MEDICAID EXPANSION DURING THE COVID-19 PANDEMIC: An analysis of preventive screening rates following Medicaid expansion

Danielle Swanson

A thesis

submitted in partial fulfillment of the

requirements for the degree of

Master of Public Health

University of Washington

2023

Committee:

Elise Chayet

Jennifer Bobb

Program Authorized to Offer Degree:

School of Public Health, Health Systems and Population Health

University of Washington

ABSTRACT

MEDICAID EXPANSION DURING THE COVID-19 PANDEMIC: An analysis of preventive screening rates following Medicaid expansion

Danielle Swanson

Chair of the Supervisory Committee:

Elise Chayet

School of Public Health

Preventive medicine is a widely accepted means to improving health outcomes among populations and access to healthcare coverage is a critical step to increasing preventive screening rates. As states have continued to expand Medicaid eligibility under the Affordable Care Act (ACA), previous studies identified significant changes in preventive screening rates following expansion. However, none of these studies occurred during the COVID-19 pandemic. This study focuses on how expansion of Medicaid during the COVID-19 pandemic by Utah and Idaho may have influenced preventive healthcare, including cancer screening, diabetes screening, cholesterol screening, HIV screening, and influenza vaccination status, among low-income, non-elderly adults. Using the CDC Behavioral Risk Factor Surveillance System (BRFSS) survey dataset to perform a difference-in-difference (DiD) analysis of preventive care rates in expansion vs. non-expansion states during between two time points, 2018-2019 (pre-period) and 2020-2021 (post-period). This study identifies statistically significant increases in healthcare coverage DiD estimate 6.1%, $p = <0.001$), routine check-ups (DiD estimate 3.2%, $p = 0.003$), influenza

vaccination (DiD estimate 2.8%, p = 0.008), and HIV screening (DiD estimate 6.5%, p = <0.001) among expansion states. This study did not identify statistically significant differences in trends (change from pre- to post- period) in cancer, diabetes, and cholesterol screening rates when comparing expansion and non-expansion states. This study indicates that Medicaid expansion during the COVID-19 pandemic resulted in preventive screening rate changes which differ from similar studies conducted prior to the pandemic. Future studies are needed to determine (i) why increases in healthcare coverage and routine check-ups are not indicative of increases in preventive screening, and (ii) how factors related to the COVID-19 pandemic influenced these deviations. If consistent increases in physician visits yet low preventive care rates continue to be observed following the COVID-19 pandemic, additional considerations toward implementing patient education and support services, and/or value-based prevention incentives among physicians concurrent with expansion of coverage mechanisms may be needed.

INTRODUCTION

INTRODUCTION TO MEDICAID AND PREVENTIVE HEALTHCARE

The US Medicaid system was signed into law in 1965 with the intention of providing insurance coverage to low-income individuals (CMS, n.d.). Since then, there have been numerous efforts nationwide to enhance and expand Medicaid coverage among this population of focus, as well as individuals in need of long-term care, pregnant women, and persons with disabilities (CMS, 2021). Most notable among recent efforts is the enactment of the Patient Protection and Affordable Care Act (ACA), which expanded Medicaid coverage to include individuals at <138% of the federal poverty line (US Government, n.d.). Expansion of state Medicaid programs is often seen by leading experts as a critical means to increasing healthcare access for these populations, as it has been shown to lead to improved health and financial outcomes (US Government, 2021). Increased coverage under this mechanism includes improved access to acute and emergency healthcare services, behavioral health services, pharmaceutical coverage, and the focus of this analysis, preventive healthcare (CMS, n.d.).

Preventive healthcare can include, but is not limited to, vaccinations, tobacco cessation and alcohol abuse screening, diabetes and cardiovascular disease screening, preventive medication administration, dental care, and other evidence-based measures aimed at reducing an individual's risk of developing or dying from preventable diseases (US Government, n.d.). These evidence-based recommendations are analyzed and set by professional societies, most notable among them being the United States Preventive Services Task Force (USPSTF), which is comprised of experts providing recommendations on age, frequency, and circumstances in which individuals should receive preventive healthcare services (USPSTF, n.d.). Previous studies have estimated that

improvements in preventive services could save greater than two million life-years and result in cost savings of over three billion dollars (Maciosek, 2010). However, a 2015 analysis by Borsky et al. (2018), indicated that "as of 2015, only eight percent of US adults ages 35 and older had received all of the high-priority, appropriate clinical preventive services recommended for them." Furthermore, Borsky et. al contributes that as many as five percent of US adults are receiving none of the preventive healthcare services recommended (Borsky, 2018). Though some preventive screening rates in the US are comparable with other Organization for Economic Cooperation and Development (OECD) countries, individuals in the US still cite lack of health insurance, lack of health literacy, limited access to a primary care physician (particularly in rural settings), reduced incentivization among physicians to prevent disease, and personal financial strain as prominent reasons for not utilizing preventive services (Tikkanen & Abrams, 2020; Levine et. al, 2019; Loftus et. al, 2018); Yagi et. al, 2022; Borsky et. al, 2018, UnitedHealth Foundation, 2016). While federal, state, and local health professionals engage in consistent strategies to increase screening rates, consistent barriers to care continue to prevail (CDC, 2021b).

Understanding that expanded health coverage does not eliminate all barriers to preventive service utilization cited in the literature, it may help to lessen the burden of some of these factors. Among those barriers, a lack of adequate insurance levels remains prominent (Sabatino, 2021), and although the number of uninsured in the US is at an all-time low, more than 25 million US residents are still without health insurance as of 2021 (Lee, 2022). For this reason, many health professionals advocate that continued expansion of Medicaid to include a larger portion of low-income populations may drastically improve screening rates and reduce overall healthcare costs (Ku, 2021). Though Medicaid expansion efforts began with the implementation of the ACA in 2014, there are still currently 12 states which have not chosen to expand Medicaid (KFF, 2022).

Medicaid Expansion and Preventive Care

Studies surrounding Medicaid expansion have revealed consistent increases in the number of individuals obtaining insurance coverage, however, determination of whether preventive health services have increased concurrently have varied (MACPAC, 2022). For example, an analysis of survey and electronic health record (EHR) data by Bloodworth et al. (2018) showed increases in flu vaccination rates and blood pressure screenings among select populations following Medicaid expansion. Additionally, studies by both Sabik et al. (2015) and Song & Kuckik (2022) utilizing CDC Behavioral Risk Factor Surveillance System (BRFSS) data observed increased cancer screening rates post-expansion. Analysis of BRFSS data by Tummalapalli & Keyhani (2020) determined that, "Medicaid expansion was associated with an increase in aspirin use, influenza vaccination, and HIV screening in expansion states. Despite improvements in access to care, including health insurance, having a primary care doctor, and routine visits, Medicaid expansion was not associated with improvements in cancer screening, cholesterol monitoring, diabetes care, or alcohol use screening." Variation in the literature may be partially attributed to length of time following expansion, as previous studies have shown individuals often prioritize treatment of existing acute and chronic conditions after obtaining coverage following periods of uninsured or underinsured status (BCBS Foundation, 2016). Additional analysis to evaluate service utilization following expansion is needed as states across the US continue to expand of Medicaid programs.

