Effects of Public Health Insurance Expansions on the Non-Healthcare Consumption Expenditures of Low-Income Households

Thadchaigeni Panchalingam*

The Ohio State University

November 2021

Researcher(s) own analyses calculated (or derived) based in part on data from The Nielsen Company (US), LLC and marketing databases provided through the Nielsen Datasets at the Kilts Center for Marketing Data Center at The University of Chicago Booth School of Business.

The conclusions drawn from the Nielsen data are those of the researcher(s) and do not reflect the views of Nielsen. Nielsen is not responsible for, had no role in, and was not involved in analyzing and preparing the results reported herein.

*Corresponding author: Department of Agricultural, Environmental, and Development Economics, 344, Agricultural Administration Building, 2120 Fyffe Road, Columbus, OH 43210. Email: panchalingam.1@osu.edu; Website: www.thadchapanchalingam.com. This work has greatly benefitted from comments from Professors Brian Roe from OSU and Tara Watson from Williams College and NBER, seminar participants from 2020 Annual Meeting of American Society of Health Economists, 2020 Annual Meeting of Agricultural and Applied Economics Association, and seminar participants at the Ohio State University.

Abstract

I explore patterns of non-healthcare consumption in targeted U.S. households due to public health insurance expansions. Specifically, I investigate the effects of the recent Medicaid expansions on eligible low-income households' recurring food and other preventative non-healthcare consumption expenditures. I use a consumer panel data that deploys at-home scanner technology to track grocery purchases. Using an event-study design, and a triple difference-in-differences framework, I find that the Medicaid eligible households from expansion states spent less on fresh produce per adult and more on health and beauty products after the Medicaid expansion. Almost all the increase in the health and beauty product expenditure is due to an increase in expenditure on over-the-counter medications and remedies, which are more responsive and palliative than preventative in nature. The robust reduction in fresh produce expenditures and increase in expenditures on over-the-counter medications and remedies suggests that while expanded public health insurance increases formal healthcare activity and it decreases informal preventative non-healthcare expenditures. These new patterns of non-healthcare consumption may occur because of improved finances due to subsidized healthcare, changes in relative costs of healthcare and non-healthcare consumption, or the substitution between healthcare and preventative non-healthcare consumption. These findings may begin to shift the focus in the literature on the unintended consequences of Medicaid expansion from sins of commission, i.e., moral hazard responses such as increased smoking, alcohol use and junk food consumption, to sins of omission, i.e., responses in which preventative health habits erode.

Effects of Public Health Insurance Expansions on the Non-Healthcare Consumption Expenditures of Low-Income Households

1. Introduction

In this paper I interrogate whether public health insurance expansion leads to new patterns of non-healthcare consumption among beneficiaries. In doing so, first I examine whether there are overall spending changes in recurring total food and non-food expenditures (i.e., income effects), and then examine whether there are changes in preventative non-healthcare consumption expenditures (i.e., substitution effects). I define preventative non-healthcare as purchases that improve health or prevent ill-health but are not generally classified as healthcare, e.g., spending on fresh fruits and vegetables and vitamin supplements. Theoretically, it is possible that health insurance coverage may reduce preventative non-healthcare activities, but empirical research has provided mixed results. The new patterns of preventative non-healthcare consumption may occur because of improved finances due to subsidized healthcare (Baicker et al., 2013; Finkelstein et al., 2012; Mazumder and Miller, 2016), changes in relative costs of healthcare and non-healthcare consumption (Dave and Kaestner, 2009; Einav and Finkelstein, 2018), increased access to preventive healthcare and primary care in general (Courtemanche et al., 2018; Miller et al., 2019; Simon et al., 2017), or a combination of these factors.

Whether public health insurance expansion leads to new patterns of non-healthcare consumption among beneficiaries is an important policy question, firstly, because preventative non-healthcare consumption of healthy foods, vitamins, other diet aids, and contraceptives affects overall individual health and can either reinforce or undermine total health. An individual can maintain better health by eating a healthy diet (i.e. a preventative non-healthcare) or by taking

prescription medications (i.e. healthcare). Greater consumption of certain types of food such as fruits and vegetables reduce the risk of cardiovascular disease, type-2 diabetes, some cancers, and obesity (Millen et al., 2016; Rolls et al., 2004), while greater consumption of foods with too much saturated fat, refined grains, added sugar, and sodium exacerbate these conditions (Binkley et al., 2000; Nicklas et al., 2001). Second, it is unclear whether the households with positive income effects due to obtaining public health insurance (Baicker et al., 2013; Finkelstein et al., 2012; Mazumder and Miller, 2016) would spend the extra income on more non-healthcare consumption, including preventative non-healthcare consumption. The empirical evidence on changes in overall non-healthcare consumption (e.g., food, transportation, education) is mixed (Dillender, 2017; Gruber and Yelowitz, 1999; Leininger et al., 2010; Levy et al., 2019).

This paper connects two strands of literature. First, the literature on preventive behavioral changes due to expanded health insurance coverage, which focuses on ex-ante moral hazard via sins of commission, i.e., increasing risky health behaviors such as smoking, drinking, or consuming unhealthy food and drink (Barbaresco et al., 2015; Brook et al., 1983; Cotti et al., 2019; He et al., 2020; Simon et al., 2017). However, the provision of more health care need not only spur increases in risky behaviors but could also affect preventative behaviors, i.e., health sins of omission, i.e. a lack of exercise or diets with fewer fruits and vegetables. The premise that whether the health care provision induces health sins of omission has received less attention in the literature with the exception of studies assessing if expanded coverage has affected the frequency of exercise, where results are mixed (Brook et al., 1983; Courtemanche and Zapata, 2014; Dave and Kaestner, 2009; Preux, 2011; Simon et al., 2017). Even though changes in food consumption behavior has received less attention, Nguyen et al. (2016) assess diet quality via two-sided *t*-tests to compare health risk factors between expansion and non-expansion states before the Affordable

Care Act public health insurance expansions began. In the related literature on food-security, Himmelstein (2019) finds that Medicaid expansion was associated with a significant adjusted 2.2-percentage-point decline in rates of very low food security in the states that expanded Medicaid between 2014 and 2016.

The second strand of literature is on the relationship between health insurance and changes in non-healthcare consumption. These studies found mixed results and did not focus on preventative non-healthcare consumption expenditures. Gruber and Yelowitz, (1999) found that the Medicaid expansions in late 1980s and early 1990s lowered the asset holding of eligible households by a net 16.3 percent while increasing consumption of non-durable goods by $538 in 1987 dollars. Leininger et al., (2010) found strong positive effects on transportation expenditures due to expansions in state Child Health Insurance Programs between 1996 and 2002. In contrast, Dillender (2017) found no evidence of consumption changes due to Medicaid eligibility in the 2000s. Levy et al. (2019) found no evidence of changes in non-healthcare consumption expenditures in response to recent Medicaid expansion using Consumer Expenditure Survey data.

This study contributes to the limited literature on the relationship between public health insurance and non-healthcare consumption with a specific focus on preventative non-healthcare consumption. I show that provision of more healthcare could also affect preventative behaviors in addition to risky health behaviors by exploring expenditures on goods known to help prevent disease, such as fruits and vegetables, and supplementary nutrition and preventative care items which have received less attention in the literature. This study also contributes to the literature on the effects of public health insurance coverage expansions on financial outcomes by providing new evidence of changes in range of recurring consumption expenditures.

I examine how subsidizing healthcare expenditures may affect the preventative non-healthcare expenditures of targeted households by exploiting a quasi-experimental change in the Medicaid expansion under the Affordable Care Act (ACA). To identify the effects of Medicaid expansion on preventative non-healthcare expenditures, I use an event-study design, and a triple difference-in-differences approach, which are appropriate to exploit the variations in the time of adoption by states and the eligibility criterion under the ACA Medicaid expansions. The expenditure data comes from Nielsen Homescan Consumer Panel, which uses at-home scanner technology to track regular grocery and other household purchases from stores the households visit for their regular groceries and for other recurring purchases from pharmacies, large retailers, and supercenters.[1] I analyze data from 2011 to 2017. Compared to data from the Consumer Expenditure Survey (CEX) the data used in this study are less nationally representative and do to not capture all consumption categories captured in CEX such as housing, transportation, education, and healthcare. Therefore, assessing the changes in overall financial wellbeing of the households is out of scope for this study.

My findings show that there is a significant decrease in fresh produce expenditures (18.6% of pre-expansion level) and an increase in frozen food expenditures, but no significant change in frozen vegetables and fruits expenditures (4.4% of pre-expansion level) per adult equivalent unit per quarter among eligible households in response to Medicaid expansion. Among non-food categories, there is a significant increase in targeted households' expenditure on health and beauty products (10.3% of pre-expansion level) of which more than 90% comes from increases in over-the-counter medications and remedies with no changes in vitamins and diet supplements. The

[1] Some examples of products purchased and recorded in the data include most at home food purchases, toys and sporting goods, some apparel, electrical items such as mobile phones, household appliances such as microwaves, household cleaning supplies, diet aids, non-prescription medications, laundry supplies etc.

robust reduction in fresh produce expenditures and increase in expenditures on over-the-counter medications and remedies suggests that while expanded public health insurance increases formal healthcare activity, it decreases informal preventative non-healthcare expenditures. No significant change in total expenditure is documented, suggesting that even if there are positive income effects, they do not manifest in recurring household food and other consumption expenditures.

2. Data

Universal health coverage is among the top health-related policy discourses in the United States. Currently, employer-sponsored health insurance covers about 55 percent of the US population, while public insurance covers the elderly, the disabled, and low-income children and adults (U.S. Census Bureau, 2018). The Medicaid program, which was created by the Social Security Amendments of 1965, provides health insurance to 1 in 5 Americans.[2] There have been substantial changes to the eligibility for Medicaid since then. The Patient Protection and Affordable Care Act (ACA) of 2010 expanded Medicaid for all non-Medicare eligible individuals under 65 with incomes up to 138% of the Federal Poverty Line (FPL) defined by Unites States Health and Human Services (HHS) (The Patient Protection and Affordable Care Act, 2010; Sommers and Rosenbaum, 2011). Under the ACA all eligible adults are guaranteed a basic benefit package that meets the essential health care benefits through health insurance marketplaces (Kaiser Family Foundation, 2013). However, the Supreme Court ruling on the constitutionality of the ACA made the decision to expand Medicaid optional for states. Following the Supreme Court decision in 2012, only 32 states and the District of Columbia (DC) had expanded Medicaid from 2014 to 2016, which is the time frame considered for Medicaid expansion in this study (appendix figure

[2] Kaiser Family Foundation estimates based on the Census Bureau's American Community Survey, 2008-2017.

A1). Only 36 states and DC have adopted the Medicaid expansion in the period of 2014-2019 (Kaiser Family Foundation, 2019).

I use Nielsen Homescan Consumer Panel (NHCP) data on purchases made by consumers from 2011 to 2017.[3] The NHCP consists of a panel of households who scan their purchases after all grocery and other shopping trips from stores they usually visit using an at-home scanner technology. The data captures a variety of store types; this includes grocery, drug, mass merchandise, superstore, club, convenience, and dollar stores.[4] The stores that are visited by the panelists are not restricted to the stores where Nielsen receives point of sale (POS) data for the Nielsen's retailer scanner data, which is not used in this study. However, if a panelist visited a store that is covered in retailer scanner data, then the panelist is not required to enter the prices paid. This is an attempt to minimize the data entry burden of panelists. Instead, Nielsen imputes the price as an average weighted price for the item that week in that particular store. The imputed prices are indistinguishable from the prices recorded by the panelists in the data set.

