The Spillover Effects of Nurse Practitioner Scope of Practice Expansions on Safety Net Program Participation: Evidence from WIC[*]

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Abstract

Nurse practitioner (NP) scope of practice (SOP) reform has been shown to improve access to healthcare, leading to direct health benefits. However, given that NPs are likely to practice in underserved areas, liberalizing SOP may also have spillover benefits on safety net program participation, which would amplify the benefits of SOP expansion for underrepresented populations. In this paper, we study these potential spillovers by examining the effect of NP SOP expansions on enrollment in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Leveraging the staggered rollout of NP SOP expansions across states, we find that starting 4-5 years after SOP expansion, total WIC participation increases by 4% in treated states, which rises to 6.8% one decade after SOP expansion. This increase in total WIC enrollment is driven by increases in the enrollment of women and children. Mechanism analyses suggest that while access to healthcare is an important channel, the effect may also be driven by the fact that NPs are trained to deliver holistic, patient-centered care. Our results suggest that spillovers on safety net program participation are another pathway by which NP SOP expansions can improve the health and well-being of underserved populations.

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I. Introduction

In the past two decades, many states have enacted laws expanding nurse practitioner (NP) scope of practice (SOP) (McMichael and Markowitz 2023), granting these nonphysician providers greater autonomy in independently treating patients. NP SOP expansions have been shown to yield notable improvements in health care access and, as a result, better health outcomes (see Traczynski and Udalova 2018, McMichael 2023). Furthermore, given that NPs are more likely to practice in underserved areas and deliver care to underrepresented populations (Xue et al. 2019), liberalizing SOP might also have spillover effects on participation in safety net programs, amplifying the health benefits of SOP expansion for underserved and underrepresented populations. However, little is known about the spillover effects of NP SOP laws on safety net program participation, and measuring the extent of these spillovers is important for understanding the full implications of scope of practice reform for health equity and wellbeing.

In this paper, we assess the potential spillover effects of NP SOP laws by estimating the effect of expanding scope of practice for nurse practitioners on enrollment in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Though WIC has been shown to yield numerous benefits for enrollees, the program is highly underutilized – in 2021, only 51% of eligible individuals received benefits (Kessler et al. 2023). Access to independent NPs might improve WIC enrollment through reducing information costs, as providers and clinics often assess patient eligibility for public programs after completing screening for social determinants of health (Garg et al. 2015, Thomas-Henkel and Schulman 2017, LaForge et al. 2018, Lynch et al. 2024, O'Gurek and Henke 2018). It may also reduce stigma associated with program enrollment, if providers can properly convey the benefits of program participation.

To estimate the effect of NP SOP expansion on WIC enrollment, we leverage the staggered rollout of full practice authority (FPA) for NPs across states using an event study framework with

a difference-in-differences identification strategy. Implementation of this policy enables nurse practitioners to deliver care independently of a supervising physician, representing a significant expansion in scope of practice. To account for the staggered rollout of our treatment, we compute our event study estimates using the approach described in Sun and Abraham (2021).

Using WIC administrative data from 2005-2019, we find that starting in years 4-5 after the implementation of NP FPA, WIC participation increases by 4.0% in treated states. The effect continues to grow from that point, reaching 4.2% in years 6-7 and 6.8% in years 8-9 post-FPA. Our finding that the effect of NP FPA on WIC enrollment takes years to materialize is consistent with prior work on SOP expansions (McMichael 2023) and is likely attributable to rigidities in contracts and practice agreements (Smith 2021). The long-run effects we estimate are most pronounced in states with high nonwhite populations, potentially reflecting the areas in which NPs are most likely to deliver care. We find that the increase in total WIC enrollment following NP FPA is driven by increased enrollment for women and children, where we find effect sizes of 7.2% and 8.4% in years 8-9 post NP FPA implementation, respectively.

Additional analyses suggest there are two mechanisms driving the effect of NP FPA on WIC enrollment. First, we provide suggestive evidence that NP FPA increases access to care for the WIC-eligible population. Access to care might be an important channel by which WIC enrollment increases because clinics often screen patients for public programs as part of screening for social determinants of health (O'Gurek and Henke 2018). Second, we show that the uptake in WIC following NP SOP may be driven by the unique nature of NPs in delivering holistic, patient-centered care through the nursing model. Specifically, we show that expansions in physician assistant scope of practice, which have similar effects on access to care but expose patients to a different type of provider, do not lead to an increase in WIC enrollment.

Our work contributes to two broad strands of literature. First, we contribute to the literature on the effects of NP scope of practice expansions. Broadly, these laws have been shown to increase access to care. Traczynski and Udalova (2018) find increases in the likelihood of regular checkups following NP FPA. McMichael (2023) finds reductions in mortality. We contribute to this literature by studying the spillover effects of this increased access to care on public program participation among women, infants, and children. Our findings may provide additional context for the results in Bhai and Mitchell (2024), who find improvements in children's health following NP FPA. Generally, our results build on the body of evidence that provides empirical support for the benefits of NP SOP expansion.

Second, we contribute to the literature on the determinants of safety net program participation, specifically as it relates to WIC enrollment. Broadly, WIC participation increases when there are increases in eligibility through expansions in other social safety net programs such as SNAP (Han 2020) and Medicaid (Ko 2024). We add to this literature by examining the potential spillover effect of expanding NP SOP on WIC participation. Our results also contribute to prior work related to the ease of enrolling in and accessing WIC including studies that examine geographic proximity (Meckel et al. 2023, Rossin-Slater 2013), EBT rollout (Meckel 2020, Hanks et al. 2019), and transaction costs (Bitler et al. 2003).

Our results have important policy implications. Notably, we show that liberalizing scope of practice for nurse practitioners has spillover effects on safety net program participation. This suggests another pathway by which SOP expansion can improve the health and wellbeing of underserved populations. Furthermore, we provide policymakers with a potential tool for increasing enrollment in beneficial yet underutilized public programs. Specifically, our findings imply that initiatives which improve access to care and emphasize more holistic care might reduce

information costs pertaining to program enrollment and thereby increase safety net program participation.

II. Background

Nurse Practitioner Scope of Practice Laws

Nurse practitioners (NPs) are registered nurses that have completed a Master of Science in Nursing (MSN) and subsequently passed a national certification exam. NPs receive training under a nursing model of education, which emphasizes a patient-centered, holistic approach to treating patients. This contrasts with the medical model that is used to train physicians and physician assistants, which emphasizes the biology of disease and treatment. Though NPs practice in a variety of settings, the majority practice in an area of primary care, such as family practice, pediatrics, or women's health (AANP 2024). NPs are known to be especially important in the delivery of care to underserved populations; patients who are low income or reside in rural areas are significantly more likely to receive care from NPs (Patel et al. 2023, Xue et al. 2019)

The role that NPs play in the delivery of care is governed by a set of regulations called scope of practice law, which are typically set at the state-level. In so-called "full practice" states, NPs have the same prescriptive authority as physicians and can practice without physician oversight. In "restricted practice" states, NPs are either limited in their prescribing authority or are required to practice under the supervision of a physician. As a result of intense political pressure and strong lobbying efforts, many states have expanded NP SOP by moving from restricted to full practice (McMichael 2017, Traczyncki and Udalova 2018). Specifically, between 2005 and 2019, 18 states granted full practice authority to NPs (McMichael and Markowitz 2023). **Figure 1** shows the geographic variation in SOP expansion over our sample period of 2005 to 2019. By the end of

2019, 29 states (including District of Columbia) had implemented NP FPA, with the majority of those states being in the northern and western parts of the country.

A vast and growing literature has demonstrated that expanding NP FPA increases access to quality healthcare (Patel et al. 2019). Notably, Traczynski and Udalova (2018) find that expanding NP SOP increased the likelihood of having a routine checkup. Neff et al. (2018) show that individuals in states with full practice for NPs had shorter drive times to primary care. Other works have shown that the increase in access to care afforded by NP SOP expansion improves children's health (Bhai and Mitchell 2024), reduces emergency department visits (McMichael et al. 2019), and reduces all-cause mortality (McMichael 2023). A notable pattern in these works, which is most evident in McMichael (2023), is that the effects of NP SOP expansions often take years to materialize. This is potentially attributable to rigidities in contracts, practice agreements, and within-practice norms (Smith 2021).

NP SOP expansions may also have spillover effects which can improve health outcomes and wellbeing through channels other than the direct effects of access to care. In particular, as NPs are more likely to deliver care in underserved areas and to underrepresented populations, expansion of NPs might affect enrollment in public safety net programs. Many clinics, especially those that serve underrepresented patients, screen patients for eligibility in public programs as part of screening for the social determinants of health (Thomas-Henkel and Schulman 2017, LaForge et al. 2018, Lynch et al. 2024). This is aided by the development and implementation of screening and referral tools such as those described in Garg et al. (2015) and O'Gurek and Henke (2018). Furthermore, as NPs receive training that emphasizes a holistic, patient-centered approach to treatment, these providers might be well-suited to communicate the benefits of program participation to patients. Through both of these mechanisms, proliferation of NPs in underserved

areas might increase safety net program enrollment. If this is the case, this represents another mechanism by which NP scope of practice expansions can improve the well-being of underrepresented populations.

WIC

We examine WIC as a case study for the spillover effect of NP scope of practice expansions on safety net program participation. WIC is a federally funded program administered by states with the goal of providing nutritional support to pregnant, postpartum, and breastfeeding mothers; infants; and children up to five years old. In fiscal year 2023, there were around 6.576 million average annual participants receiving an average of $56.06 per participant each month (USDA Food and Nutrition Service 2024). WIC provides in-kind benefits; participants receive vouchers or electronic benefit transfer cards that allow them to purchase specific qualified food items. To qualify for WIC benefits, a potential participant must not only fall into one of the above-mentioned categories, but also be below an income threshold and be assessed to be at a nutritional risk. The income requirements vary by state, but in general, if the potential participant is eligible for Medicaid, SNAP, or TANF, they automatically meet the income eligibility requirement.

Previous studies have shown that WIC participation during pregnancy improves birth outcomes including increasing birth weights (Ko 2024, Hoynes et al. 2011), reducing the incidence of low birth weight (Currie & Rajani 2015, Bitler & Currie 2005), and reducing the probability of a premature birth (Currie & Rajani 2015). Further, Robinson (2013) also found that there are spillover health benefits for older male children living in a WIC participant's household. WIC has also been found to impact the behavior of participating mothers including reducing exclusive breastfeeding duration (Bullinger & Gurley-Calvez 2016) and encouraging enrolled pregnant women to quit smoking (Yunzel-Butler et al. 2010).