COVID-19 and Preventive Healthcare

Amidst existing barriers to improving the US healthcare system, the world faced an unprecedented challenge in 2020 with the emergence of the SARS-CoV-2 (COVID19) virus (CDC, 2021a). COVID-19 caused record increases in hospital utilization due to high transmittance and previously nonexistent mortality rates associated with the virus (CDC, 2022b). Additionally, COVID-19

mortality disproportionately affected individuals in minority groups, including Black and Hispanic/Latinx populations (Alcendor, 2020). Due the dramatic increase in acute illness, health systems across the US enacted emergency prevention efforts to slow the spread of the virus, including cancelled or delayed non-essential procedures such as preventive screening. As a result, the COVID-19 pandemic resulted in significant decreases among preventative screening rates (Degroff et al., 2021). Early studies revealed decreases in cancer screening rates ranging from 39-90% and childhood vaccination rates down by 60-75%, with patients indicating that they were avoiding available screening due to exposure concerns (Janda et al., 2020; Martin et al., 2021; Taneja, 2021).

Although the US healthcare system saw decreases in preventive screening rates during COVID-19, states concurrently saw record increases in Medicaid enrollment, with state enrollment growth ranging from 14.8% to 64.5% (Corallo, 2022). A June 2022 highlight released by CMS reports that almost 90 million individuals in the US were covered through Medicaid and the Children's Health Insurance Program (CHIP) (CMS, n.d.). This is largely due to Medicaid regulations and allowances associated with the public health emergency (PHE) – still in effect as of October 2022 – as well as pandemic-related legislation. The Families First Coronavirus Response Act (FFCRA) implemented the continuous enrollment requirement, which prevented state Medicaid programs from disenrolling Medicaid beneficiaries during the PHE (Corallo, 2022). Federal policy and legislation also provided allowances for additional Medicaid matching funds, Medicaid coverage mechanisms, and expansion of Medicaid benefits (Dolan, 2021). These changes encouraged mass enrollment and allowed state Medicaid agencies to provide vital resources needed by low-income populations during the pandemic.

Medicaid Expansion Amidst COVID-19

Joining 33 other states which expanded Medicaid to include individuals at <138% of the federal poverty level, as allowable via the ACA, Idaho, Oklahoma, Missouri, Nebraska, and Utah each implemented Medicaid expansion policies at various stages of the COVID-19 pandemic (KFF, 2022). While various studies (as described above) have been conducted to evaluate changes in preventive screening in post-expansion states, these studies do not evaluate how expansion during the COVID-19 pandemic may have altered previous findings. Record Medicaid enrollment amongst low-income populations, concurrent with overall decreases in preventive screening due to the COVID-19 pandemic (particularly among low-income, minority populations) may have affected screening rates in previously unforeseen ways. As the COVID-19 pandemic continues to affect our health systems, further analysis is needed to assess the degree to which these changes are occurring. The Office of the Assistant Secretary for Planning and Evaluation estimates that roughly 15 million people may lose Medicaid coverage at the close of the PHE continuous enrollment requirement ("Unwinding the Medicaid Continuous Enrollment Provision," 2022). With the potential for a massive increase in uninsured individuals on the horizon, evaluation of the outcomes following Medicaid expansion and an understanding of how COVID-19 may have affected previously identified trends in screening may be critical to encouraging remaining states to enact long-term enrollment expansions nationwide. This study used a difference-in-difference (DiD) analysis to evaluate how changes in preventive screening rates over time among states that implemented Medicaid expansion during the pandemic may have differed from those who have opted not to expand Medicaid.

Methods

Study Participant Dataset

To evaluate changes in preventive screening rates among states that expanded Medicaid during COVID-19, I utilized the Centers for Disease Control and Prevention (CDC) BRFSS dataset. Per CDC, "BRFSS is the nation's premier system of health-related random-dialing [cellular and landline] telephone surveys that collect state data about U.S. residents regarding their health-related risk behaviors, chronic health conditions, and use of preventive services". BRFSS surveys are conducted annually and consist of a subset of core questions (asked each year), rotating core questions (asked every other year) and optional state modules (34 modules from which states can choose). While each state is required to ask participants the core questions, the total number of interviews conducted and the number of optional modules included are dependent on state funding dedicated to the survey and vary from state to state. Participants are able to opt out of any question and BRFSS data is not verified using EHR or utilization data (CDC, 2022). Additionally, While BRFSS collects data from >400,000 respondents in all 50 states, this study focuses on a subset of the data consisting of low-income, non-elderly adults between the ages of 18 and 65 (at which age patients are eligible for Medicare coverage) to align with the target of Medicaid insurance coverage strategies. For the purposes of this study, low-income was classified as those respondents with a household income of <138% federal poverty line. Due to the categorical nature of the BRFSS questionnaire, I opted to use the midpoint income of each income category, as suggested for Medicaid expansion analysis by the State Health Access Data Assistance Center (Hest, 2019).

States that expanded Medicaid during the onset of the COVID-19 pandemic (January 1, 2020) were included as the treatment group in the study, while states which have not yet expanded

Medicaid were labeled as the control group. COVID expansion states (n=2) include Idaho and Utah. Non-expansion states (n=12) include Alabama, Florida, Georgia, Kansas, Mississippi, North Carolina, South Carolina, South Dakota, Tennessee, Texas, Wisconsin, and Wyoming. Of note, Missouri, Nebraska, and Oklahoma also enacted Medicaid expansion measures after this date, however, they were excluded from this dataset (both expansion and non-expansion) as expansion did not occur for either state until part-way through the "post-expansion" period, leaving minimal expansion data in the sample. Additionally, South Dakota has since opted to expand Medicaid, however, planned implementation will not occur until July 2023 and therefore South Dakota is included in the dataset as a non-expansion state. To evaluate any changes in preventive screening rates before and after expansion, I analyzed four years of BRFSS data from 2018-2021, which provides a uniform pre-post period of two years of screening data before and after Medicaid expansion as both Idaho and Utah expanded at the midpoint of the study period, January 1, 2020. Preventive screening rate data was combined into two groups, pre-period (2018 and 2019) data versus post-period (2020 and 2021) data. For Idaho and Utah, the post-period grouping was representative of the post-Medicaid expansion period. By refining the BRFSS dataset using these factors, I analyzed 62,763 survey responses, representing low-income, non-elderly individuals during the 2018-2021 time period.

