

WIC Eligibility and Participation: The Roles of Changing Policies, Economic Conditions, and Demographics

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Abstract:

This paper studies WIC eligibility and participation. These outcomes are related to economic conditions, Medicaid, cash welfare, and WIC policies, and demographic characteristics. The analysis uses state level data from 1983 to 2006, a period that covers significant expansion in the Medicaid program, the transition from AFDC to TANF, and significant changes in economic conditions. The results show that take-up has increased more than eligibility over this time period. Separating eligibility and participation is important because a number of state characteristics have opposite effects on these outcomes. Economic conditions, the Medicaid expansions, and immigration in the post-TANF period are shown to be associated with WIC eligibility and participation.

Keywords: WIC program | Medicaid expansions | Economics

Article:

INTRODUCTION

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) provides recipients with food vouchers, nutritional counseling, and referrals to health-care providers. Between 1980 and 2008 the number of recipients increased 355 percent, from 1.9 million to 8.7 million individuals. Over this same period, significant changes to the Medicaid program, as well as changes to the WIC program itself, increased access to WIC. Consequently, the increase in recipients may result from the increase in the number of eligible individuals alone (i.e., with no change in take-up behavior conditional on eligibility) or in combination with changes in take-up behavior.

Considering both eligibility and take-up is important because the number of recipients depends on both. Furthermore, changing policies, economic conditions, and demographics may affect

eligibility and take-up differently. For example, an increase in unemployment will increase the number of individuals eligible for WIC, but it will also lower the take-up rate if the newly eligible individuals have a lower take-up rate than previously eligible individuals. Consequently, to understand the full effects of a change in the environment, eligibility and take-up must both be considered.

Additionally, the number of recipients may not immediately adjust to a change in conditions. In the case of an increase in unemployment, an initial reduction in take-up may be offset by increases in subsequent periods if the take-up rate among newly eligible individuals increases over time or if the worsened economic conditions result in increased reciprocity by those previously eligible. Whether the total effect is positive or negative is then an empirical question.

WIC eligibility and take-up may also depend on the policies of other assistance programs because recipients of a number of programs (e.g., Medicaid, food stamps, AFDC/TANF) are automatically income eligible for WIC. Thus it is important to include policy changes such as the Medicaid expansions of the 1980s and the Personal Work Opportunity and Responsibility Act of 1996, which replaced AFDC with TANF, in the analysis. The Medicaid expansions are especially important because the major expansions in eligibility occurred during the same time period that the number of WIC recipients increased.

Understanding how policies, economic conditions, and demographic characteristics affect eligibility for and receipt of WIC is important for a number of reasons. First, a number of studies suggest that WIC participation improves recipients' health outcomes. For example, Devaney et al. (1992), Gordon and Nelson (1995), Brien and Swann (2001), Kowaleski-Jones and Duncan (2002), Bitler and Currie (2005), and Figlio, Hamersma, and Roth (2009) found prenatal WIC participation improves birth outcomes while Carlson and Senauer (2003) found improvements in child health.¹

Second, there is evidence that these health improvements may generate cost savings for Medicaid that offset the cost of WIC. Devaney et al. (1992) and Buescher, et al. (1993) concluded that improvements in infant health result in savings to the Medicaid program that outweigh the costs of WIC, and GAO (1992) found that WIC generates substantial saving in health costs to the Medicaid program, state and local governments, and private insurers through age 18.

Third, the expansion of WIC eligibility, largely through expanded Medicaid eligibility and automatic WIC eligibility for Medicaid recipients, has increased the amount of income a family can earn and be eligible (Besharov and McCall 2009). To the extent that health benefits may be most likely to be realized by the neediest recipients, higher income eligibility will result in smaller average health benefits and thus smaller reductions in Medicaid costs. This in turn may alter the cost benefit calculations from the Devaney et al (1992) and Buescher et al. (1993) studies which relied on data gathered before the Medicaid expansions were fully phased in (1987-1988).

Finally, there is the reach of the program. Although not as large as food stamps or Medicaid in dollar value, over 50 percent of infants and pregnant women are estimated to be eligible for WIC.

The purpose of this paper is to better understand the relationship between eligibility and receipt of WIC on the one hand and state-level policies, economic conditions, and demographic characteristics on the other. The analysis uses state level data for the period 1983 to 2006 and allows for delayed adjustment to changing economic conditions and policies. The time period is important because there were significant changes in the Medicaid and AFDC/TANF programs during this period. Additionally, the study period covers multiple business cycles allowing for a more complete understanding of the role played by economic conditions. To the extent that there are significant relationships among these variables, it may be possible to design policies to increase take-up among eligible individuals, to increase or decrease the number of individuals who are eligible, or to anticipate future demands on the program that result from changing societal trends or economic conditions.

The results show that the per capita eligibility rate increased at the time of the Medicaid expansions but that increases in the take-up rate are larger than increases in eligibility over the 1983 to 2006 time period. The unemployment rate and the income threshold for Medicaid eligibility are found to be positively related to per capita eligibility, but negatively related to current period take-up rate. The model also allows for eligibility and participation to sluggishly adjust to changes in economic conditions, and increases in the unemployment rate are shown to positively affect take-up with a delay. Finally, immigration in the post-TANF period is associated with increases in the WIC take-up rate suggesting substitution between programs.

BACKGROUND ON THE WIC PROGRAM

The WIC program began as a pilot program in 1972 and became a national program in 1974. It is administered as a partnership among the Federal government, 88 state-level agencies, and 1,885 local agencies.² The Federal government provides annual funding, issues regulations regarding eligibility and administration of the program, and monitors compliance with those regulations. The state agencies administer the program at the state level or through local agencies, typically at the county level. The state agencies distribute funds to the local agencies, set rules not dictated by the Federal government, and monitor compliance with those rules. The local agencies work with WIC clinics. The clinics, which may be located in a number of settings such as county departments of public health, hospitals, or mobile vans, are the point of contact for applicants and recipients.

Over the history of the program, the Federal government has exercised increasing control over program administration. Until the late 1980s, states had significant discretion in determining eligibility for the program. For example, states had the option of automatically making Medicaid, AFDC, and food stamp recipients income eligible until the Child Nutrition and WIC Reauthorization Act of 1989 mandated that these groups be deemed income eligible. Similarly, states were allowed to set their own standards regarding the income documentation required to determine eligibility until October 1989 when the Federal government required states to collect documentation.

In spite of the standardization of WIC rules, the general eligibility requirements have been constant over time. In order to participate, an individual must meet three requirements. First, only certain groups are eligible: infants; children younger than five years old; and pregnant, postpartum and breastfeeding women. Second, recipients must be at “nutritional risk”. The criteria for judging risk vary by group. For example, nutritional risk criteria for pregnant women include anemia, being overweight, smoking, drug or alcohol use, or past history of poor birth outcomes while criteria for infants include anemia, failure to thrive, or low birth weight. Finally, WIC is a means-tested program, and individuals may be income eligible in one of two ways. They must either live in a family whose income is less than 185 percent of the poverty threshold or be adjunctively eligible as a result of participation in another program.

WIC participants receive nutritional and behavioral counseling, health care referrals, and vouchers for nutritious food. The specific bundle of foods and services depends on the individual’s age and specific nutritional needs. For example, infants may receive formula, infant cereal, and juice while young children may receive milk, eggs, cereal, juice, and beans. The value of the average food bundle is relatively modest. In nominal terms, per recipient spending on food has averaged about \$30 over the history of the program. Unlike AFDC/TANF and food stamps, there is no benefit formula, and average benefits per month are calculated by dividing expenditures by person-months.

Figure 1 presents trends in the number of recipients. WIC has grown from 2.5 million recipients in 1983 to about 8 million recipients in 2006. The top line in Figure 1 shows the number of total recipients over the study period (1983 to 2006). The remaining lines in Figure 1 show that children make up the largest group of recipients.