The dataset comprises of a representative panel of 40,000-60,000 active panelist households in each panel year with a retention rate of 80% from one year to another. The sampling of panelists follows a proportionate random sampling approach in which the key demographic characteristics of the panelists are matched to the demographics of the continental US population and regular checks are made to ensure the representativeness.[5] Nielsen samples all states except Alaska and Hawaii. The are 8,819 Medicaid eligible households in the sample which is 10.6% of the total number of unique households in the sample. Nationally about 18% of the U.S. population

[3] The data were obtained from Kilts Center for Marketing at the University of Chicago.
[4] The store types are further subdivided into channel types such as apparel, footwear, automotive, computer, etc. For example, in 2017 about 0.1% of all items purchased are from apparel stores and about 0.01% of items are from computer stores.
[5] Nielsen uses nine demographic characteristics to balance the sample which are household size, income, head's age, female and male heads' education levels, presence of children, race, ethnicity, and head's occupation.

is enrolled in Medicaid. These figures are not directly comparable since national level statistics are at the individual level rather than at the household level. The incentives for participation include monthly prize drawings, gift points redeemable for merchandise and gift cards, sweepstakes, and contests; the incentives are designed not to influence purchasing habits. No account-specific coupons are provided to avoid any impacts on selection of outlets and products and incentives are regularly tested to check if they are correlated with retention rates.[6]

The Universal Product Code (UPC) of each purchased item is recorded, and consumers provide information on the price (if required by the Nielsen), quantity, store information and package details.[7] The data also includes information on various demographic characteristics of the households including household size, income, education of the household heads, age composition, employment, race/ethnicity, and zip code of residence. A previous study tested the accuracy of NHCP data found that it captures about 80% of the total calories reported by National Health and Nutrition Examination Survey (NHANES) (Oster, 2018).[8] The NHCP is not without measurement errors due to households failing to report trips or products and misreporting the information on stores and dates. However, several validation studies show that the reported data have a high level of accuracy while data misreporting is comparable to other commonly used datasets in economics and unlikely to affect the averages calculated (Einav et al., 2008; Zhen et al., 2009).

While NHCP data is available at a weekly reporting level, many items are not purchased on a weekly basis. Hence, I aggregate the data for each household across calendar quarters to

[6] He et al. (2020) provides evidence that Medicaid expansion in 2014 did not affect household program attrition in the Nielsen panel.

[7] The products that do not use standard UPC codes (e.g., random weight product) are called Magnet data and only a subset of households regularly report Magnet Product purchases. These products can still be grouped into different product categories.

[8] NHANES is an annual survey of a nationally representative sample of about 5,000 persons in the US and it is used to assess the health and nutritional status of adults and children. The survey includes demographic, socioeconomic, dietary, medical conditions, and health behavior-related questions.

ensure purchasing patterns that are representative of each households normal patterns while still being able to exploit precisely the timing of state expansion of coverage (Appendix table A1). Further, data on consumer expenditure surveys such as CEX use quarterly time units hence making comparison easier. Also, research calculating the healthfulness of grocery purchases use quarterly shopping baskets of total expenditures (Allcott et al., 2019; Volpe and Okrent 2012). Twenty-five states and DC expanded Medicaid in January 2014 while seven states adopted after January 2014. Appendix table A1 shows the state expansion dates.[9]

3. Methods

To measure the impacts of Medicaid expansion on various expenditure outcomes, I estimate the following event-study model:

$$Y_{hsyq} = \beta_0 + \sum_{j=-8}^{j=8} \beta_{0j} I(Expand_{syq} = j) + \sum_{j=-8}^{j=8} \beta_{1j} I(Expand_{syq} = j) \times Eligible_{hsyq} + \beta_E Eligible_{hsyq} + \beta_x X_{hsyq} + \alpha_h + \tau_y + \gamma_q + \delta_{syq} + \varepsilon_{hsyq}. \quad (1)$$

In the above equation, Y_{hsyq} is the outcome for household *h* in state *s*, in year *y*, and quarter *q*. Outcome variables are explained in detail in section 3.1. $I(Expand_{syq} = j)$ are indicator variables for quarters leading up to the expansion and quarters following the expansion in state *s*. The omitted expansion quarter is *j = -1*. Quarters ≥ 8 together and quarters ≤ -8 together are combined into single indicator variables. $Eligible_{hsyq}$ is an indicator equal to one if a household has an annual income below 100% of the federal poverty line (FPL). I include controls for time

[9] Although Wisconsin did not adopt the ACA expansion, it offers Medicaid to adults below 100% of FPL, hence it is considered an adoption state for the purpose of this study.

varying household characteristics[10] (X_{hsyq}); household (α_h), year (τ_y), and quarter (γ_q) fixed effects; and state specific linear time trends (δ_{syq}).

The identifying variation of this model comes from comparing households who are eligible for Medicaid expansion with households who would be ineligible during quarters leading up to and during quarters after Medicaid expansions. The identifying assumption is that the households that are eligible and ineligible did not have differential expenditure trends in expanding and non-expanding states. I verify this by graphing the trends in outcomes in expanded and non-expanded states between eligible and ineligible households. I test the null hypothesis of identical pre-trends using a joint *F*-test of pre-expansion coefficients.

I do not directly observe whether a household receives Medicaid, thus, I use the eligibility for Medicaid as a proxy. A household in an expansion state is eligible for Medicaid if its income is below 100% of FPL. A 100% below FPL cutoff is used instead of 138% of FPL which is the official cutoff because the households that have incomes between 100% and 138% of FPL are still eligible for health insurance marketplace subsidies in non-expansion states (Simon et al., 2017). The income recorded in NHCP has a lag of approximately two years, therefore, the FPL that I used, based on the Department of Health and Human Services federal poverty guidelines, is matched to the year corresponding to when the income was reported.[11] Further, there are five states with significant prior expansions. Persons who are 65 and older are eligible for Medicare and persons under 26 are eligible for dependent coverage provision. Thus, the sample used in the main analysis does not include the following: households with income between 100 and 138% of the

[10] All models include controls for age, marital status, years of education of the household head, race, ethnicity of the household, number of household heads, hours of employment, and presence of children in the household.

[11] This potentially introduces measurement error regarding Medicaid eligibility; however, this avoids a potential source of bias arising from household incomes responding to Medicaid expansions since the incomes considered for eligibility precede the income changes that potentially result from changes in Medicaid status.

FPL, households from states with significant prior expansions, and households with a head of age 65 and above and below 26 years old. If the household has more than one head, both heads' ages are considered. In a robustness check I relax income as well as age eligibility.

Following the event-study model, I also estimate the following triple difference-in-differences model. The notation follows equation 1 except for $Expand_{syq}$ which is whether state *s* expanded Medicaid in year *y* and quarter *q*. The three differences come from the state (expanded or not), the timing (before and after the expansion), and the eligibility within the state (eligible and ineligible households). The coefficient of interest is β_I.

$$Y_{hsyq} = \beta_0 + \beta_M Expand_{syq} + \beta_E Eligible_{hsyq} + \beta_I Expand_{syq} * Eligible_{hsyq} + \beta_x X_{hsyq} + \alpha_h + \tau_y + \gamma_q + \delta_{syq} + \varepsilon_{hsyq} \quad (2)$$

Table 1 shows summary statistics of the household characteristics of the sample used in this study. Except for income, marriage and employment characteristics, households in the eligible and ineligible groups are similar in other characteristics such as education, race, and household size. Medicaid enrollment by race/ethnicity shows that 40% of the enrollees are white, 21% are Black, and 25% are Hispanic (Kaiser Family Foundation, 2019). While education level is not a perfect predictor of the eligibility, other studies have used having less than a high school degree as an eligibility cutoff for Medicaid. In the Nielsen sample the education attainment of eligible households is higher than national averages.

Table 1. Summary statistics of household characteristics for years 2011-2017

	Eligible households		Ineligible households		
Variable	Mean	Standard Deviation	Mean	Standard Deviation	Difference in means
Income (2011$)	21,207	22,404	71,810	35,481	-51,603***
Household size	2.581	1.665	2.623	1.348	-0.041***
Years of Education	13.830	1.962	14.800	1.838	-0.975***
Age	50.670	9.525	50.570	9.379	0.103**
White	0.788	0.409	0.799	0.401	-0.011***
Black	0.124	0.329	0.110	0.313	0.014***
Asian	0.024	0.154	0.042	0.200	-0.017***
Hispanic Origin	0.066	0.249	0.071	0.256	-0.005**
Presence of Children	0.321	0.467	0.313	0.464	0.008**
Married	0.431	0.495	0.694	0.461	-0.263***
Employed	0.485	0.446	0.802	0.314	-0.318***
Weekly Work Hours	16.280	15.440	30.320	12.210	-14.040***
Number of households	8,819		74,219		

Notes: Author's calculations from NHCP. The number of households shown are the unique number of households across all years and each household contributes to more than one household-quarter observation. *, **, *** indicate significance at the 10%, 5%, 1% level, respectively

3.1 Outcome variables

The primary outcome variable Y_{hsyq} is expenditure (2011$) per adult equivalents[12] of household *h* from state *s* in quarter *q* in year *y* on a given category. I use expenditure per adult equivalent unit so that the expenditures are comparable across households with different sizes and compositions. All outcomes are adjusted for inflation. The major categories are food, non-food, and total expenditure and the sub-categories derived from departments as defined by NHCP. The sub-categories of food include dairy, deli, dry grocery, frozen food, fresh produce, and packaged meat. The non-food category includes non-food grocery, general merchandise, health and beauty products, and alcohol.[13] Table 2 shows summary statistics of the outcome variables. The total food

[12] Adult-equivalent units are a measure of household size that accounts for ages and relative calorie needs of household members (Oster 2018).

[13] If a panelist, e.g., buys a printer or a cellphone along with groceries, both printer and cellphone are scanned and included under the general merchandise category.

expenditures for the eligible households on the lower bound of the income strata is about 79% of what is reported in the Consumer Expenditure Survey. It appears under-reporting is greater among the eligible households, but this doesn't affect the estimates as household is observed both before and after the expansion so similar underreporting is cancelled. The expenditure in the non-food category is not directly comparable as it is not defined similarly across the two datasets.

Table 2. Summary statistics of household level quarterly expenditure per adult equivalent unit for years 2011-2017

	Eligible households		Ineligible households		
Variable	Mean ($)	Standard Deviation ($)	Mean ($)	Standard Deviation ($)	Difference in means
Total Expenditure	509.50	419.30	528.50	391.50	-18.98***
Total food expenditure	320.30	234.80	324.40	220.70	-4.05***
Dairy	37.39	32.84	39.61	31.29	-2.22***
Deli	22.17	54.65	24.57	57.99	-2.40***
Dry Grocery	173.30	134.4	167.90	120.20	5.36***
Fresh Produce	17.87	26.36	23.72	29.78	-5.85***
Frozen Food	52.67	53.52	52.00	49.50	0.67
Packaged Meat	16.94	19.59	16.55	18.02	0.39
Total non-food expenditure	175.80	234.70	186.40	205.60	-10.58***
General Merchandise	67.38	130.40	78.83	130.20	-11.45***
Health and Beauty	50.64	115.30	55.23	77.44	-4.58***
Non-Food Grocery	57.82	93.07	52.37	70.22	5.45***
Alcohol	13.32	54.66	17.67	53.03	-4.35***
Number of households	8,819		74,219		

Notes: Author's calculations from NHCP, all expenditures are adjusted for inflation. *, **, *** indicate significance at the 10%, 5%, 1% level, respectively

4. Results and Discussion

4.1 Parallel Trends

Figures 1, 2, and 3 plot average quarterly expenditures on food, non-food, and total expenditures for Medicaid eligible and ineligible households from expansion and non-expansion states over the 2011-2017 period. The plots suggest that the relative pre-expansion trends between

eligible and ineligible households are similar in expansion and non-expansion states. Event study estimates are used to verify if there are differential pre-trends between Medicaid eligible and non-eligible households in expansion and non-expansion states before expansion (Appendix Tables A1, A2, A3). All models include controls for age, marital status, years of education of the household head, race, ethnicity of the household head, number of household heads, hours of employment, and presence of children in the household. Additionally, all models include household, year and quarter fixed-effects, and state-specific time trends. Robust standard errors clustered at the state-level are in parentheses.

