The Effect of Minimum Wages on Adolescent Fertility: A Nationwide Analysis

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Objectives. To investigate the effect of minimum wage laws on adolescent birth rates in the United States.

Methods. I used a difference-in-differences approach and vital statistics data measured quarterly at the state level from 2003 to 2014. All models included state covariates, state and quarter-year fixed effects, and state-specific quarter-year nonlinear time trends, which provided plausibly causal estimates of the effect of minimum wage on adolescent birth rates.

Results. A $1 increase in minimum wage reduces adolescent birth rates by about 2%. The effects are driven by non-Hispanic White and Hispanic adolescents.

Conclusions. Nationwide, increasing minimum wages by $1 would likely result in roughly 5000 fewer adolescent births annually. (*Am J Public Health.* 2017;107:447–452. doi:10.2105/AJPH.2016.303604)

See also Galea and Vaughan, p. 363.

Adolescent childbearing is linked to several socioeconomic disadvantages, including reductions in educational attainment and earnings and increased participation in public assistance programs.[1] Although adolescent pregnancy has declined dramatically in the past several decades, the United States still has the highest adolescent birth rate among developed countries. In 2014, 24.2 of every 1000.0 girls aged between 15 and 19 years gave birth in the United States compared with typical rates of 4.0 to 14.0 per 1000.0 girls in other developed countries.[2]

With the exceptions of less generous welfare benefits and better access to family planning services, most policy interventions aimed at reducing adolescent childbearing rates have had little effect.[3] Some argue that the high adolescent pregnancy rate in the United States is because of underlying economic inequality and immobility. That is, instead of investing in their economic futures, adolescents become pregnant because they do not have economic advancement opportunities, leaving few reasons to delay childbearing.[3]

Minimum wage contributes to economic security and may improve economic opportunities for low-wage workers. Opponents of minimum wage increases contend that higher minimum wages would raise employers' labor costs, decrease employment, and increase prices. Although some studies have found negative employment effects, there is considerable evidence that minimum wage increases have no significant effects on employment, even among adolescents.[4] Higher wages might keep adolescents attached to the labor market—potentially increasing their future advancement opportunities—and thus provide a reason to delay childbearing or offer a chance to substitute work for leisure.

Most research studying minimum wages consists of labor market effects. The effects of minimum wages on non–labor market outcomes, such as health and fertility, remain understudied. Because workers younger than 25 years represent nearly half of minimum wage workers,[5] there may be other, non–labor market behavioral responses to changes in minimum wages specific to adolescents and young adults. I took advantage of variation in minimum wage laws across states and over time to evaluate the effect of minimum wages on adolescent fertility.

METHODS

I evaluated the effect of the minimum wage by examining recent policy changes in minimum wage levels, which resulted in changes in the real minimum wage. Because states introduced minimum wage legislation at different times, I was able to employ a quasiexperimental approach that, in its simplest form, was equivalent to identifying a difference-in-differences estimator. I found the difference-in-differences estimate by comparing adolescent birth rates in states that had a change in the real minimum wage during a particular quarter-year to states that did not have a change in the real minimum wage during the same quarter-year before and after the minimum wage changed. When exploiting the variation in the timing of policy implementation across states, the implicit assumption of the difference-in-differences framework is that the exact timing of the policy change is exogenous to trends in that state's adolescent birth rate. I addressed this potential source of bias by including state-specific trends.

Data

I measured quarterly state-level adolescent birth rates for all 50 states plus the District of Columbia from the last quarter of 2003 through 2014. The adolescent birth rate is calculated as the number of live births in a state

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during a quarter born to mothers aged 15 to 19 years relative to the number of females aged 15 to 19 years in the same state during the year. The numerator, which comprises the population of births in the United States, came from the National Center for Health Statistics Vital Statistics System. The denominator was from the National Center for Health Statistics bridged-race intercensal population estimates. I also conducted subgroup analyses, because minimum wage laws and economic opportunities may affect racial and ethnic minorities differently.[6]

The independent variable of interest was the binding real minimum wage. I used reports from the National Conference of State Legislatures to obtain each state's nominal hourly minimum wage and the effective date of changes. I obtained the federal minimum wage from the Bureau of Labor Statistics. As is customary in minimum wage studies, I used the higher of the federal and state minimum wage for each state and quarter.[7–10] I then converted the nominal values to real values in 2014 dollars to adjust for inflation using the consumer price index published by the Bureau of Labor Statistics. It should be noted that although nominal minimum wages only increase over time, the real minimum wage both increases and decreases in value because of inflation. I lagged all explanatory variables, including minimum wages, three quarters to better estimate the conditions at the time of conception.