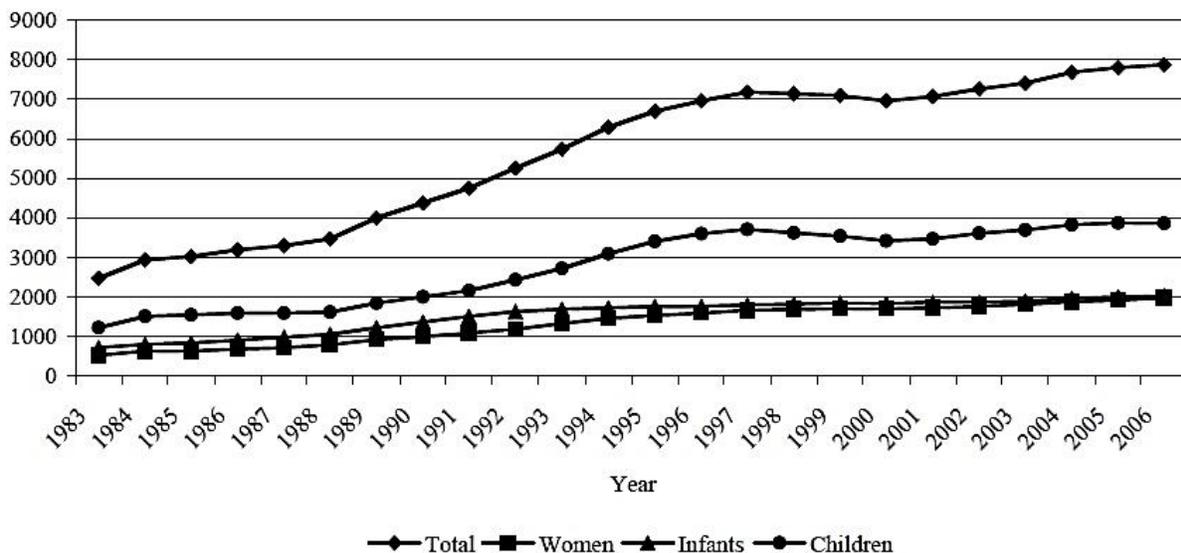


Figure 1: Number of Recipients

PREVIOUS LITERATURE

Although not as extensive as the literature studying the effect of WIC on birth outcomes, there are a number of studies of WIC participation. Brien and Swann (2001) estimated a linear probability model of participation among eligible pregnant women in 1988, but their measure of eligibility was very crude. Bitler and Currie (2005) studied Medicaid-eligible women and estimated a logit model of participation for the period 1992-1999. Bitler, Currie, and Scholz (2003) focused specifically on eligibility and participation. They used individual level data from the Survey of Income and Program Participation to construct estimates of eligibility and take-up at the national level for 1998 and to examine the correlates of participation by eligible individuals in 1998. They also used individual-level CPS data from 1997-2000 and state-level administrative data for the period 1992-2000 to study the take-up rate in the population (not accounting for eligibility).³

Bitler, Currie, and Scholz (2003) and Bitler and Currie (2005) include the income threshold for Medicaid eligibility in their analyses, but their data do not cover the period of most significant expansion of Medicaid eligibility. Additionally, none of these studies covers a complete business cycle. Bitler, Currie, and Scholz (2003) suggest this may be the reason they find little relationship between WIC recipients and economic conditions. Finally, none of these studies models both eligibility and take-up. The present paper seeks to fill these gaps.

ANALYTIC FRAMEWORK

The analysis is performed at the state level and considers three measures of the WIC program: 1) WIC recipients per 1,000 population (the population participation rate), 2) eligible individuals per 1,000 population (the eligibility rate), and 3) recipients per 1,000 eligible individuals (the take-up rate). Rates are used to account for large differences in state populations. State-level data are used because individual level data are only available for recent years and do not cover the full expansion of the Medicaid program. Moreover, it can be difficult to determine eligibility for pregnant and breastfeeding women at the individual level.

The outcome variables are assumed to depend on a state's economic conditions, policy environment, and demographic characteristics.⁴ Economic conditions affect the number of individuals who are eligible and the number who choose to receive benefits. Non-WIC policies affect the number of people eligible for WIC through their effect on Medicaid and TANF participation. Additionally, non-WIC policies may affect take-up of WIC among eligible individuals if, for example, these policies (e.g., TANF) are perceived as punitive and discourage individuals from applying for benefits more generally. Finally, some of the analysis includes WIC variables that are expected to affect both eligibility and take-up.⁵

The full response of take-up to a change in economic conditions or policy may not be felt immediately (Ziliak, et al. 2000; Blank 2001). Consider an increase in the income threshold for Medicaid. Because it affects WIC eligibility through its effect on Medicaid participation, the effect of a change may be felt immediately, or it may be felt with some delay if it takes time for individuals to become aware of their eligibility for Medicaid and to participate.⁶ The effect on take-up may also change over time. When the income threshold increases, we can think of

eligible individuals as being either originally eligible or newly eligible. If the take-up rate among newly eligible individuals is lower than the take-up rate for those who were previously eligible, then the take-up rate will fall. This could happen if newly eligible individuals are not aware of their eligibility or if they believe they do not need the benefits. In subsequent periods, the take-up rate will rise as some of the newly eligible do choose to take up benefits, and the full effect may be positive or negative. Such dynamic effects are also likely to exist for changes in economic conditions. Consequently, the model includes lags of the unemployment rate and the income eligibility threshold for Medicaid.⁷

This example also highlights the fact that a policy change such as the expansion of Medicaid discussion may have different effects on eligibility and take-up. In the above example, it is possible that increasing the income threshold increases the eligibility rate and decreases the take-up rate, and an analysis of only the population take-up rate might conclude that there is no effect of expansions in Medicaid eligibility on WIC participation. From a policy perspective, however, it would be helpful to know the offsetting effects on eligibility and participation.

The empirical analysis uses a fixed-effects regression model.⁸ This model relates the measures of WIC eligibility and receipt to state-level economic conditions, policies, and demographic characteristics. The model also includes a full complement of state effects, year effects, and state-specific time trends. The model is

$$y_{it} = X_{it}^p \beta + X_{it}^e \gamma + X_{it}^d \delta + \lambda_t + \alpha_i + \tau_i t + \varepsilon_{it} \quad (1)$$

where i indexes states, t indexes time, y_{it} is a measure of WIC eligibility or participation, X_{it}^p is a vector of variables measuring state i 's policies at time t , X_{it}^e is a vector of measures of state i 's economic conditions at time t , X_{it}^d is a vector of variables measuring demographic characteristics of state i at time t . The parameter λ_t is a time period specific disturbance, α_i is a state specific disturbance, τ_i measures a state-specific time trend, and ε_{it} is a random disturbance that is, conditional on α_i , τ_i , and λ_t , assumed to be independent over states and time periods.⁹ The estimates are weighted by the number of individuals infants, children, and pregnant and postpartum breastfeeding women in each state in each year. The tables below report Huber-White robust standard errors.

DATA

The empirical analysis uses state level data on the WIC program, economic conditions, WIC, Medicaid, and AFDC/TANF policies, and demographic characteristics. Data sources are described in Appendix Table 1, and descriptive statistics for the variables described below are given in Appendix Table 2. The remainder of this section describes key groups of variables.

WIC ELIGIBILITY AND RECEIPT

The dependent variables for the analysis are the population participation rate, the eligibility rate, and the take-up rate. These are constructed separately for all recipients and for women, infants, and children. As an example, consider infants. The population participation rate is the number of

infant recipients divided by the number of infants (eligible or not) in the population; the eligibility rate is the number of eligible infants divided by the number of infants in the population; and the take-up rate is the number of infant recipients divided by the number of eligible infants.

Administrative data are available for the number of total recipients and separately for the number of women, infants, and children. Data are not readily available on the number of WIC eligible individuals. However, for budgeting and forecasting purposes, the USDA developed a methodology to estimate the number of eligible women, infants, and children. The original methodology produced estimated take-up rates of over 100 percent for some groups (National Research Council 2003) which suggested that the USDA was underestimating eligibility. As a result, the USDA asked the National Academy of Sciences to study the measurement of WIC eligibility. In 2003, the National Research Council (NRC) at the National Academy of Sciences published a monograph describing several issues with the USDA methodology and recommending changes to it.

Like the original methodology, the NRC-recommended methodology uses CPS data to estimate the number of infants and children and then uses the estimated number of infants to calculate the number of eligible pregnant and postpartum women. Unlike the original method, the estimates are adjusted to account for the undercount of infants in the CPS and for the use of annual income in the CPS (WIC eligibility is based on monthly income); individuals receiving Medicaid, Food Stamps, or cash welfare are considered WIC-eligible; and no adjustment is made for nutritional risk.¹⁰ Taken together, these changes have the effect of increasing the number of individuals who are estimated to be eligible for WIC (NRC 2003, Besharov and McCall 2009). For example, under the original methodology 1.5 million infants were estimated to be eligible in 1999, and this number rose to 2.2 million under the new methodology (NRC 2003).¹¹

The NRC methodology is used to construct estimates of the number of WIC eligible women, infants, and children in each state for the time period 1983 to 2006, and these estimates are used to construct the population participation rate, the eligibility rate, and the take-up rate.¹² The calculation of the number of individuals depends on the number of eligible infants, and there are relatively few eligible infants in some state-year combinations.¹³ These smaller sample sizes increase the likelihood of measurement error in the number of eligible individuals. Because eligibility appears as the dependent variable, measurement error increases the standard error of the estimated coefficients but should not bias the parameter estimates (Wooldridge 2002).