Despite the benefits of WIC, the USDA estimates that less than 60% of the population that qualifies for WIC participates in the program. **Figure 2** displays the extent of this underutilization by participant type by year. Infants exhibit the highest utilization of WIC, with about 80% of eligible infants enrolled. Children have the lowest rate of utilization, with under 50% of eligible children enrolled in the program. Regarding the determinants of WIC participation, Bitler et al. (2003) found that WIC participation is higher in states that reduce the transaction costs associated with participation in the program and lower in states with stricter eligibility requirements. Expanding other social programs such as SNAP (Han 2020) and Medicaid (Ko 2024) also increases WIC participation rates. Beyond program expansions, closer proximity to WIC clinics or vendors also increases the likelihood that a mother will receive WIC benefits (Meckel et al. 2023, Rossin-Slater 2013). Potentially, the expansion of NP SOP might also increase WIC enrollment through increased access to clinics screening for WIC and increased access to providers that can communicate the benefits of WIC.

III. Data

For the outcome of WIC enrollment, we obtained state-level monthly WIC participation data from 2005 to 2019 from the USDA. The data contains information on total WIC participation for each state each month, as well as participation for each of the mutually exclusive subpopulations of women, infants (up to their first birthday), and children (up to their fifth birthday). The data also contains mutually exclusive subclassifications of these broader WIC categories. For example, the total women enrollment is divided into enrollment by pregnant women, postpartum women, and partially or exclusively breastfeeding women.[1] Infant enrollment

[1] Before 2010, the data only contains the total enrollment of breastfeeding women. After 2010, this is separated into women fully and partially breastfeeding.

is divided into partially breastfeeding, fully breastfeeding, and fully formula-fed infants.[2] To construct our main outcomes, we take logs of these WIC enrollment numbers.

For the treatment variable of NP SOP expansions, we follow McMichael and Markowitz (2023) in the classification of state NP SOP laws. Specifically, we identify the date on which each state granted full practice authority (FPA) to nurse practitioners (NP). **Figure 1** shows the geographic variation in the rollout of NP FPA over our sample period. A total of 18 states granted FPA to NPs between 2005 and 2019. These states are largely well-dispersed across the US, though none of our treated states are located in the southeast.

We include several controls in our specification, including a control for the logged population. The group in the logged population control varies based on the WIC outcome such that we only include the relevant group for the outcome. For example, for the outcome of logged women enrollment, we include a control for the log of the number of women aged 15-44. For log infant enrollment, we include a control for the log number of individuals aged less than one. For log children's enrollment, we include a control for the log number of individuals aged 1-4. For total enrollment estimates, we include a control for the log of the total of each of the above populations. The inclusion of these logged population controls allows us to interpret our estimates as percentage changes in WIC enrollment rates.[3] We also included controls for if the state expanded Medicaid, the percentage of the state that is in poverty, and age and sex profiles. We source this information from the American Community Survey 1-year estimates.

[2] Similar to the breastfeeding women subclassifications, the infant subclassifications are available only after 2010.
[3] An alternative would be to directly construct our outcome as the log of per-capita of WIC enrollment, or the log of a WIC enrollment rate. However, because we are unable to precisely capture the WIC-eligible population, we believe it is preferable to include the population as a logged control. From an interpretation standpoint, this achieves the same thing as a per-capita outcome, though it also allows for a fractional effect of the population control on the WIC enrollment outcome, which is more realistic as not everyone in the population control is eligible for WIC. Nonetheless, when computed using the per-capita outcomes our estimates are qualitatively similar.

Table 1 presents summary statistics for the main analytic sample. The table shows average WIC enrollment per 10,000 and several demographic measures in states that granted NP full practice authority before 2019 and states that did not.[4] The only major demographic difference between the two groups is that states that did not grant NPs full practice have a slightly higher percent of the population that is below the federal poverty line. This difference helps to explain why WIC enrollment is higher on average in states that did not expand nurse practitioner scope of practice.

IV. Method

To evaluate the spillover effects of NP SOP expansions on WIC enrollment, we leverage the staggered rollout of nurse practitioner FPA at the state level. To do this, we use a staggered difference-in-differences approach that compares the change in WIC enrollment for states that implemented NP FPA to the change in enrollment for states that maintained restricted practice. Our baseline empirical strategy is the following event study specification operationalized through two-way fixed effects (TWFE)

$$\ln y_{st} = \beta_0 + \sum_{j \neq -1} \beta_j (\text{FPA}_s \times D_{stj}) + \alpha_s + \tau_t + \beta_x' X_{st} + \varepsilon_{ipt} \qquad (1)$$

where $\ln y_{st}$ is the log of WIC enrollment for state s in year-month t. FPA_s is an indicator for if state s implemented NP FPA during the sample period. D_{stj} is an indicator for if year-month t is j years before or after the year of NP FPA enactment in state s. Therefore, though the data is monthly, we estimate yearly dynamics to capture long run effects. The reference period is $j = -1$, the year before NP FPA enactment. α_s and τ_t are state and year-month fixed effects that capture time-invariant heterogeneity between states and national shocks, respectively. X_{st} is a vector of

[4] WIC enrollment per 10,000 is the count of WIC participants divided by the population for the relevant subgroup (i.e. women 15-44, infants, children 1-4) and multiplied by 10,000.

covariates including the logged group-specific population controls described above, the percentage of the state's population in poverty, age profiles, and sex profiles. We also control for whether the state expanded Medicaid. Finally, the standard errors are clustered at the state-level.

Our coefficients of interest are β_j, which are dynamic average treatment on the treated (ATT) parameters. In this setting, β_j represents the difference in the percentage change in WIC enrollment rates between the reference period and the period j years (before or) after NP FPA for treated states relative to states that did not enact NP FPA at the same time.[5] For tabular estimates, we pool the dynamic ATTs into two-year buckets. Therefore, we estimate the effect of NP FPA at 0-1 years post-FPA, 2-3 years, 4-5 years, et cetera.

Recent econometrics literature has shown that when the rollout of treatment is staggered, estimates of β_j are biased under TWFE if the treatment effects are heterogeneous across cohorts. In particular, Goodman-Bacon (2021) shows staggered difference-in-differences estimates reflect a weighted average of the treatment effects of the underlying 2x2 difference-in-difference comparisons, and some of these weights could be negative. To provide a causal estimate of the dynamic ATTs that overcomes these concerns and is robust to heterogeneous treatment effects, we estimate event studies using the procedure outlined in Sun and Abraham (2021). In the appendix, we additionally estimate dynamics using the imputation procedure outlined in Borusyak, Jaravel, and Spiess (2024).

In any case, our identification assumption is the canonical assumption of parallel trends. Namely, a causal interpretation of our dynamic estimates rests on the assumption that the trend in WIC enrollment between the pre- and post-period in treated states would have been the same as

[5] We can interpret the coefficient as a percentage change in a WIC enrollment rate because our outcome is logged and we include a log population control, acting as the denominator in the rate.

the trend in comparison states had the treated states not expanded NP FPA. Though this assumption is untestable, we provide evidence for its validity in two ways. First, we show in **Appendix Table A1** that we are unable to predict the both the occurrence and timing of NP FPA using WIC enrollment rates, mitigating concerns of policy endogeneity. Second, we compare the trend in WIC enrollment in treated and comparison states leading up to the treatment date – an analysis of pre-trends. We discuss this test further in the coming results section.

V. Results

Main Results

Table 2 presents the estimates of β_j (for $j \geq 0$) pooled into a set of two-year effects for the outcome of logged total WIC enrollment. Columns (1) and (2) present estimates using TWFE and columns (3) and (4) present estimates from the estimator described in Sun and Abraham (2021), hereinafter SA. Columns (1) and (3) contain the baseline estimates which includes only the log of total population control. Thus, all of our estimates can be interpreted as percentage changes in WIC enrollment rates following NP FPA. Columns (2) and (4) add the full set of controls.

Our TWFE estimates in columns (1) and (2) show little effect of NP FPA on WIC enrollment in the first three years post-policy. However, starting in years 4-5 post-FPA, we find that in this longer run period there are large and significant effects of expanding NP SOP on WIC. Our SA estimates in Panel B corroborate this pattern. Specifically, our SA estimates show that NP FPA increases WIC enrollment by 4.0% in years 4-5 post-FPA, 4.2% in years 6-7, and 6.8% in years 8-9 post-FPA.

The event studies for logged total enrollment are presented in **Figure 3.** In blue diamonds we present the TWFE estimates and in red triangles we show the SA estimates. The two estimations yield very similar results. We draw two main conclusions from these plots. First, all

of the pre-period estimates are insignificant and display no evidence of a systematic trend, suggesting that states where SOP was expanded experienced similar pre-FPA trends in WIC enrollment as states where SOP was not expanded. This suggests that treated states would have experienced similar trends as comparison states had FPA not been granted, supporting the identification assumption of parallel trends. Second, the first three years post-FPA show little change in WIC enrollment. In the fourth year, we observe an uptick in WIC enrollment rates, which continues to grow even a decade post-FPA. This supports the existing literature which finds that the effects of NP FPA take years to materialize given rigidities in contracts, practice agreements, and within-practice norms (Smith 2021, McMichael 2023).

The previous results suggest that expanding NP SOP increases total WIC enrollment in the longer run (after four years of FPA). However, total WIC enrollment consists of the sum of women, infants, and children enrollment. In **Table 3**, we estimate the dynamic effects of NP FPA on each type of WIC enrollment separately. For both the TWFE and SA estimates, we find that the effect of NP FPA on WIC enrollment is driven by increases in the enrollment of women and children. Namely, SA estimates indicate that NP FPA increases the enrollment of women by 7.2% and children by 8.4% in years 8-9 post implementation. The TWFE estimator also indicates that the enrollment of infants increases by 4.5% in years 8-9 post-FPA, but this finding is not replicated in neither the SA estimation nor the Borusyak, Jaravel, and Spiess (2024) estimation, suggesting that this finding could be a result of the estimation method. Further, since around 80% of all eligible infants participate in WIC (as shown in **Figure 1**), it is possible that expanding NP SOP did not induce a sufficiently large change to move the margins in the already high participation of infants.