Other variables in my analyses included several time-varying state-level characteristics that may have an effect on both state minimum wage levels and adolescent birth rates. These included the proportion of adolescents (aged 16–19 years) in the state that are non-Hispanic White, non-Hispanic Black, Hispanic, graduated from high school, aged 17 years, aged 18 years, aged 19 years (aged 16 years was the reference category), married, cohabitating, and the percentage living in a metropolitan area. All of these variables are measured annually and come from the outgoing rotation groups of the Current Population Survey.

Generally, more generous welfare benefits modestly increase nonmarital childbearing.[11] I used several measures to capture the provision of social services, income assistance, and welfare generosity of a state. Because the Supplemental Nutrition Assistance Program has become a much more prominent social safety net program in the past decade, I included the maximum combined Temporary Assistance for Needy Families and Supplemental Nutrition Assistance Program payment for a family of 3, converted to 2014 dollars using the consumer price index (in thousands), state earned income tax credit rate, and a binary variable for whether the earned income tax credit is refundable, all of which came from the University of Kentucky Poverty Research Data Center.[12]

Access to contraceptives also affects adolescent fertility and may be correlated with a state's minimum wage.[13–16] To control for this element, I included binary variables for whether the state had a (1) Medicaid family planning expansion waiver, (2) parental notification abortion restriction, and (3) contraceptive insurance coverage mandate. Medicaid family planning waiver data came from Wherry,[17] Kearney and Levine,[13] and the Guttmacher Institute; parental notification abortion restriction laws came from the Guttmacher Institute; and data on contraceptive insurance coverage mandates came from Raissian and Lopoo.[18]

Macroeconomic factors also affect adolescent fertility. Specifically, higher unemployment rates lead to lower adolescent birth rates.[19] We also know that girls who grow up in poverty are more likely to be adolescent mothers. To control for omitted variable bias of the macroeconomic environment, I should have included variables that affect both the adolescent fertility and state minimum wages. I did not, however, want to include variables that are affected by minimum wages, because an effect of minimum wages on an element that subsequently affects adolescent fertility would be part of the effect from minimum wages.

A recent review concluded that there are no significant reductions in employment from minimum wage increases.[4] Therefore, I also included the unemployment rate—from the Bureau of Labor Statistics—although the results are relatively unaffected by omitting the unemployment rate. Poverty rates, however, should not be included as a control variable, because a recent review of 54 estimates found overwhelming evidence that increases in the minimum wage reduce poverty.[20]

Statistical Analysis

By using panel data, the policy and economic variables, state fixed effects, quarter-year fixed effects, and nonlinear state-specific trends, I was able to suggest a causal relationship between minimum wages and adolescent fertility. State fixed effects control for time-invariant differences across states, such as an embedded "culture" of adolescent pregnancy. Quarter-year fixed effects control for temporal changes that occur nationwide, including macroeconomic conditions affecting all states and seasonality in fertility.[21] Finally, I allowed state-specific effects to vary nonlinearly by including a quadratic state-specific trend.

Throughout the study period, adolescent birth rates were mostly flat until about 2009, when a decline began. Quarter-year fixed effects would capture this nonlinearity nationwide, but these patterns likely differed across states. The single turning point suggests that the underlying trend is best captured by a quadratic time trend. One might also argue that rates rose slightly between 2006 and 2007 before falling. For this reason, I also tried a model replacing quadratic state trends with cubic time trends. The results were not sensitive to this modification. Because the R^2 was slightly more predictive in the models with quadratic time trends than were the R^2 in the models with cubic time trends, these were my preferred models.