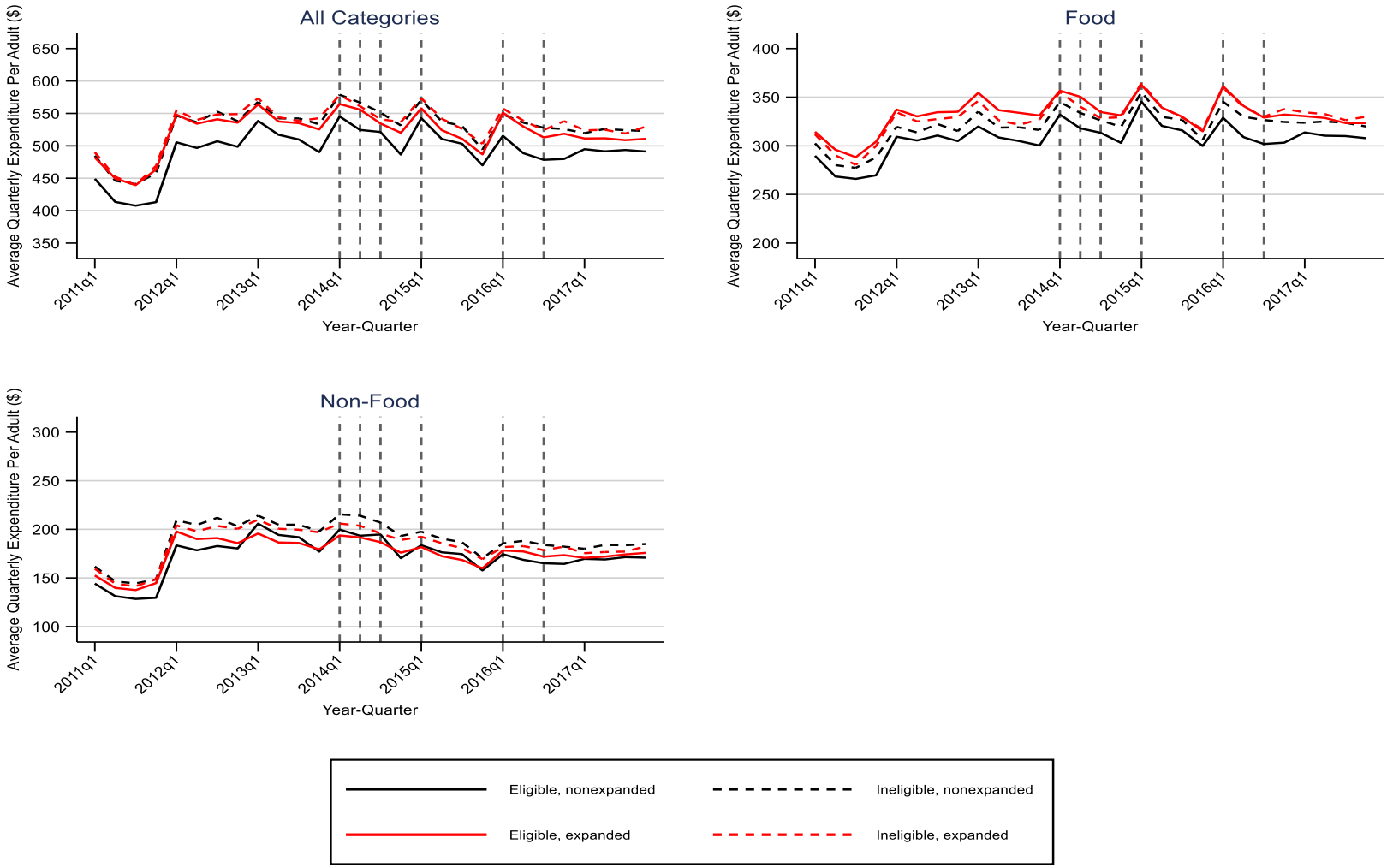

Figure 1. Trends of average quarterly expenditures (2011$) per adult equivalent unit for eligible and ineligible households in expansion and non-expansion states, 2011-2017.

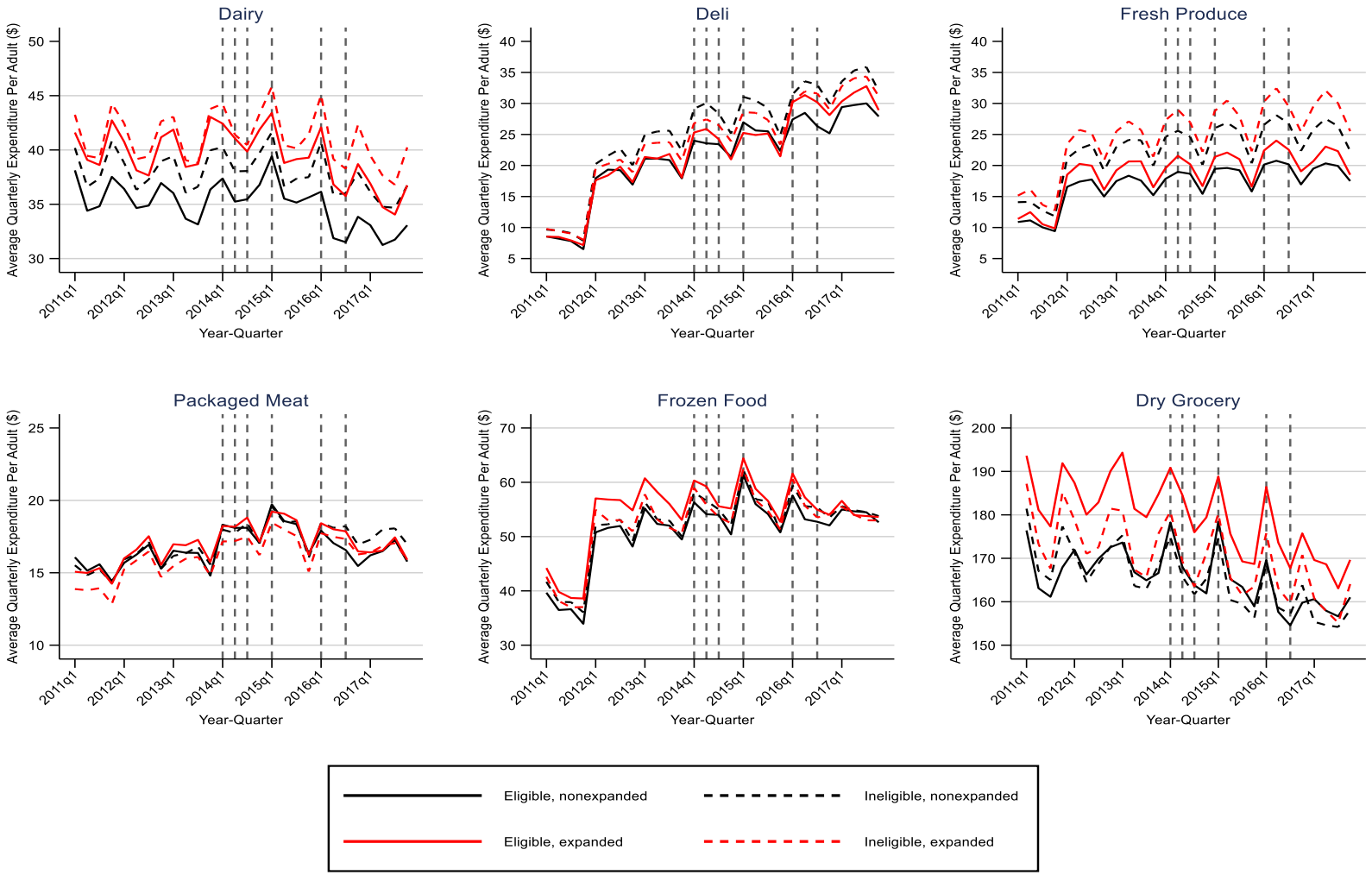

Figure 2. Trends of average quarterly expenditures (2011$) per adult equivalent unit on food categories for eligible and ineligible households in expansion and non-expansion states, 2011-2017

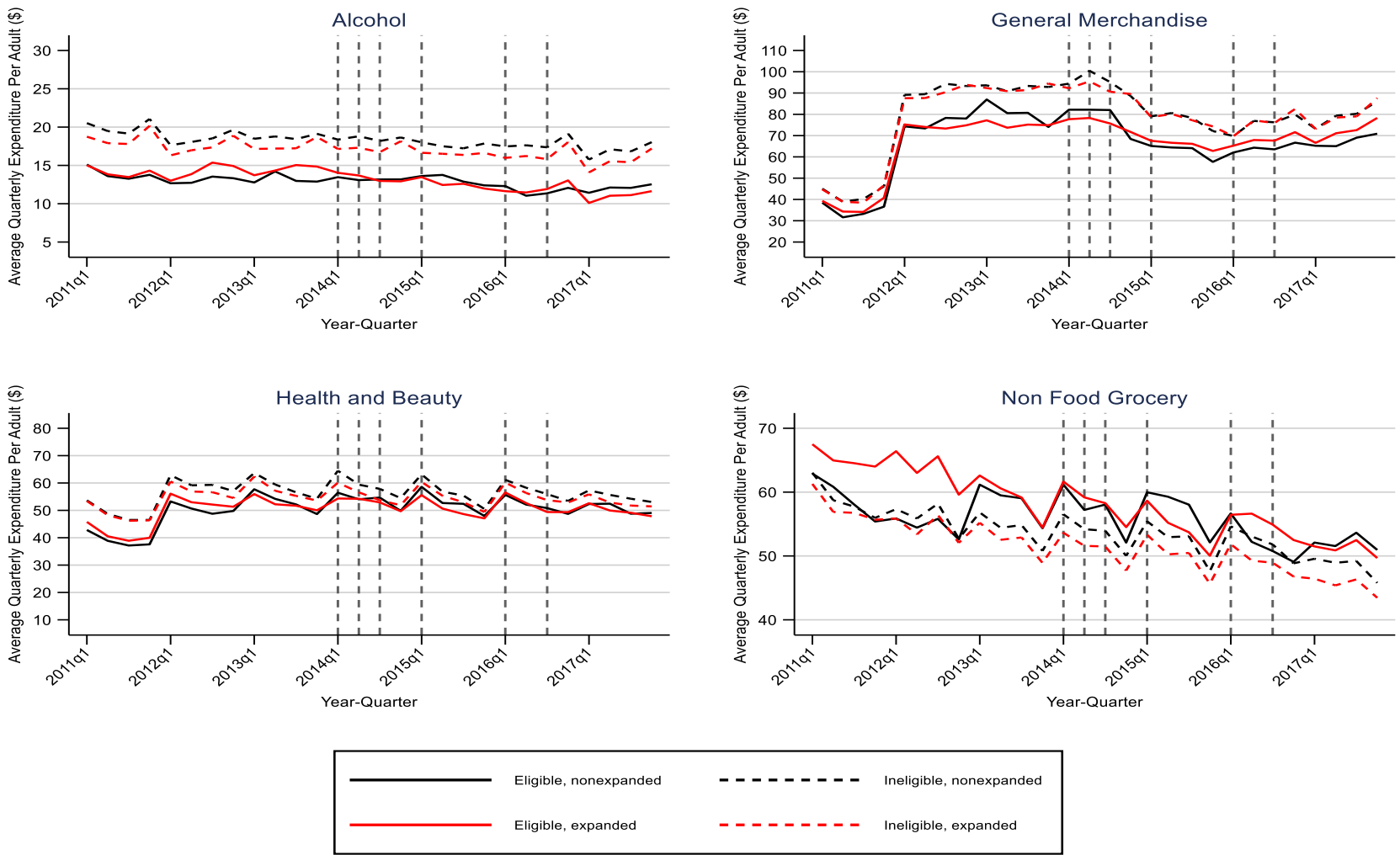

Figure 3. Trends of average quarterly expenditures (2011$) per adult equivalent unit on non-food categories for eligible and ineligible households in expansion and non-expansion states, 2011-2017

I estimate the effects of Medicaid expansion on spending of low income households using equations 1 and 2 and plot the coefficients against quarters relative to expansion as presented in figures 4 through 8. Strong seasonal effects in the figures are justifiable given that most expansions happened at the same time. The quarter before the expansion is the omitted category. The triple-difference model coefficients and their standard errors are written on the event-study plots with their significant levels indicated. The detailed tables of event-study estimates are presented in appendix tables 1, 2, and 3. The event-study estimates suggest that, overall, there is no strong evidence of differential pre-existing trends in quarterly expenditure between expansion and non-expansion states. The *p*-value of the *F*-test whether coefficients on quarters to expansion are jointly zero are presented on the same appendix tables. The *F*-test rejects the parallel trends for dry groceries and alcohol at the 5% significance level. Other categories effects do not suggest existing pre-trends at conventional significant levels.

4.2 Effects on Total Expenditures

In all estimations, the outcomes measured are the inflation-adjusted quarterly expenditures (2011$) per adult equivalent unit at the household-level. The total expenditure summed across all categories, or total expenditure on food or non-food categories, do not show any impacts even though the effect on total and food expenditures is negative in magnitude (figure 4). This suggests that even if there are positive income effects, they do not manifest in recurring household food and other consumption expenditures.