The corresponding event studies, disaggregated by type of enrollment, are presented in **Figure 4**. **Panel A** contains the TWFE results and **Panel B** contains the SA results. We show the

enrollment of women in blue diamonds, infants in red triangles, and children in green circles. As in **Figure 3**, we find no evidence of pre-trends for any of the WIC enrollment types. Furthermore, we continue to find that there is no effect of NP FPA on any of the WIC enrollment types in the first 3 years after NPs were granted FPA. Starting in year 4 post-FPA and onward we find a statistically significant increasing trend in WIC enrollment for women and children. As suggested in the analysis in **Table 3**, the estimates for infants do not show a significant increase in participation for any of the post-FPA time periods, further confirming that the increase in total WIC participation is driven by increases in women and children's participation.

The WIC data also disaggregates women and infants into mutually exclusive subtypes. For example, total women disaggregate to pregnant women, breastfeeding women, and postpartum women. Starting in 2010, breastfeeding women are further disaggregated to fully and partially breastfeeding women. Also starting in 2010, infants are disaggregated into fully breastfed infants, partially breastfed infants, and fully formula-fed infants. In **Appendix Tables A3** and **A4**, we report results for the impact of NP FPA on WIC participation for each of these subtypes. Looking at the SA results for women's WIC subtypes (**Appendix Table A3**), we find immediate increases in WIC enrollment for partially breastfeeding women and postpartum (non-breastfeeding) women. The increase in postpartum women's WIC enrollment persists throughout the treatment period, peaking in years 4-5 at a 9.4% increase. However, the increase in partially breastfeeding women does not persist throughout the post-FPA period. The SA results for infant subtypes in **Appendix Table A4** illustrate a decrease in partially breast-fed infants and an increase in fully formula-fed infants, likely offsetting each other such that the aggregate infant enrollment is largely unchanged. It should be noted that we only find statistically significant effects for the SA results, so these results should be interpreted as suggestive evidence.

Robustness

In this section, we perform robustness checks for our main NP FPA analysis. First, we assess whether the effects we estimate in the previous section are a function of the chosen difference-in-differences estimator as opposed to the existence of a meaningful treatment effect. To do this, we estimate the main event study specification using the imputation estimator described in Borusyak, Jaravel, and Spiess (2024). The dynamic estimates pooled into two-year buckets are presented in **Appendix Table A2** and the corresponding event studies are visualized in **Appendix Figure A1**. As in the main results, we document significant increases in the WIC enrollment of women and children in the long run. For total WIC enrollment, with the exception of the 8-9 year post-FPA estimate, the results are largely imprecise. This can be attributed to the fact that the imputation estimator additionally finds a sizeable negative effect of NP FPA on infant enrollment. This negative effect is not found in either of the TWFE estimates and SA estimates, which leads us to believe that this effect is a product of the imputation procedure. Aside from this estimate, the results in **Appendix Table A2** are qualitatively similar to our main results.

Second, we assess whether the main estimates are driven by outlier states. Potentially, a singular state may experience a large spurious increase in WIC enrollment at the same time as NP FPA expansion, which could then translate to noticeable effects for the whole sample. We test for this in **Figure 5** by estimating the preferred event study specification (Columns (2) and (4) of **Table 2**) by iteratively dropping states from the analytic sample. Our results indicate the same pattern of a long-term increase in WIC enrollment regardless of which states are included in our estimation, allaying concerns that the main estimated effects are driven by outlier states.

Heterogeneity

Previous literature shows that NPs are more likely to deliver care to underserved populations, including minorities and those below 100% of the federal poverty line (Xue et al. 2019). At the same time, underserved populations are more likely to be eligible for WIC. Therefore, expanding NP SOP should have greater spillover effects on WIC enrollment for underserved populations relative to populations with already-adequate healthcare access.

To assess whether this is true, we perform two heterogeneity analyses. First, we stratify the main analysis by states that have an above-median percentage of population nonwhite versus states that have a below-median percentage of population nonwhite.[6] The results are presented in **Table 4**.[7] The increases in enrollment are entirely concentrated in states that have a large nonwhite population. Namely, the SA estimates in **Panel B** indicate that in years 8-9 post-FPA, WIC enrollment increases by 10.2% in states with a large nonwhite population and has negligible effects on WIC enrollment in states with a low nonwhite population. There is some evidence that for states with below-median nonwhite populations, WIC enrollment actually declined in the first few years post-FPA, though by the end of the analysis period the negative effect vanishes. This pattern of larger increases in WIC enrollment in states with a large nonwhite population holds true across all types of enrollment: women, infants, and children.

Similarly, **Table 5** stratifies the analysis by states that have an above-median percentage of the population in poverty versus states that have a below-median percent in poverty.[8] There is some suggestive evidence that states with an above median percentage of the population in poverty

[6] The median is calculated based on the nonwhite percentages of other states. In other words, we identify the percentage of the population that is nonwhite for each state, then compute the median from this set. Therefore, this process splits the sample into two equal-size groups.

[7] TWFE results are provided in **Appendix Table A5**

[8] TWFE results are provided in **Appendix Table A6**.

experience increases in WIC enrollment, but there is no persistent trend in the post-treatment period. Overall, these two heterogeneity analyses loosely corroborate existing literature in finding larger effects of NP FPA in underserved areas.

Mechanisms

Our main results show that expanding NP scope of practice leads to increases in WIC enrollment. We hypothesize two main mechanisms by which this effect operates. First, NP SOP expansion might increase WIC enrollment due to increased access to care, which might lower information costs associated with program enrollment. This is evident in the fact that providers and clinics will often screen patients for eligibility in public programs and encourage enrollment among those who are eligible but not enrolled (Garg et al. 2015, Thomas-Henkel and Schulman 2017, LaForge et al. 2018, Lynch et al. 2024, O'Gurek and Henke 2018). This ensures that women with little information about how to enroll in WIC have this information upon making a healthcare visit.

We confirm the mechanism of access to care by establishing whether NP FPA increases access to care for women, infants, and children less than five. Though prior work demonstrates that NP FPA increases access to care (Patel et al. 2019), less is known about the improvement in access among the WIC-eligible population specifically.

To estimate the effect of NP FPA on access to care for this population, we use survey data from the National Health Interview Survey from 2005 to 2018.[9] We focus on two variables that provide information on access to care: whether the respondent has a usual place of care and if it has been over a year since the respondent has been to the doctor. We limit the survey responses to women with children less than five years old or children less than five years old, constituting a

[9] We omit the 2019 NHIS as it does not contain the variables of interest for this analysis.

measure of WIC-eligible population. We aggregate the data to the census region-month level and estimate the following specification

$$y_{rt} = \beta_0 + \beta_1 \text{ShareFPA}_{rt} + \alpha_r + \tau_t + \beta_x' X_{rt} + \varepsilon_{rt}$$

where y_{rt} is the average healthcare access outcome among individuals in census region r in year-month t. ShareFPA_{rt} represents the share of region r's total population that is exposed to NP FPA in year-month t. In different specifications, we include lags of this variable to estimate the dynamics of increasing NP autonomy. This is a crude overall measure but still provides a sense of the proliferation of NPs in a given geography. As in our main specification, we include place and time fixed effects represented by α_r and τ_t and a set of controls contained in X_{rt}.

The results are presented in **Appendix Table A7**. The results in **Panel A** illustrate that the share of the population exposed to NP FPA is positively correlated with the likelihood of reporting a usual place of care four years later. While only significant at 90% level, this result provides suggestive evidence that granting NPs full practice autonomy increases access to care among the WIC-eligible population. The fact that this effect appears after four years of exposure to NP FPA is consistent with our event studies, which show WIC enrollment increasing about four years after NP FPA. Furthermore, **Panel B** of **Appendix Table A7** shows that the share of the population exposed to NP FPA is negatively correlated with the likelihood of going more than one year since seeing a doctor four years later, though the result is not significant. Together, these results provide suggestive evidence that NP FPA increases access to care among the WIC-eligible population, which may reduce the information costs associated with WIC enrollment and thereby increase participation.

Beyond access to care, we note a second mechanism which can potentially explain our estimated effects of NP FPA on WIC enrollment. Clearly, the expansion of NP SOP increases

exposure of patients to nurse practitioners. NPs receive training under the nursing model, which emphasizes a patient-centered, holistic approach to treating patients. This contrasts with physicians and physician assistants, who receive training under the medical model, which emphasizes a biology-focused approach to treating disease. Because of this difference in training, an NP might be more likely to discuss aspects of the patient's life beyond just their health care needs, including enrollment in public programs for which the patient is eligible (Matteliano and Street 2012). This might also reduce the stigma associated with program enrollment if NPs can effectively communicate the benefits of program participation. Therefore, while our effects may be attributed to increased access to care, they may also be attributable to the fact that NP FPA increases access to a type of provider that uses a unique patient-centered approach in treatment.

To assess whether this is the case, we leverage a different SOP policy which has similar, albeit smaller effects on access to care (McMichael 2023) - the expansion of physician assistant (PA) scope of practice to remote practice authority (RPA). Whereas full practice authority for NPs allows the NP to practice independently of a physician, remote practice authority for PAs merely reduces the amount of day-to-day physician supervision required. Though PA RPA has been shown to yield improvements in access to care, it does not expose patients to a patient-centered provider type, as PAs receive training under the same medical model physicians. Therefore, estimating the effect of PA RPA on WIC enrollment will allow us to develop a sense of whether or result is driven by access to care in general or rather by access to a particular provider type.

Appendix Figure A2 presents the event studies for the effect of state-level PA RPA on WIC enrollment. While we are unable to make definitive causal claims about the impact of PA RPA on WIC enrollment due to the presence of pre-trends in both the TWFE and SA models, it is clear that WIC enrollment does not increase following PA RPA. Thus, these results show that

increasing access to care through expanding PA SOP does not yield increases in WIC enrollment, providing suggestive evidence that the effect of NP SOP on WIC enrollment partially operates through access to a uniquely trained provider type.

VI. Discussion

In this paper, we assess whether NP SOP expansions have spillover effects on enrollment in safety net programs, specifically WIC. Our results show that nurse practitioner full practice authority leads to significant increases in WIC enrollment in the long run. Specifically, we find that starting 4-5 years post-FPA, WIC enrollment experiences a significant increase of 4.0%, which rises to 6.8% 8-9 years after NP FPA. As the average total WIC enrollment in treated states is about 800 individuals per 10,000 population, the 8-9 year estimate of 6.8% implies that NP FPA leads to at least 54 additional WIC enrollees per 10,000 population per month in the long run.