Remaining potential threats to validity are unobservable characteristics that are related to adolescent birth rates and that deviate from a state's trend at the same time as the minimum wage changes. Because minimum wage laws often go into effect at various points throughout the calendar year, including January, July, and October, it is unlikely that an omitted variable will consistently deviate from a state's adolescent birth rate trend when minimum wage changes take place.

Additionally, I weighted regressions by the state's annual adolescent female population and by racial/ethnic subgroup population in the subgroup analysis. I used ordinary least squares estimation with Stata/SE version 12.1 (StataCorp LP, College Station, TX). SEs are heteroskedasticity robust and clustered at the state (intervention) level to account for within-state serial correlation.[22]

RESULTS

During the study period, there were 234 changes in state minimum wages. Sixty-two of these resulted from state policy changes, 103 resulted from federal policy changes, and 69 resulted from changes in inflation. Although there were as many changes because of inflation as there were changes because of state policies, the changes in minimum wages because of inflation themselves may have played a role in the adolescent fertility trends during this period, so I included all changes. Figure 1 plots the average total adolescent birth rate on the left y-axis and the mean real minimum wage on the right y-axis by quarter. This figure shows that adolescent birth rates were roughly stable from 2003 to 2008, when they began to decline, providing evidence for the inclusion of quadratic state trends. Just before 2008 the mean real minimum wage began to increase in value, providing suggestive evidence that there may be a relationship between the minimum wage and adolescent fertility.

Main Results

Table 1 shows the results of the main analysis (a full table with all covariates and additional models is available as a supplement to the online version of this article at http://www.ajph.org as Table A). Model 1 includes state-level controls, state fixed effects, and quarter-year fixed effects. Overall, following increases in the minimum wage, adolescent birth rates were lower three quarters later. After including state-specific quadratic trends in model 2, the effects were reduced in magnitude although they were still statistically significant. Model 2 estimates imply that a $1 increase in the minimum wage yields approximately 0.2 fewer births per quarter per 1000 adolescents three quarters after minimum wage changes ($P < .01$). Relative to a mean of 8.82 births per quarter per 1000 adolescent females, these results imply a reduction of about 2%. The effects are driven by fertility changes among non-Hispanic White and Hispanic adolescents, as the estimates for non-Hispanic Black adolescents are no longer statistically distinguishable from zero after including quadratic trends. Non-Hispanic White and Hispanic adolescents experienced reductions of 0.11 and 0.49 births per 1000.00 female adolescents, respectively, or about 2% to 3%.

Why minimum wage changes have stronger effects on non-Hispanic White and Hispanic adolescents can be at least partially understood by exploring the labor market and wage effects of changes in the minimum wage. First, non-Hispanic Black adolescents are less likely to be employed than are non-Hispanic White and Hispanic adolescents. Figure A (available as a supplement to the online version of this article at http://www.ajph.org) displays patterns in the probability of being employed by race/ethnicity using data from the outgoing rotation groups of the Current Population Survey. Non-Hispanic White adolescents are the most likely to be employed, followed by Hispanic adolescents, and then non-Hispanic Black adolescents.

Second, non-Hispanic Black adolescents are also less likely to experience wage effects of the minimum wage. Using data from the outgoing rotation groups of the Current Population Survey, I estimated the effects of changes in the minimum wage on usual hours working per week, hourly wages, and weekly earnings. I limited the sample to employed adolescents (aged 16–19 years) because among adolescents, minimum wage increases are more likely to reduce the probability of becoming employed than the probability of remaining employed.[23] Results in Table B (available as a supplement to the online version of this article at http://www.ajph.org) show that employed non-Hispanic White and Hispanic adolescents experienced no change in the number of hours worked per week and experienced increases in hourly wages. Conversely, non-Hispanic Black employed adolescents—who are already less likely to be employed—possibly experience a reduction in hours worked and no change in

