



Supplemental Nutrition Assistance Program (SNAP) Participation and Health Care Cost & Utilization for Health First Colorado Members

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Brief #20
September 2021

Overview

To better understand the potential impacts of Supplemental Nutrition Assistance Program (SNAP) participation on Medicaid expenditures, the University of Colorado School of Medicine (CUSOM) Eugene S. Farley, Jr. Health Policy Center assessed the health care cost and utilization of Health First Colorado (the state's Medicaid program) members who concurrently participated in SNAP.

The Farley Health Policy Center linked SNAP administrative data with Health First Colorado administrative and claims data from 2014 to 2018 and assessed per member per month total cost of medical care, as well as per member per month costs and utilization of primary care, emergency department, and pharmacy services.

The findings suggest there is a substantial and immediate association of **SNAP participation and lower health care cost** for children and youth under the age of 18 years.

Among adults, longer sustained participation in **SNAP is associated with lower total cost of care and primary care cost.**

Introduction

The Supplemental Nutrition Assistance Program (SNAP) and Medicaid/Child Health Insurance Program (CHIP) are critical safety-net programs that increase food and health care security for low-income individuals in the United States. Colorado's Medicaid program, known as Health First Colorado, and its CHIP, known as CHP+, provide health insurance coverage to over one million Coloradans, while SNAP serves nearly 500,000 individuals and 225,000 households across the state.^{1,2} While there are differences in eligibility for these programs, there is also substantial overlap in the income eligibility requirements for SNAP and Health First Colorado/CHP+, both of which are based on individual/family or household income relative to the federal poverty level. National research suggests that upwards of 75% of households receiving SNAP benefits also have at least one individual on Medicaid or CHIP. This is especially true in Medicaid expansion states such as Colorado.³

Previous research suggests SNAP participation can decrease food insecurity and lead to improved health outcomes among low-income individuals, especially those living with chronic conditions.^{4,5} Among low-income adults, SNAP participation has been linked to lower health care cost and utilization including fewer inpatient hospitalizations and lower use of emergency services. Not all benefits from SNAP result in lower costs, though, as SNAP has also been shown to reduce the likelihood of foregoing prescription refills among adults.⁶⁻⁸ Additional evidence suggests that SNAP participation among seniors can lead to decreases in nursing home admissions, emergency care visits, and hospitalizations.^{9,10} These decreases in health care utilization also lead to and aid in reduced health care expenditures, and Medicaid expenditures historically have responded to changes in SNAP benefits, suggesting there is a dose response.^{4, 6, 8, 11}

SNAP participation among children has been associated with a number of benefits ranging from health to educational outcomes. Children who live in a household receiving SNAP were more likely to have better overall health, less likely to be underweight or obese, and at lower risk for developmental conditions compared to SNAP non-participants.¹²

Families receiving SNAP benefits were also reported as less likely to defer or forego health care services for their children because of cost. SNAP participation has also been linked to lower rates of nutritional related health problems, such as anemia, and lower risks of nutritional deficiencies in children.^{12,13} Improved school attendance, reading, and math scores have also been seen among children participating in SNAP compared to children who are not.¹³ The existing literature also suggests that SNAP participation in childhood is associated with long-term outcomes. For example, SNAP participation in early childhood has been associated with better health outcomes across the life course, including reduced risk of chronic conditions (diabetes, heart disease, obesity) and higher likelihood of high school graduation.^{4,14} While the vast majority of research has focused on the health benefits of SNAP participation in children, little research has assessed how receipt of SNAP is associated with health care cost and utilization during childhood.

Although there is strong evidence to suggest there could be a beneficial impact of SNAP participation on health care cost and utilization of Medicaid beneficiaries, the existing literature has focused on studies performed at a population level rather than an individual level, which this study aims to do. To our knowledge, these associations have not been explored in Colorado since the state has expanded Medicaid. This study aims to inform policy makers and state agencies on the impact of SNAP participation on Health First Colorado members.

To address this gap in our understanding this study examined four specific policy questions:

- 1 Do Health First Colorado members who are concurrently co-enrolled in SNAP have lower per-member per-month (PMPM) cost of care compared to months they are not co-enrolled in SNAP? Does this association differ by age?
- 2 Is the number of months Health First Colorado members were co-enrolled in SNAP in the past three years associated with lower PMPM cost of care? Does this association differ by age?
- 3 Do Health First Colorado members who are concurrently co-enrolled in SNAP have higher utilization of primary care and pharmacy benefits and lower utilization of emergency department services? Does this association differ by age?
- 4 Is the number of months Health First Colorado members were co-enrolled in SNAP in the past three years associated with higher utilization of primary care and pharmacy benefits and lower utilization of emergency department services? Does this association differ by age?