To further put our results further into context, Smith (2021) finds that relaxed scope of practice laws for NPs increases the share of NP-provided visits billed independently by 13%, which can be interpreted as a sort of first stage. In turn, Traczynski and Udalova (2018) find that NP SOP expansions increased primary care utilization by 5% on the extensive margin. Finally, McMichael (2023) finds a 2% reduction in healthcare-amenable deaths following NP full practice authority. Our long-run estimate of a 6.8% increase in WIC enrollment is highly reasonable given the established literature on the effects of NP SOP expansions. Our estimated effect size is smaller than Smith's (2021) "first stage" estimate of 13%, likely reflecting the fact that not all individuals seen by an NP are eligible for WIC, and larger than McMichael's 2% estimate from healthcare-amenable deaths, which can be viewed as a lower bound given the challenge in averting these deaths.

Our estimates are most pronounced for the enrollment of women and children, where we find effect sizes of 7.2% and 8.4% in years 8-9 post-FPA, respectively. Specifically, given the average WIC enrollment for these groups, our estimates imply that NP FPA leads to at least 19 additional monthly women enrollees per 10,000 women and 190 additional monthly child enrollees per 10,000 children in the long run. This is a notable finding, as women and children significantly underutilize WIC, as seen in **Figure 2**. We do not find that NP FPA leads to large increases in the number of infants enrolled in WIC. This is likely explained by the fact that infants experience the highest utilization of WIC, making it difficult to affect WIC enrollment for this population other than by changing of composition of enrolled infants.

Our results have numerous implications for policy. Notably, our results support the growing body of evidence on the benefits of nurse practitioner scope of practice expansions. Generally, we show that expanding NP autonomy can have spillover benefits on public program participation. In that sense, we add to the evidence that documents the importance of NPs in delivering care to underserved populations. In our heterogeneity analyses, we find that NP FPA leads to larger increases in WIC enrollment in states with a high non-white population. This suggests that NPs may be most impactful in delivering care and social support to this population. Ultimately, our results highlight an additional mechanism by which expansion of autonomy for nurse practitioners can improve the health and well-being of underserved populations.

Furthermore, our results provide a better understanding of the determinants of public program participation. Though many scholars have recognized the benefits of WIC enrollment, a substantial number of eligible individuals are not enrolled in the program. Our findings suggest that there is a potential role for policymakers in increasing the utilization of WIC. In particular, public health initiatives which improve access to care may reduce information costs and stigma

surrounding program participation, thereby enabling more eligible individuals to obtain benefits from public programs. As healthcare access initiatives have direct health benefits which are already attractive to policymakers, our findings show that such initiatives are likely to have spillover benefits, further increasing the attractiveness of these policies.

VII. Conclusion

Do nurse practitioner scope of practice expansions have spillover effects on safety net program participation? Leveraging the staggered rollout of full practice authority for nurse practitioners, we find that starting in years 4-5 post-FPA, WIC enrollment increases in treated states, culminating in a 6.8% increase in WIC enrollment in years 8-9 post-FPA. Accordingly, we find that NP FPA increases the long run WIC participation of women and children such that in years 8-9 post-FPA implementation, an additional 19 women and 190 children per 10,000 population participate in WIC each month. Our results suggest another pathway by which scope of practice expansions can improve the health and wellbeing of underrepresented populations. Future work should investigate if NP FPA has spillover effects on participation in other social safety net programs such as Medicaid and SNAP as well as delve deeper into the specific mechanisms by which these spillovers operate.

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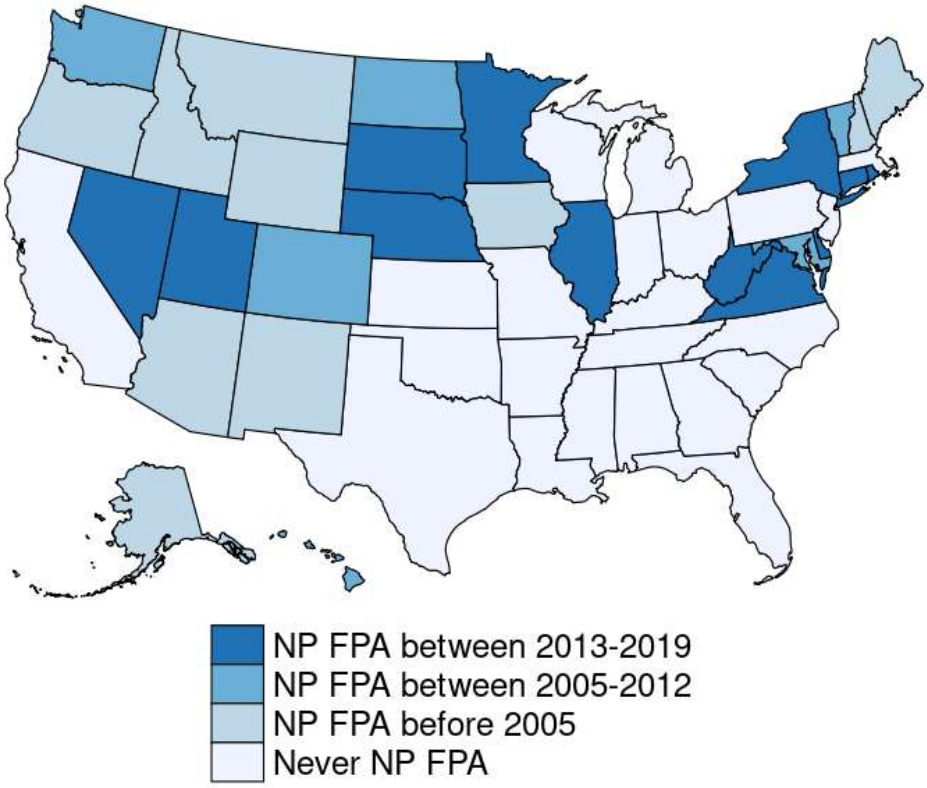
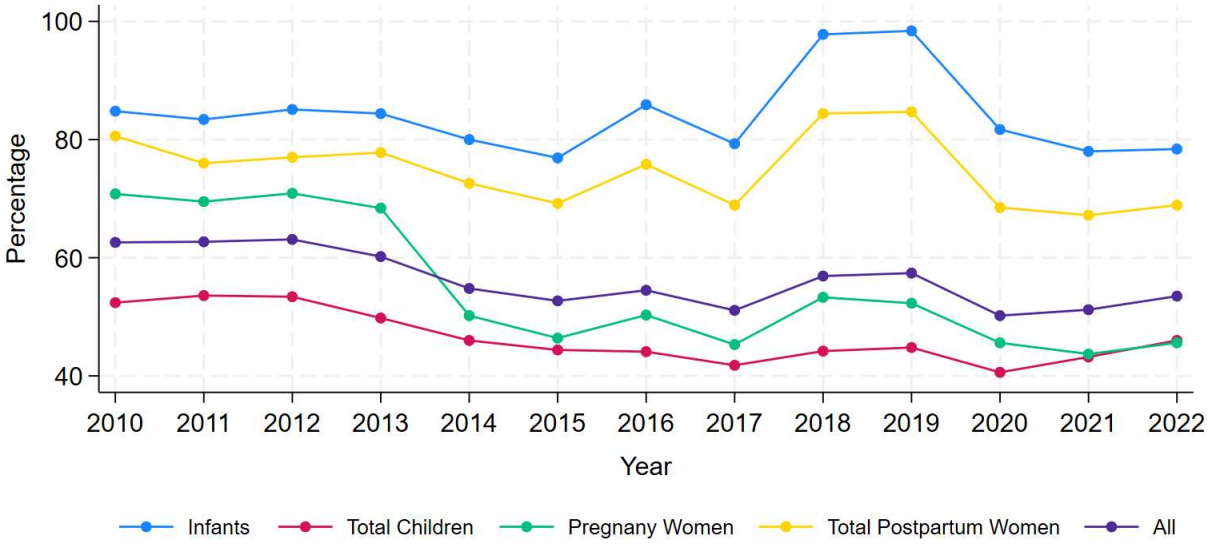
Figures

Figure 1: States that Expanded Nurse Practitioner Scope of Practice between 2005 and 2019



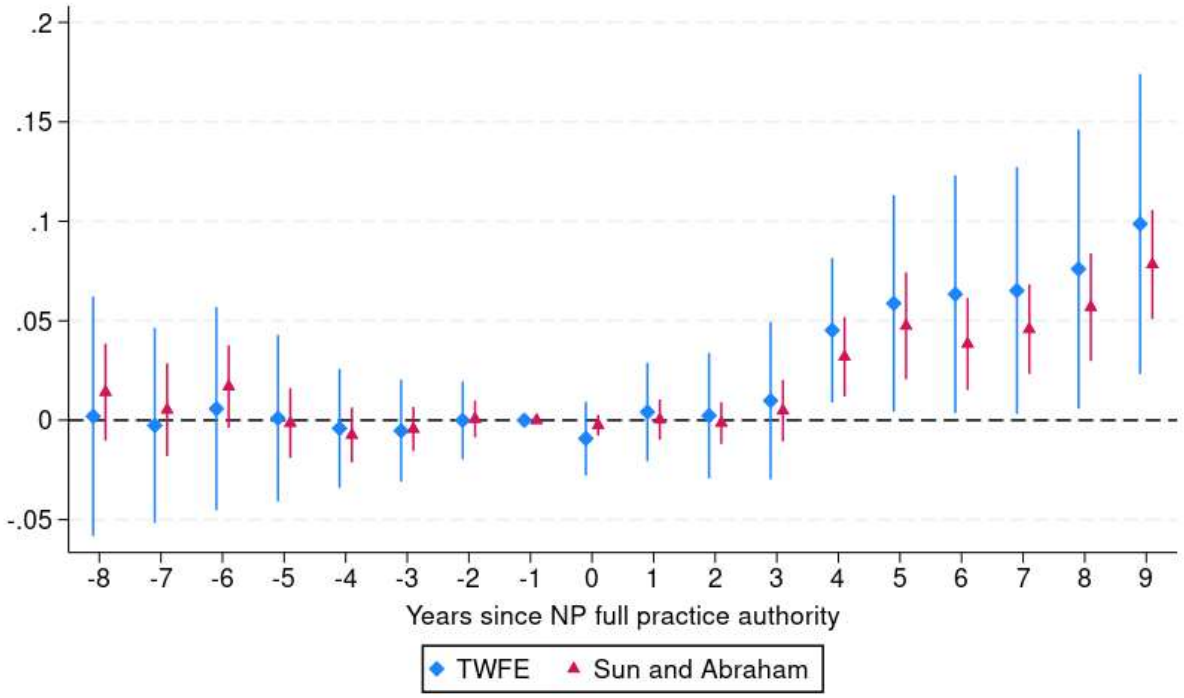
Source: NP FPA classifications are based on McMichael and Markowitz (2023).