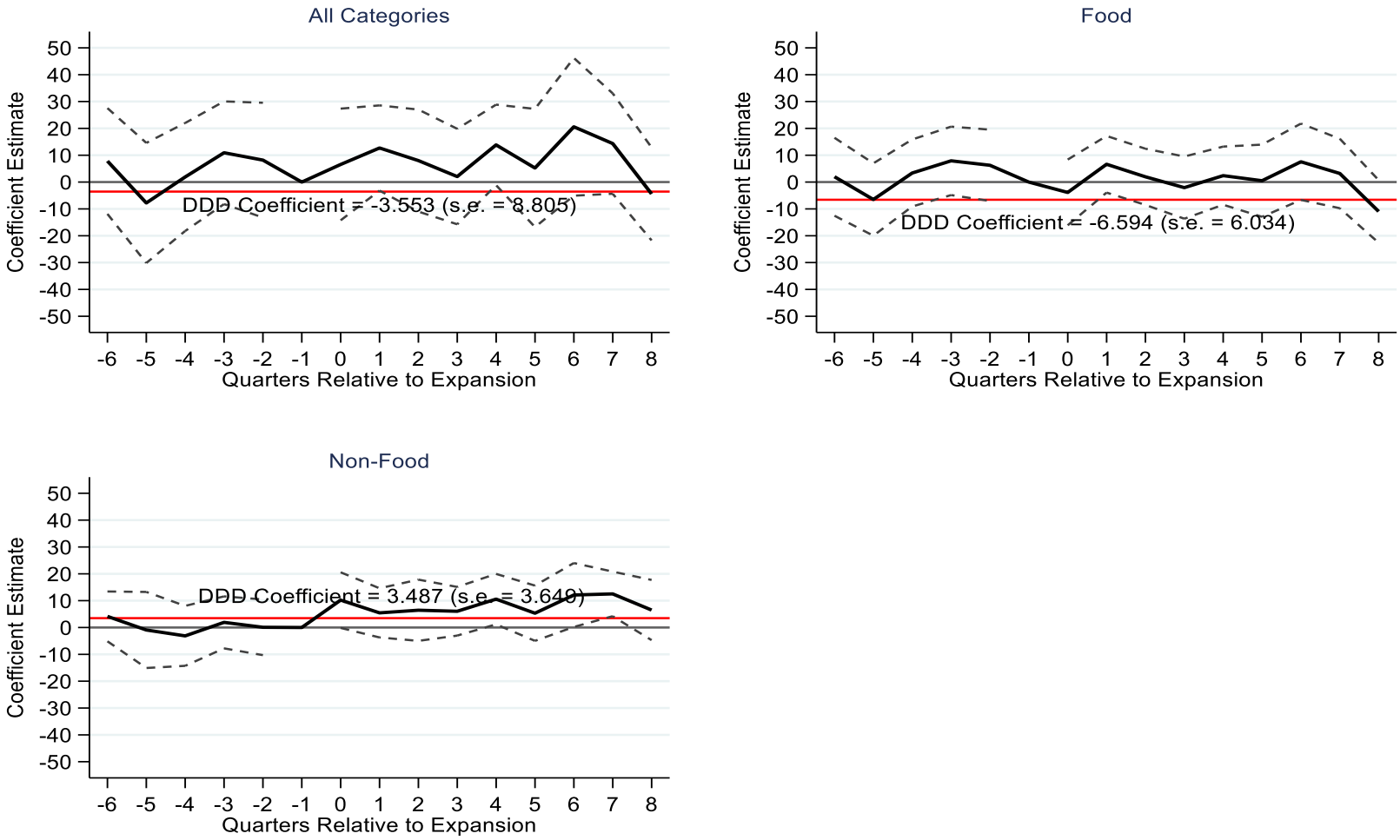

Figure 4. Effects of Medicaid expansion on eligible households' quarterly expenditure (2011$) per adult equivalent unit – total expenditures, 2011-2017. *Notes:* the red line denotes the triple difference model coefficient. The dark thick solid black line denotes the coefficients of interest from event study. The short, dashed lines are the confidence intervals of the event study coefficient estimates. The solid gray line denotes no change line (y-zero). The omitted expansion quarter is $j = -1$.

4.3 Effects on Food Expenditures

Among food categories, there is a significant negative effect ($2.88 per adult equivalent unit) on quarterly fresh produce expenditure, and a significant negative effect ($2.13 per adult equivalent unit) on quarterly frozen food expenditure (figure 5). These are about 18.6% and 4.4% of pre-expansion mean expenditures of the eligible households in expanded states with some variations over time. The reduction in fresh produce expenditure is persistent across post-expansion quarters, while the reduction in frozen food expenditures are largely driven by a strong reduction eight quarters post-expansion. There are no effects on expenditure on other food categories.

The negative effect on the fresh produce expenditure shows that health insurance expansion may have unintentionally worsened diet habits. However, the negative effects on fresh and frozen food expenditures together could also mean that the households substitute foods at home with food away from home after the expansion due to an income effect as well as increase in confidence in the overall health and life quality. This claim is not testable without data on food-away-from-home purchases. Todd et al. (2010) show that food away from home is associated with an increase in daily caloric intake and a reduction in diet quality using dietary recall data from the 1994-96 Continuing Survey of Food Intakes by Individuals (CSFII) and the 2003-04 NHANES which covers a broader sample of US consumers. Hence, a substitution of food-at-home expenditure with food-away-from-home expenditure would still point to a reduction in overall diet quality. Further disaggregation of the expenditure on frozen food categories shows no change in the expenditures on frozen fruits and vegetables category (figure 6). This suggests that the expenditure reduction in high quality fruits and vegetables comes solely from the reduction in fresh produce expenditures.

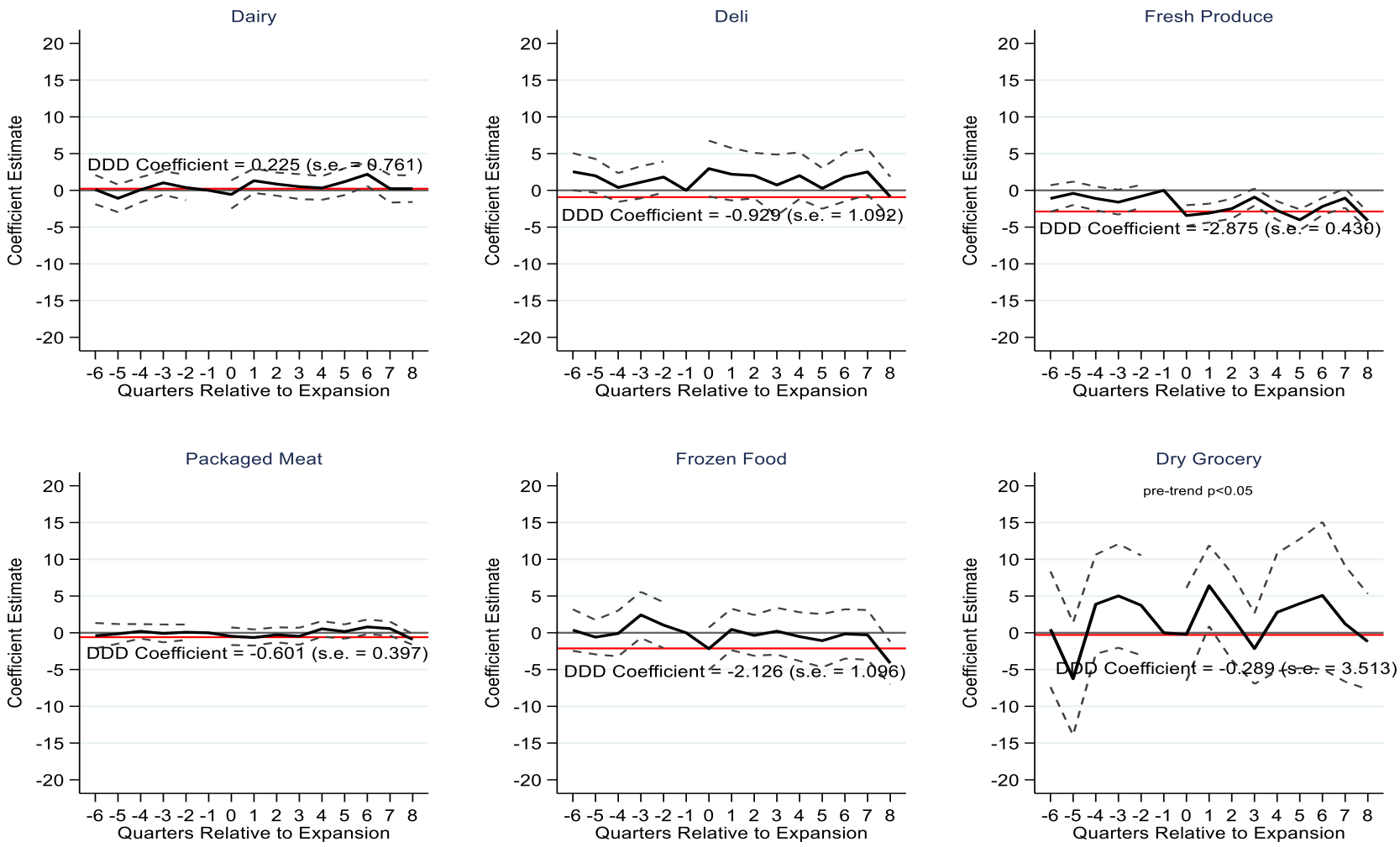

Figure 5. Effects of Medicaid expansion on eligible households' quarterly expenditure (2011$) per adult equivalent unit – food expenditures, 2011-2017. *Notes:* the red line denotes the triple difference model coefficient. The dark thick solid black line denotes the coefficients of interest from event study. The short, dashed lines are the confidence intervals of the event study coefficient estimates. The solid gray line denotes no change line (y-zero). The omitted expansion quarter is $j = -1$.

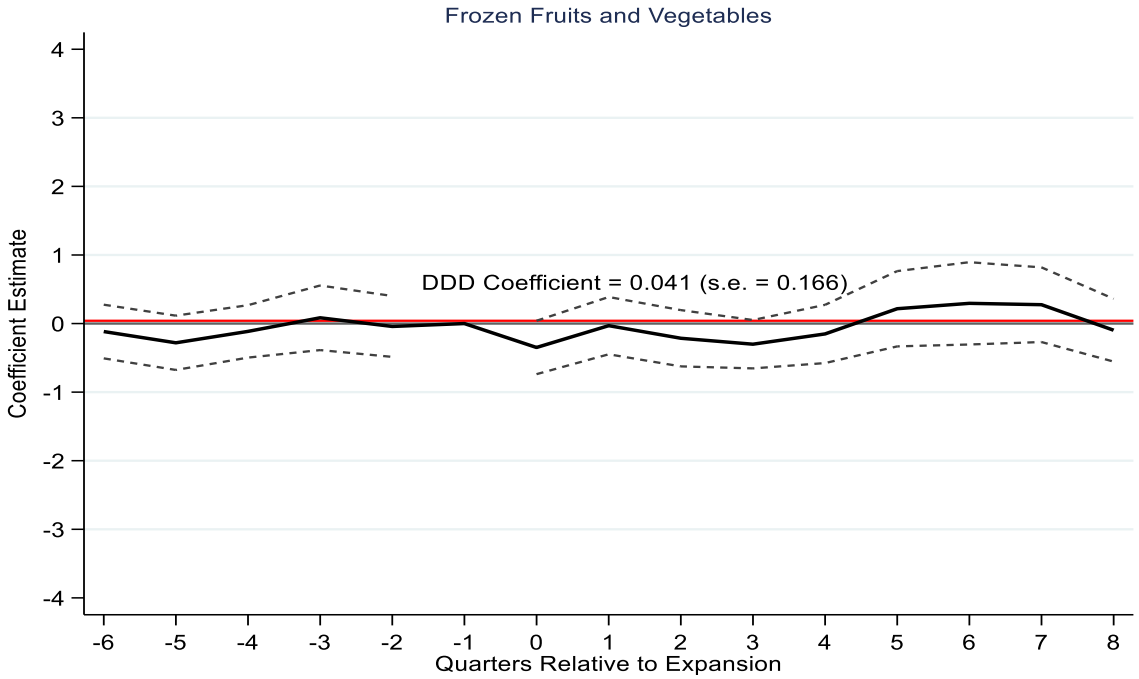

Figure 6. Effects of Medicaid expansion on eligible households' quarterly expenditure (2011$) per adult equivalent unit – sub-categories of frozen products – frozen fruits and vegetables, 2011-2017. *Notes*: The red line denotes the triple difference model coefficient. The dark thick solid black line denotes the coefficients of interest from event study. The short, dashed lines are the confidence intervals of the event study coefficient estimates. The solid gray line denotes no change line (y-zero). The omitted expansion quarter is $j = -1$.

4.4 Effects on Non-Food Expenditures

Among non-food categories, there is a significant positive effect of $4.97 per adult equivalent unit on quarterly expenditure on health and beauty products of eligible households due to expansion (figure 7). This is equivalent to about 10.3% of pre-expansion mean expenditure of the eligible households in expanded states. There are no effects on alcohol, general merchandise, or non-food grocery expenditures.