These four questions are rooted in the principle that food security is a key social determinant of health that may impact health and health care utilization through multiple pathways. Social determinants of health can be defined as any number of social or environmental circumstances that affect an individual's health and wellbeing. For example, SNAP benefits provide families with a level of food security that may reduce chronic stress related to feeding themselves and their families. Reducing stress, even in the short-term, can have beneficial affects on health such as reducing the likelihood of developing or exacerbating a chronic condition (high blood pressure, heart disease, etc.) and mental illness, which is likely to reduce utilization of emergency department services. Additionally, SNAP benefits may allow families to purchase more nutritious food and, in some cases, free up financial resources that can be spent on preventative health (e.g., primary care, necessary prescriptions) or other needs. For families with limited financial resources there may be instances where they have to choose between putting food on the table or purchasing a child's inhaler, in which case the benefit provided by SNAP may make it possible to provide both and subsequently benefit the family and a child's health. In addition, the association between SNAP participation and health care cost and utilization is likely to differ by age. Understanding SNAP as a social determinant of overall health is important to understanding how this safety-net program may impact health care cost and utilization.

The next section describes the SNAP and Medicaid data sources, the cost and utilization outcome measures that address these four policy questions, and the measures of SNAP participation and other measures that are included in the analysis. Section 3 describes our data analysis methodology and presents our analytical model specifications. Section 4 presents the results of our analysis and discusses some of its limitations. The report concludes with a discussion of the policy implications and additional analyses that would further enhance our understanding of the associations between SNAP participation and health care cost and utilization.

Data Sources and Measures

Study Population

The Colorado Department of Human Services Office of Economic Security provided the Farley Health Policy Center with SNAP administrative data for 1,278,333 individuals who were members of households that received SNAP benefits for at least one month from 2014 through 2018. Information on individuals who were determined eligible for SNAP and included in a SNAP household in a month were assigned as a SNAP participant in that month. Household-level information (e.g., amount of SNAP benefits) was assigned to all eligible individuals in the SNAP household for that month. This person-month level SNAP data was linked to administrative and claims data for the same time period provided by the Colorado Department of Health Care Policy and Financing. The linkage of SNAP and Health Care Policy and Financing data resulted in identifying 2,331,364 unique persons with at least one month of participation in SNAP, Health First Colorado, or CHP+, and 81,796,637 person-months of data when these individuals were participating in one or more of these three programs in a month.

While administrative and claims data are unique in that they include information on the entire population of interest, these data sources have a number of limitations. One limitation of our administrative data is the result of the different eligibility criteria for SNAP compared to Health First Colorado/CHP+. While income eligibility and SNAP benefits are determined at the household level, including SNAP benefit amounts that are paid on a household level, Health First Colorado/CHP+ income eligibility is determined at a family level. While our preferred approach would have been to identify individuals in the same households and families for the analysis, the lack of SNAP household identifiers in the Health First Colorado/CHP+ data precluded us from identifying members of the same SNAP household in the months individuals were not participating in SNAP. Without a household identifier, we conducted the analysis at the individual person-month level.

A second limitation of the Health First Colorado claims data used in this analysis is that it only includes fee-for-service claims paid directly by the Colorado Department of Health Care Policy and Financing. As such, our claims data does not include CHP+ claims, behavioral health claims paid by Behavioral Health Organizations/Regional Accountable Entities, or claims paid by one of the Medicaid managed care organizations in Colorado. In addition, we did not have health care cost or utilization measures for months where individuals were not enrolled in Health First Colorado and were either uninsured or had other health insurance coverage. In addition, we do not have complete cost information for Health First Colorado members that are also simultaneously enrolled in Medicare.