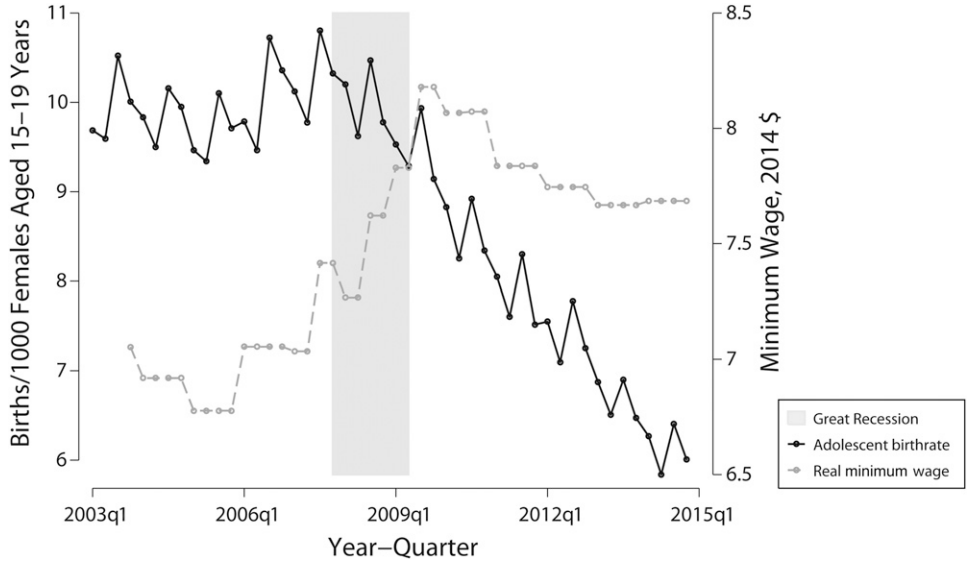

FIGURE 1—Adolescent Birth Rate and Real Minimum Wage: United States, 2003–2014

TABLE 1—Effect of the Real Minimum Wage on Adolescent Birth Rates: United States, 2003–2014

	Total		Non-Hispanic White		Non-Hispanic Black		Hispanic	
Variable	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Real minimum wage in 2014 dollars, b (SE)	−0.40** (0.10)	−0.18** (0.05)	−0.31** (0.07)	−0.11** (0.04)	−0.61* (0.25)	−0.09 (0.11)	−1.75** (0.42)	−0.49** (0.15)
R^2	0.967	0.986	0.976	0.986	0.935	0.984	0.893	0.984
Mean of dependent variable	8.82		5.77		14.06		16.61	

Note. The sample size was n = 2142. Adolescent birth rate was the dependent variable. I estimated the models using ordinary least squares: n = (51 states) × (42 quarters) = 2142. The robust SE is clustered at the state level. Model 1 includes state and quarter-year fixed effects, and model 2 adds state-specific quadratic time trends.

*P < .05; **P < .01.

hourly wages. Similarly, Allegretto et al.[24] have found that the effect of the minimum wage on non-Hispanic Black adolescents' wages is sensitive to model choice and found no significant effects for models similar to the ones employed here. The second part of Table B shows that, as expected, wage effects are stronger among employed adolescents who earn up to 150% of the state's minimum wage.

It is also worth noting that the results on the other covariates (Table A) generally do not deviate from findings in previous studies. As expected, a larger proportion of the state's adolescents graduating from high school is associated with a lower adolescent birth rate. Higher welfare benefits are associated with a higher adolescent birth rate, consistent with Moffitt's findings.[11] Contraceptive insurance coverage mandates are associated with lower adolescent birth rates, consistent with Mulligan's findings,[16] and a higher unemployment rate is associated with lower adolescent births rates, consistent with Kearney and Levine's findings.[19]

Sensitivity Analyses

An alternative way to measure the minimum wage is to normalize the effective minimum wage by the median wage rate in the state. I refer to this measure as the "relative minimum wage." Effectively, the relative minimum wage captures how much impact the minimum wage level might have. Minimum wage increases in states where the median hourly wage is much higher than the minimum wage may not have as binding of an effect on the labor market as states where the median hourly wage is much closer to minimum wage levels.

I used data from the Current Population Survey to calculate a quarterly state-specific median wage. To construct this variable, I divided the reported wage and salary income by the product of weeks worked and usual hours worked per week. A larger ratio of the minimum wage to state's median wage implies that the minimum wage level is more binding in that state. For example, a minimum wage to median hourly wage ratio of 1 implies that half of workers in the state earned the minimum wage. Compared with lower ratios, a minimum wage increase in this state would have stronger effects on overall labor market wages.