Figures 2, 3, and 4 present trends in the population participation rate, the eligibility rate, and the take-up rate, respectively. Each graph shows the trend for all recipients and separately for women, infants, and children. Figure 2 shows the participation rates are generally similar in shape to the trends in recipients. Infants have a notably high participation rate while children have the lowest participation rate. Figure 3 shows that, consistent with the timing of the Medicaid expansions, there an increase in the late 1980s and early 1990s. There is also a drop in eligibility around the introduction of the TANF program. Infants are most likely to be eligible, but the difference in eligibility is much smaller than the difference in the population participation rate shown in Figure 2. Finally, Figure 4 shows that take-up rates are significantly higher for infants than for other groups, and, as with the population participation rate, children have the

lowest take-up rate. The key result to emerge from the analysis of trends is that the overall increase in recipients appears to result from an increase participation conditional on eligibility rather than changes in eligibility itself.

The NRC methodology can also be used to estimate the number of individuals who are income eligible and the number of individuals who are not income eligible but are adjunctively eligible. In Figure 5 the “income eligible” line is the number of individuals who live in families with income less than 185% of poverty while the “adjunctively (but not income) eligible” line gives the number of individuals who are not income eligible but who are eligible by virtue of the fact that they receive Medicaid, food stamps, or cash welfare.¹⁴ The number of people who are adjunctively eligible prior to 1989 is not 0 because some states made recipients of other programs eligible prior to the Federal mandate. Information about this policy is first available in 1988, and the figure assumes that states did not change their policies between 1983 and 1988.¹⁵