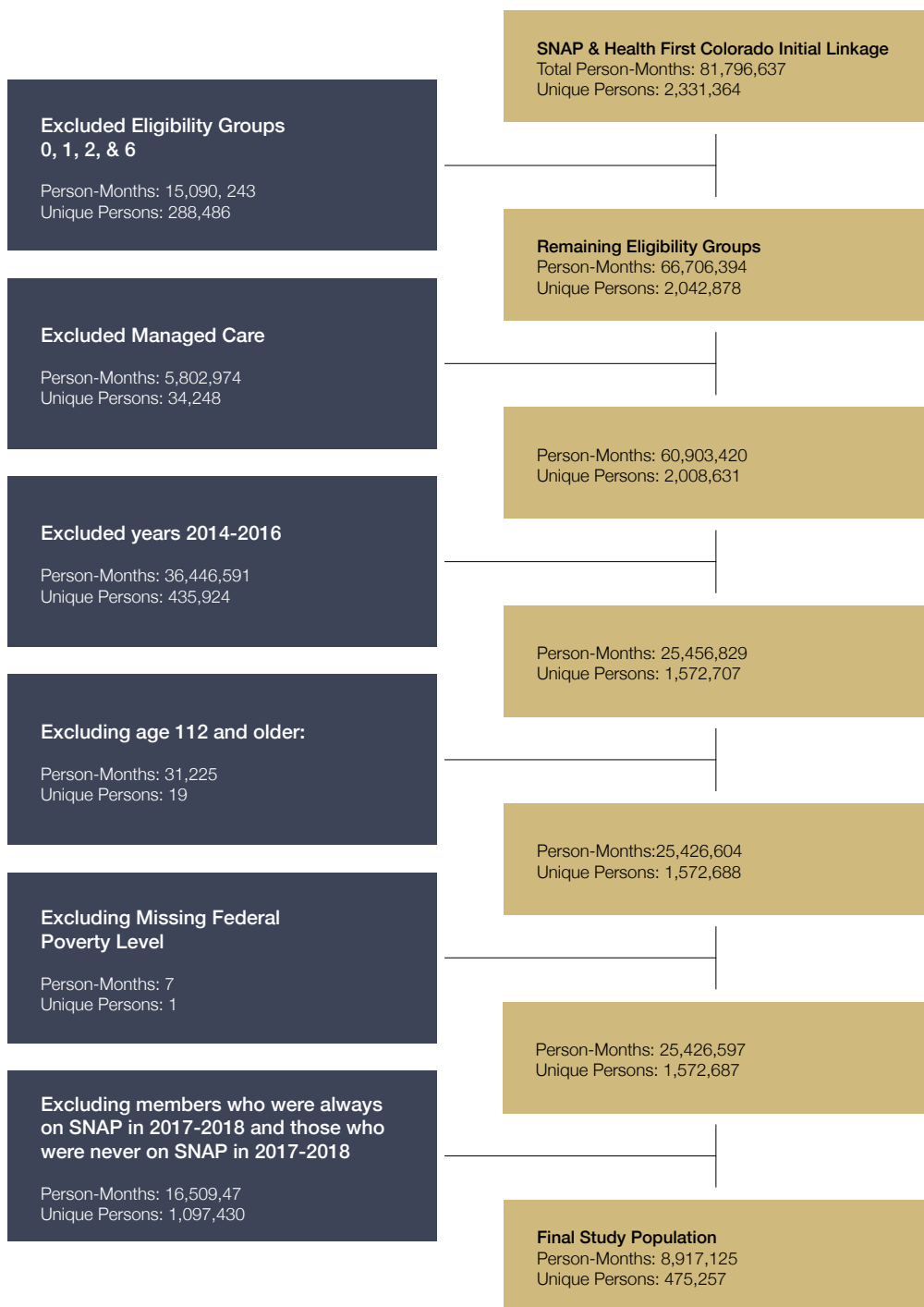
These gaps in our health care cost information resulted in our exclusion of person-months in which individuals were enrolled in CHP+, a managed care plan, or both Medicare and Health First Colorado member. The identification of months individuals were in one or more of these categories was determined using the administrative data files provided by the Department of Health Care Policy and Financing, which includes monthly information on enrollment in CHP+, managed care plans, and Medicare. Person-months were also excluded for individuals with a missing date of birth or a date of birth before 1905. Person-month records were also excluded if information on a family's income relative to the Federal Poverty Level was missing.