Demographic and Preventive Screening Measures and Analyses

Descriptive statistics were produced to identify demographics for the target respondents and were summarized using the percentage at which they were present in either expansion states or non-expansion states. Additionally, existing categorical variables in the BFRSS were limited to the following categories for sex (male and female), age (18-24, 25-34, 35-44, 45-54, 55-64), race

(White Non-Hispanic, Black Non-Hispanic, Asian Non-Hispanic, American Indian/Alaskan Native Non-Hispanic, Hispanic, Other), employment status (employed for wages, not in labor force, retired, self-employed, unemployed, no data), education level (1-3 year of college, college graduate, did not graduation high school, high school graduate, no data), and marital status (divorced, separated, or widowed, married, never married, no data, missing). Expansion and non-expansion states were also described using prevalence of diabetes, overweight/obesity (BMI greater than or equal to 25), hypertension, and cardiovascular disease (including coronary heart disease, angina, stroke, or myocardial infarction).

In addition to descriptive statistics for respondents, I analyzed base factors of whether healthcare coverage status and status of routine check-up within the last year changed from the pre- to post-expansion period in relation to non-expansion states. This was done using the following categorical questions in the BRFSS dataset; “Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare, or Indian Health Service?” and “About how long has it been since you last visited a doctor for a routine checkup?” respectively. Type of insurance (Medicaid versus other payers) was not assessed as this question was not asked during the pre-period for the expansion states. Results were analyzed using a DiD analysis between expansion and non-expansion states.

To determine which outcomes would be considered in the pre- and post-expansion preventive health analysis, I reviewed standard recommendations set by leading national societies and field experts, including USPSTF A and B level screening recommendations, CDC vaccination recommendations, and the American Diabetes Association (ADA) diabetes screening guidelines. These recommendations were then cross-referenced with the available data in the BRFSS dataset.

This resulted in evaluation of the following factors: cancer screening (breast, cervical, and colorectal), vaccination status (flu, human papilloma virus [HPV], and pneumonia), pre-diabetes screening, and finally HIV screening. Variables were also limited to the age range for which professional screening guidelines adhered to at the start of this study (2018). For example, sigmoidoscopy and colonoscopy screening rates were evaluated only for adults ages 50+, aligning with USPSTF guidelines at that time (USPSTF, n.d.). More information on the society recommendations in relation to the BRFSS survey questions is available in Table 1, below. Of note, while previous studies also evaluated changes in routine diabetes care screening (A1c monitoring, foot and eye exams, and cholesterol monitoring), this measure was excluded from the dataset as it was provided as an optional module by CDC and not asked by the expansion states.

For cancer screening variables, questions formatted as "Have you ever had a [mammogram, Pap test, HPV test, sigmoidoscopy or colonoscopy]?" were analyzed alongside the subsequent question, "[How long has it been/When was your last] [mammogram, Pap test, HPV test, sigmoidoscopy or colonoscopy]?" to determine presence and frequency of cancer screening tests. For prediabetes screening and vaccination, questions formatted as "In the last 12 months, have you had a/an [high blood sugar, diabetes, influence vaccination, HPV vaccination, pneumonia vaccination]?" were used to identify presence and frequency of health measures. Several preventive screening factors were not included in the analysis if they were not present in one or more years of the dataset. For example, aspirin use as a preventive measure for cardiovascular disease was not included in the BRFSS dataset following the 2018 release, as it was no longer recommended by USPSTF as a preventive screening measure (USPSTF, n.d.). A full list of BRFSS questions by year used in this study is available in Table 2.

After determining which indicators from the BRFSS dataset to include in the analysis, I performed a retrospective cross-sectional analysis using DiD of Medicaid expansion states versus non-expansion states across a pre- to post-Medicaid expansion time period. To evaluate whether to include state-level fixed effects in the model, I used the Hausman test (Qin & Amin, 2022). The test suggested that differences in the error term across states were not correlated and therefore state fixed effects were not necessary in my analysis to control for potential bias due to confounding by state-level factors. I proceeded with a standard DiD model that aligns with the methods followed by Tummalapalli & Keyhani (2020). The DiD analysis was performed on the general health coverage factors indicated above. Analyses of each of the binary outcomes were conducted at the person (respondent) level using a linear regression with indicator terms for expansion versus non-expansion states, period (post vs. pre) and an interaction term between these two variables; the coefficient on the interaction term corresponds to the DiD estimate. Regression models controlled for age and sex, with the exception of breast and cervical cancer screening factors, which were controlled for age only. Participants with missing data (inclusive of no data, unsure, or refused to answer) were excluded from the DiD analysis for each individual preventive screening analysis. Following accepted practice for DiD analysis, the parallel trends assumption was confirmed visually using graphical representation of preventive screening rates for expansion and non-expansion states over the 2018 and 2019 pre-period (Columbia SPH, n.d.).

Results

Patient Demographics

Prevalence of patient demographics are included below in Table 2. Marriage status distributions were similar in both expansion and non-expansion states. Though age distribution was similar

across most age groups, expansion states did have a significantly higher percentage of 18-24 year old respondents than non-expansion states (19.1% vs 11.4%, respectively). Respondents in non-expansion states were also more likely to be Black, Non-Hispanic than those in expansion states (22.0% vs. 1.1%, respectively). Rates of non-employed persons and persons who did not graduate high school were higher in non-expansion states than expansion states (non-employed persons: 12.3% vs. 9.7%, respectively; did not graduate high school: 17.9% vs. 13.6%, respectively). Overall, slightly increased prevalence rates of disease were observed in non-expansion states when compared to expansion states (current smoker status: 29.9% vs. 20.5%; overweight/obesity: 66.3% vs. 59.0%; hypertension: 36.8% vs. 25.8%; cardiovascular disease: 12.3% vs. 7.0%; and diabetes: 16.9% vs. 12.2%, respectively). Comparison of each of the sociodemographic factors was statistically significant ($p<0.001$).

Healthcare Coverage Status

In non-expansion states, the rate of respondents with healthcare coverage increased by 1.0 percentage points from the pre-period (2018 and 2019) to the post-period (2020 and 2021). In contrast, the rate of respondents with healthcare coverage in expansion states increased by 7.1 percentage points over that same period. The DiD estimate is equal to the difference between these rates, 6.1% (95% CI 4.0, 8.2; p-value <0.001). Only the DiD estimate is provided for the remaining outcomes in the text below, however, full results are summarized in Table 3. Post-expansion survey results also indicated a statistically significant DiD estimate of 3.2% (95% CI 1.1, 5.2; p-value 0.003) in routine health checkups. Healthcare coverage statuses for expansion versus non-expansion states over the 2018-2021 time period is also represented in Figures 1-2 in Appendix B,

Graphs, below. Graphs also include a counterfactual representation of coverage rates, visualizing the estimated screening rates in the absence of the intervention.