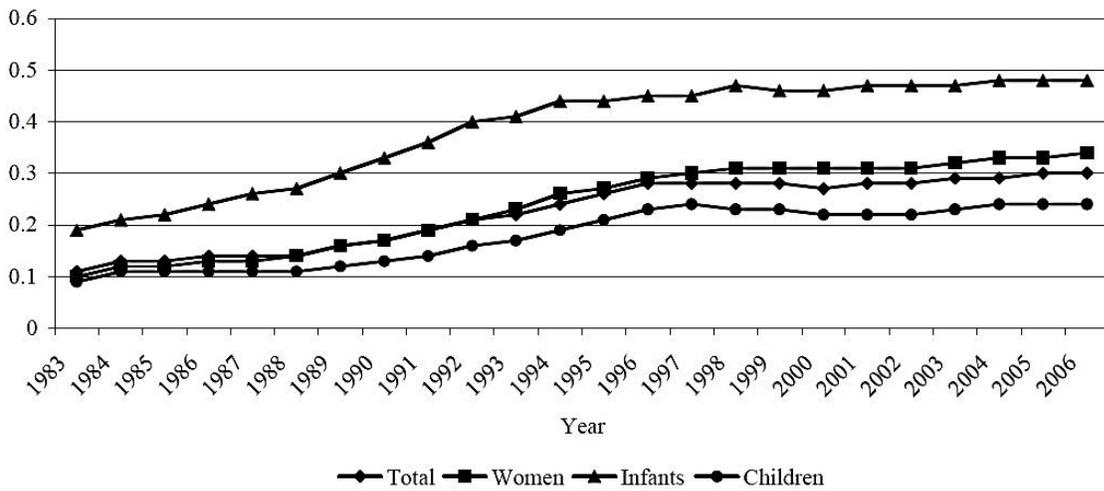


Figure 2: Population Participation Rate

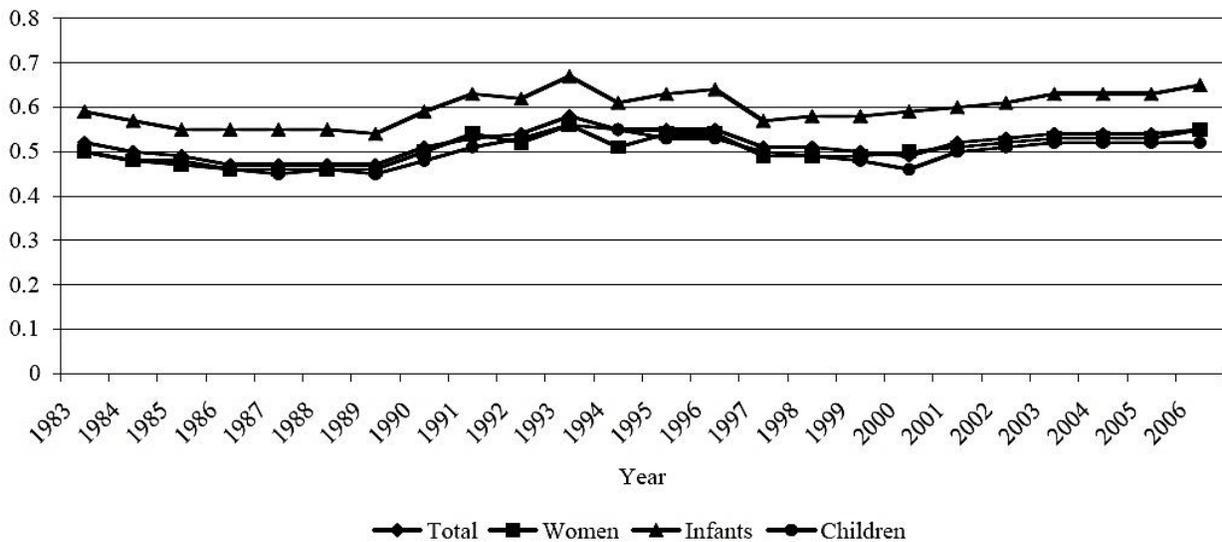


Figure 3: Eligibility Rates

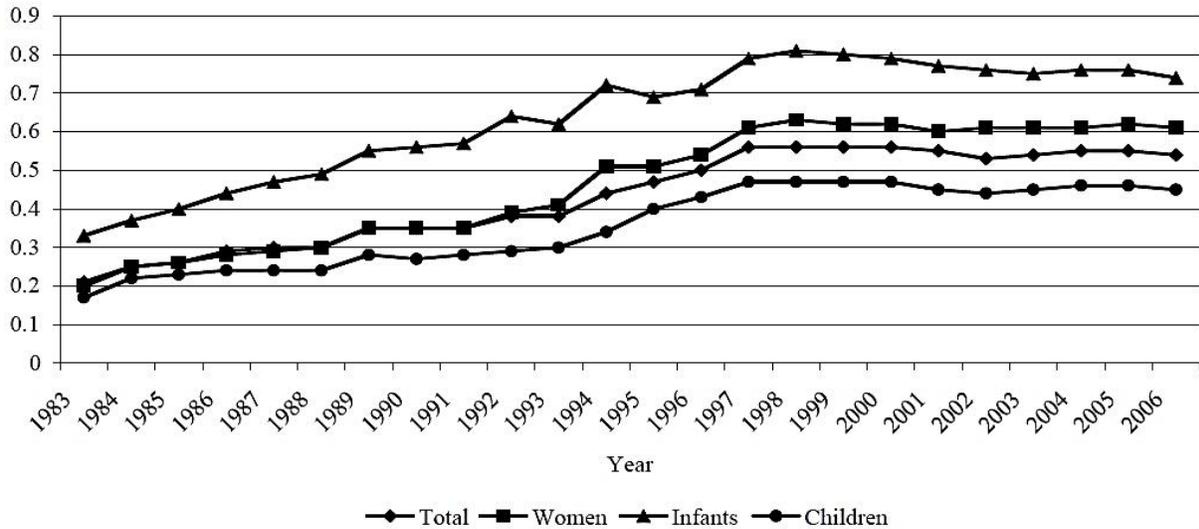


Figure 4: Take-up Rates

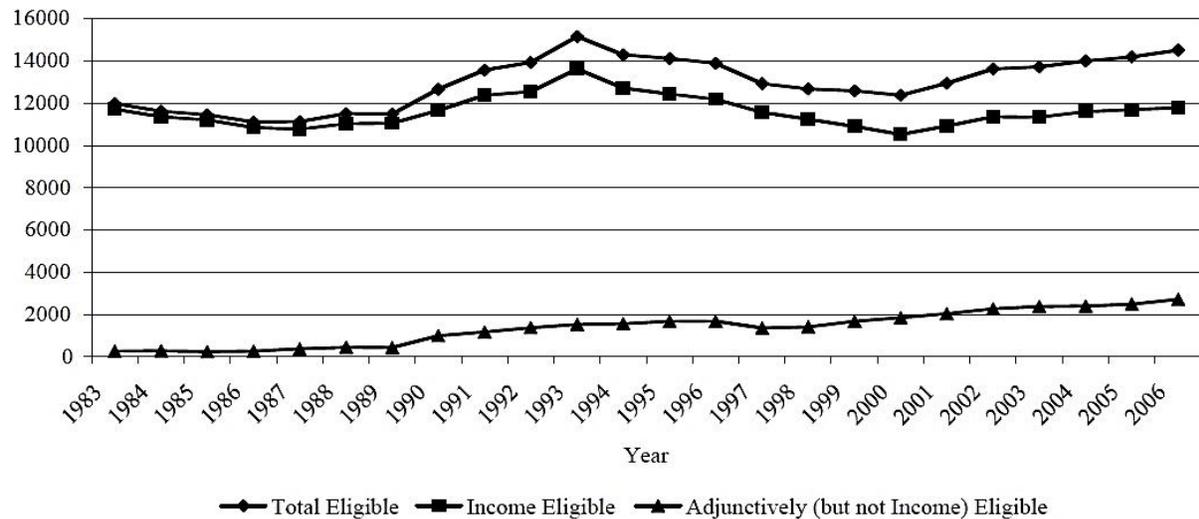


Figure 5: Type of Eligibility

The number of individuals who are adjunctively (though not income) eligible shows an increase between 1989 and 1996, consistent with the Federal rule change mandating adjunctive eligibility for Medicaid, AFDC/TANF, and food stamp recipients. The decline around 1996 is likely the result of passage and implementation of TANF. In contrast, the number of individuals who are income eligible generally follows the business cycle.

ECONOMIC VARIABLES

Because WIC is means-tested, the number of eligible individuals will depend on economic conditions in the state. Following the studies of welfare caseloads (e.g., CEA 1997), economic conditions are primarily parameterized by the unemployment rate. As discussed above, the

number of eligible individuals or recipients may not adjust immediately. Consequently, the model includes the current period unemployment rate and three lags.¹⁶ The analysis also controls for the growth rate in employment to account for changing job opportunities that may not be captured by the unemployment rate.

MEDICAID AND CASH WELFARE VARIABLES

Because of adjunctive eligibility for Medicaid and cash welfare recipients, the analysis includes variables measuring a number of aspects of these programs. The Medicaid expansions of the 1980s broke the link between AFDC and Medicaid and, over time, made higher income women and children Medicaid eligible.^{17,18} The expansion in eligibility is parameterized by the income threshold for Medicaid eligibility for a pregnant woman (e.g., 100 percent of poverty, 185 percent of poverty and so on). Prior to the expansions, eligibility for Medicaid was tied to AFDC participation, and the AFDC income threshold determined Medicaid eligibility. The Consolidated Omnibus Budget Reconciliation Act of 1985 extended coverage to all pregnant women who were income-eligible for AFDC regardless of participation. Thereafter, the threshold was determined either by the federal mandate or by the expansion of coverage offered by states.¹⁹ For the years prior to the Medicaid expansions, the cutoff is assumed to be the percentage of the poverty threshold associated with the AFDC need standard for a family of three. The income threshold is expected to have a direct effect on eligibility through adjunctive eligibility for Medicaid recipients. It may have an indirect effect on take-up if increasing income eligibility changes the eligible population in ways that reduce take-up (e.g., higher income individuals made eligible through the expansions are less likely to know they are eligible).

In addition to changes in Medicaid, there have also been significant changes in the provision of cash welfare during the history of the WIC program, and a number of variables are included to capture these changes. The monthly real benefit level for a family of three measures both eligibility (a higher guarantee increases break-even income making more people eligible) and financial generosity which affects take-up.

During the early to mid 1990s, many states received waivers to AFDC program rules. These waivers included policies such as time limits, enhanced work requirements, and increased sanctions for non-compliance with rules. The analysis includes a variable indicating whether a “major” waiver was in place. A major waiver must cover a significant portion of the state population and include at least one of six types of policies as described by CEA (1997). Similarly, a variable that measures the implementation of the TANF program is included in the analysis. In the year of implementation, the variable indicates the fraction of the year in which the waiver (or TANF) is in effect. In all cases, implementation dates rather than approval dates are used.

TANF had particularly significant implications for immigrants as most immigrants were made ineligible for benefits. To allow for this, a measure of immigration (newly admitted immigrants as a percentage of the state’s $TANF \cdot (immigrants - \mu_{imm})$ where $TANF$ is the TANF variable, $immigrants$ is the percentage of immigrants, and μ_{imm} is the average percentage of immigrants. With this specification, the coefficient on the non-interacted TANF variable measures the effect of TANF when immigrants are evaluated at μ_{imm} (Wooldridge 2009).

TANF policies (or AFDC waivers) are not likely to affect the number of individuals eligible for WIC because most individuals who receive welfare are income eligible. However, the effect on take-up is ambiguous. Individuals who exit welfare may seek out benefits from WIC to off-set lost welfare benefits, or they may choose not apply for assistance because they may assume that they are not eligible for other assistance programs.

WIC PROGRAM VARIABLES

Ideally the analysis would include a full array of WIC program variables. Unfortunately, variables describing WIC program rules are only available for a limited number of years. Information about policies comes from WIC Program and Participant Characteristics surveys. These began in 1988 and have been conducted every two years (with the exception of 1990). Because information on the policies is not available for all years, variables describing the WIC program are only included in a subset of the analysis.

Three WIC policies are considered. First, as noted above, prior to 1989 states had the option to make recipients of other assistance programs income eligible for WIC. In November 1989 the Federal government mandated that Medicaid recipients be automatically income eligible for WIC benefits.²⁰ This mandate affected 22 states that did not already make Medicaid recipients income eligible for WIC benefits. Second, in 1998 states were required to collect income documentation for WIC applicants. At the time of implementation, 10 states did not require such documentation. Finally, as of April 1999 the Federal government standardized the nutritional risk criteria. Prior to this, each state set its own eligibility cutoffs, and the analysis includes the hemoglobin cutoff for a pregnant woman in her first trimester.

DEMOGRAPHIC VARIABLES

The analysis also includes variables describing the demographic make-up of the state. Changes in the demographic composition of a state over time may be important determinants of caseloads even after controlling for economic conditions and policies. The variables included are the percentage of a state's population who are newly admitted immigrants (described above), the percentage of adults with less than a high school degree, the percentage with a high school degree (the percentage of the state's population with more than a high school degree is the reference group), the percentage of the state's population that is black, the percentage that is Hispanic, the percentage that is of another race (non-Hispanic white is the reference group), and the percentage of children living in families with no father present. These variables are calculated from the March CPS.

RESULTS

RESULTS FOR ALL RECIPIENTS

The analysis begins by examining (the logarithm of) total recipients per 1000 population (the population participation rate) where "population" means the number of pregnant women, postpartum women, infants, and children up to age 5. The results are presented in the first column of Table 1. The table (and all subsequent tables) reports coefficients multiplied by 100 so

the table entries are interpreted as the percent change in the dependent variable associated with a one unit change in the explanatory variable.

The estimates suggest little relationship between the population participation rate and assistance policies. The exception is the implementation of TANF which is associated with a 9.8 percent reduction in the recipients per 1000 population. However, the results also suggest that post-TANF increases in the percentage of new immigrants increase the population participation rate. Specifically, a one tenth of one percentage point increase in new immigrants (recall that the mean is 0.35) is estimated to increase the population participation rate by 2.1 percent. The population participation rate does not statistically depend on current unemployment, but it is positively associated with unemployment in periods t-2 and t-3. This suggests that there is delayed adjustment to increases in unemployment. Over a four year period, a one percentage point increase in unemployment is estimated to increase the population participation rate by 3.6 percent (F-stat 36.87, p-value 0.00).