To aid in isolating the relationship between SNAP participation and health care cost and utilization from individual traits and other factors that influence an individual's health care cost and utilization, we excluded individuals who received SNAP benefits in every month they were eligible for Health First Colorado. We also excluded individuals who never received SNAP benefits. In essence, these two exclusions permit each individual to act as their own comparison because we are analyzing cost and utilization for the same individual in months they received SNAP benefits and these same individuals in months they were not receiving SNAP benefits.

Finally, to account for the possibility that prior SNAP participation is related to health care cost and utilization in addition to current participation, we analyzed person-months in calendar years 2017 and 2018. Limiting our analysis to person-months in these two calendar years allows us to examine the extent to which SNAP participation over a 36-month period is related to current health care cost and utilization.

Applying these exclusion criteria and limiting the analysis to person-months in calendar years 2017 and 2018 resulted in an analysis data set including 475,247 individuals with 8,917,125 months of eligibility for Health First Colorado. A consort diagram of the exclusion criteria and other restrictions applied in constructing our analysis data set is shown in Figure 1.

Figure 1. Consort Diagram of Study Population



Outcome and Predictor Variables

To assess the relationship between SNAP participation and health care cost and utilization, we analyzed seven cost and utilization outcome measures using the linked SNAP and Health First Colorado data for calendar years 2017 and 2018. The primary outcome variables are: (1) modified total per member per month (PMPM) cost; (2) PMPM cost for emergency department (ED) visits; (3) PMPM cost for primary care visits; (4) PMPM pharmacy cost; (5) utilization of ED services in a month; (6) utilization of primary care services in a month; and, (7) utilization of pharmacy services. Modified total PMPM costs consists of all fee-for-service Health First Colorado claims and includes professional services, ED, pharmacy, and inpatient/hospitalization costs. We label this modified total cost because it excludes capitated behavioral health costs and dental claims. To limit the influence of extreme values on the relationship between SNAP participation and costs, we top-coded modified total cost of care and hospitalization costs in a month for an individual at \$100,000, ED and pharmacy costs at \$10,000 and cost of primary care services at \$5,000 per month, which approximately equals the 99th percentile of the respective cost. Tables 1 and 2 show average monthly values for all seven cost and utilization measures for the entire study population and separately for three age categories (0-17 years old, 18-54 years old, and age 55 and older).

Table 1: Average per member per month health care among the study population by age (standard deviation in parentheses)

Category	All (N=8,917,125)	Age 0-17 yrs (N=4,222,761)	Age 18-54 yrs (N=4,253,430)	Age 55 & Older (N=440,934)
Modified Total Cost	\$234.10 (1,441.9)	\$146.30 (1,269.3)	\$286.30 (1,437.2)	\$571.50 (2,545.7)
Primary Care Cost	\$38.80 (123.6)	\$35.10 (107.5)	\$40.00 (130.1)	\$63.70 (185.3)
Emergency Dept. Cost	\$23.10 (139.1)	\$13.50 (92.2)	\$32.40 (170.9)	\$25.10 (163.3)
Pharmacy Cost	\$50.40 (386.5)	\$19.90 (213.5)	\$69.80 (457.5)	\$155.60 (735.8)

Table 2: Percentage of Medicaid members utilizing a health care service in a month among the study population by age (standard deviation in parentheses)

Category	All (N=8,917,125)	Age 0-17 yrs (N=4,222,761)	Age 18-54 yrs (N=4,253,430)	Age 55 & Older (N=440,934)
Primary Care Utilization	19.7% (1,758,786)	19.6% (827,857)	19.1% (812,663)	26.8% (118,266)
Emergency Dept. Utilization	5.8% (520,862)	4.6% (193,394)	7.2% (306,029)	4.9% (21,439)
Pharmacy Utilization	20.5% (1,826,477)	11.4% (483,281)	27.2% (1,156,941)	42.2% (186,255)

Participation in SNAP is the primary predictor of interest in our analysis. We examined two measures of SNAP participation. One is an indicator variable equal to one if the individual participated in SNAP in the month and zero otherwise. To examine longer-term relationships between SNAP participation and health care cost and utilization, the second measure of SNAP participation included in the model is the number of months out of the prior 36 months the individual participated in SNAP. These two measures allow us to capture immediate relationships as well as examine the findings from the literature that SNAP participation is related to future health outcomes.