Figure 2: WIC Coverage Rates by Year



Source: USDA Food and Nutrition Service
Notes: Starting in 2018, the U.S. Census Bureau changed their methodology for calculating the number of eligible individuals.

Figure 3: Dynamics in the Effect of NP FPA on Total WIC Enrollment

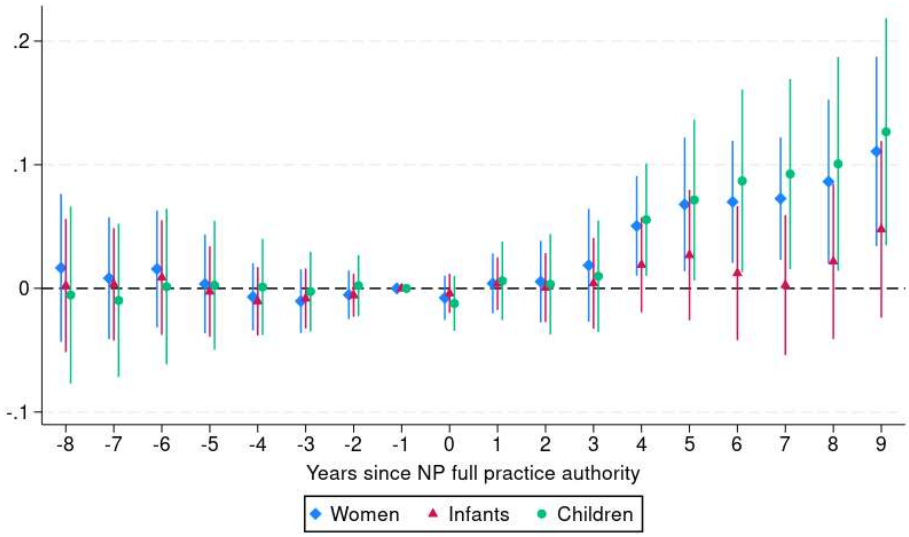


Source: WIC enrollment data, SOP classifications as in McMichael and Markowitz (2023), and American Community Survey 1-year estimates.

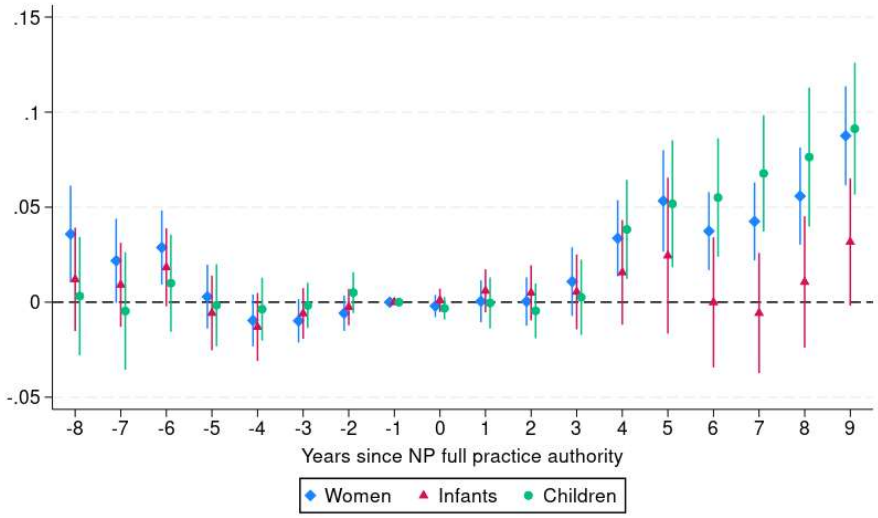
Notes: Each model includes state and year-month fixed effects; controls for the log of WIC-eligible population, Medicaid expansion status, percentage of the state population in poverty, percentage under 18 years, percentage 65 years or older, and percentage female. Blue diamonds represent TWFE estimates and red triangles are the Sun and Abraham (2021) estimates. Lines represent 95% confidence intervals.

Figure 4: Dynamics in the Effect of NP FPA on WIC Enrollment by Type

Panel A: TWFE



Panel B: Sun & Abraham

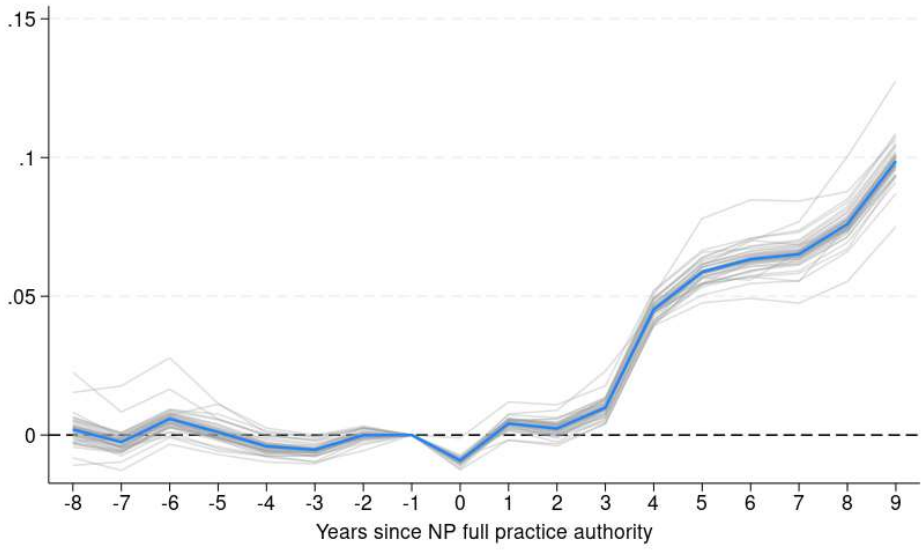


Source: WIC enrollment data, SOP classifications as in McMichael and Markowitz (2023), and American Community Survey 1-year estimates.

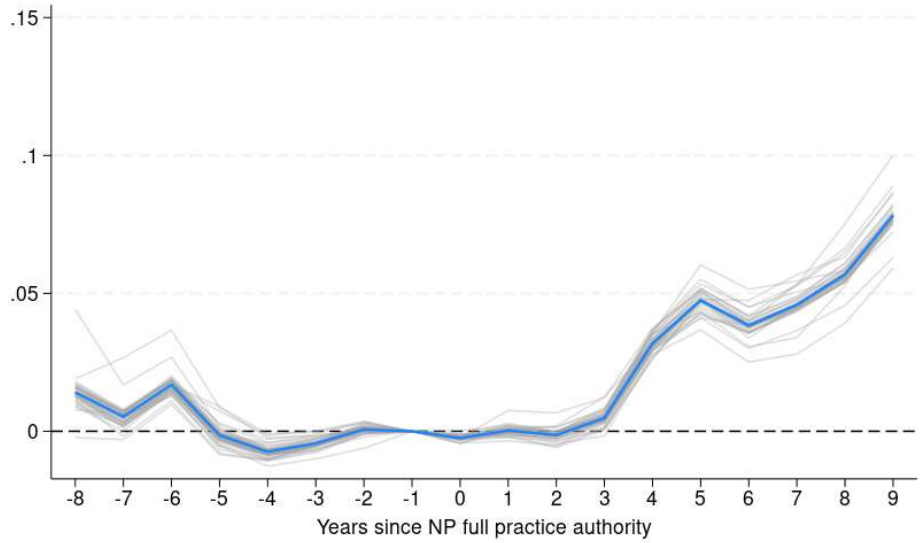
Notes: Each model includes state and year-month fixed effects; controls for the log of WIC-eligible population, Medicaid expansion status, percentage of the state population in poverty, percentage under 18 years, percentage 65 years or older, and percentage female. Panel A the contains TWFE estimates and Panel B contains Sun & Abraham estimates. Blue diamonds represent estimates for women enrollment, red triangles for infant enrollment (< 1 years), and green circles for children enrollment (1-5 years). Lines represent 95% confidence intervals.

Figure 5: Dynamics in the Effect of NP FPA on WIC Enrollment by Iteratively Dropping States

Panel A: TWFE



Panel B: Sun & Abraham



Source: WIC enrollment data, SOP classifications as in McMichael and Markowitz (2023), and American Community Survey 1-year estimates.

Notes: The blue line represents baseline event study estimates. Each gray line represents the event study estimates for after dropping all observations corresponding to a given state. Each model includes state and year-month fixed effects; controls for the log of WIC-eligible population, Medicaid expansion status, percentage of the state population in poverty, percentage under 18 years, percentage 65 years or older, and percentage female (specification in column (3) of **Table 2**). Panel A contains TWFE estimates and Panel B contains Sun & Abraham estimates.

Tables

Table 1: Summary Statistics of States that Granted NP FPA Versus States that Did Not Grant NP FPA

	Granted NP FPA before 2019		Did not grant NP FPA before 2019	
Enrollment per 10k	Mean	SD	Mean	SD
Total	796.70	169.31	904.09	177.95
Women	260.62	59.96	304.79	66.74
Infant	2109.16	420.34	2552.90	478.45
Children	2256.83	544.28	2415.53	484.10
Covariates				
% Female	50.43	0.94	50.99	0.43
% < 18 years	23.09	2.48	23.60	1.57
% 65 +	14.18	2.45	14.30	2.01
% < 100 FPL	12.29	2.81	14.93	2.90
Number of states	29		22	

Source: WIC enrollment data, SOP classifications as in McMichael and Markowitz (2023), and American Community Survey 1-year estimates.