Table 1: All Recipients – Basic Models

Variable	Recipients/Population	Eligibles/Population	Recipients/Eligibles
<i>Policy Variables</i>			
Medicaid Income Cutoff	-0.005(0.027)	0.065**(0.026)	-0.069*(0.036)
Medicaid Income Cutoff t-1	0.022(0.026)	-0.009(0.027)	0.032(0.037)
Welfare Benefit Level for Family of 3	0.003(0.013)	0.0004(0.012)	0.003(0.018)
Major Waiver to AFDC Rules	-2.682(2.414)	1.111(2.366)	-3.793(3.425)
TANF Program	-9.763*(5.663)	-2.237(5.684)	-7.526(4.841)
TANF * Percent New Immigrants	20.904**(7.423)	-1.322(6.016)	22.226**(9.928)
<i>Economic Variables</i>			
Unemployment rate	0.096(0.486)	1.608**(0.437)	-1.512**(0.677)
Unemployment rate t-1	0.392(0.509)	0.451(0.452)	-0.059(0.712)
Unemployment rate t-2	1.254**(0.461)	-0.072(0.417)	1.327**(0.630)
Unemployment rate t-3	1.878**(0.426)	0.764**(0.376)	1.111*(0.583)
<i>Demographic Variables</i>			
Percent New Immigrants	-5.505*(2.864)	-0.497(2.071)	-4.548(3.972)
Percent Kids Not Living With Father	0.088(0.111)	0.218**(0.104)	-0.131(0.154)
Percent Black	-0.560(0.366)	0.274(0.374)	-0.835(0.535)
Percent Hispanic	-0.163(0.473)	0.506(0.400)	-0.669(0.604)
Percent Other Race/Ethnicity	-0.412(0.548)	-0.350(0.541)	-0.062(0.764)
Percent < HS	0.235(0.380)	0.822**(0.331)	-0.587(0.522)
Percent with HS	-0.158(0.337)	0.910**(0.305)	-1.068**(0.469)

Notes: Sample size is 1165. All models include the employment growth rate, state effects, year effects, and state time trends. Table entries are coefficient estimates multiplied by 100. Percent white and percent with more than a HS education are the base categories for race/ethnicity and education, respectively. Robust standard are in parentheses. * denotes $p \leq 0.1$. ** denotes $p \leq 0.05$.

The second and third columns present results with the (logarithm of the) eligibility and take-up rates as the dependent variables. The current period Medicaid income threshold is positively related to the eligibility rate with an increase of 10 percentage points in the income cutoff for Medicaid estimated to increase the eligibility rate by 0.65 percent. Over the course of two years this effect is estimated to be a statistically significant 0.55 percent (F-Stat 4.25, p-value 0.04).

At the same time, the last column shows a negative relationship between the take-up rate and the current period Medicaid income threshold. This result is consistent with lower take-up by newly eligible individuals when compared to individuals who were WIC-eligible prior to the increase in Medicaid eligibility. The take-up rate rises in the second period (t-1), although the effect is not statistically significant, and the coefficients are not jointly statistically significant (F-stat 0.92, p-value 0.34). These results suggest only weak evidence that the newly eligible increase their participation in WIC after one year of eligibility. They are consistent with Blank and Ruggles (1996) who find that most AFDC and food stamp eligibility spells end without participation (which would lower the take-up rate) and that most individuals who will participate do so early in their eligibility (which means take-up would not be expected to rise significantly over time).

Taken together, these results show how offsetting eligibility and take-up estimates can obscure potentially important relationships when they are combined into the population participation rate. In the case of Medicaid, the 0.65 percent increase in eligibility resulting from a 10 percentage point increase in the Medicaid income threshold is almost exactly offset by a 0.69 percent decrease in take-up.

Similar results are found for an increase in the current period unemployment rate. However, unlike Medicaid, where there are no dynamic effects, over four years an increase in the unemployment rate is associated with an increase in the population participation rate even though the initial effects on eligibility and take-up offset each other. Over the course of four years, a one percentage point increase in unemployment is estimated to increase the population participation rate by 3.6 percent (F-stat 36.87, p-value 0.00).

This 3.6 percent increase over four years results from a 2.8 percent increase in eligibility (F-Stat 34.64, p-value 0.00) and a 0.9 percent increase in take-up (F-stat 1.45 p-value 0.23). Similar to the result for Medicaid eligibility, increased unemployment initially reduces the take-up rate. However, take-up in period t is positively related to unemployment in periods t-2 and t-3. This is consistent with learning about benefits and/or with longer-term need in periods of high unemployment.

TYPE OF ELIGIBILITY

As discussed above, an individual is eligible for WIC when her income is less than 185 percent of poverty or when she participates in Medicaid, Food Stamps, or AFDC/TANF. In the same way the population participation rate was broken into the eligibility rate and take-up rate, the results in Table 2 decompose the eligibility rate into income and adjunctive eligibility. Higher unemployment rates, lower education, and higher current period Medicaid eligibility thresholds are positively associated with the income eligibility rate. Higher welfare benefits are estimated to increase the adjunctive eligibility rate. Somewhat surprisingly, higher Medicaid eligibility does not affect the adjunctive eligibility rate.

ALTERNATIVE SPECIFICATIONS

Tables 3 and 4 explore the sensitivity of the results for eligibility and take-up, respectively, to a number of changes in the specification. The first column of each table reproduces the results from Table 1. Ziliak, et al. (2000) raise the issue of non-stationarity in a model of monthly AFDC caseloads and consider dynamic specifications. Although this is less likely to be an issue with annual data, the second column of each table includes the lagged value of the dependent variable as an independent variable.²¹ For both outcomes, there is evidence of autocorrelation in eligibility and take-up, but there is no evidence of nonstationarity or of substantial changes in the other estimates.

The third column includes measures of Medicaid, Food Stamp and cash welfare recipients. These variables are meant to more directly control for adjunctive eligibility. Their inclusion does not substantially alter the conclusions from the base case for the eligibility rate. For take-up, including other program recipients increases the estimated effect of TANF (in absolute value) and reduces the estimated effect of immigrants during the post-TANF period. The basic Medicaid and income results are unaffected.

Table 2: Type of Eligibility

Variable	Eligibles/Population	Inc. Elig./Population	Adj. Elig./Population
<i>Policy Variables</i>			
Medicaid Income Cutoff	0.065**(0.026)	0.062**(0.030)	-0.162(0.219)
Medicaid Income Cutoff t-1	-0.009(0.027)	-0.026(0.028)	0.086(0.191)
Monthly Welfare Benefit Level for Family	0.0004(0.012)	-0.004(0.014)	0.190**(0.087)
Major Waiver to AFDC Rules	1.111(2.366)	-0.641(2.614)	14.595(11.753)
TANF Program	-2.237(5.684)	-4.548(5.959)	22.544(15.317)
TANF * Percent New Immigrants	-1.322(6.016)	-2.400(6.603)	13.633(27.008)
<i>Economic Variables</i>			
Unemployment rate	1.608**(0.437)	1.901**(0.487)	-3.115(3.008)

Unemployment rate t-1	0.451(0.452)	0.757(0.505)	-3.323(3.046)
Unemployment rate t-2	-0.072(0.417)	-0.090(0.472)	0.704(2.664)
Unemployment rate t-3	0.764**(0.376)	0.714*(0.414)	-1.108(2.783)
<i>Demographic Variables</i>			
Percent New Immigrants	-0.497(2.071)	-3.038(2.245)	-8.137(15.736)
Percent Kids Not Living with Father	0.218**(0.104)	0.228(0.112)	-0.376(0.795)
Percent Black	0.274(0.374)	0.574(0.398)	-1.589(2.263)
Percent Hispanic	0.506(0.400)	0.563(0.437)	-0.500(2.628)
Percent Other Race/Ethnicity	-0.350(0.541)	-0.213(0.609)	-6.694(2.263)
Percent < HS	0.822**(0.331)	0.804**(0.367)	1.973(2.765)
Percent with HS	0.910**(0.305)	0.965**(0.336)	0.427(2.026)
Sample Size	1165	1165	1026

Notes: All models include the employment growth rate, state effects, year effects, and state time trends. Table entries are coefficient estimates multiplied by 100. Percent white and percent with more than a HS education are the base categories for race/ethnicity and education, respectively. Robust standard are in parentheses. *denotes $p \leq 0.1$. ** denotes $p \leq 0.05$.

Table 3: Alternative Specifications for Eligibility

Variable	Base Model	Lagged Dependent Variable	Other Program Recipients	Infant Take-up Rate < 1000	No Adjustment to CPS Weights
<i>Policy Variables</i>					
Medicaid Income Cutoff	0.065**(0.026)	0.063**(0.026)	0.063**(0.023)	0.043*(0.024)	0.064**(0.026)
Medicaid Income Cutoff t-1	-0.009(0.027)	-0.013(0.026)	-0.014(0.025)	0.005(0.024)	-0.001(0.026)
Welfare Benefit Level for Family of 3	0.0004(0.012)	0.002(0.012)	-0.008(0.011)	0.0010(0.011)	0.0001(0.012)
TANF Program	-2.237(5.684)	-2.692(5.735)	-0.045(5.717)	0.531(6.820)	-2.282(5.658)
TANF * Percent New Immigrants	-1.322(6.016)	-1.929(5.996)	-0.379(5.747)	-1.184(5.920)	-1.335(5.998)
Lagged Dependent Variable	-----	9.424**(4.002)	-----	-----	-----
Medicaid Recipients /1000 Pop.	-----	-----	0.013**(0.003)	-----	-----
Food Stamps	-----	-----	0.003(0.003)	-----	-----

Recip. / 1000 Pop.					
AFDC/TANF Recip. / 1000 Pop.	-----	-----	0.120**(0.023)	-----	-----
Economic Variables					
Unemployment rate	1.608**(0.437)	1.641**(0.438)	1.181**(0.410)	1.545**(0.424)	1.592**(0.436)
Unemployment rate t-1	0.451(0.452)	0.288(0.455)	0.257(0.408)	0.718(0.441)	0.466(0.452)
Unemployment rate t-2	-0.072(0.417)	-0.110(0.417)	-0.351(0.385)	-0.071(0.403)	-0.076(0.416)
Unemployment rate t-3	0.764**(0.376)	0.718*(0.373)	0.451(0.351)	0.648*(0.373)	0.744**(0.375)
Demographic Variables					
Percent New Immigrants	-0.497(2.071)	-0.637(2.080)	1.008(2.088)	0.423(2.063)	-0.513(2.108)
Sample Size	1165	1165	1165	1015	1160

Notes: All models include the employment growth rate, state effects, year effects, and state time trends. Table entries are coefficient estimates multiplied by 100. Percent white and percent with more than a HS education are the base categories for race/ethnicity and education, respectively. Robust standard are in parentheses. *denotes $p \leq 0.1$. ** denotes $p \leq 0.05$.