Utilization and cost of health care are related to a wide variety of other individual and contextual factors. Although administrative data (such as SNAP participation and Medicaid administrative data) have limited information on an individual's circumstances, we accounted for the following individual characteristics:

- Age, measured as a categorical variable for ages 5 and under, 6 to 12, 13 to 17, 18 to 24, 25 to 34, 35 to 44, 45 to 54, 55 to 64, and 65 and older.
- Sex, measured as an indicator for male.
- Race and ethnicity, measured as a categorical variable for Hispanic, non-Hispanic White, non-Hispanic Black, and non-Hispanic other race/multiple races.
- Family income relative to the Federal Poverty Level (FPL), measured as the percentage of the FPL in one of 20 categories.
- Health First Colorado eligibility group, measured as a categorical variable for Expansion, non-Expansion Modified Adjusted Gross Income, and other eligibility categories.

In addition, we accounted for the individual's county of residence in the month.

These individual characteristics and county of residence were derived from the Medicaid administrative data files. Values for age, family income relative to the FPL, eligibility group and county of residence can vary month to month for an individual. Family income information is based on the income most recently reported prior to the calendar month. However, month to month income changes may not be reported by Health First Colorado members in a timely manner, and the family income relative to the FPL used in the analysis may not accurately reflect variations in member's family income.

Statistical Analysis

To analyze the association between cost and utilization of health care and SNAP participation, we implemented a repeated measures regression framework using generalized estimating equations to adjust for unobserved correlation over time for the same individual. Building off the literature, we examined separate models for different age groups. Specifically, in addition to models for each of the cost and utilization outcomes for all ages, separate models were examined for children (under 18 years of age), younger adults (ages 18 to 54) and older adults (ages 55 and older).

An individual's utilization and associated cost of health care services varies substantially over time with months of no utilization and cost followed by one or more months of increased utilization and cost as episodes of acute illness occur. To reflect these patterns in utilization and cost we used a two-stage statistical model that is often referred to as a hurdle model. The first stage analyzes whether an individual utilizes a health care service in a month and, as a result, incurs a cost for that service. For example, for our modified total cost of care outcome measure the first stage examines if an individual used any health care service in a month or not. Similarly, the first stage for our ED, primary care, and pharmacy services examines if an individual utilized each of these services in a month. The second stage examines the cost of a service in a month for those individuals that utilized that service in that month. We examined a logistic regression model for whether an individual utilized a service in a month and had positive cost versus no cost for that service in a month. As cost of a service is a continuous outcome for those that utilized a service, the second stage used a linear regression model with only positive costs as the outcome.

While the two-stage hurdle model is the most appropriate framework for analyzing these types of health care cost and utilization data, the results from these models do not directly address our research questions. To address our research questions, we use the results from these models and calculate predicted values of the probability an individual will utilize health care services in a month and the predicted cost of each health care services in a month that combines the results from the first and second stages. We calculate predicted values for every person-month in our analysis data, which includes predicted values for modified total cost of care, cost of ED services, cost of primary care services, pharmacy cost, probability of utilizing ED services, probability of utilizing primary care services, and probability of using prescription drugs in a month.

The seven predicted outcomes provide meaningful and readily interpretable information. However, to answer our research questions we need to measure what would have happened if an individual that was participating in SNAP in a month did not receive SNAP benefits that month and what would have happened if an individual had one more month of SNAP participation in the last 36-months. While we are unable to change individuals' SNAP participation and observe what happens, we can measure the predicted values from our two-stage hurdle models to estimate what would have happened if we artificially changed their SNAP participation. Specifically, to answer the first and third research questions (about the relationship between current month SNAP participation and current month cost of care and service utilization), we compare the predicted values for the months individuals were participating in SNAP to the predicted values for these same months assuming they were not participating in SNAP that month. Similarly, to answer the second and fourth research questions (about the relationship between prior SNAP participation and current month cost of care and service utilization), we compare the predicted values for each month in our analysis data before and after adding one additional month to each individuals' number of months participating in SNAP over the previous 36-months. These differences in predicted values indicate the relationship between health care cost and utilization and SNAP participation for Health First Colorado members.