Notes: States that granted NP FPA are those that enacted the NP FPA legislation before 2019. Those that did not grant NP FPA are the states that did not enact NP FPA legislation before 2019. WIC enrollment is the count of WIC participants divided by the WIC-eligible population (i.e. women 15-44, children 1-4, infants) and multiplied by 10,000.

Table 2: Effect of FPA for NP on Total WIC Enrollment

	TWFE		Sun & Abraham	
	(1)	(2)	(3)	(4)
	Log(Total Enrollment)	Log(Total Enrollment)	Log(Total Enrollment)	Log(Total Enrollment)
Years 0-1 post-FPA	-0.0051	-0.0063	0.0026	-0.0011
	(0.0169)	(0.0159)	(0.0024)	(0.0034)
Years 2-3 post-FPA	0.0068	0.0075	0.0055	0.0017
	(0.0217)	(0.0209)	(0.0053)	(0.0059)
Years 4-5 post-FPA	0.0400*	0.0459**	0.0393***	0.0397***
	(0.0225)	(0.0205)	(0.0081)	(0.011)
Years 6-7 post-FPA	0.0405	0.0513**	0.0386***	0.0421***
	(0.0268)	(0.0244)	(0.0082)	(0.0104)
Years 8-9 post-FPA	0.0593**	0.0711***	0.0643***	0.0676***
	(0.0275)	(0.0263)	(0.0101)	(0.0126)
Observations	9180	9180	9180	9180
Population control	X	X	X	X
All controls		X		X

Source: WIC enrollment data, SOP classifications as in McMichael and Markowitz (2023), and American Community Survey 1-year estimates.

Notes: All columns include state and year-month fixed effects. Columns (1) and (2) are estimated with TWFE and columns (3) and (4) are estimated with Sun and Abraham (2021). Columns (1) and (3) contain controls for the log of WIC-eligible population. Columns (2) and (4) adds controls for Medicaid expansion status, percentage of the state population in poverty, percentage under 18 years, percentage 65 years or older, and percentage female. Standard errors are clustered at the state-level. * p <0.1, ** p <0.05, *** p<0.01

Table 3: Effect of FPA for NP on WIC Enrollment by Type

	TWFE			Sun & Abraham		
	(1) Log(Women)	(2) Log(Infant)	(3) Log(Children)	(4) Log(Women)	(5) Log(Infant)	(6) Log(Children
Years 0-1 post-FPA	-0.0081	0.0028	-0.0116	-0.0008	0.0035	-0.0018
	(0.0165)	(0.0119)	(0.0212)	(0.0036)	(0.0039)	(0.0044)
Years 2-3 post-FPA	0.0124	0.0102	0.0017	0.0056	0.0052	-0.001
	(0.0241)	(0.0177)	(0.0251)	(0.0068)	(0.0082)	(0.0081)
Years 4-5 post-FPA	0.0498**	0.0232	0.0507*	0.0435***	0.0201	0.045***
	(0.0189)	(0.0201)	(0.0264)	(0.0104)	(0.0168)	(0.0141)
Years 6-7 post-FPA	0.0597***	0.0128	0.0592*	0.0399***	-0.0029	0.0614***
	(0.0202)	(0.0208)	(0.0322)	(0.0093)	(0.0164)	(0.0142)
Years 8-9 post-FPA	0.0828***	0.0445**	0.0770**	0.0717***	0.0211	0.0838***
	(0.0247)	(0.0212)	(0.0364)	(0.0116)	(0.0166)	(0.0164)
Observations	9180	9180	9180	9180	9180	9180
Population control	X	X	X	X	X	X
All controls	X	X	X	X	X	X

Source: WIC enrollment data, SOP classifications as in McMichael and Markowitz (2023), and American Community Survey 1-year estimates.

Notes: All columns include state and year-month fixed effects; controls for the log of WIC-eligible population for the relevant subgroup, Medicaid expansion status, percentage of the state population in poverty, percentage under 18 years, percentage 65 years or older, and percentage female. Columns (1)-(3) are estimated with TWFE and columns (3)-(6) are estimated with Sun and Abraham (2021). Standard errors are clustered at the state-level. * p <0.1, ** p <0.05, *** p<0.01

Table 4: Heterogeneity in the Effect of NP FPA by Percentage Nonwhite, Estimated with Sun and Abraham

	Log(Total)		Log(Women)		Log(Infants)		Log(Children)	
	(1)	(2)	(3)	(4)	(7)	(8)	(9)	(10)
	Above median % nonwhite	Below median % nonwhite	Above median % nonwhite	Below median % nonwhite	Above median % nonwhite	Below median % nonwhite	Above median % nonwhite	Below median % nonwhite
Years 0-1 post-FPA	0.0111	-0.0142***	0.0163*	-0.0183***	0.0158***	-0.0076	0.0051	-0.0159**
	(0.0074)	(0.0039)	(0.0083)	(0.0053)	(0.0057)	(0.0086)	(0.0094)	(0.0068)
Years 2-3 post-FPA	0.0307***	-0.0386***	0.047***	-0.0511***	0.0277***	-0.0242**	0.0188**	-0.0398***
	(0.0085)	(0.0081)	(0.0112)	(0.0088)	(0.0098)	(0.0121)	(0.0103)	(0.0145)
Years 4-5 post-FPA	0.0883***	-0.019	0.0992***	-0.0399***	0.0672***	-0.0448**	0.0821***	-0.0093
	(0.0147)	(0.012)	(0.017)	(0.0091)	(0.0222)	(0.0211)	(0.0201)	(0.0209)
Years 6-7 post-FPA	0.0695***	-0.0057	0.0671***	-0.0201*	0.0278	-0.0445*	0.0797***	0.0005
	(0.0191)	(0.0142)	(0.0207)	(0.0112)	(0.0187)	(0.024)	(0.0243)	(0.0238)
Years 8-9 post-FPA	0.1024***	0.0323*	0.0976***	0.0261	0.0522**	0.0438**	0.1156***	0.0133
	(0.0197)	(0.0171)	(0.0209)	(0.0211)	(0.0255)	(0.0172)	(0.026)	(0.0167)
Observations	4680	4500	4680	4500	4680	4500	4680	4500
Population control	X	X	X	X	X	X	X	X
All controls	X	X	X	X	X	X	X	X

Source: WIC enrollment data, SOP classifications as in McMichael and Markowitz (2023), and American Community Survey 1-year estimates.

Notes: All columns include state and year-month fixed effects; controls for the log of WIC-eligible population for the relevant subgroup, Medicaid expansion status, percentage of the state population in poverty, percentage under 18 years, percentage 65 years or older, and percentage female. All columns are estimated using Sun and Abraham (2021). States are partitioned based on whether they are above or below the median of the percentage of the population that is nonwhite across states. Standard errors are clustered at the state-level. * p <0.1, ** p <0.05, *** p<0.01

Table 5: Heterogeneity in the Effect of NP FPA by Percentage Poverty, Estimated with Sun and Abraham

	Log(Total)		Log(Women)		Log(Infants)		Log(Children)	
	(1)	(2)	(3)	(4)	(7)	(8)	(9)	(10)
	Above median % poverty	Below median % poverty	Above median % poverty	Below median % poverty	Above median % poverty	Below median % poverty	Above median % poverty	Below median % poverty
Years 0-1 post-FPA	0.0089	-0.0089	0.0015	-0.0054	0.0194*	-0.006	0.0129	-0.014**
	(0.0086)	(0.0054)	(0.0109)	(0.0055)	(0.0089)	(0.0046)	(0.0088)	(0.0056)
Years 2-3 post-FPA	-0.0002	-0.0008	-0.0092	0.013	0.0069	0.0016	0.0064	-0.0151
	(0.014)	(0.0124)	(0.0172)	(0.0116)	(0.0107)	(0.0119)	(0.0136)	(0.0111)
Years 4-5 post-FPA	0.0344**	0.0263	0.0296	0.0386*	0.0316**	0.0071	0.0342**	0.0235
	(0.0155)	(0.0233)	(0.0189)	(0.0205)	(0.0139)	(0.026)	(0.0157)	(0.0223)
Years 6-7 post-FPA	0.021	0.0403	0.0255	0.0462	0.0239	-0.0209	0.0096	0.057*
	(0.0174)	(0.0346)	(0.0175)	(0.0301)	(0.0206)	(0.0301)	(0.0195)	(0.0332)
Years 8-9 post-FPA	0.0318	0.0661	0.0637**	0.0752*	0.0827***	-0.0073	-0.0061	0.0792**
	(0.0228)	(0.0462)	(0.0248)	(0.0429)	(0.0246)	(0.0336)	(0.0234)	(0.0396)
Observations	4500	4680	4500	4680	4500	4680	4500	4680
Population control	X	X	X	X	X	X	X	X
All controls	X	X	X	X	X	X	X	X

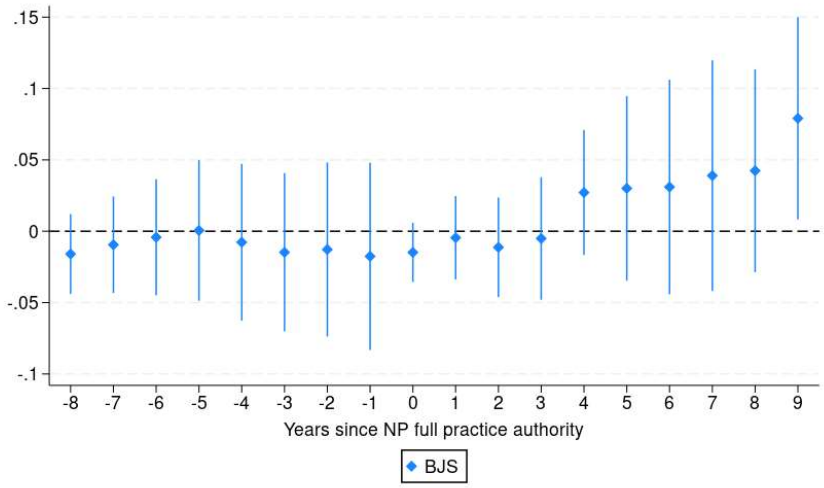
Source: WIC enrollment data, SOP classifications as in McMichael and Markowitz (2023), and American Community Survey 1-year estimates.