Table 4: Alternative Specifications for Take-up

Variable	Base Model	Lagged Dependent Variable	Other Program Recipients	Infant Take-up Rate < 1000	No Adjustment to CPS Weights
Policy Variables					
Medicaid Income Cutoff	-0.069*(0.036)	-0.081**(0.034)	-0.062*(0.023)	-0.036(0.037)	-0.068*(0.036)
Medicaid Income Cutoff t-1	0.032(0.037)	0.050(0.035)	0.029(0.038)	0.001(0.037)	0.032(0.037)
Welfare Benefit Level for Family of 3	0.003(0.018)	-0.009(0.017)	-0.002(0.018)	-0.013(0.018)	0.004(0.018)
TANF Program	-7.526(4.841)	-4.129(4.878)	-10.496**(4.900)	-11.107**(4.964)	-7.292(4.805)
TANF * Percent New Immigrants	22.226**(9.928)	14.038(9.629)	9.956(9.709)	21.904**(10.364)	22.099**(9.897)
Lagged Dependent Variable	-----	24.445**(3.331)	-----	-----	-----

Medicaid Recipients /1000 Pop.	-----	-----	0.011**(0.001)	-----	-----
Food Stamps Recip. / 1000 Pop.	-----	-----	0.014**(0.001)	-----	-----
AFDC/TANF Recip. / 1000 Pop.	-----	-----	-0.290**(0.035)	-----	-----
<i>Economic Variables</i>					
Unemployment rate	-1.512**(0.677)	-1.633**(0.661)	-1.276*(0.656)	-1.322**(0.657)	-1.495**(0.675)
Unemployment rate t-1	-0.059(0.712)	0.247(0.682)	0.325(0.670)	-0.331(0.695)	-0.081(0.711)
Unemployment rate t-2	1.327**(0.630)	1.324(0.616)	1.071*(0.599)	1.392**(0.600)	1.331**(0.627)
Unemployment rate t-3	1.111*(0.583)	0.809(0.551)	1.264**(0.562)	0.132**(0.571)	1.138**(0.580)
<i>Demographic Variables</i>					
Percent New Immigrants	-4.548(3.972)	-1.938(4.136)	-5.896(3.655)	-4.769(3.992)	-4.586(4.021)
Sample Size	1165	1165	1165	1015	1160

Notes: Table entries are estimated coefficients multiplied by 100. All models include state effects, year effects, state time trends, and additional demographic controls as described in Table 1. Robust standard are in parentheses. * denotes $p \leq 0.1$. ** denotes $p \leq 0.05$.

The sample size is 1160 rather than 1165 in the last column because, as described in footnote 12, observations with infant take-up rates > 2000 are excluded from the analysis. There are 5 more of these observations when the weights are not adjusted than there are when the NRC (2003) adjustments are used.

SENSITIVITY TO SMALL STATE-YEAR CPS SAMPLE SIZES

As described above, the number of eligible individuals is measured with error because of small samples of WIC eligible infants in some state-year combinations.²² The econometric effect of the measurement error is to increase standard errors (because eligibility is a dependent variable). However, the estimates of eligibility also result in take-up rates for infants that are higher than 100 percent for some state-year combinations. To investigate whether the results are sensitive to the inclusion of these observations, the fourth column of tables 3 and 4 presents results when the sample omits the 150 observations with take-up rates over 100 percent. The only significant changes are for take-up where the income threshold for Medicaid becomes statistically insignificant while the effect of TANF implementation becomes significant.

SENSITIVITY TO ASSUMPTIONS USED IN ESTIMATING ELIGIBILITY

As described above a number steps are taken in the calculation of the number of eligible individuals. These include adjustments to the CPS weights and assumptions about the relationship between eligible infants and eligible pregnant women (e.g., the number of eligible infants is multiplied by 0.533 to account for the length of pregnancy and income fluctuations

around pregnancy). To assess the importance of these assumptions on the results, the models were estimated under a number of alternative assumptions. The last column of Tables 3 and 4 reports the results for the case where the CPS weights are not adjusted for undercounts of infants, and the conclusions of the model are not altered by this change. Additional tests were conducted for a number of the multipliers (e.g., changing the multiplier for calculating pregnant women from 0.533 to the original USDA value of 0.75) with no effect on the results.

SUBGROUP ANALYSIS

Figure 1 shows that during the late 1980s and the 1990s, the number of child recipients grew more rapidly than the number of infants or women participants. At the same time, take-up rates for children are lower for other groups. To explore whether the policies, economic conditions, and demographics have different effects on the different groups of recipients, Table 5 presents results separately for women, infants, and children. Although Tables 3 and 4 show the results are not sensitive to assumptions used to calculate eligibility, the table begins with children because they are a larger group than infants and because the estimates of women are based on the (smaller) number of infants. In the Table, Columns 1, 2, and 3 present population participation rate, eligibility rate, and take-up rate results, respectively.

The first three columns show the importance of Medicaid eligibility and the TANF program for child eligibility and take-up, respectively. Most striking are the large effects of immigration on take-up and thus on the population participation rate for children. Before TANF, a one tenth of a percentage point increase in new immigrants is estimated to reduce the population participation rate by 1.9 percent. After TANF, the same increase in immigrants is estimated to increase this same outcome by 2.5 percent [=0.1*(-19.1+43.9)].

The results for infants and women show no association between immigration (or the TANF program itself) and WIC eligibility or participation. Increases in income eligibility for Medicaid are negatively related to take-up for both infants and women. In the case of infants, this effect is strong enough that the population participation rate is estimated to be negative. However the effect of an increase in Medicaid eligibility is not statistically significant over two years at conventional values (F-stat 2.43, p-value 0.12).

The negative relationship between the Medicaid eligibility threshold and the population participation rate is somewhat surprising. Columns 2 and 3 show that this occurs because the estimated reduction in take-up is larger than the estimated increase in eligibility. This means that the take-up rate for individuals who were eligible prior to the expansion must fall. This could happen if there are omitted variables that are positively correlated with the income thresholds and negatively correlated with WIC participation. Possible examples are changes in Medicaid coverage of prenatal care services and Early and Periodic Screening, Diagnostic and Treatment benefits. At the same time that income eligibility is rising, coverage of these benefits is growing. If these expanded benefits significantly improve birth outcomes and infant health, then some mothers may decide to forego infant WIC benefits even though they are income eligible. Currie and Gruber (1996) find evidence that the Medicaid expansions improved birth outcomes providing support for this idea.