Results

Tables 3 and 4 present our findings of the association between SNAP participation and health care cost and utilization for Health First Colorado members. Table 3 presents the results for children and youth (under age 18 at the end of the month) and Table 4 presents the results for younger adults (age 18 to 54 at the end of the month). Part A of each table presents the difference between the predicted values for PMPM costs for our measures of modified total cost of care, cost of primary care services, cost of ED services, and pharmacy cost. Part B of each table presents the difference between the average predicted monthly percentage of members utilizing primary care services, ED services, and pharmacy services. The first row in each part of these tables (Current Month) represent the change in cost or utilization that are associated with participating in SNAP in a month compared to not participating in that month without changing the number of months of previous SNAP participation. The second row in each part of these tables (Additional Past Month) represents the change associated with an additional month of previous participation in SNAP over the last 36 months without changing current month participation. A positive difference indicates SNAP participation is associated with higher cost or utilization and a negative difference indicates SNAP participation is associated with lower cost or utilization.

We initially analyzed a two-stage hurdle model for all age groups together, as well as separate models for children, adults and older adults. As suggested by the literature, our results indicated the association between SNAP participation and health care cost and utilization differs by age. As such, we present the findings from the models for children and younger adults. We are not reporting results for older adults due to a smaller sample size and instability in the general estimation equation methods for the two-stage hurdle model for this age group.

Children

Total health care costs for children in a month is immediately and substantially lower if they are participating in SNAP in the current month. As shown in the top part of Table 3a, children receiving SNAP had a lower PMPM modified total cost of care of \$37.60 compared to the cost they are expected to have if they did not participate in SNAP that month. This is a significant effect relative to the average PMPM total cost of \$146.30 in Table 1. These results also suggest that each additional month of SNAP participation over the last 36 months decreases the PMPM of modified total cost of care by \$3.30. Current participation in SNAP is not associated with lower PMPM cost for primary care, ED, or pharmacy; however, these differences are relatively small. An additional month of prior SNAP participation was associated with a lower PMPM cost for primary care and emergency department services and was not associated with any change in PMPM pharmacy cost. Children receiving SNAP for at least one month lead to health care cost savings for primary care, while 26 months of past SNAP participation lead to emergency department cost savings. Specifically, an additional month of SNAP participation reduces

PMPM cost for primary care of \$0.80 relative to an average PMPM cost of \$35.10 for primary care and a reduction of \$0.10 relative to an average PMPM cost of \$13.50 for ED services. We found no association between SNAP participation and pharmacy cost among children.

As shown in Table 3b, children receiving SNAP in the current month are predicted to use primary care services at a higher rate than if they had not received SNAP. Specifically, our models predict that utilization of primary care services by children increases by 2.3 percentage points in a month they are participating in SNAP compared to what we would predict if they were not receiving SNAP in that month. This is a modest increase in utilization as the average monthly utilization of primary care services for children in the study population was 19.6% (Table 2). Utilization of primary care services is also predicted to increase with additional months of SNAP participation over the last 36 months with an increase of 0.3 percentage points per additional month of SNAP. The findings in Table 3b also indicate that utilization of ED services and prescription drugs increase in the month children participate in SNAP. However, utilization of ED and pharmacy services are not associated with additional months of participation in SNAP over the prior three years.

Table 3a: Association between SNAP Participation and Health First Colorado Per-Member Per-Month Cost for Children and Youth Age 0-17 (N=4,222,761 person-months)

SNAP Participation	Modified Total Cost of Care	Primary Care Cost	Emergency Dept. Cost	Pharmacy Cost
Current Month	-\$37.60***	\$0.70***	\$2.60	\$1.40
Additional Past Month	-\$3.30***	-\$0.80***	-\$0.10***	\$0.00

*** Indicates statistical significance at p-value <0.001

Table 3b: Association between SNAP Participation and Percentage of Health First Colorado Member Utilization of Health Care Services for Children and Youth Age 0 – 17 (N=4,222,761 person-months)

SNAP Participation	Primary Care Cost	Emergency Dept. Cost	Pharmacy Cost
Current Month	2.3%***	0.9%***	1.6%***
Additional Past Month	0.3%***	0.0%***	0.0%

*** Indicates statistical significance at p-value <0.001

Overall, the findings presented in Table 3 confirm the hypothesized relationships between SNAP participation and health care cost and utilization stated in our four research questions for children and youth. The results in Table 3a suggest that current month SNAP participation for children is associated with lower total cost of care and additional months of participation in SNAP over the last three years further lowers total cost of care, confirming research questions 1 and 2. The findings in Table 3b indicate that current month SNAP participation is associated with increased utilization of primary care services and prescribed medications confirming these components of the third research question. Table 3b also suggests that current month SNAP participation is associated with higher emergency department utilization, which is opposite the hypothesized relationship. The results in Table 3b support the hypothesized relationship of previous SNAP participation and utilization of primary care as stated in the fourth research question and suggest there is no relationship with utilization of emergency department and pharmaceutical services.