Preventive Healthcare/Screening

Changes in preventive rates over the study period for expansion and non-expansion states and the DiD analysis of preventive healthcare and screening measures is summarized in Table 3, below. Decreases were observed in expansion states in rates of colonoscopies (DiD estimate -0.1%; 95% CI -5.6, 5.4), sigmoidoscopies (DiD estimate -8.1%; 95% CI -16.3, 0.04), and pre-diabetes screening (DiD estimate -0.1%; 95% CI -4.6, 4.8). Increases were observed in expansion states in rates of mammograms (DiD estimate 3.2%; 95% CI -4.6, 11.1), PAP tests (DiD estimate 0.9%; 95% CI -3.2, 5.0), HPV screenings (DiD estimate 2.3%; 95% CI -2.6, 7.2), blood stool tests (DiD estimate 0.9%; 95% CI -3.6, 5.4), cholesterol screening (DiD estimate 2.4%; 95% CI -0.3, 5.0), influenza vaccinations (DiD estimate 2.8%; 95% CI 0.7, 4.9), and HIV screening (DiD estimate 6.5%; 95% CI 4.1, 8.8). Of the indicated variables, only influenza vaccinations and HIV screening differences were indicated to be statistically significant (p-value 0.008 and <0.001, respectively). Visual representation of these measures for expansion versus non-expansion states over the 2018-2021 time period is also represented in Figures 3-12 in Appendix B, Graphs, below. Graphs also include a counterfactual representation of screening rates in the absence of the intervention.

Discussion

Literature Comparison and COVID-19 Considerations

When comparing preventive healthcare and screening measures for states that expanded Medicaid during COVID-19 relative to those which have not, the above analysis showed only two

statistically significant increases in healthcare/screening rates, influenza vaccinations and HIV testing. This is consistent with previous observations by Tummalapalli & Keyhani (2020), who also observed increases in these measures. While this may be partly attributed to Medicaid expansion, it is important to note that this may also have been due to the significant increase in influenza vaccinations seen during the COVID-19 pandemic as described by Kuehn (2021). To reduce the potential burden on the healthcare system that could have been brought on by a heavy flu season, concurrent with the ongoing COVID-19 pandemic, health officials increased campaign efforts to encourage influenza vaccination during 2020 and 2021 (King, 2020). Though Kuehn's study did not categorize increases by insurance status, overall rise in influenza vaccination across multiple age groups and various insurance statuses may have influenced observed changes. Alternatively, HIV screening rates in expansion states appear to diverge from trends seen during the pandemic, such as the overall decrease noted by Kuehn (2022), which may indicate an increase due to coverage changes.

Results of this analysis contrast with previous studies in which Sabik et al. (2015) and Song & Kuckik (2022) observed increases in cancer screening rates. Though slight increases were seen in this study among expansion states in mammograms and HPV screening rates, no statistically significant changes were observed between the two groups. Surprisingly, trends for expansion and non-expansion states appear to contradict previous findings which showed an overall reduction in cancer screening rates during COVID-19 across all recommended age groups (Janda et al., 2020). As indicated graphically in Appendix B, Graphs, both expansion and non-expansion states showed increases in colon cancer screening methods across the four-year period, with slightly slower increases among expansion states. Variations in results seen in this study, and across relevant literature, may be attributed to several factors. These include: (i) access to services in rural areas,

which may not increase relative to Medicaid expansion, (ii) length of time following expansion that study was conducted, which may affect individual utilization of services to address current acute or chronic conditions, and (iii) availability of utilization data (public survey, reimbursement codes, EHR data, etc.) (Loftus et. al, 2018; BCBS Foundation, 2016).

Political Ideology and Public Policy

Another factor that may have contributed to diversions in the data presented is the availability of screening mechanisms. The COVID-19 pandemic saw mass variations in public policy correlated with the majority political affiliation in that state. Adolph et. al noted that conservative states were more likely to ease restriction sooner than liberal states (2022). As both of the expansion states and 10 of the 12 non-expansion states voted on the conservative end of the political spectrum in the 2020 election, it is likely that the proportion of open business and facilities was higher than may have been observed in traditionally liberal states (Vestal et. al, 2022) and may have resulted in more screening locally than observed nationwide. Additionally, political discourse around expansion may have affected benefit uptake in unknown ways. For example, while the Utah population voted to expand Medicaid in 2018, conservative lawmakers spent nearly two years exploring options to limit expansion options. After receiving rejection from the Centers for Medicare and Medicaid Services (CMS), Utah finally rolled out their Medicaid expansion plan in 2020. Utah's expansion also includes a work requirement which has been temporarily suspended during the COVID-19 pandemic, however, could impact population enrollment and utilization rates once the moratorium ends (Norris, 2021).

Healthcare and Public Health Implications

Because overall comparison of healthcare coverage and routine check-up status shows a statistically significant increase among Medicaid expansion states, suggesting that individuals within the defined age and demographic group were taking advantage of the increased opportunity for coverage presented in these states, it may be beneficial for future studies to assess what concerns and ailments were being discussed during these visits in the absence of significant increases in preventive services. For example, it may be prudent for healthcare stakeholders to understand if this increase in utilization, but not prevention, is a result of recall error/sampling bias, or if routine visits are not adequately incorporating preventive education and advocacy into services. If initial encounters are being utilized to address existing acute and chronic conditions as has been seen following the ACA, analysis of long-term data to identify trends in preventive healthcare rates may be needed (BCBS Foundation, 2016).

Furthermore, for states which expanded Medicaid during COVID-19, future analysis may be needed to determine if traditional increases in preventive healthcare seen following Medicaid expansion will be observed once the effects of the pandemic subside and more data becomes available. As demonstrated by Tummalapalli et. al, increases in health coverage and preventive screening may experience some lag in uptake due to the necessity of state officials to educate the public on eligibility changes and covered services and may vary state by state (2020). State and health officials interested in utilizing preventive screening data from the expansion states used in the study should consider the degree to which the data may be altered by COVID-19 associated factors. As such, there is a risk to policymakers using recent Medicaid expansion data as a foundation for policy decisions. If consistent increased physician visits exist and low preventive care results continue to be observed, state and federal programs may need to consider the need to implement patient education and support services, and/or value-based incentives among

physicians to encourage increases in preventive healthcare concurrent with expansion of coverage mechanisms. Finally, this study evaluates preventive healthcare across the entirety of the populations of the expansion and non-expansion states and does not attempt to evaluate how preventive screening rates may vary among demographic groups. While there were two observations of clinically significant increases in preventive care, additional studies are needed to determine if these changes are more prominent among certain demographic groups in order to adequately develop strategies aimed at reaching populations who are traditionally challenging to reach.

LIMITATIONS

The primary limitations to the analysis arise from limits in data availability. Previous studies of a similar nature typically included early expansion (within the first 1-3 years) and late expansion (3-5 years) periods in their analysis, however, that amount of data is not available for post-pandemic expansion states due to pandemic recency. There is also a limited number of states which expanded Medicaid during the COVID-19 pandemic, only two of which were utilized in this study to maintain data integrity during the post-expansion period. Additionally, the survey data used for the analysis may be limited by recall bias, particularly for variables in which respondents were asked to recall screening data from further in the past, such as colonoscopy screening over the last 10 years. Survey data is also naturally subject to bias related to respondents willing to participate in surveys and the exclusion of respondents unwilling to answer questions related to the study variables.