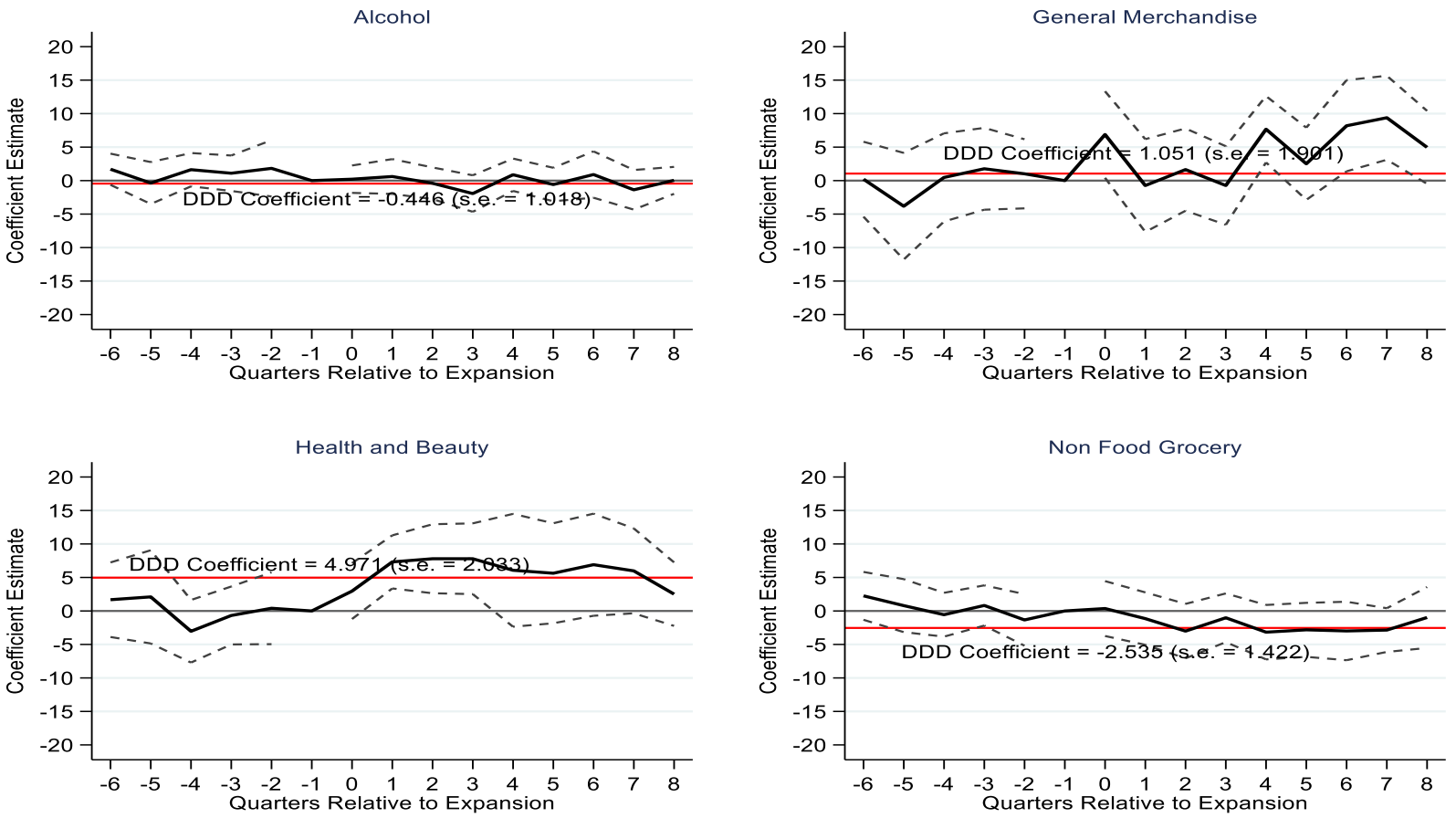

Figure 7. Effects of Medicaid expansion on eligible households' quarterly expenditure (2011$) per adult equivalent unit – non-food categories, 2011-2017. *Notes*: the red line denotes the triple difference model coefficient. The dark thick solid black line denotes the coefficients of interest from event study. The short, dashed lines are the confidence intervals of the event study coefficient estimates. The solid gray line denotes no change line (y-zero). The omitted expansion quarter is $j = -1$.

To further analyze what kind of health and beauty products contributed to the increase, I subdivide the health and beauty products into 1) health products and 2) beauty products and find no significant contribution from beauty products. More than 90% of the significant increase in health and beauty product expenditure comes from the increase in expenditure on health products (figure 8). I further divide the health products subcategory as 2-i) diet aids and vitamins, 2-ii) hygiene and sanitary protection, and 2-iii) over-the-counter medications/remedies/first aid. The results are presented in figure 8. The increase primarily comes from the over-the-counter medications/remedies/first-aid category, which is only partially preventative. This category includes products such as cough and cold remedies, contraceptives, pregnancy test kits, antacids, insulin syringes, blood pressure kits, pain remedies, etc. This suggests that this low-income sample made more frequent use of over-the-counter palliative medication, for example Ibuprofen for pain or cold medication. While unlikely to influence mortality, this type of palliative medication substantially improves quality of life when moderately sick or injured.

Though not testable with the data I have, this result is consistent with a pattern in which increased doctor visits and access to preventive care due to Medicaid expansion (Simon et al., 2017), as well as more exposure to health information in general, result in spillovers to these over-the-counter product expenditures. This pattern is also consistent with state level results. Using the Oregon Medicaid lottery experiment, Baicker et al. (2017) found that assignment to Medicaid coverage increased the use of nonprescription, over-the-counter medications for gastrointestinal conditions such as ulcers. Increased doctor visits allowed for the new diagnoses of gastrointestinal conditions and effective treatment with over-the-counter medications. The category diet aids and vitamins, which is putatively preventative, did not see any significant changes. Hygiene and sanitary protection expenditures were also unaffected.

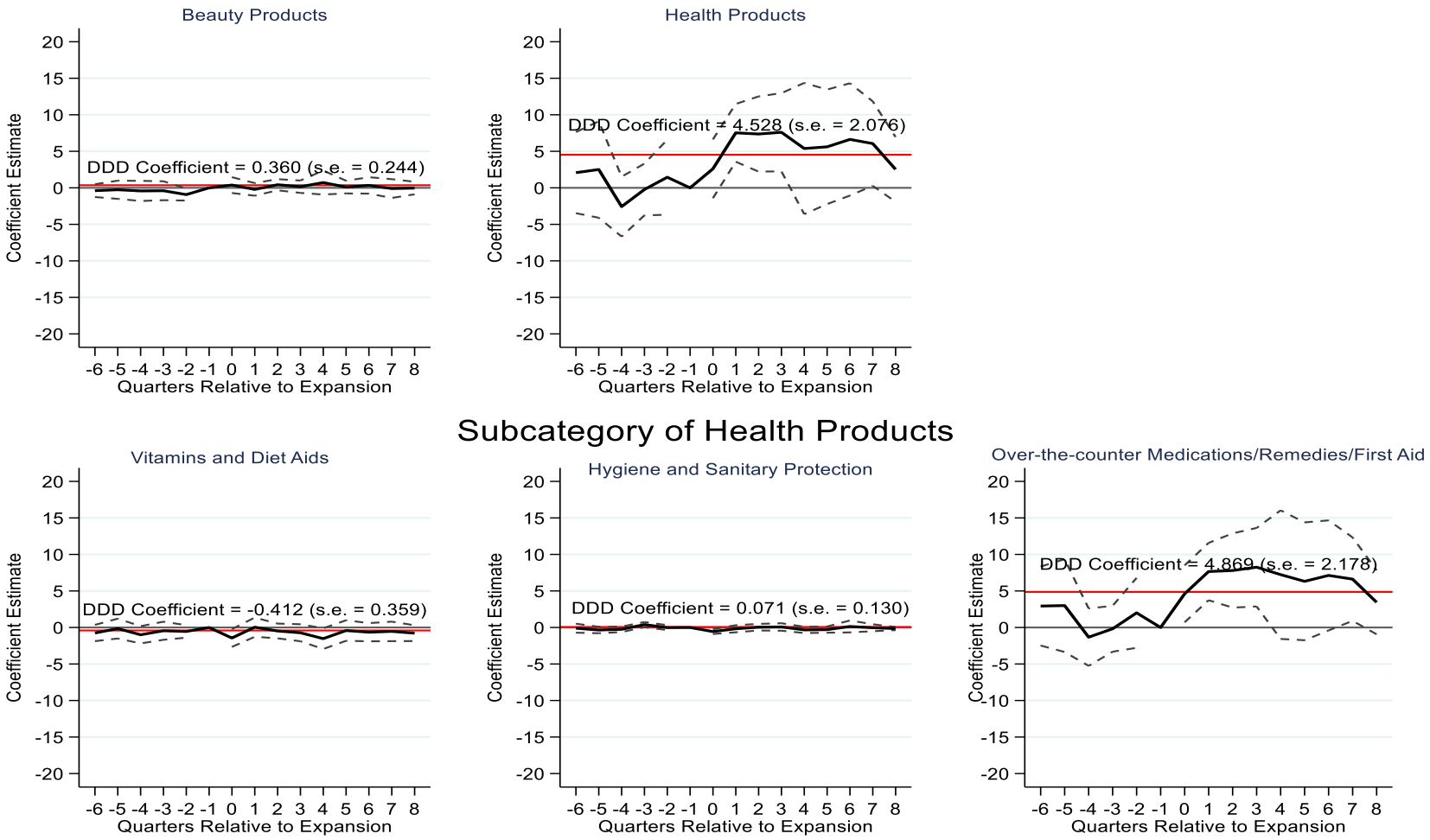

Figure 8. Effects of Medicaid expansion on eligible households' quarterly expenditure (2011$) per adult equivalent unit – sub-categories of health and beauty products, 2011-2017. *Notes*: The red line denotes the triple difference model coefficient. The dark thick solid black line denotes the coefficients of interest from event study. The short, dashed lines are the confidence intervals of the event study coefficient estimates. The solid gray line denotes no change line (y-zero). The omitted expansion quarter is $j = -1$. The bottom three graphs are the subcategories of health products.

4.5 Effects on groups most impacted by the expansion

Low-income childless adults benefitted most from the Medicaid expansion because this group was previously largely ineligible for any public health insurance. I estimate the main models using only households without children under the age of 18 (i.e. Childless adults). In the model with only childless households, there is greater reduction in fresh produce expenditure ($3.73), an insignificant reduction in frozen food expenditure, and a greater increase in health and beauty products expenditure ($7.42) as expected. This suggests more substitution behavior between eating healthy and using more medication among the targeted households.

It is reasonable to assume that another subgroup that benefitted significantly is older people who are not yet eligible for Medicare. Hence, I conduct the main analysis for a subgroup of households with both heads between ages 55 and 64. The increase in the health and beauty product expenditure is even higher ($11.00) among this group, as expected, even though the decrease in the fresh produce expenditure is smaller ($2) compared to the main sample ($2.88). The results from both groups are presented in tables 3, 4, and 5.

4.6 Sensitivity Analysis

I conducted a series of robustness checks by re-estimating the main models presented in figures 3, 4, and 5. First, I estimate the model including the states that had significant prior expansions. Second, I estimate the model including the households with income between 100 and 138 percentage of federal poverty level. These households were not included in the main model because they are still eligible for marketplace subsidies in both expansion and non-expansion states. Third, I estimate the model without state-specific time trends. Fourth, I include region-year-quarter fixed effects because of the geographic clustering of the Medicaid expansion and because many Southern states did not implement the ACA Medicaid expansion. Fifth, I narrow the age-eligibility by including the households where both heads are between 30 and 60 years old. Sixth, I drop the year 2011 since some categories have sharp jumps around the first quarter of 2012. In some cases, researchers use low education to identify eligibility for Medicaid instead of income cutoffs as incomes may respond to changes in Medicaid coverage expansions. As a sensitivity analysis I use both income and education to define eligibility. Households with heads who have less than a high school degree are considered as having low education hence eligible for Medicaid. I also exclude the late expanders (i.e., states that expanded Medicaid later than 2015) and re-estimate the main models.