The lower modified total cost of care in conjunction with the increased utilization and cost of primary care, emergency department, and pharmacy suggests that children and youth are using less specialty care, hospital, and ancillary services. These findings support the view that increased food security and enhanced nutrition that has been associated with SNAP participation lower health care costs and increased use of primary care and preventative services, which are commonly viewed as higher-value services. Additional analyses of the association between SNAP participation and utilization of additional specific health care services are needed to enhance the evidence base for these relationships for children and youth Medicaid populations.

Adults

Table 4a and 4b present our findings for younger adult Health First Colorado members between the age of 18 and 54 years. In contrast to the findings for children, PMPM modified total cost of care is predicted to increase by \$58.80 in a month with current SNAP participation (Table 4a). This is relative to an average PMPM total cost of care of \$286.30 observed among younger adults in the study population (see Table 1). In addition, PMPM cost for primary care and pharmacy services are predicted to increase in a month with current SNAP participation. Additional past months of SNAP participation is predicted to be associated with decreasing cost over time for modified total cost of care and primary care cost. For example, adults with SNAP participation in more than 33 months out of the previous 36 months receiving SNAP would have a slightly lower predicted PMPM modified total cost of care compared to what their predicted cost would be if they had never participated in SNAP over these three years. There appears to be no association between SNAP participation and emergency department cost for adults.

The findings in Table 4b suggest that SNAP participation in the current month is associated with an increase in the utilization of primary care, ED, and pharmacy services. For example, the percentage of younger adult Health First Colorado members utilizing primary care services in a month is predicted to be 4.9 percentage points higher when they are participating in SNAP in that month compared to their predicted percentage if they were not participating in SNAP that month. Similarly, the percentage of adults utilizing ED and pharmacy services in a month is predicted to be higher by 1.4 and 6.0 percentage points, respectively, in the current month if they are participating in SNAP compared to not participating in SNAP. These predicted changes in utilization are approximately 20 to 25 percent higher compared to average monthly utilization rates (see Table 2), suggesting a substantial increase in utilization of the health care services. The last row in Table 4b suggests utilization of these three categories of health care services are statistically associated with past SNAP participation; however, the estimated relationships do not meaningfully translate into changes in utilization.

Table 4a. Association between SNAP Participation and Health First Colorado Per-Member Per-Month Cost for Younger Adults Age 18 – 54 (N=4,253,430 person-months)

SNAP Participation	Modified Total Cost of Care	Primary Care Cost	Emergency Dept. Cost	Pharmacy Cost
Current Month	\$58.80***	\$10.50***	\$6.40	\$13.10***
Additional Past Month	-\$1.80***	-\$0.20***	\$0.01	\$0.40***

*** Indicates statistical significance at p-value <0.001

Table 4b. Association between SNAP Participation and Percentage of Health First Colorado Member Utilization of Health Care Services for Younger Adults Age 18 – 54 (N=4,253,430 person-months)

SNAP Participation	Primary Care Cost	Emergency Dept. Cost	Pharmacy Cost
Current Month	4.9%***	1.4%***	6.0%***
Additional Past Month	0.0%***	-0.0%***	-0.1%***

*** Indicates statistical significance at p-value <0.001

Overall, the results presented in Table 4 for younger adults are at odds with the hypothesized relationships between SNAP participation and total health care cost stated in our research questions, and they differ substantially from the results for children and youth. Table 4a suggests that younger adult Health First Colorado members experience higher health care cost in months they are participating in SNAP compared to what their cost would be if they were not participating in SNAP. The last row in Table 4a does indicate that additional months of prior participation in SNAP over the last 36 months reduces modified total cost of care; however, an individual would need to have participated in SNAP for 33 of the last 36 months to offset the higher cost resulting from current month participation. While the results presented in Table 4b are similar to the utilization findings for children and youth in Table 3b, the increases in utilization of primary care and pharmaceutical services with current month SNAP participation are larger than the increases for children and youth. For example, the increase in primary care utilization of 4.9 percentage points for younger adults compared to 2.3 percentage points for children and youth represents a 26 percent increase for younger adults compared to a 12 percent increase for children and youth. These increases are consistent with our third research question. However, as was the case for children and youth, the increase in utilization of emergency department services is inconsistent with our fourth research question.

