions

Using data from a time when families ate few meals away from home, our analyses provide insights about the quality of the diet in Upstate New York in the mid-1930s and early 1950s. We conclude that the 1930s diet in this region should not be viewed with nostalgia. At best, while the average diet may have met caloric needs, it appears to have been somewhat lacking in terms of variety and quality relative to 1952. Essentially, one might want to think twice about aspiring to the diet of a great-grandmother who lived in Upstate New York.

By the early 1950s, however, both the variety of foods served and quality, as measured by the HEI, had improved in this region of the country. This shift was *not* attributable to more time being spent by homemakers in food-related activities. Rather it appears to be a function of new kitchen technologies, especially the proliferation of refrigerators and refrigerator/freezers. These new technologies, perhaps coupled with greater income and more access to reasonably priced grocery options, seem to have been important catalysts for dietary gains over the two decades in question. The shift may also be partially attributable to the growing body of nutrition research on the importance of diet for good health and the public nutrition education efforts that these nutrition studies spawned.

Based on our analyses, the average diet of the 1950s in Upstate New York contained more variety and was of higher quality than the average diet of today.[21] Thus, it could be a model for how to improve Americans' health. Yet, the homemakers in our 1952 survey averaged about 2.5 hours per day in food-related activities. Today the average American woman spends only 51 minutes per day in food preparation. And, while men also contribute to food-related activities in the current era, they average only 22 minutes per day (Hamrick 2016). Thus, the sum of adult time spent in food-related activities in two-adult households is still more than an hour less that the average time married women spent in 1952. The likely factors associated with this decline in food-related time use include the increased prevalence of processed and prepared foods in grocery stores and the growth in Americans' expenditures on food away from home (Economic Research Service 2016; Holodny 2017). In light of these shifts, it is unrealistic to think that Americans would make drastic change in time use to make dietary gains.

A more promising tactic may be to look to new technologies in the kitchen as possible catalysts for improvements in diets. Cutler et al. (2003) noted the importance of technological change at the industrial food production level as a key contributing factor to the obesity epidemic. Our analyses show that new household technologies were linked to *higher* diet quality in the first half of the twentieth century. Can technical changes within the kitchen that lower the price of producing greater food variety and higher diet quality (e.g., food processors, "instant pot" pressure cookers, intelligent ovens, *sous-vide* cooking systems) lead Americans to embrace more healthful diets in the future? It remains an open question as to whether innovative home technologies in the twenty-first century can contribute to improved diets in the years to come.

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[21]The most recent USDA figures indicate that the average adult HEI is 58.27 on a 100-point scale, or 58.27 percent of a perfect score (Center for Nutrition Policy and Promotion 2016). This compares to an average HEI of 36.8 on the 50-point scale used for the 1952 data, which translates into 73.6 percent of a perfect score.

Supplementary material. To view supplementary material for this article, please visit http://dx.doi.org/10.1017/ssh.2019.36

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