Though they are currently being evaluated, BRFSS does not currently utilize statistical estimation or online response options as a method to access hard to reach populations. There are also several

preventive screening recommendations for which data is not included in the BRFSS questionnaire. Some examples include non-HIV sexually transmitted disease or infection testing, skin cancer screening, and maternal-child health-related preventive screening. Without the inclusion of these factors in the BRFSS dataset, we are unable to determine if Medicaid expansion results in an increase in these preventive measures among the low-income, non-elderly population. Finally, long-term effects of the COVID-19 pandemic on health-related data still require further evaluation, as these may cause unforeseen outlier effects.

References

Adolph, C., Amano, K., Bang-Jensen, B., Fullman, N., Magistro, B., Reinke, G., Castellano, R., Erickson, M., & Wilkerson, J. (2022). The Pandemic Policy U-Turn: Partisanship, Public Health, and Race in Decisions to Ease COVID-19 Social Distancing Policies in the United States. *Perspectives on Politics*, 20(2), 595–617. https://doi.org/10.1017/S1537592721002036

Alcendor, D. J. (2020). Racial Disparities-Associated COVID-19 Mortality among Minority Populations in the US. *Journal of Clinical Medicine*, 9(8), 2442–. https://doi.org/10.3390/jcm9082442

Bloodworth, R., Chen, J., & Mortensen, K. (2018). Variation of preventive service utilization by state Medicaid coverage, cost-sharing, and Medicaid expansion status. *Preventive Medicine*, 115, 97–103. https://doi.org/10.1016/j.ypmed.2018.08.020

Blue Cross Blue Shield Foundation. (2016). NEWLY ENROLLED MEMBERS IN THE INDIVIDUAL HEALTH INSURANCE MARKET AFTER HEALTH CARE REFORM: THE EXPERIENCE FROM 2014 AND 2015. *In bcbs.com*. Retrieved December 7, 2022, from https://www.bcbs.com/the-health-of-america/reports/newly-enrolled-members-the-individual-health-insurance-market-after

Borsky, A., Zhan, C., Miller, T., Ngo-Metzger, Q., Bierman, A. S., & Meyers, D. (2018). Few Americans Receive All High-Priority, Appropriate Clinical Preventive Services. *Health Affairs*, 37(6), 925–928. https://doi.org/10.1377/hlthaff.2017.1248

Corallo, B., & Moreno, S. (2022, October 4). *Analysis of Recent National Trends in Medicaid and CHIP Enrollment*. KFF. Retrieved October 10, 2022, from https://www.kff.org/coronavirus-covid-19/issue-brief/analysis-of-recent-national-trends-in-medicaid-and-chip-enrollment/.

Centers for Disease Control and Prevention. (2021a, November 4). *Basics of COVID-19*. Centers for Disease Control and Prevention. Retrieved October 10, 2022, from https://www.cdc.gov/coronavirus/2019-ncov/your-health/about-covid-19/basics-covid-19

Centers for Disease Control and Prevention. (2021b, November 10). *Evidence-Based Interventions*. Centers for Disease Control and Prevention. Retrieved October 10, 2022, from https://www.cdc.gov/screenoutcancer/interventions/index.htm

Centers for Disease Control and Prevention. (2022a, June 21). CDC - BRFSS. Centers for

Centers for Disease Control and Prevention. (2022b). Laboratory-Confirmed COVID-19 Associated Hospitalizations. chart, from https://gis.cdc.gov/grasp/covidnet/covid19_3.html

Centers for Medicare & Medicaid Services. (2021, December 1). *History*. CMS. Retrieved October 10, 2022, from https://www.cms.gov/About-CMS/Agency-Information/History

Centers for Medicare & Medicaid Services. (n.d.). *June 2022 Medicaid & Chip Enrollment Data highlights*. Medicaid. Retrieved October 10, 2022, from https://www.medicaid.gov/medicaid/program-information/medicaid-and-chip-enrollment-data/report-highlights/index.html

Centers for Medicare & Medicaid Services. (n.d.). *Program History*. Medicaid. Retrieved October 10, 2022, from https://www.medicaid.gov/about-us/program-history/index.html

Centers for Disease Control and Prevention. Retrieved August 6, 2022, from https://www.cdc.gov/brfss/index.html

Columbia Mailman School of Public Health. (n.d.). *Difference-in-difference estimation*. Columbia Public Health. Retrieved January 11, 2023, from https://www.publichealth.columbia.edu/research/population-health-methods/difference-difference-estimation

Corallo, B., & Moreno, S. (2022, August 3). Analysis of recent national trends in Medicaid and chip enrollment. KFF. Retrieved August 6, 2022, from https://www.kff.org/coronavirus-covid-19/issue-brief/analysis-of-recent-national-trends-in-medicaid-and-chip-enrollment/.

DeGroff, A., Miller, J., Sharma, K., Sun, J., Helsel, W., Kammerer, W., Rockwell, T., Sheu, A., Melillo, S., Uhd, J., Kenney, K., Wong, F., Saraiya, M., & Richardson, L. . (2021). COVID-19 impact on screening test volume through the National Breast and Cervical Cancer early detection program, January–June 2020, in the United States. Preventive Medicine, 151, 106559–106559. https://doi.org/10.1016/j.ypmed.2021.106559

Dolan, R., & Guth, M. (2021, August 26). *How have states used Medicaid emergency authorities during COVID-19 and what can we learn?* KFF. Retrieved September 25, 2022, from https://www.kff.org/medicaid/issue-brief/how-have-states-used-medicaid-emergency-authorities-during-covid-19-and-what-can-we-learn/.

Hest, R. (2019). Four Methods for Calculating Income as a Percent of the Federal Poverty Guideline (FPG) in the Behavioral Risk Factor Surveillance System (BRFSS). State health Access Data Assistance Center. Robert Wood Johnson Foundation. Retrieved September 28, 2022, from chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.shadac.org/sites/default/files/publications/Calculating_Income_as_PercentFPG_BRFSS.pdf.

Janda, M. Paul, C., & Horsham, C. (2021). Changes in cancer preventive behaviours, screening and diagnosis during COVID-19. Psycho-Oncology (Chichester, England), 30(2), 271–273. https://doi.org/10.1002/pon.5575

Kaiser Family Foundation. (2022, September 20). *Status of State Medicaid Expansion Decisions: Interactive Map*. KFF. Retrieved October 10, 2022, from https://www.kff.org/medicaid/issue-brief/status-of-state-medicaid-expansion-decisions-interactive-map/

King, R. (2020, August 20). *CDC director warns of major public health complications if public doesn't take flu and covid-19 seriously*. Fierce Healthcare. Retrieved October 16, 2022, from https://www.fiercehealthcare.com/hospitals/cdc-director-warns-major-public-health-complications-if-public-doesn-t-take-flu-and-covid

Kiviniemi, M. T., Orom, H., Hay, J. L., & Waters, E. A. (2022). Prevention is political: political party affiliation predicts perceived risk and prevention behaviors for COVID-19. *BMC Public Health*, 22(1), 298–298. https://doi.org/10.1186/s12889-022-12649-4

Ku, L. & Brantley, E. (2021, May). *The Economic and Employment Effects of Medicaid Expansion Under the American Rescue Plan*. Commonwealth Fund. https://doi.org/10.26099/x6zp-g424

Kuehn, B. M. (2021). Influenza Vaccination Increased During the COVID-19 Pandemic. *JAMA : the Journal of the American Medical Association*, 326(24), 2465–2465. https://doi.org/10.1001/jama.2021.22390

Kuehn, B. M. (2022). Reduced HIV Testing and Diagnoses During COVID-19 Pandemic. *JAMA : the Journal of the American Medical Association*, 328(6), 519–519. https://doi.org/10.1001/jama.2022.12790

Lee, A., Ruhter J., Peters, C., De Lew, N., Sommers, B.D. National Uninsured Rate Reaches All-Time Low in Early 2022. (Issue Brief No. HP-2022-23). Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services. August 2022.