Notes: All columns include state and year-month fixed effects; controls for the log of WIC-eligible population for the relevant subgroup, Medicaid expansion status, percentage of the state population in poverty, percentage under 18 years, percentage 65 years or older, and percentage female. All columns are estimated using Sun and Abraham (2021). States are partitioned based on whether they are above or below the median of the percentage of the population that is in poverty across states. Standard errors are clustered at the state-level. * p <0.1, ** p <0.05, *** p<0.01

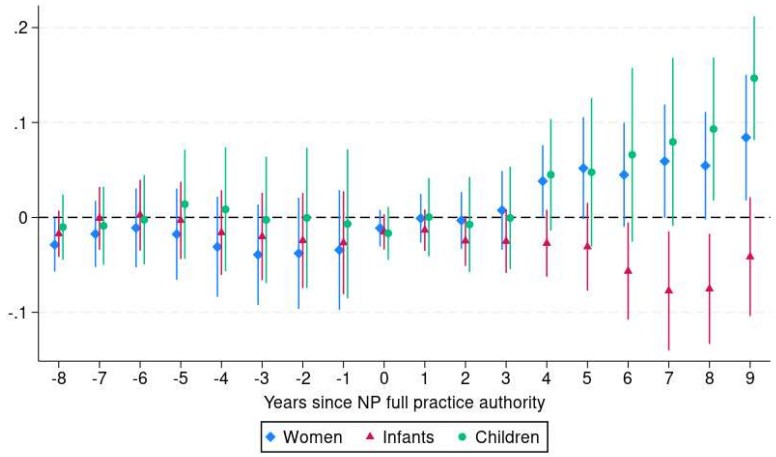
Appendix

Appendix Figure A1: Effect of NP FPA on WIC Enrollment, Estimated with BJS

Panel A: Total



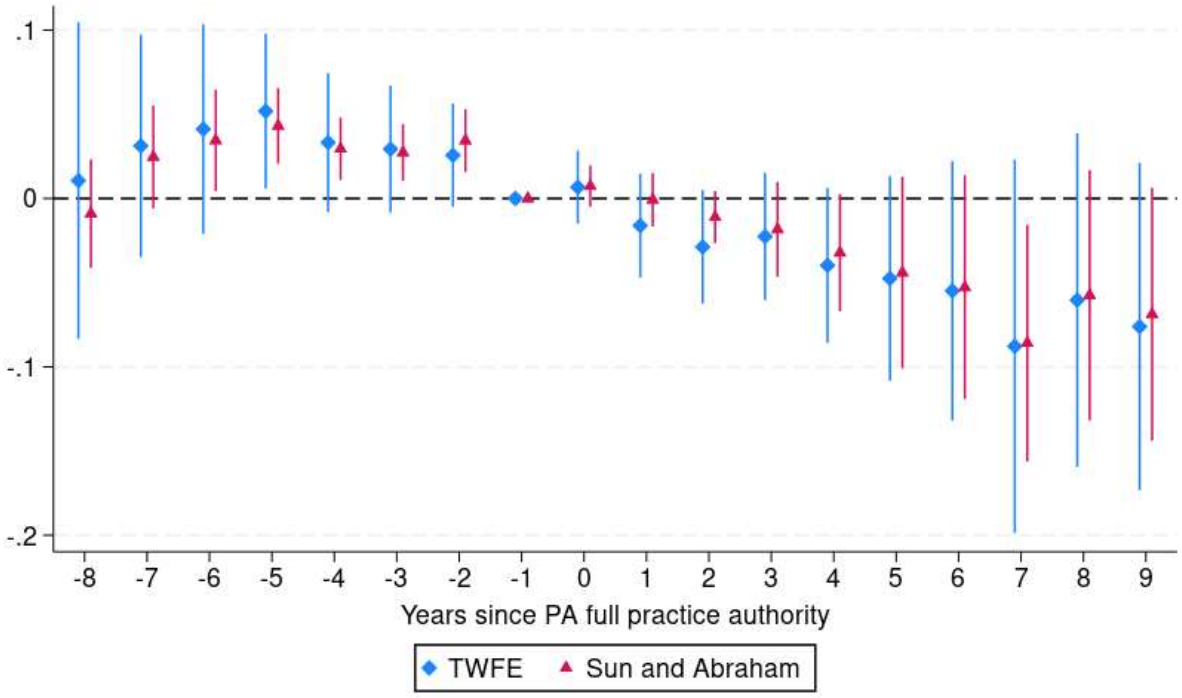
Panel B: By Type



Source: WIC enrollment data, SOP classifications as in McMichael and Markowitz (2023), and American Community Survey 1-year estimates.

Notes: Each model is estimated with BJS and includes state and year-month fixed effects; controls for the log of WIC-eligible population, Medicaid expansion status, percentage of the state population in poverty, percentage under 18 years, percentage 65 years or older, and percentage female. Panel A represents results for total enrollment, while Panel B presents results for enrollment by type. In Panel B, blue diamonds represent estimates for women, red triangles for infants, and green circles for children. Lines represent 95% confidence intervals.

Appendix Figure A2: Effect of PA RPA on Total WIC Enrollment



Source: WIC enrollment data, SOP classifications as in McMichael and Markowitz (2023), and American Community Survey 1-year estimates.

Notes: Each model includes state and year-month fixed effects; controls for the log of WIC-eligible population, Medicaid expansion status, percentage of the state population in poverty, percentage under 18 years, percentage 65 years or older, and percentage female. Blue diamonds represent TWFE estimates and red triangles are the Sun and Abraham (2021) estimates. Lines represent 95% confidence intervals.

Appendix Table A1: Prediction of NP FPA Using WIC Enrollment

	(1)	(2)	(3)	(4)	(5)
Panel A: Treated NP FPA	Treated NP FPA	Treated NP FPA	Treated NP FPA	Treated NP FPA	Treated NP FPA
Total per 10k		0.0003			
		(0.0007)			
Women per 10k	0.0001		0.0008		
	(0.0034)		(0.0021)		
Infant per 10k	0			0.0001	
	(0.0005)			(0.0003)	
Child per 10k	0.0001				0.0001
	(0.0003)				(0.0002)
Observations	40	40	40	40	40
Panel B: Year-month of NP FPA	Year-month of NP FPA	Year-month of NP FPA	Year-month of NP FPA	Year-month of NP FPA	Year-month of NP FPA
Total per 10k		-0.0799			
		(0.0955)			
Women per 10k	0.2727		-0.1369		
	(0.5108)		(0.2864)		
Infant per 10k	-0.026			-0.0358	
	(0.0796)			(0.0464)	
Child per 10k	-0.0374				-0.0292
	(0.0410)				(0.0260)
Observations	22	22	22	22	22

Source: WIC enrollment data, SOP classifications as in McMichael and Markowitz (2023), and American Community Survey 1-year estimates.

Notes: Panel A presents results in which we regress an indicator for whether the state implemented NP FPA between 2005 and 2019 onto WIC enrollment in 2005. Panel B regresses the year-month that a state implemented NP FPA onto WIC enrollment in 2005. Each model includes controls for percentage of the state population in poverty, percentage under 18 years, percentage 65 years or older, and percentage female.

Appendix Table A2: Effect of FPA for NP on Total WIC Enrollment, Estimated with BJS

	(1) Log(Total)	(2) Log(Women)	(3) Log(Infant)	(4) Log(Children
Years 0-1 post-FPA	-0.0097	-0.0062	-0.0143	-0.0082
	(0.0125)	(0.0112)	(0.0101)	(0.0174)
Years 2-3 post-FPA	-0.0082	0.0021	-0.025*	-0.0041
	(0.0194)	(0.018)	(0.015)	(0.0261)
Years 4-5 post-FPA	0.0286	0.045**	-0.0291	0.0463
	(0.026)	(0.022)	(0.0198)	(0.0322)
Years 6-7 post-FPA	0.035	0.0521*	-0.067**	0.0728
	(0.0393)	(0.0286)	(0.0288)	(0.0451)
Years 8-9 post-FPA	0.0608*	0.0693**	-0.0584**	0.1199***
	(0.0336)	(0.0295)	(0.0282)	(0.034)
Observations	7200	7200	7200	7200
Population control	X	X	X	X
All controls	X	X	X	X

Source: WIC enrollment data, SOP classifications as in McMichael and Markowitz (2023), and American Community Survey 1-year estimates.

Notes: All columns include state and year-month fixed effects; controls for the log of WIC-eligible population for the relevant subgroup, Medicaid expansion status, percentage of the state population in poverty, percentage under 18 years, percentage 65 years or older, and percentage female. All columns are estimated using BJS. Standard errors are clustered at the state-level. * p <0.1, ** p <0.05, *** p<0.01

Appendix Table A3: Effect of FPA for NP on Women's WIC Enrollment Subtypes

	TWFE					Sun & Abraham				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Log(Preg. women)	Log(Fully bfeeding women)	Log(Partially bfeeding women)	Log(Total bfeeding women)	Log(Postpar. women)	Log(Preg. women)	Log(Fully bfeeding women)	Log(Partially bfeeding women)	Log(Total bfeeding women)	Log(Postpar. women)
Years 0-1	-0.0137	-0.0037	-0.019	-0.0228	0.0201	-0.0151**	-0.0011	0.0349**	0.0134**	0.0122**
	(0.0184)	(0.0399)	(0.0427)	(0.0316)	(0.0297)	(0.0061)	(0.0143)	(0.0164)	(0.0063)	(0.0059)
Years 2-3	0.0089	-0.0257	0.0049	-0.011	0.0371	-0.0129	-0.0369	0.0668**	0.0035	0.0349***
	(0.0264)	(0.0524)	(0.0644)	(0.0422)	(0.0306)	(0.0101)	(0.0256)	(0.0264)	(0.0134)	(0.0107)
Years 4-5	0.0452	0.0005	-0.0415	0.0174	0.0779*	0.0125	-0.0235	0.044	0.0353*	0.0942***
	(0.0279)	(0.0542)	(0.0637)	(0.0309)	(0.0404)	(0.0197)	(0.0312)	(0.0393)	(0.021)	(0.0212)
Years 6-7	0.0746**	-0.0074	-0.0494	0.0315	0.0432	0.0256	-0.0222	0.0145	0.0311	0.0565**
	(0.0330)	(0.0504)	(0.0642)	(0.0278)	(0.0457)	(0.0204)	(0.0304)	(0.0538)	(0.0211)	(0.0237)
Years 8-9	0.0856***	0.0405	-0.0409	0.0842*	0.0437	0.0634***	0.0462	-0.0186	0.0718***	0.0618**
	(0.0299)	(0.0706)	(0.0579)	(0.0430)	(0.0582)	(0.0237)	(0.031)	(0.0653)	(0.0268)	(0.0292)
Observations	9180	6261	6273	9180	9180	9180	6261	6273	9180	9180
Pop. control	X	X	X	X	X	X	X	X	X	X
All controls	X	X	X	X	X	X	X	X	X	X

Source: WIC enrollment data, SOP classifications as in McMichael and Markowitz (2023), and American Community Survey 1-year estimates.