The results from sensitivity analysis are similar with some exceptions. Comparisons made are relative to the main models. When states with significant prior expansions are included, there is an economically insignificant but statistically significant reduction in expenditure on packaged meat (in addition to the significant effects on fresh produce and frozen foods) and the effect on health and beauty products is no longer significant. Results similar to the main results are obtained when the model includes households with income between 100 and 138 percentage of federal

poverty level. Results are robust to the exclusion of state specific time trends and to the inclusion of region-year-quarter fixed effects. The effects on health and beauty products are not significant when age eligibility is narrowed. When the year 2011 is dropped, both general merchandise and health and beauty product expenditures significantly increase resulting in an increase in the total non-food expenditure. Results are robust to using both income and education for identifying Medicaid eligibility.[14] Similar results are obtained when late expanders are excluded.

Table 3. Sensitivity Analysis – Total Expenditures

	(1) All	(2) Food	(3) Non-food
Include states with significant prior expansions (N=1,079,983)	-5.964	-7.107	1.514
	(8.016)	(5.400)	(3.470)
Include households with income between 100 138 percent of FPL (N=1,069,069)	-1.074	-4.970	4.285
	(7.924)	(5.435)	(3.434)
No state-specific time trends (N=990,914)	-3.485	-6.548	3.435
	(8.820)	(6.039)	(3.657)
Add region-year-quarter fixed effects (N=990,914)	-3.976	-6.683	3.100
	(8.936)	(6.093)	(3.724)
Both heads are between 30 and 60 years old (N=789,659)	-6.683	-9.387	2.371
	(11.517)	(7.510)	(5.060)
Drop year 2011 (N=843,805)	0.138	-7.540	8.065**
	(9.298)	(5.986)	(3.956)
Education in addition to income cutoffs for eligibility (N=990,914)	-1.832	-5.570	4.452
	(8.293)	(5.692)	(3.638)
Childless adults (N=679,753)	-2.921	-6.436	4.328
	(9.635)	(6.881)	(4.447)
Older heads (both heads between ages 55 and 64) (N=331,463)	7.769	-0.454	9.994
	(10.911)	(7.050)	(6.484)
Exclude late expanders (states expanded after 2015) (N=974,280)	-4.314	-6.473	2.637
	(9.054)	(6.185)	(3.712)
Estimates from the base model	-3.553	-6.594	3.487
	(8.805)	(6.034)	(3.649)

Notes: *, **, *** indicate significance at the 10%, 5%, 1% level, respectively. All models include controls for age, marital status, years of education of the household head, number of household heads, hours of employment, and presence of children in the household. Additionally, all models include household, year and quarter fixed-effects, and state-specific time trends. Robust standard errors clustered at the state-level are in parentheses. These estimates are from the triple-difference model and the units are in inflation adjusted dollar expenditures (2011$).

[14] When only education is used to define eligibility, none of the earlier effects are significant even though the health and beauty product expenditure saw greater increase. This might be due to a lack of statistical power and education may not be a good predictor of eligibility in this data.

Table 4. Sensitivity Analysis – Food Expenditures

	(1) Dairy	(2) Deli	(3) Fresh Produce	(4) Packaged Meat	(5) Frozen Food	(6) Dry Grocery
Include states with significant prior expansions (N=1,079,983)	-0.024	-1.133	-3.045***	-0.735*	-1.894*	-0.276
	(0.715)	(0.960)	(0.403)	(0.368)	(1.070)	(3.135)
Include households with income between 100-138 percentage of FPL (N=1,069,069)	0.370	-1.003	-2.347***	-0.490	-1.727*	0.227
	(0.718)	(0.890)	(0.369)	(0.338)	(0.993)	(3.233)
No state-specific time trends (N=990,914)	0.212	-0.959	-2.858***	-0.581	-2.112*	-0.251
	(0.764)	(1.096)	(0.432)	(0.397)	(1.096)	(3.513)
Add region-year-quarter fixed effects (N=990,914)	0.231	-0.968	-2.821***	-0.564	-2.159*	-0.403
	(0.762)	(1.095)	(0.444)	(0.386)	(1.124)	(3.492)
Both heads are between 30 and 60 years old (N=789,659)	0.119	-0.820	-3.168***	-0.949*	-3.088**	-1.482
	(0.929)	(1.185)	(0.524)	(0.549)	(1.373)	(4.324)
Drop year 2011 (N=843,805)	0.169	-1.053	-2.146***	-0.514	-2.212**	-1.784
	(0.750)	(1.130)	(0.467)	(0.403)	(1.088)	(3.364)
Education in addition to income cutoffs for eligibility (N=990,914)	0.124	-0.322	-2.646***	-0.629	-2.003*	-0.094
	(0.689)	(1.162)	(0.427)	(0.377)	(1.076)	(3.314)
Childless adults (N=679,753)	0.081	-1.047	-3.728***	-0.283	-1.847	0.388
	(0.860)	(1.461)	(0.585)	(0.410)	(1.213)	(4.210)
Older heads (both heads between ages 55 and 64) (N=331,463)	0.075	-1.685	-2.011***	0.020	0.142	3.005
	(1.029)	(1.770)	(0.676)	(0.372)	(1.440)	(4.264)
Exclude late expanders (states expanded after 2015) (N=974,280)	0.300	-0.998	-2.927***	-0.558	-2.249*	-0.042
	(0.778)	(1.101)	(0.445)	(0.404)	(1.120)	(3.584)
Estimates from the base model	0.225	-0.929	-2.875***	-0.601	-2.126*	-0.289
	(0.761)	(1.092)	(0.430)	(0.397)	(1.096)	(3.513)

Notes: *, **, *** indicate significance at the 10%, 5%, 1% level, respectively. All models include controls for age, marital status, years of education of the household head, number of household heads, hours of employment, and presence of children in the household. Additionally, all models include household, year and quarter fixed-effects, and state-specific time trends. Robust standard errors clustered at the state-level are in parentheses. These estimates are from the triple-difference model and the units are in inflation adjusted dollar expenditures (2011$).

Table 5. Sensitivity Analysis – Non-Food Expenditures

	(1) Alcohol	(2) General Merchandise	(3) Health and Beauty	(4) Non Food Grocery
Include states with significant prior expansions (N=1,079,983)	-0.372	0.833	3.419	-2.738**
	(0.897)	(1.708)	(2.117)	(1.285)
Include households with income between 100 and 138 percentage of FPL (N=1,069,069)	-0.389	1.094	4.679**	-1.488
	(0.866)	(1.808)	(1.870)	(1.357)
No state-specific time trends (N=990,914)	-0.371	1.039	4.919**	-2.523*
	(1.015)	(1.906)	(2.023)	(1.423)
Add region-year-quarter fixed effects (N=990,914)	-0.393	0.891	4.773**	-2.564*
	(1.008)	(1.957)	(2.060)	(1.419)
Both heads are between 30 and 60 years old (N=789,659)	0.334	-0.242	4.435	-1.822
	(1.121)	(1.997)	(3.041)	(1.542)
Drop year 2011 (N=843,805)	-0.386	4.818**	5.290**	-2.043
	(1.067)	(2.100)	(1.981)	(1.363)
Education in addition to income cutoffs for eligibility (N=990,914)	-0.714	1.964	4.642**	-2.153
	(0.952)	(1.745)	(1.989)	(1.481)
Childless adults (N=679,753)	-0.812	0.546	7.420**	-3.638*
	(1.427)	(2.281)	(2.954)	(1.836)
Older heads (both heads between ages 55 and 64) (N=331,463)	-1.771	3.221	10.996*	-4.223
	(2.395)	(3.499)	(5.786)	(2.594)
Exclude late expanders (states expanded after 2015) (N=974,280)	-0.477	0.890	4.125**	-2.378
	(1.038)	(1.942)	(1.972)	(1.444)
Estimates from the base model	-0.446	1.051	4.971**	-2.535*
	(1.018)	(1.901)	(2.033)	(1.422)

Notes: *, **, *** indicate significance at the 10%, 5%, 1% level, respectively. All models include controls for age, marital status, years of education of the household head, number of household heads, hours of employment, and presence of children in the household. Additionally, all models include household, year and quarter fixed-effects, and state-specific time trends. Robust standard errors clustered at the state-level are in parentheses. These estimates are from the triple-difference model and the units are in inflation adjusted dollar expenditures (2011$).

4.7 Falsification Test

As a falsification test, I estimate the same models for only the households with heads who are below 26 years old or above 65 years old. The expectation is that there are no effects because these households' eligibility for health insurance would not change before and after the Medicaid expansion as they are either eligible for Medicare or other provisions. The triple-difference model estimates are presented in table 6. None of the effects except the dry grocery category is significant as expected. The dry category also had a significant pre-trend so this coefficient might not be well-identified.[15]

4.8 Limitations

The information about household participation in other safety nets that affect household food consumption such as Supplemental Nutrition Assistance Program (SNAP) is not available hence not controlled for in the models. Research shows that Medicaid enrollment increases SNAP participation and vice versa (Baicker et al., 2014; Yelowitz, 1996; Schmidt et al., 2019). If a household that newly enrolled in Medicaid also started participating in SNAP, then the mechanism that the food consumption changes is via the Medicaid induced SNAP participation and not a direct effect of Medicaid. Data shows that more than two-thirds of SNAP participants are households with children and a third are households with elderly or disabled people (Center on Budget and Policy Priorities, 2019). Therefore, the stronger robust results in the childless adult sample suggest that the effects are mainly due to the expansion in Medicaid coverage because there is a higher probability that childless households are not SNAP recipients.

[15] I also tested and confirmed that the household income, employment, and work hours are not responsive to Medicaid expansion using an event study design.

Table 6. Falsification test: triple difference model coefficients for households unaffected by Medicaid expansion (N = 319,160)

Total Spending						
	All	Food	Non-food			
Medicaid Eligible*Expansion	2.778	0.644	1.053			
	(11.738)	(6.471)	(6.999)			
Food Category						
Variable	Dairy	Deli	Fresh Produce	Packaged Meat	Frozen Food	Dry Grocery
Medicaid Eligible*Expansion	-0.614	-2.869	-1.410	-0.609	-2.117	8.263**
	(0.930)	(1.741)	(1.112)	(0.665)	(1.825)	(3.352)
Non Food Category						
	Alcohol	General Merchandise		Health and Beauty	Non Food Grocery	
Medicaid Eligible*Expansion	1.081	-1.145		-0.012	2.210	
	(0.939)	(3.132)		(4.009)	(1.902)	

Notes: *, **, *** indicate significance at the 10%, 5%, 1% level, respectively. All models include controls for age, marital status, years of education of the household head, number of household heads, hours of employment, and presence of children in households. Additionally, all models include household, year and quarter fixed-effects, and state-specific time trends. Robust standard errors clustered at the state-level are in parentheses. The models include only the households with heads less than 26 years old or greater than 65 years old, drop households with income between 100 and 138% of FPL and drop DC and states with prior expansions which are, Delaware, Massachusetts, New York, and Vermont.

It is not clear whether the seasonality of fresh produce prices affects the purchase behavior of fresh produce. I have tried to control for seasonality by adding quarter fixed effects, but this may be insufficient. Due to these limitations, the mechanisms through which fresh produce expenditure is reduced are not fully unraveled. However, given the robustness of the results a plausible explanation is the substitution of healthcare consumption for preventative non-healthcare consumption (i.e. less fresh produce consumption).

The results on alcohol purchases are similar to some previous studies (Brook et al., 1983; Cotti et al., 2019; De Preux, 2011) who found that insurance coverage had no effect on the probability of purchasing alcohol, which suggests that the expansion did not create an ex-ante moral hazard in alcohol consumption. There could be an increase in alcohol consumption away from home which is not captured in this data.[16] Further the eligibility instead of actual participation in Medicaid is used, hence the estimates are likely to be the lower bound of the true effects.

5. Conclusions

In this study, I investigate the effects of recent Medicaid expansion on the eligible households' quarterly food and non-food expenditures using state and time variation in Medicaid expansion. Eligible households from expansion states spent less on quarterly fresh produce and frozen foods per adult and more on health and beauty products after Medicaid expansion. Almost all the increase in the health and beauty product expenditure is due to an increase in expenditure on over-the-counter medications and remedies, which are more responsive and palliative in nature.

The robust reduction in fresh produce expenditures and increase in expenditures on over-the-counter medications and remedies suggests that while expanded public health insurance

[16] Households were instructed to scan purchases from liquor stores

increases formal healthcare activity, it also decreases informal preventative non-healthcare expenditures. This does not mean that public health insurance coverage should be limited. The evidence on the benefits of public insurance coverage expansions on health and financial outcomes of the beneficiaries is overwhelmingly positive. Further, pricing incentives such as subsidies aimed at promoting fruits and vegetables purchases for SNAP recipients have been shown to be effective in encouraging fruit and vegetable consumption (An, 2013; Durward et al., 2019; Rummo et al., 2019). Among SNAP beneficiaries, financial incentives combined with nutrition education are proven to be effective in improving dietary intake relative to single programs (Verghese et al., 2019). Policy makers can combine health insurance programs with education programs on healthy behaviors and price incentives to help people find a better balance between preventative non-healthcare consumption and healthcare consumption.