Levine, S., Malone, E., Lekiachvili, A., & Briss, P. (2019). Health Care Industry Insights: Why the Use of Preventive Services Is Still Low. *Preventing Chronic Disease*, 16, E30–E30. https://doi.org/10.5888/pcd16.180625

Loftus, J., Allen, E. M., Call, K. T., & Everson-Rose, S. A. (2018). Rural-Urban Differences in Access to Preventive Health Care Among Publicly Insured Minnesotans. *The Journal of Rural Health*, 34(S1), s48–s55. https://doi.org/10.1111/jrh.12235

Maciosek, M. V., Coffield, A. B., Flottemesch, T. J., Edwards, N. M., & Solberg, L. I. (2010). Greater use of preventive services in U.S. health care could save lives at little or no cost. *Health Affairs*, 29(9), 1656–1660. https://doi.org/10.1377/hlthaff.2008.0701\

Martin, K., Kurowski, D., Given, P., Kennedy, K., & Clayton, E. (2021, April 16). The impact of covid-19 on the use of Preventive Health Care. HCCI. Retrieved September 25, 2022, from https://healthcostinstitute.org/hcci-research/the-impact-of-covid-19-on-the-use-of-preventive-health-care

Medicaid and CHIP Payment and Access Commission. (2022, March 31). *Medicaid Enrollment Changes Following the ACA*. MACPAC. Retrieved October 10, 2022, from https://www.macpac.gov/subtopic/medicaid-enrollment-changes-following-the-aca/

Norris, L. (2021, December 7). *ACA Medicaid Expansion in Utah*. healthinsurance.org. Retrieved December 1, 2022, from https://www.healthinsurance.org/medicaid/utah/

Qin, Y., & Al Amin, M. (2022, September 2). *Panel Data Using R: Fixed-effects and Random-effects*. Princeton University. Retrieved February 1, 2023, from https://libguides.princeton.edu/R-Panel

Sabatino, S. A., Thompson, T. D., White, M. C., Shapiro, J. A., de Moor, J., Doria-Rose, V. P., Clarke, T., & Richardson, L. C. (2021). Cancer Screening Test Receipt - United States, 2018. *MMWR. Morbidity and mortality weekly report*, 70(2), 29–35. https://doi.org/10.15585/mmwr.mm7002a1

Sabik, L., Tarazi, W. W., & Bradley, C. J. (2015). State Medicaid Expansion Decisions and Disparities in Women's Cancer Screening. American Journal of Preventive Medicine, 48(1), 98–103. https://doi.org/10.1016/j.amepre.2014.08.015The United States Government. (n.d.). *Affordable care act (ACA) - glossary*. HealthCare.gov. Retrieved October 10, 2022, from https://www.healthcare.gov/glossary/affordable-care-act/

Song, S., & Kucik, J. E. (2022). Trends in the Impact of Medicaid Expansion on the Use of Clinical Preventive Services. American Journal of Preventive Medicine, 62(5), 752–762. https://doi.org/10.1016/j.amepre.2021.11.002

Taneja, V., El-Dallal, M., Bilal, M., Flier, S. N., Sheth, S. G., Ballou, S. K., Berzin, T. M., Pleskow, D. K., Feuerstein, J. D., & Sawhney, M. S. (2021). Patient Perspective on Safety of Elective Gastrointestinal Endoscopy During the COVID-19 Pandemic. Techniques and Innovations in Gastrointestinal Endoscopy, 23(3), 234–243. https://doi.org/10.1016/j.tige.2021.05.001

The United States Government. (n.d.). *Preventive Care Benefits for Adults*. HealthCare.gov. Retrieved October 10, 2022, from https://www.healthcare.gov/preventive-care-adults/

The United States Government. (2021, June 22). The effects of earlier medicaid expansions: A literature review. *The White House*. Retrieved September 25, 2022, from https://www.whitehouse.gov/cea/written-materials/2021/06/22/the-effects-of-earlier-medicaid-expansions-a-literature-review/

Tikkanen, R., & Abrams, M. K. (2020, January 30). *U.S. health care from a global perspective, 2019: Higher spending, worse outcomes?* Commonwealth Fund. Retrieved November 30, 2022, from https://www.commonwealthfund.org/publications/issue-briefs/2020/jan/us-health-care-global-perspective-2019

Tummalapalli, & Keyhani, S. (2020). Changes in Preventative Health Care After Medicaid Expansion. Medical Care, 58(6), 549–556.

UnitedHealth Foundation. (2016, February). *Spotlight Prevention*. America's Health Rankings. Retrieved November 30, 2022, from https://www.americashealthrankings.org/learn/reports/spotlight-prevention

United States Preventive Services Taskforce. (n.d.). *About the USPSTF*. USPSTF. Retrieved October 10, 2022, from https://www.uspreventiveservicestaskforce.org/uspstf/about-uspstf

United States Preventive Services Taskforce. (n.d.). *A & B Recommendations*. USPSTF. Retrieved October 10, 2022, from https://www.uspreventiveservicestaskforce.org/uspstf/recommendation-topics/uspstf-a-and-b-recommendations

Unwinding the Medicaid Continuous Enrollment Provision: Projected Enrollment Effects and Policy Approaches (Issue Brief HP-2022-20) Washington, DC: Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services. August 19, 2022

Vestal, A. J., Briz, A., Choi, A., Jin, B., McGill, A., & Mihalik, L. (2022, November 8). *2020 Election Results*. Politico. Retrieved November 30, 2022, from https://www.politico.com/2020-election/results/president/

Yagi, B. F., Luster, J. E., Scherer, A. M., Farron, M. R., Smith, J. E., & Tipirneni, R. (2022). Association of Health Insurance Literacy with Health Care Utilization: a Systematic Review. *Journal of General Internal Medicine* : JGIM, 37(2), 375–389. https://doi.org/10.1007/s11606-021-06819-0