Table 5: Subgroups

Variables	Children			Infants			Women		
	1	2	3	1	2	3	1	2	3
Policy Variables									
Medicaid Income Cutoff	0.087**(0.042)	0.049**(0.022)	0.038(0.048)	-0.113**(0.032)	0.083(0.051)	-0.196**(0.058)	-0.042(0.037)	0.083(0.051)	-0.125*(0.067)
Medicaid Income Cutoff t-1	-0.040(0.047)	0.001(0.023)	-0.050(0.051)	0.050(0.032)	-0.030(0.046)	0.083(0.059)	0.089**(0.040)	-0.030(0.046)	0.122*(0.066)
Welfare Benefit Level for Family of 3	0.017(0.025)	-0.009(0.012)	0.026(0.028)	0.0008(0.017)	-0.016(0.018)	-0.018(0.026)	0.008(0.019)	-0.016(0.018)	-0.010(0.028)
TANF Program	-19.073**(8.677)	-2.745(5.411)	-16.328**(7.768)	-9.953(6.860)	-3.216(8.509)	-6.738(9.340)	-8.422(6.737)	-3.216(8.509)	-5.206(9.324)
TANF * Percent New Immigrants	43.925**(12.694)	-1.168(5.873)	45.093**(7.676)	-0.594(9.542)	-1.346(10.120)	0.753(14.385)	5.198(9.836)	-1.346(10.120)	6.544(14.192)
Economic Variables									
Unemployment rate	-0.545(0.719)	1.008**(0.421)	-1.553*(0.843)	0.902(0.687)	2.421**(0.704)	-1.519(1.011)	0.271(0.744)	2.421**(0.704)	-2.150**(0.105)
Unemployment rate t-1	1.446**(0.712)	0.421(0.457)	1.025(0.886)	-0.551(0.668)	0.526(0.758)	-1.077(1.036)	-0.488(0.733)	0.526(0.758)	-1.014(1.103)
Unemployment rate t-2	1.612**(0.639)	0.004(0.004)	1.572**(0.779)	1.211**(0.667)	-0.167(0.722)	1.378(0.996)	1.669**(0.743)	-0.167(0.722)	1.836*(1.070)
Unemployment rate t-3	2.463**(0.604)	0.392(0.377)	2.072**(0.716)	1.502**(0.580)	1.327**(0.645)	0.175(0.893)	1.913**(0.633)	1.327**(0.645)	0.587(0.947)
Employment Growth Rate	-0.223(0.186)	0.040(0.133)	-0.263(0.231)	-0.020(0.195)	-0.082(0.228)	0.062(0.303)	0.018(0.215)	-0.082(0.228)	0.100(0.316)
Demographic Variables									
Percent New Immigrants	-18.909**(6.254)	-1.573(1.895)	-17.336**(7.144)	2.515(2.925)	0.659(2.828)	1.856(4.541)	-0.244(3.163)	0.659(2.828)	-0.903(4.435)

Notes: The dependent variables for Columns 1, 2, and 3 are the (logarithms of the) Population Participation Rate, the Eligibility Rate, and the Take-up Rate, respectively. Sample size is 1165. Column 2 is the same for infants and women because both the population and the number eligible are based on the number of infants as described in footnote 12. Both columns are

included in the table for ease of exposition. Table entries are estimated coefficients multiplied by 100. All models include state effects, year effects, state time trends, and additional demographic controls as described in Table 1. Robust standard are in parentheses. * denotes $p \leq 0.1$. ** denotes $p \leq 0.05$.

Table 6: The Role of WIC Policies – 1987 to 2006

Variable	Recipients/Population	Eligibles/Population	Recipients/Eligibles
<i>WIC Policy Variables</i>			
Adjunctive Eligibility	11.709**(3.344)	8.710**(3.066)	2.999(4.495)
Self-Declare Income	-2.005(2.535)	1.705(2.432)	3.710(3.836)
Hemoglobin Cutoff	0.732(1.848)	0.095(1.798)	0.637(2.801)
<i>Non-WIC Policy Variables</i>			
Medicaid Income Cutoff	-0.002(0.003)	0.066**(0.027)	-0.068*(0.039)
Medicaid Income Cutoff t-1	0.034(0.020)	-0.019(0.026)	0.053(0.036)
Welfare Benefit Level for Family of 3	0.022(0.019)	0.013(0.013)	0.010(0.029)
Major Waiver	-4.237*(2.484)	0.999(2.535)	-5.237(3.571)
TANF Program	-10.164**(5.068)	-2.719(5.178)	-7.445(4.951)
TANF * Percent New Immigrants	19.288**(8.072)	7.348(6.860)	11.940(11.178)
<i>Economic Variables</i>			
Unemployment rate	0.303(0.513)	1.392**(0.533)	-1.089(0.773)
Unemployment rate t-1	0.173(0.535)	0.410(0.532)	-0.237(0.790)
Unemployment rate t-2	1.099(0.494)	0.259(0.505)	0.841(0.719)
Unemployment rate t-3	1.765**(0.482)	0.302(0.464)	1.463**(0.694)
Employment Growth Rate	-0.088(0.133)	-0.042(0.147)	-0.047(0.202)
<i>Demographic Variables</i>			
Percent New Immigrants	-9.385(6.786)	-10.659**(3.936)	1.274(6.642)

Notes: Sample size is 929. All models include percent of children living in families with no father present, percent black, percent Hispanic, percent other race/ethnicity, percent with less than HS education, percent with a HS education, state effects, state time trends, and year effects. Table entries are coefficient estimates multiplied by 100. Robust standard are in parentheses. * denotes $p \leq 0.1$. ** denotes $p \leq 0.05$.

THE ROLE OF WIC POLICY

The number of WIC eligible individuals and the number of recipients are also related to WIC policies.²³ Table 6 reports results with the three WIC policies described above. Because information on WIC policies is first available in 1988, the sample period is taken to be 1987 to 2006 – with the assumption that no changes in policy occurred between 1987 and 1988.

The results in Table 6 show that adjunctive eligibility is positively related to the eligibility rate and the population participation rate. None of the WIC variables is statistically related to take-up. The remainder of the results are similar to the results from Table 1. The importance of adjunctive eligibility for Medicaid recipients is not surprising given the growing role of adjunctive eligibility over time. Perhaps more surprising is the lack of a relationship between the ability to self-declare income and take-up. This may be explained by relatively little variation in this policy as only 10 states were forced to change when the policy was standardized, and there were few changes in the policy in other years.

DISCUSSION AND CONCLUSION

This paper studies the relationship between measures of WIC eligibility and participation on one hand and state policies, economic conditions, and demographic characteristics on the other. The analysis separates the population participation rate into the eligibility rate and the take-up rate and allows eligibility and take-up to adjust to changes in the environment over time.

Before discussing the results further, it is, however, important to note some caveats. First, WIC program rules are only included in a subset of the analysis. It would be ideal to account for changes in WIC policy over the full sample period, but these data are not available. If WIC policies are correlated with, for example, Medicaid eligibility thresholds, then some of the effects attributed to Medicaid are actually due to WIC policies. However, because the data on WIC policies indicates that states did not change policies frequently, these effects may be captured by the state effects instead. Second, there is evidence that Medicaid and AFDC recipients are undercounted in the CPS. To the extent that the undercounted individuals had income above 185 percent of poverty, this lowers the number of individuals estimated to be eligible which in turn lowers the eligibility rate and raises the take-up rate. With these caveats in mind, we turn to some key results.

USDA (2006) and Besharov and McCall (2009) have shown that the eligibility rate was relatively flat from 1994 to 2003. But this time period misses the Medicaid expansions of the 1980s, and the present analysis shows eligibility increased between 1989 and 1994 coinciding with the Medicaid expansions. Nonetheless, over the full 1983-2006 period, changes in the take-up rate were significantly larger than changes in the eligibility rate. The likely reason that the Medicaid expansions did not result in more dramatic increases in eligibility is that for much of the time period the income thresholds for Medicaid remained below the income threshold for WIC eligibility. This is particularly true for children.

Because the eligibility rate has remained *relatively* constant, increases in the population participation rate result from increases in take-up among eligible individuals. The results show a strong positive association between the number of post-TANF immigrants and WIC participation

among eligibles. This result is largely driven by increases in the number of child recipients and is consistent with newly TANF ineligible immigrants seeking benefits from WIC.

In addition to their differing trends over time, it is important to consider eligibility and take-up separately because a number of state characteristics have opposite effects on take-up and eligibility. In these cases, analysis of the population participation rate, which combines eligibility and take-up into one measure, may show no effect. For example, Bitler, Currie, and Scholz (2003) find no evidence of a relationship between unemployment (or poverty) and the population participation rate. Similar results are obtained here for the current period effect of unemployment, and unreported results of a model that approximates the one used by Bitler, Currie, and Scholz (e.g., no state time trends, no lags, including participation rates in other programs) also finds no relationship between unemployment and recipients. However, the results in this paper show that this “non-effect” is the result of two off-setting effects.

From a policy perspective, not finding an effect when there truly is no effect on either eligibility or take-up is different from not finding an effect because a positive eligibility effect and a negative take-up effect offset each other. In the case of an increase in unemployment, the positive eligibility effect is expected, and knowing that there is a negative take-up effect provides the opportunity to better understand why that is and to explore how it may be raised.

One possible reason for the negative effect on take-up is that a significant proportion of the newly eligible individuals do not participate. This hypothesis is supported by work by Blank and Ruggles (1996) who study eligibility and participation spells in the AFDC and food stamp programs and find that the majority of eligibility spells end without participation. They also find that most women who will participate in AFDC or Food stamps do it early in their eligibility but that, among women who do not participate early, later participation (as opposed to the eligibility spell ending without any participation) is positively related to unemployment. This result is consistent with the delayed response in take-up to an increase in unemployment found in this paper. The policy response depends on the reason for the delay. For example, if individuals lack information about eligibility then a public information campaign may improve take-up.