References

Allcott, H., Diamond, R., Dubé, J.-P., Handbury, J., Rahkovsky, I., Schnell, M., 2019. Food Deserts and the Causes of Nutritional Inequality. Q. J. Econ. 134, 1793–1844. https://doi.org/10.1093/qje/qjz015

An, R., 2013. Effectiveness of subsidies in promoting healthy food purchases and consumption: a review of field experiments. Public Health Nutr. 16, 1215–1228. https://doi.org/10.1017/S1368980012004715

Baicker, K., Allen, H.L., Wright, B.J., Finkelstein, A.N., 2017. The Effect Of Medicaid On Medication Use Among Poor Adults: Evidence From Oregon. Health Aff. (Millwood) 36, 2110–2114. https://doi.org/10.1377/hlthaff.2017.0925

Baicker, K., Finkelstein, A., Song, J., Taubman, S., 2014. The Impact of Medicaid on Labor Market Activity and Program Participation: Evidence from the Oregon Health Insurance Experiment. Am. Econ. Rev. 104, 322–328. https://doi.org/10.1257/aer.104.5.322

Baicker, K., Taubman, S.L., Allen, H.L., Bernstein, M., Gruber, J.H., Newhouse, J.P., Schneider, E.C., Wright, B.J., Zaslavsky, A.M., Finkelstein, A.N., 2013. The Oregon experiment—effects of Medicaid on clinical outcomes. N. Engl. J. Med. 368, 1713–1722.

Barbaresco, S., Courtemanche, C.J., Qi, Y., 2015. Impacts of the Affordable Care Act dependent coverage provision on health-related outcomes of young adults. J. Health Econ. 40, 54–68. https://doi.org/10.1016/j.jhealeco.2014.12.004

Binkley, J.K., Eales, J., Jekanowski, M., 2000. The relation between dietary change and rising US obesity. Int. J. Obes. 24, 1032–1039. https://doi.org/10.1038/sj.ijo.0801356

Brook, R.H., Ware, J.E., Rogers, W.H., Keeler, E.B., Davies, A.R., Donald, C.A., Goldberg, G.A., Lohr, K.N., Masthay, P.C., Newhouse, J.P., 1983. Does Free Care Improve Adults' Health? N. Engl. J. Med. 309, 1426–1434. https://doi.org/10.1056/NEJM198312083092305

Center on Budget and Policy Priorities, 2019. Policy Basics: The Supplemental Nutrition Assistance Program (SNAP) [WWW Document]. Cent. Budg. Policy Priorities. URL https://www.cbpp.org/research/food-assistance/policy-basics-the-supplemental-nutrition-assistance-program-snap (accessed 9.10.20).

Cotti, C., Nesson, E., Tefft, N., 2019. Impacts of the ACA Medicaid expansion on health behaviors: Evidence from household panel data. Health Econ. 28, 219–244. https://doi.org/10.1002/hec.3838

Courtemanche, C., Marton, J., Ukert, B., Yelowitz, A., Zapata, D., 2018. Effects of the Affordable Care Act on Health Care Access and Self-Assessed Health After 3 Years. Inq.

J. Health Care Organ. Provis. Financ. 55, 004695801879636. https://doi.org/10.1177/0046958018796361

Courtemanche, C.J., Zapata, D., 2014. Does Universal Coverage Improve Health? The Massachusetts Experience. J. Policy Anal. Manage. 33, 36–69. https://doi.org/10.1002/pam.21737

Dave, D., Kaestner, R., 2009. Health insurance and ex ante moral hazard: evidence from Medicare. Int. J. Health Care Finance Econ. 9, 367–390. https://doi.org/10.1007/s10754-009-9056-4

De Preux, L.B. de, 2011. Anticipatory ex ante moral hazard and the effect of Medicare on prevention. Health Econ. 20, 1056–1072. https://doi.org/10.1002/hec.1778

Dillender, M., 2017. Medicaid, family spending, and the financial implications of crowd-out. J. Health Econ. 53, 1–16. https://doi.org/10.1016/j.jhealeco.2017.02.002

Durward, C.M., Savoie-Roskos, M., Atoloye, A., Isabella, P., Jewkes, M.D., Ralls, B., Riggs, K., LeBlanc, H., 2019. Double Up Food Bucks Participation is Associated with Increased Fruit and Vegetable Consumption and Food Security Among Low-Income Adults. J. Nutr. Educ. Behav. 51, 342–347. https://doi.org/10.1016/j.jneb.2018.08.011

Einav, L., Finkelstein, A., 2018. Moral Hazard in Health Insurance: What We Know and How We Know It. J. Eur. Econ. Assoc. 16, 957–982. https://doi.org/10.1093/jeea/jvy017

Einav, L., Leibtag, E.S., Nevo, A., 2008. On the Accuracy of Nielsen Homescan Data [WWW Document]. AgEcon Search. https://doi.org/10.22004/ag.econ.56490

Finkelstein, A., Taubman, S., Wright, B., Bernstein, M., Gruber, J., Newhouse, J.P., Allen, H., Baicker, K., Group, O.H.S., 2012. The Oregon health insurance experiment: evidence from the first year. Q. J. Econ. 127, 1057–1106.

Gruber, J., Yelowitz, A., 1999. Public health insurance and private savings. J. Polit. Econ. 107, 1249–1274.

He, X., Lopez, R.A., Boehm, R., 2020. Medicaid expansion and non-alcoholic beverage choices by low-income households. Health Econ. hec.4133. https://doi.org/10.1002/hec.4133

Himmelstein, G., 2019. Effect of the Affordable Care Act's Medicaid Expansions on Food Security, 2010–2016. Am. J. Public Health 109, 1243–1248. https://doi.org/10.2105/AJPH.2019.305168

Kaiser Family Foundation, 2019. Status of State Action on the Medicaid Expansion Decision.

Kaiser Family Foundation, 2013. Summary of the Affordable Care Act.

Leininger, L., Levy, H., Schanzenbach, D., 2010. Consequences of SCHIP Expansions for Household Well-Being. Forum Health Econ. Policy 13. https://doi.org/10.2202/1558-9544.1201

Levy, H., Buchmueller, T., Nikpay, S., 2019. The Impact of Medicaid Expansion on Household Consumption. East. Econ. J. 45, 34–57. https://doi.org/10.1057/s41302-018-0124-7

Mazumder, B., Miller, S., 2016. The effects of the Massachusetts health reform on household financial distress. Am. Econ. J. Econ. Policy 8, 284–313.

Millen, B. E., et al. 2016. The 2015 dietary guidelines advisory committee scientific report: development and major conclusions. Advances in nutrition 7.3: 438-444.

Miller, S., Johnson, N., Wherry, L.R., 2019. Medicaid and Mortality: New Evidence from Linked Survey and Administrative Data (Working Paper No. 26081), Working Paper Series. National Bureau of Economic Research. https://doi.org/10.3386/w26081

Nguyen, B.T., Han, X., Jemal, A., Drope, J., 2016. Diet quality, risk factors and access to care among low-income uninsured American adults in states expanding Medicaid vs. states not expanding under the affordable care act. Prev. Med. 91, 169–171. https://doi.org/10.1016/j.ypmed.2016.08.015

Nicklas, T.A., Baranowski, T., Cullen, K.W., Berenson, G., 2001. Eating Patterns, Dietary Quality and Obesity. J. Am. Coll. Nutr. 20, 599–608. https://doi.org/10.1080/07315724.2001.10719064

Oster, E., 2018. Diabetes and Diet: Purchasing Behavior Change in Response to Health Information. Am. Econ. J. Appl. Econ. 10, 308–348. https://doi.org/10.1257/app.20160232

Patient protection and affordable care act. Public Law 111, 759–762.

Rolls, B.J., Ello-Martin, J.A., Tohill, B.C., 2004. What Can Intervention Studies Tell Us about the Relationship between Fruit and Vegetable Consumption and Weight Management? Nutr. Rev. 62, 1–17. https://doi.org/10.1111/j.1753-4887.2004.tb00001.x

Rummo, P.E., Noriega, D., Parret, A., Harding, M., Hesterman, O., Elbel, B.E., 2019. Evaluating A USDA Program That Gives SNAP Participants Financial Incentives To Buy Fresh Produce In Supermarkets. Health Aff. (Millwood) 38, 1816–1823. https://doi.org/10.1377/hlthaff.2019.00431

Schmidt, L., Shore-Sheppard, L., Watson, T., 2019. The Impact of Expanding Public Health Insurance on Safety Net Program Participation: Evidence from the ACA Medicaid Expansion (No. w26504). National Bureau of Economic Research, Cambridge, MA. https://doi.org/10.3386/w26504

Simon, K., Soni, A., Cawley, J., 2017. The impact of health insurance on preventive care and health behaviors: evidence from the first two years of the ACA Medicaid expansions. J. Policy Anal. Manage. 36, 390–417.

Sommers, B.D., Rosenbaum, S., 2011. Issues in health reform: how changes in eligibility may move millions back and forth between Medicaid and insurance exchanges. Health Aff. (Millwood) 30, 228–236.

Todd, J.E., Mancino, L., Lin, B.-H., 2010. The Impact of Food Away from Home on Adult Diet Quality (SSRN Scholarly Paper No. ID 1557129). Social Science Research Network, Rochester, NY. https://doi.org/10.2139/ssrn.1557129

Volpe, R., and A. Okrent. 2012. "Assessing the Healthfulness of Consumers' Grocery Purchases", EIB-102, U.S. Department of Agriculture, Economic Research Service, November 2012.

Verghese, A., Raber, M., Sharma, S., 2019. Interventions targeting diet quality of Supplemental Nutrition Assistance Program (SNAP) participants: A scoping review. Prev. Med. 119, 77–86. https://doi.org/10.1016/j.ypmed.2018.12.006

Yelowitz, A.S., 1996. Did recent medicaid reforms cause the caseload explosion in the food stamp program? (No. 1109–96), Institute for Research on Poverty Discussion Papers, Institute for Research on Poverty Discussion Papers. University of Wisconsin Institute for Research on Poverty.

Zhen, C., Taylor, J.L., Muth, M.K., Leibtag, E., 2009. Understanding differences in self-reported expenditures between household scanner data and diary survey data: a comparison of Homescan and consumer expenditure survey. Rev. Agric. Econ. 31, 470–492.

Appendix

Table A1. State Medicaid Expansion and Dates

State	Expansion
Alaska	9/2015
Arizona	1/2014
Arkansas	1/2014
California	1/2014
Colorado	1/2014
Connecticut	1/2014
Delaware	1/2014
District of Columbia	1/2014
Hawaii	1/2014
Illinois	1/2014
Indiana	2/2015
Iowa	1/2014
Kentucky	1/2014
Louisiana	7/2016
Maryland	1/2014
Massachusetts	1/2014
Michigan	4/2014
Minnesota	1/2014
Montana	1/2016
Nevada	1/2014
New Hampshire	8/2014
New Jersey	1/2014
New Mexico	1/2014
New York	1/2014
North Dakota	1/2014
Ohio	1/2014
Oregon	1/2014
Pennsylvania	1/2015
Rhode Island	1/2014
Vermont	1/2014
Washington	1/2014
West Virginia	1/2014
Wisconsin	1/2014

Note: Data from Simon, Soni, and Cawley (2017), and Kaiser Family Foundation, 2019.