Appendix A: Tables

Table 1. Preventive Healthcare Variables

Variable	Numerator	Denominator	Guideline Source	Relevant BRFSS Questions
Healthcare Coverage				
Respondent Healthcare Coverage	Healthcare Coverage (Yes)	All respondents*	N/A	Do you have any kind of health care coverage?
Routine Checkup Within the Last Year	Routine Checkup in the last 1 yrs	All respondents*	N/A	About how long has it been since you last visited a doctor for a routine checkup?
Breast Cancer Screening				
Mammogram	Screening in the last 2 yrs	Women age 50-64	USPSTF, Grade B[1]	Have you ever had a mammogram? How long since mammogram?
Cervical Cancer Screening				
Pap Test	Screening in the last 3 yrs	Women age 21-64	USPSTF, Grade A[1]	Have you ever had a PAP test? How long since PAP test?
HPV Test	Screening in the last 3 yrs	Women age 21-64	USPSTF, Grade A[1]	Have you ever had an HPV test? How long since HPV test?
Colorectal Cancer Screening				
Colonoscopy	Screening in the last 10 yrs	All Respondents Age 50-64	USPSTF, Grade A[1]	Have you ever had a colonoscopy? How long since colonoscopy?
Sigmoidoscopy	Screening in the last 5 yrs	All Respondents Age 50-64	USPSTF, Grade A[1]	Have you ever had a sigmoidoscopy? How long since sigmoidoscopy?
Blood Stool Test	Screening in the last 1 yrs	All Respondents Age 50-64	USPSTF, Grade A[1]	Have you ever had a blood stool test? How long since blood stool test?
Cardiovascular Health Screening				
Cholesterol Screening**	Screening in the last 5 yrs	All Respondents Age 20-64	CDC[4]	Cholesterol check within past five years
Cholesterol Screening**	Screening in the last 5 yrs	Respondents with Diabetes	ADA[2], CDC DiDT[3]	Cholesterol check within past five years
Other Preventive Healthcare				
Flu Vaccination	Vaccine in the last 1 yrs	All respondents*	CDC[5]	During the past 12 months, have you had either flu vaccine

				THAT WAS SPRAYED IN YOUR NOSE OR FLU SHOT INJECTED INTO YOUR ARM?
HIV SCREENING	SCREENING IN THE LAST 1 YRS	ALL RESPONDENTS*	USPSTF, GRADE A[1]	INCLUDING FLUID TESTING FROM YOUR MOUTH, BUT NOT INCLUDING TESTS YOU MAY HAVE HAD FOR BLOOD DONATION, HAVE YOU EVER BEEN TESTED FOR H.I.V?
PRE-DIABETES SCREENING	SCREENING IN THE LAST 1 YRS	OVERWEIGHT/OBESE RESPONDENTS AGE 35-64	USPSTF, GRADE B[1]	HAVE YOU HAD A TEST FOR HIGH BLOOD SUGAR OR DIABETES WITHIN THE PAST THREE YEARS?

**All respondents denominator category includes only low-income (<138% FPL), Non-elderly (<65 Years) individuals.*
*** Cholesterol screening was only included in the 2019 and 2021 BRFSS questionnaire.*
[1]*Recommended by USPSTF (grade A or B published recommendations) -* https://www.uspreventiveservicestaskforce.org/uspstf/
[2]*Recommended by the American Diabetes Association (ADA) -* https://diabetes.org/diabetes/newly-diagnosed/health-checks-people-with-diabetes
[3]*Recommended by CDC Division of Diabetes Translation (DiDT) -* https://www.cdc.gov/diabetes/managing/care-schedule.html
[4]*Recommended by CDC Cholesterol -* https://www.cdc.gov/cholesterol/index.htm
[5]*Recommended by CDC Immunization Schedule -* https://www.cdc.gov/vaccines/schedules/index.html

Table 2. Sociodemographic Prevalence (Expansion and Non-Expansion States)[1]

Sociodemographic	Expansion States (N=8,696)	Non-Expansion States (N=54,067)
Sex		
Male	3967 (45.6%)	21,679 (40.1%)
Female	4729 (54.4%)	32,388 (59.9%)
Age		
18-24	1,657 (19.1%)	6,155 (11.4%)
25-34	2,008 (23.1%)	10,370 (19.2%)
35-44	1,866 (21.5%)	10,981 (20.3%)
45-54	1,577 (18.1%)	11,242 (20.8%)
55-64	1,588 (18.3%)	15,319 (28.3%)
Race		
White, Non-Hispanic	6,266 (72.1%)	27,495 (50.9%)
Black, Non-Hispanic	95 (1.1%)	11,869 (22.0%)
Asian, Non-Hispanic	105 (1.2%)	611 (1.1%)
American Indian/Alaskan Native, Non-Hispanic	223 (2.6%)	2,602 (4.8%)
Hispanic	1,740 (20.0%)	9,543 (17.7%)
Other	267 (3.1%)	1,947 (3.6%)
Employment		
Employed for Wages	3,918 (45.1%)	19,795 (36.6%)
Not in Labor Force	2,704 (31.1%)	19,711 (36.5%)
Retired	299 (3.4%)	2,708 (5.0%)
Self-Employed	838 (9.6%)	4,798 (8.9%)
Unemployed	844 (9.7%)	6,635 (12.3%)
No Data/Refused	93 (1.1%)	420 (0.8%)
Education		
1-3 Years of College	2,961 (34.1%)	16,396 (30.3%)
College Graduate	1,536 (17.7%)	7,563 (14.0%)
Did Not Graduate High School	1,183 (13.6%)	9,657 (17.9%)
High School Graduate	2,994 (34.4%)	20,318 (37.6%)
No Data/Refused	22 (0.3%)	133 (0.2%)
Marital Status		
Divorced, Separated, or Widowed	2,072 (23.8%)	16,991 (31.4%)
Married	3,551 (40.8%)	16,559 (30.6%)
Never Married	3,015 (34.7%)	20,219 (37.4%)
No Data/Refused	58 (0.7%)	291 (0.5%)
Not Asked/Missing	0 (0%)	7 (0.0%)
Current Smoker[2]	1,786 (20.5%)	16,149 (29.9%)
Overweight or Obese (BMI ≥ 25)[2]	5,132 (59.0%)	35,841 (66.3%)
Hypertension[2]	1,120 (25.8%)	8,793 (36.8%)
Cardiovascular Disease[2]	607 (7.0%)	6,632 (12.3%)
Diabetes[2]	1,058 (12.2%)	9,159 (16.9%)

Expansion states included Idaho and Utah.

Non-expansion states included Alabama, Florida, Georgia, Kansas, Mississippi, North Carolina, South Carolina, South Dakota, Tennessee, Texas, Wisconsin, and Wyoming.

[1]Comparison of all variables in Table 2 using chi-squared and t-test analyses resulted in p values of <0.001.