The findings for younger adults in Table 4 could differ from those for children and youth in Table 3 for a number of potential reasons, and additional analyses are needed to understand the sources of these differences. For example, the acute health care needs of prime working age adults are more likely to be associated with churning in SNAP participation while covered by Health First Colorado due to family income fluctuations. These acute health care needs would increase health care cost and utilization at the same time as reduced household income changes SNAP eligibility. It is also possible that younger adults are more likely to have chronic conditions compared to children and youth whose acute health care needs are likely more sensitive to changes in food security and nutrition. While the linked SNAP and Health First Colorado data are sufficient to investigate some of the potential reasons for these differences in results, others will require additional data sources. For example, to investigate the association of income fluctuations with both acute health care needs and current SNAP participation would be greatly enhanced by linking employment and earnings information from the Colorado Department of Labor and Employment quarterly employer wage reports maintained by the Division of Unemployment Insurance.

Summary and Conclusion

The results presented in Tables 3 and 4 indicate that the association between SNAP participation and the cost and utilization of health care by Health First Colorado members differed by age group. The association between SNAP participation and health care cost and utilization among children and youth (under age 18) suggest that current and prior SNAP participation reduces total health care cost and increases utilization of primary care and pharmaceutical services. Specifically, the findings presented in Table 3 indicate that both current and past participation in SNAP are associated with lower total health care costs as measured by PMPM modified total cost of care and primary care cost. Higher utilization of primary care services among children and youth receiving SNAP did not result in higher modified total cost

of care, suggesting that children receiving SNAP are receiving high-value preventative services through primary care. These results suggest that SNAP participation may be critical to children and youth Health First Colorado member's health and wellbeing, as well as contribute to lower health care costs for the largest group of Health First Colorado members.

The results presented in Table 4 for younger adults (age 18 – 54) shows the opposite relationship between current SNAP participation and health care cost. These results suggest that current SNAP participation is associated with higher PMPM modified total cost of care, as well as higher primary care, ED, and pharmacy costs. However, these findings also suggest that long-term SNAP participation does help offset these increased cost over time. Additional analyses are needed to understand these age differences and the underlying associations among acute and chronic health care needs, periods of SNAP participation, and total cost of care.

Finally, across both age groups, our findings indicate that current and prior SNAP participation is associated with increased utilization of what are commonly viewed as higher-value primary care services, which include preventative care. These results also indicate that current SNAP participation is associated with increased use of prescription medications. This increase in pharmacy utilization and costs may reflect a finding from the literature that SNAP participation provides Medicaid members with more discretionary income to fill prescriptions. Contrary to the hypothesis that SNAP participation would be associated with lower utilization of emergency department services, the findings for both age groups indicate that current month participation in SNAP is associated with higher use of these services. While there were not any significant increases in emergency department cost, this finding merits additional analyses to understand the types of acute health care needs being addressed in emergency departments.

Overall, the findings presented above contribute to our understanding of how SNAP participation is associated with health care cost and utilization. However, these findings also point to a number of areas that need additional investigation. For example, while SNAP participation in the current month and over the last 36 months have the same directional relationship with PMPM modified total cost of care for children; they have opposite directional relationships for adults. While there are potential explanations related to health status of younger adults, their income, and other social determinants of health that could explain this difference, additional analyses investigating the presence of acute health care episodes and the earnings of younger adults would contribute to our understanding of these relationships. The linkage of SNAP and Health First Colorado data also provides an opportunity to extend and refine the investigation of SNAP participation to include assessments of chronic as contrasted with acute health care cost and utilization, cost and utilization of dental services by children, and cost and utilization of behavioral health services. Further linkages with other administrative data, such as data for the Women, Infants and Children program, earnings information from the Unemployment Insurance program, early childhood education programs, would provide the opportunity to develop and refine policies designed to improve the health and well-being of all Coloradans.

Acknowledgements

We would like to acknowledge the work and contributions of our partners at the Colorado Department of Human Services (Office of Economic Security): Christine Willoughby, Max Young, and Joseph Alexander and our collaborators at the Colorado Department of Health care Policy and Financing: Lisa Pera and Marivel Kleuckman.

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