Table A2. Effects of Medicaid expansion on quarterly expenditure ($) per adult equivalent unit: Event-study estimates (N = 990,914)

Variables	(1) All Categories	(2) Food	(3) Non-Food
Eligible*Quarters to Expansion = 7	2.906	-0.304	1.663
	(10.830)	(7.928)	(6.285)
Eligible*Quarters to Expansion = 6	7.842	1.990	4.150
	(10.051)	(7.407)	(4.733)
Eligible*Quarters to Expansion = 5	-7.771	-6.490	-0.917
	(11.411)	(6.877)	(7.231)
Eligible*Quarters to Expansion = 4	1.898	3.378	-3.115
	(10.263)	(6.367)	(5.691)
Eligible*Quarters to Expansion = 3	10.931	7.909	1.918
	(9.763)	(6.500)	(4.941)
Eligible*Quarters to Expansion = 2	8.175	6.256	0.085
	(10.913)	(6.779)	(5.291)
Eligible*Quarters to Expansion = 1		Omitted	
Eligible*Quarters after Expansion = 0	6.559	-3.863	10.208*
	(10.616)	(6.245)	(5.285)
Eligible*Quarters after Expansion = 1	12.701	6.637	5.450
	(8.096)	(5.379)	(4.671)
Eligible*Quarters after Expansion = 2	8.005	1.955	6.441
	(9.696)	(5.339)	(5.822)
Eligible*Quarters after Expansion = 3	2.054	-2.069	6.056
	(9.068)	(5.912)	(4.625)
Eligible*Quarters after Expansion = 4	13.852*	2.395	10.580**
	(7.649)	(5.525)	(4.794)
Eligible*Quarters after Expansion = 5	5.250	0.505	5.329
	(11.226)	(6.860)	(5.253)
Eligible*Quarters after Expansion = 6	20.585	7.564	12.114*
	(13.089)	(7.253)	(6.075)
Eligible*Quarters after Expansion = 7	14.350	3.198	12.525***
	(9.540)	(6.604)	(4.238)
p-value of the F-test that coefficients on quarters to expansion are jointly equal to zero	0.2904	0.1715	0.4684

Notes: *, **, *** indicate significance at the 10%, 5%, 1% level, respectively. All models include controls for age, marital status, years of education of the household head, number of household heads, hours of employment, and presence of children in the household. Additionally, all models include household, year and quarter fixed-effects, and state-specific time trends. Robust standard errors clustered at the state-level are in parentheses. The main model drops households with income between 100 and 138% of FPL and drops the DC and states with prior expansions which are, Delaware, Massachusetts, New York, and Vermont, and households with heads less than or equal to 25 years old or greater than or equal to 65 years old.

Table A3. Effects of Medicaid expansion on quarterly expenditure ($) per adult equivalent unit of food categories: Event-study estimates (N = 990,914)

Variables	(1) Dairy	(2) Deli	(3) Fresh Produce	(4) Packaged Meat	(5) Frozen Food	(6) Dry Grocery
Eligible*Quarters to Expansion = 7	0.191	1.467	-1.153*	-0.513	0.605	-0.901
	(0.947)	(1.364)	(0.672)	(0.731)	(1.590)	(4.443)
Eligible*Quarters to Expansion = 6	0.100	2.537*	-1.107	-0.398	0.367	0.490
	(1.013)	(1.292)	(0.923)	(0.883)	(1.440)	(4.014)
Eligible*Quarters to Expansion = 5	-1.082	1.979*	-0.405	-0.142	-0.591	-6.250
	(0.958)	(1.168)	(0.812)	(0.678)	(1.195)	(3.910)
Eligible*Quarters to Expansion = 4	0.081	0.394	-1.103	0.205	-0.088	3.889
	(0.871)	(0.995)	(0.827)	(0.501)	(1.588)	(3.448)
Eligible*Quarters to Expansion = 3	1.024	1.107	-1.604*	-0.083	2.436	5.028
	(0.822)	(1.117)	(0.861)	(0.619)	(1.598)	(3.599)
Eligible*Quarters to Expansion = 2	0.378	1.812*	-0.805	0.081	1.048	3.742
	(0.878)	(1.076)	(0.792)	(0.536)	(1.592)	(3.466)
Eligible*Quarters to Expansion = 1			Omitted			
Eligible*Quarters to Expansion = 0	-0.559	2.959	-3.422***	-0.465	-2.165	-0.212
	(0.980)	(1.942)	(0.719)	(0.612)	(1.471)	(3.226)
Eligible*Quarters after Expansion = 1	1.312	2.194	-3.092***	-0.638	0.457	6.405**
	(0.852)	(1.819)	(0.653)	(0.560)	(1.441)	(2.805)
Eligible*Quarters after Expansion = 2	0.853	2.010	-2.489***	-0.270	-0.353	2.204
	(0.801)	(1.579)	(0.692)	(0.522)	(1.416)	(3.010)
Eligible*Quarters after Expansion = 3	0.509	0.728	-0.918	-0.467	0.222	-2.142
	(0.867)	(2.112)	(0.596)	(0.591)	(1.618)	(2.456)
Eligible*Quarters after Expansion = 4	0.322	1.999	-2.747***	0.540	-0.517	2.797
	(0.818)	(1.617)	(0.643)	(0.539)	(1.693)	(4.089)
Eligible*Quarters after Expansion = 5	1.180	0.262	-4.012***	0.174	-1.073	3.974
	(0.931)	(1.413)	(0.726)	(0.494)	(1.845)	(4.478)
Eligible*Quarters after Expansion = 6	2.194***	1.828	-2.187***	0.800	-0.152	5.081
	(0.814)	(1.692)	(0.588)	(0.513)	(1.711)	(5.105)
Eligible*Quarters after Expansion = 7	0.224	2.517	-1.058	0.571	-0.282	1.226
	(0.959)	(1.599)	(0.668)	(0.486)	(1.726)	(4.016)
p-value of the F-test that coefficients on quarters to expansion are jointly equal to zero	0.0860	0.2058	0.0687	0.9388	0.3855	0.0222

Notes: *, **, *** indicate significance at the 10%, 5%, 1% level, respectively. All models include controls for age, marital status, years of education of the household head, number of household heads, hours of employment, and presence of children in the household. Additionally, all models include household, year and quarter fixed-effects, and state-specific time trends. Robust standard errors clustered at the state-level are in parentheses. The main model drops households with income between 100 and 138% of FPL and drops the DC and states with prior expansions which are, Delaware, Massachusetts, New York, and Vermont, and households with heads less than or equal to 25 years old or greater than or equal to 65 years old.

Table A4. Effects of Medicaid expansion on quarterly expenditure ($) per adult equivalent unit of non-food categories: Event-study estimates (N = 990,914)

Variables	(1) Alcohol	(2) General Merchandise	(3) Health and Beauty	(4) Non Food Grocery
Eligible*Quarters to Expansion = 7	1.546	2.434	-1.059	0.288
	(1.564)	(3.271)	(3.642)	(2.056)
Eligible*Quarters to Expansion = 6	1.702	0.212	1.679	2.259
	(1.190)	(2.854)	(2.841)	(1.822)
Eligible*Quarters to Expansion = 5	-0.364	-3.820	2.106	0.797
	(1.597)	(4.060)	(3.550)	(2.018)
Eligible*Quarters to Expansion = 4	1.635	0.476	-3.031	-0.560
	(1.268)	(3.360)	(2.384)	(1.670)
Eligible*Quarters to Expansion = 3	1.104	1.769	-0.673	0.822
	(1.349)	(3.117)	(2.207)	(1.532)
Eligible*Quarters to Expansion = 2	1.834	1.016	0.406	-1.337
	(2.144)	(2.631)	(2.735)	(1.966)
Eligible*Quarters to Expansion = 1		Omitted		
Eligible*Quarters to Expansion = 0	0.215	6.880**	2.965	0.363
	(1.044)	(3.294)	(2.126)	(2.090)
Eligible*Quarters after Expansion = 1	0.614	-0.733	7.324***	-1.140
	(1.326)	(3.535)	(2.022)	(1.998)
Eligible*Quarters after Expansion = 2	-0.391	1.647	7.799***	-3.006
	(1.204)	(3.135)	(2.630)	(2.073)
Eligible*Quarters after Expansion = 3	-1.933	-0.726	7.798***	-1.016
	(1.390)	(2.990)	(2.694)	(1.854)
Eligible*Quarters after Expansion = 4	0.878	7.670***	6.076	-3.167
	(1.231)	(2.527)	(4.298)	(2.073)
Eligible*Quarters after Expansion = 5	-0.584	2.517	5.630	-2.818
	(1.274)	(2.750)	(3.810)	(2.058)
Eligible*Quarters after Expansion = 6	0.908	8.193**	6.907*	-2.986
	(1.764)	(3.473)	(3.888)	(2.226)
Eligible*Quarters after Expansion = 7	-1.372	9.391***	5.986*	-2.853*
	(1.509)	(3.198)	(3.234)	(1.665)
p-value of the F-test that coefficients on quarters to expansion are jointly equal to zero	0.0006	0.2899	0.2349	0.2944

Notes: *, **, *** indicate significance at the 10%, 5%, 1% level, respectively. All models include controls for age, marital status, years of education of the household head, number of household heads, hours of employment, and presence of children in the household. Additionally, all models include household, year and quarter fixed-effects, and state-specific time trends. Robust standard errors clustered at the state-level are in parentheses. The main model drops households with income between 100 and 138% of FPL and drops the DC and states with prior expansions which are, Delaware, Massachusetts, New York, and Vermont, and households with heads less than or equal to 25 years old or greater than or equal to 65 years old.

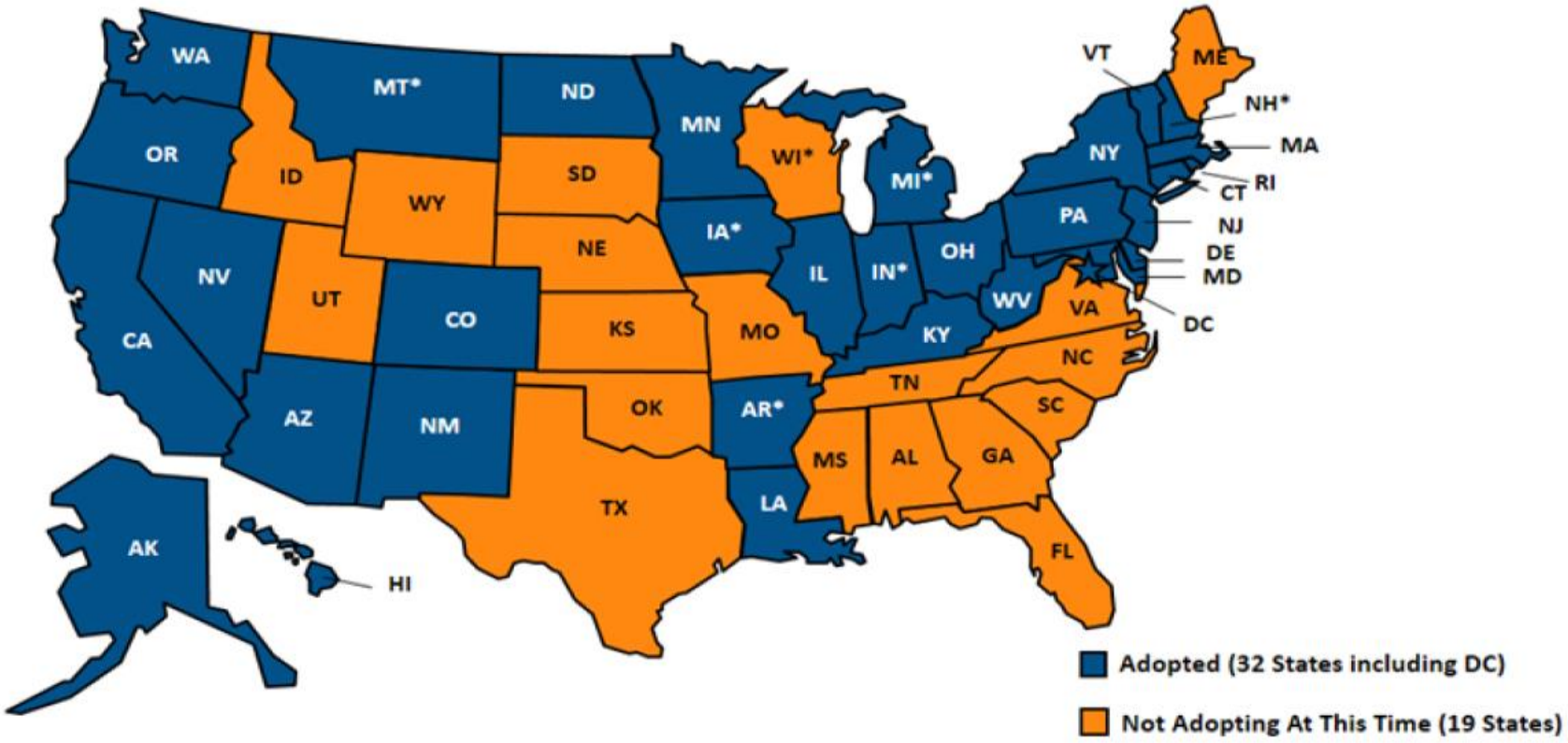

Figure A1: State Medicaid Expansion Decisions as of end of 2017