[2]No data/missing data points were removed from health outcomes, including smoking status, overweight/obese, hypertension, cardiovascular disease, and diabetes

Table 3. Variable Difference-In-Difference (Expansion vs. Non-Expansion States)

Variable	Number of Respondents (n)	Non-Expansion State Change in Screening Rates (Pre- vs Post-Period) %	Expansion State Change in Screening Rates (Pre- vs Post-Period) %	Post-expansion 2020–2021 Difference-in-Differences Estimate (%, 95% CI)	p-value
Healthcare Coverage					
Respondent Healthcare Coverage	**62,088**	**1.0%**	**7.1%**	**6.1% (4.0, 8.2)**	**<0.001***
Routine Checkup Within the Last Year	**61,039**	**-1.5%**	**1.7**	**3.2% (1.1, 5.3)**	**0.003***
Breast Cancer Screening					
Mammogram	**7,538**	**-1.4%**	**1.8%**	**3.2% (-4.6, 11.1)**	**0.42**
Cervical Cancer Screening					
Pap Test HPV Test	**17,910** **15,210**	**-2.2%** **-2.7%**	**-1.3%** **-0.4%**	**0.9% (-3.2, 5.0)** **2.3% (-2.6, 7.2)**	**0.67** **0.36**
Colorectal Cancer Screening					
Colonoscopy Sigmoidoscopy Blood Stool Test	**6,404** **3,904** **10,191**	**1.4%** **68.8%** **3.0%**	**1.3%** **60.7%** **3.9%**	**-0.1% (-5.6, 5.4)** **-8.1% (-16.2, 0.04)** **0.9% (-3.6, 5.4)**	**0.97** **0.051** **0.70**
Cardiovascular Health Screening					
Cholesterol Screening	**25,815**	**-2.7%**	**-0.3%**	**2.4% (-0.3, 5.0)**	**0.08**
Other Preventive Healthcare					
Flu Vaccination HIV Screening Pre-Diabetes Screening	**59,136** **56,285** **21,672**	**3.6%** **-3.2%** **-3.3%**	**6.5%** **3.3%** **-3.2%**	**2.8% (0.7, 4.9)** **6.5% (4.2, 8.8)** **-0.1% (-4.6, 4.8)**	**0.008*** **<0.001*** **0.97**

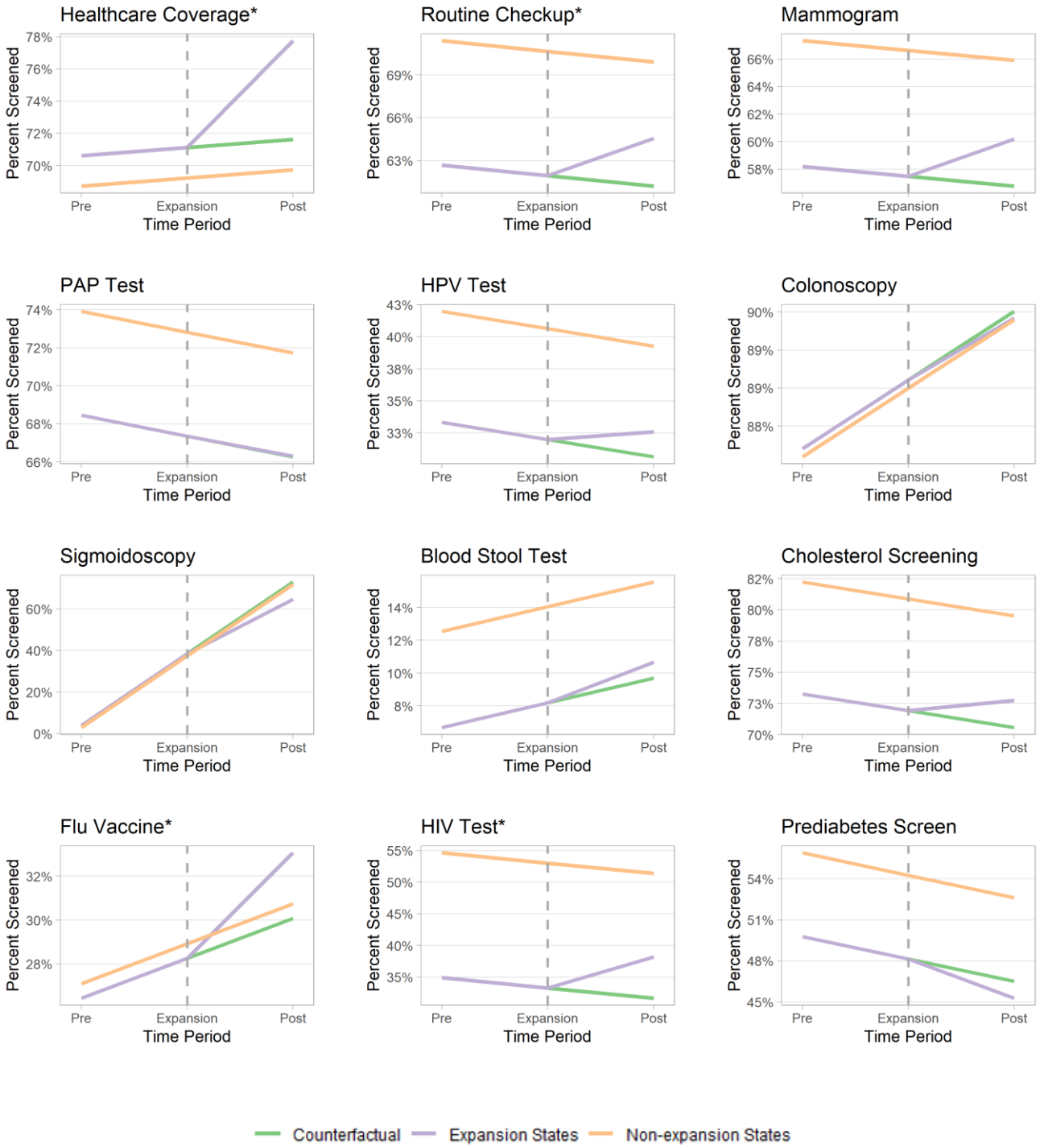
Table 2 variables were adjusted for both age and sex, excepting for cervical and breast cancer screening variables, which were adjusted for age only.

Expansion states included Idaho and Utah.

Non-expansion states included Alabama, Florida, Georgia, Kansas, Mississippi, North Carolina, South Carolina, South Dakota, Tennessee, Texas, Wisconsin, and Wyoming.

Appendix B. Graphs

FIGURES 1-16. EXPANSION AND NON-EXPANSION VARIABLES (2018-2021)



Expansion states included Idaho and Utah.
Non-expansion states included Alabama, Florida, Georgia, Kansas, Mississippi, North Carolina, South Carolina, South Dakota, Tennessee, Texas, Wisconsin, and Wyoming.
The intervention (Medicaid expansion) is indicated by the dotted line on each graph
**p-value < 0.05*

Acknowledgements

I would like to express thanks to the members of my committee, Elise Chayet, MHA and Jennifer Bobb, PhD who reviewed various iterations, answers countless questions, and provided valuable feedback and guidance throughout the completion of this thesis.

I would also like to thank Anthony Israelsen, MS who served as a valuable resource is in the development in the statistical coding and exhibited unending patience in the journey to enact my analytical vision.

Finally, I would like to thank the online MPH staff at UW, including SJ Putz, MEd, Christina J. Hughes, MEd, Genya N. Shimkin, MPH, and Daniel Enquobahrie MD, PhD, MPH, who diligently assisted in helping me cross the finish line of this program.