Notes: All columns include state and year-month fixed effects; controls for the log of WIC-eligible population for the relevant subgroup, Medicaid expansion status, percentage of the state population in poverty, percentage under 18 years, percentage 65 years or older, and percentage female. Columns (1)-(5) are estimated with TWFE and columns (6)-(10) are estimated with Sun and Abraham (2021). Standard errors are clustered at the state-level. * p <0.1, ** p <0.05, *** p<0.01

Appendix Table A4: Effect of FPA for NP on Infant's WIC Enrollment Subtypes

	TWFE			Sun & Abraham		
	(1)	(2)	(3)	(4)	(5)	(6)
	Log(Fully breastfed infants)	Log(Partially breastfed infants)	Log(Fully Formula-fed infants)	Log(Fully breastfed infants)	Log(Partially breastfed infants)	Log(Fully Formula-fed infants)
Years 0-1 post-FPA	0.0318	0.0485	0.0002	-0.0007	-0.038**	0.0021***
	(0.0509)	(0.0482)	(0.0005)	(0.017)	(0.0177)	(0.0008)
Years 2-3 post-FPA	0.0397	0.003	-0.0001	-0.0048	-0.1218***	0.0023**
	(0.0620)	(0.0580)	(0.0006)	(0.0337)	(0.0302)	(0.0009)
Years 4-5 post-FPA	0.0843	-0.0455	-0.0013	0.047	-0.1702***	0.0027**
	(0.0740)	(0.0672)	(0.0024)	(0.0418)	(0.0478)	(0.0014)
Years 6-7 post-FPA	0.0507	-0.067	-0.0012	-0.017	-0.2158***	0.003
	(0.0703)	(0.0762)	(0.0015)	(0.0482)	(0.061)	(0.002)
Years 8-9 post-FPA	0.089	0.0278	0.0004	0.0516	-0.1755**	0.0045*
	(0.0711)	(0.1003)	(0.0017)	(0.0502)	(0.0682)	(0.0025)
Observations	6273	6273	6273	6273	6273	6273
Population control	X	X	X	X	X	X
All controls	X	X	X	X	X	X

Source: WIC enrollment data, SOP classifications as in McMichael and Markowitz (2023), and American Community Survey 1-year estimates.

Notes: All columns include state and year-month fixed effects; controls for the log of WIC-eligible population for the relevant subgroup, Medicaid expansion status, percentage of the state population in poverty, percentage under 18 years, percentage 65 years or older, and percentage female. Columns (1)-(3) are estimated with TWFE and columns (4)-(6) are estimated with Sun and Abraham (2021). Standard errors are clustered at the state-level. * p <0.1, ** p <0.05, *** p<0.01

Appendix Table A5: Heterogeneity in the Effect of NP FPA by Percentage Nonwhite, Estimated with TWFE

	Log(Total)		Log(Women)		Log(Infants)		Log(Children)	
	(1)	(2)	(3)	(4)	(7)	(8)	(9)	(10)
	Above median % nonwhite	Below median % nonwhite	Above median % nonwhite	Below median % nonwhite	Above median % nonwhite	Below median % nonwhite	Above median % nonwhite	Below median % nonwhite
Years 0-1 post-FPA	0.0202	-0.0448**	0.0241	-0.0482**	0.0288*	-0.0296**	0.0108	-0.0507**
	(0.0212)	(0.0162)	(0.0185)	(0.0210)	(0.0147)	(0.0133)	(0.0283)	(0.0203)
Years 2-3 post-FPA	0.0553**	-0.0624**	0.0750***	-0.0668**	0.0513**	-0.0428*	0.0419	-0.0684**
	(0.0219)	(0.0263)	(0.0183)	(0.0295)	(0.0201)	(0.0209)	(0.0307)	(0.0306)
Years 4-5 post-FPA	0.0879***	-0.0287	0.0956***	-0.0303	0.0692***	-0.0458*	0.0876**	-0.0256
	(0.0252)	(0.0283)	(0.0203)	(0.0212)	(0.0247)	(0.0267)	(0.0339)	(0.0383)
Years 6-7 post-FPA	0.0911***	-0.0259	0.0995***	-0.0232	0.0525**	-0.0584*	0.0990**	-0.024
	(0.0311)	(0.0285)	(0.0213)	(0.0208)	(0.0226)	(0.0291)	(0.0442)	(0.0396)
Years 8-9 post-FPA	0.1069***	0.0174	0.1066***	0.0422*	0.0699**	0.019	0.1220**	0.0012
	(0.0365)	(0.0251)	(0.0311)	(0.0239)	(0.0254)	(0.0414)	(0.0516)	(0.0241)
Observations	4680	4500	4680	4500	4680	4500	4680	4500
Population control	X	X	X	X	X	X	X	X
All controls	X	X	X	X	X	X	X	X

Source: WIC enrollment data, SOP classifications as in McMichael and Markowitz (2023), and American Community Survey 1-year estimates.

Notes: All columns include state and year-month fixed effects; controls for the log of WIC-eligible population for the relevant subgroup, Medicaid expansion status, percentage of the state population in poverty, percentage under 18 years, percentage 65 years or older, and percentage female. All columns are estimated with TWFE. States are partitioned based on whether they are above or below the median of the percentage of the population that is nonwhite across states. Standard errors are clustered at the state-level. * p <0.1, ** p <0.05, *** p<0.01

Appendix Table A6: Heterogeneity in the Effect of NP FPA by Percentage Poverty (TWFE)

	Log(Total)		Log(Women)		Log(Infants)		Log(Children)	
	(1)	(2)	(3)	(4)	(7)	(8)	(9)	(10)
	Above median % poverty	Below median % poverty	Above median % poverty	Below median % poverty	Above median % poverty	Below median % poverty	Above median % poverty	Below median % poverty
Years 0-1 post-FPA	0.0275	-0.0112	0.0018	0.0046	0.0234	0.0053	0.0324	-0.0248
	(0.0423)	(0.0137)	(0.0375)	(0.0140)	(0.0259)	(0.0104)	(0.0540)	(0.0195)
Years 2-3 post-FPA	0.0382	0.0032	0.0117	0.0303	0.0173	0.016	0.0487	-0.0147
	(0.0393)	(0.0215)	(0.0397)	(0.0227)	(0.0296)	(0.0202)	(0.0441)	(0.0269)
Years 4-5 post-FPA	0.0730***	0.0357	0.0497**	0.0590**	0.035	0.0257	0.0864***	0.0296
	(0.0189)	(0.0269)	(0.0238)	(0.0257)	(0.0210)	(0.0271)	(0.0214)	(0.0329)
Years 6-7 post-FPA	0.0687**	0.0511	0.0681***	0.0742**	0.0422**	0.0217	0.0617*	0.0539
	(0.0247)	(0.0329)	(0.0214)	(0.0283)	(0.0154)	(0.0307)	(0.0345)	(0.0395)
Years 8-9 post-FPA	0.0881***	0.0723*	0.1075***	0.0923**	0.0983***	0.0507	0.0678*	0.0748
	(0.0212)	(0.0403)	(0.0170)	(0.0383)	(0.0176)	(0.0324)	(0.0350)	(0.0487)
Observations	4500	4680	4500	4680	4500	4680	4500	4680
Population control	X	X	X	X	X	X	X	X
All controls	X	X	X	X	X	X	X	X

Source: WIC enrollment data, SOP classifications as in McMichael and Markowitz (2023), and American Community Survey 1-year estimates.

Notes: All columns include state and year-month fixed effects; controls for the log of WIC-eligible population for the relevant subgroup, Medicaid expansion status, percentage of the state population in poverty, percentage under 18 years, percentage 65 years or older, and percentage female. All columns are estimated with TWFE. States are partitioned based on whether they are above or below the median of the percentage of the population that is in poverty across states. Standard errors are clustered at the state-level. * p <0.1, ** p <0.05, *** p<0.01

Appendix Table A7: Association Between the Share of Population Exposed to NP FPA and Access to Care Among Likely WIC-eligible Individuals

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Has usual place of care						
Share of population exposed to NP FPA	0.0268					0.0165
	(0.0188)					(0.0259)
Share of population exposed to NP FPA at t-1		0.0172				-0.0303*
		(0.0196)				(0.0121)
Share of population exposed to NP FPA at t-2			0.0335			0.0642**
			(0.0325)			(0.0172)
Share of population exposed to NP FPA at t-3				0.0141		-0.0278
				(0.0334)		(0.0269)
Share of population exposed to NP FPA at t-4					0.1315*	0.1674*
					(0.0495)	(0.0528)
Observations	672	624	576	528	480	480
Dep var mean	0.9281	0.9278	0.9282	0.9281	0.9282	0.9282
Panel B: Been > 1 year since seen doctor						
Share of population exposed to NP FPA	-0.0152					-0.0066
	(0.0170)					(0.0671)
Share of population exposed to NP FPA at t-1		-0.0286				-0.0246
		(0.0231)				(0.0301)
Share of population exposed to NP FPA at t-2			0.0198			0.0103
			(0.0222)			(0.0333)
Share of population exposed to NP FPA at t-3				0.0167		0.0292
				(0.0299)		(0.0349)
Share of population exposed to NP FPA at t-4					-0.2076	-0.2194
					(0.1290)	(0.0969)
Observations	672	624	576	528	480	480
Dep var mean	0.0716	0.0717	0.0714	0.0706	0.0701	0.0701

Source: National Health Interview Survey, 2005 to 2018 and SOP classifications as in McMichael and Markowitz (2023)

Notes: We limit the survey responses to women with children less than five years old or children less than five years old and aggregate the data to the census region-month level. Each model includes census region and month fixed effects and controls for the log of WIC-eligible population, share of population exposed to Medicaid expansion, percentage of the region population in poverty, percentage under 18 years, percentage 65 years or older, and percentage female. p <0.1, ** p <0.05, *** p<0.01