The conclusions of the paper point to a number of avenues for future research. First, a better understanding of undercounting of Medicaid recipients in the CPS would improve estimates of the role of adjunctive eligibility. The issue is more complicated than simply adjusting the aggregate number of Medicaid recipients because the adjustment must be made separately for individuals living in families with incomes below and above 185 percent of poverty in order to accurately count the individuals who are not income eligible but receive WIC due to adjunctive eligibility. Second, take-up is shown to be the driver behind increases in the number of recipients, and although a number of the variables significantly predict increases in take-up, much of the increase is explained by the year effects. Future research could productively be devoted to attempting to further understand the reasons for increased take-up.

Appendix Table 1: Data Sources

Variable	Source
<i>Dependent Variables</i>	

Recipients	USDA
<i>WIC Policy Variables</i>	
Self-Declare Income	Survey of WIC Program Characteristics, Various Years
Adjunctive Medicaid Elig.	Survey of WIC Program Characteristics, Various Years
<i>AFDC/TANF Policy Variables</i>	
Benefit for Family of 3	The Green Book & Data Provided by Rebecca Blank
Indicator for major waiver to AFDC rules	Council of Economic Advisors (1999)
Indicator for TANF implementation	Crouse (1999)
<i>Medicaid Policy Variables</i>	
Income Eligibility Level for Pregnant Women	National Governor's Association & Kaiser Family Foundation
<i>Economic Variables</i>	
Unemployment rate	Bureau of Labor Statistics
Employment Growth Rate	Current Population Survey
<i>Demographic Variables</i>	
Number of New Immigrants	Survey of Immigration Statistics
Percent of Kids with No Dad	Current Population Survey
Percent Black	Current Population Survey
Percent Hispanic	Current Population Survey
Percent Other Race	Current Population Survey
Percent < HS	Current Population Survey
Percent with HS	Current Population Survey

Appendix Table 2: Descriptive Statistics

Variable	Unweighted		Weighted	
	Mean	SD	Mean	SE
<i>Dependent Variables</i>				
Recipients/1000 population	230.10	85.82	225.01	4.46
Eligible People/1000 Population	519.58	113.88	519.13	3.77
Recipients/Eligible People	450.91	158.98	436.59	7.59
Women Recipients/1000 Women	243.36	111.78	240.89	5.14
Eligible Women/1000 Women	511.79	139.18	508.56	4.44
Women	496.89	238.72	484.28	9.22

Recip./1000 Eligible Women				
Infant Recipients/1000 Infants	391.06	161.80	389.72	6.23
Eligible Infants/1000 Infants	605.38	164.63	601.56	5.25
Infant Recip./1000 Eligible Infants	675.61	293.83	665.83	10.00
Child Recipients/1000 Children	188.86	74.13	179.57	4.18
Eligible Children/1000 Children	500.23	109.19	501.47	3.55
Child Recip./1000 Eligible Children	386.79	154.28	362.26	7.66
<i>Policy Variables</i>				
Medicaid				
Income Threshold	138.45	58.04	146.31	2.59
AFDC/TANF				
Benefit for Family of 3	542.69	271.72	555.88	15.90
Major Waiver Indicator	0.06	0.22	0.08	0.02
TANF Program Indicator	0.39	0.48	0.41	0.02
TANF * Percent New Immigrants 1	-0.05	0.12	-0.005	0.01
WIC				
Self-Declare Income	0.13	0.33	0.12	0.01
Adjunctive Medicaid Elig.	0.95	0.22	0.96	0.01
First Trimester Hemoglobin	11.32	0.48	11.36	0.03
<i>Economic Variables</i>				
Unemployment rate	5.90	2.15	6.08	0.08
Employment Growth Rate	1.66	3.53	1.65	0.1
<i>Demographic Variables</i>				
Percent New Immigrants	0.22	0.22	0.35	0.02

Percent Kids No Dad	23.84	8.19	24.49	0.20
Percent Black	10.88	12.02	12.33	0.28
Percent Hispanic	6.11	8.44	11.27	0.65
Percent Other Race/Ethnicity	5.10	10.06	4.67	0.24
Percent < HS	18.35	7.22	19.17	0.22
Percent with HS	36.74	4.68	35.60	0.28

Number of observations is 1165 except for the WIC policy variables where the number of observations is 929. Notes: 1Percent New Immigrants * TANF is evaluated at the (weighted) mean of Percent New Immigrants.

Notes

1 Joyce et al. (2005) and Joyce et al. (2008) suggest more limited effects of WIC.

2 For more information on the WIC program, see Oliveira et al. (2002).

3 A few studies (e.g., Swann 2007 and Tiehen and Jackowitz 2008) go beyond the participation decision itself to study the timing of initial WIC participation by pregnant women.

4 The numbers of categorically eligible individuals (e.g., infants) are taken as given.

5 As discussed below, data limitations preclude the inclusion of WIC policies in all of the analysis.

6 Blank and Ruggles (1996) study eligibility and participation spells for AFDC and food stamps.

7 Lags were considered for all of the policy variables. Multicollinearity became an issue with the full set of lags – particularly with presence of state time trends. Lagged Medicaid eligibility was retained in the model because of the focus on the Medicaid expansions.

8 Using tests outlined in Wooldridge (2002), pooled OLS and random effects models were considered and rejected in favor of fixed effects.

9 This approach has also been used to study welfare caseloads (Blank 2001, Council of Economic Advisors 1997 and 1999, and Ziliak, et al. 2000), food stamp caseloads (Currie and Grogger 2001), foster care caseloads (Swann and Sylvester 2006), and child maltreatment (Paxson and Waldfogel 2002).

10 It is generally agreed that the nutritional risk criteria is not a binding constraint so that the *de facto* requirements are categorical and income eligibility.

11 Besharov and McCall (2009) consider additional adjustments that further increase the number of eligible individuals.

12 The number of eligible infants is estimating using the following steps: 1) Use the CPS to estimate the baseline number of infants; 2) Use the adjustment factors from NRC (2003) to adjust the CPS weights for undercounts of infants. Adjustments are made separately by age and race. 3) Deem infants eligible if family income is less than 185% of poverty or they are enrolled in Medicaid, AFDC/TANF, or food stamps; and 4) Make an adjustment to account for the fact that CPS collects information about annual income while WIC eligibility is based on monthly income. This adjustment takes the form of a multiplier equal to 1.28. To estimate the number of eligible children, the process is the same except that the income multiplier is 1.10. To calculate the number of pregnant women, the number of eligible infants is multiplied by 0.533 to account for the length of pregnancy and changes in income during pregnancy that are not captured by the CPS's annual measure of income. Similar adjustments using multipliers are made to estimate the number of postpartum women who do and do not breastfeed. As with pregnant women, these estimates are based on the number of eligible infants. See NRC (2003) and Besharov and McCall (2009) for more details. When constructing the estimation sample, 15 observations are excluded because the infant take-up rate is estimated to be greater than 200 percent.

13 On average there are 22 eligible infants and 96 eligible children.

14 One caveat is that the CPS undercounts the number of individuals who receive Medicaid. To the extent the uncounted individuals are not income eligible, the eligibility rate is underestimated and the take-up rate is over-estimated. Wheaton (2007) provides estimates of Medicaid underreporting in the CPS for the period 1995-2005. Incorporating these annual estimates into the analysis did not qualitatively change the results. To properly account for underreporting, it would be necessary know the extent of undercounting among recipients with incomes greater than 185% of poverty – ideally on an annual basis for each state.

15 The small number of individuals estimated to be adjunctively eligible during this period means that the results are not sensitive to this assumption.

16 The conclusions are not qualitatively affected by including or omitting a lag.

17 For a more detailed discussion of the Medicaid expansions see Gruber (2002), Yelowitz (1995), or Currie and Gruber (1996).

18 Changes to income eligibility for Medicaid continued beyond the 1980s, and these later changes are incorporated into the analysis.

19 If SCHIP funds are used to expand Medicaid eligibility, the SCHIP funded threshold is used in the analysis.

20 States had, and continue to have, discretion over whether recipients of other programs (e.g. the school lunch program) are adjunctively eligible for WIC. Unfortunately, data on these

policies are only available for a few years of the WIC Program and Participant Characteristics surveys.

21 Estimates from a fixed effect model with a lagged dependent variable are not consistent; however, the effect is likely to be small when the coefficient on the lagged dependent variable is not close to 1 or 100 in this case since the tables report coefficients multiplied by 100 (Wooldridge 2002).

22 Sample sizes are not as much of a problem for children because of the larger age range.

23 Brien and Swann (2001), Bitler, Currie, and Scholz (2003), and Bitler and Currie (2005) show that participation is related to WIC policies.

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