Table 2 reports the results from using the relative minimum wage measure instead of the real minimum wage (a full table with all covariates and additional models is available as a supplement to the online version of this article at http://www.ajph.org as Table C). Results are substantively the same: a higher minimum wage to median hourly wage ratio—that is, having a higher proportion of workers in the state affected by the minimum wage—leads to lower adolescent birth rates three quarters after minimum wage changes. These effects are also consistent with the main results in that the effects are concentrated among non-Hispanic White and Hispanic adolescents.

As a second sensitivity check, I tested the effects of minimum wages on a population of mothers unlikely to be affected by changes in the minimum wage: women aged 30 to 54 years. Because approximately 5% of employed women aged 30 to 54 years are minimum wage workers (author's calculations using Current Population Survey data), presumably there should not be an effect—or as strong of an effect—on the birth rates of this age group. In these models, I included the covariates for the population of adults aged 30 to 54 years using the same data set. Table 3 (a full table with all covariates and additional models is available as a supplement to the online version of this article at http://www.ajph.org as Table D) shows births rates of women aged 30 to 54 years are unaffected by changes in the real minimum wage.

DISCUSSION

Adolescent parenthood is linked to several negative health and economic consequences for mothers and their children and costs the public more than $9 billion because of expenses related to health care, foster care, and foregone tax revenue from adolescent parents.[25] Through fewer adolescent births, higher minimum wages can potentially reduce these costs and improve long-run outcomes for adolescents.

Conclusions

Using state-level changes in the minimum wage and adolescent birth rate data from 2003 to 2014, I estimated the impact of the real minimum wage on adolescent fertility nationwide. The results from my analysis provide evidence that higher minimum wages reduce adolescent birth rates, particularly among non-Hispanic White and Hispanic adolescents. Specifically, a $1 increase in the real minimum wage reduces adolescent birth

TABLE 2—Effect of the Relative Minimum Wage on Adolescent Birth Rates: United States, 2003–2014

	Total		Non-Hispanic White		Non-Hispanic Black		Hispanic	
Variable	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Relative minimum wage, b (SE)	−3.22* (1.29)	−1.50** (0.47)	−1.76 (0.91)	−0.74 (0.38)	0.09 (3.99)	0.42 (1.37)	−7.47 (5.75)	−4.62* (2.02)
R^2	0.966	0.986	0.975	0.986	0.935	0.984	0.886	0.963
Mean of dependent variable	8.82		5.77		14.06		16.61	

Note. The sample size was n = 2142. Adolescent birth rate was the dependent variable. I estimated the models using ordinary least squares: n = (51 states) × (42 quarters) = 2142. The robust SE is clustered at the state level. Model 1 includes state and quarter-year fixed effects, and model 2 adds state-specific quadratic time trends.

*$P < .05$; **$P < .01$.

rates by roughly 2%. In 2014, 249 078 babies were born to adolescent mothers.[26] A 2% reduction implies approximately 5000 fewer infants born to adolescent mothers. To the extent that employment remains stable, increases of more than $1 could prevent even more adolescent births.

Currently, the federal minimum wage is $7.25. Several cities, including San Francisco and Seattle, have a $15.00 minimum wage. The Harkin-Miller minimum wage proposal, proposed in 2012 and 2013, is a federal initiative to increase the federal minimum wage to $10.10. The Congressional Budget Office concluded that the increased wages from this change would greatly outweigh the earnings lost from a slight decline in employment.[27] Thus, increases in the minimum wage of more than $1 are becoming potential policy options.

The Great Recession played a large role in reducing the adolescent fertility rate.[19] As seen in Figure 1, the adolescent birth rate began a steep decline in 2008. Specifically, from 2007 to 2010 adolescent birth rates dropped by 19.4%. Kearney and Levine found that the unemployment rate explains 16% of this decline.[19] During this same period, the real minimum wage increased by about $0.85. The results from Table 1 predict a reduction in adolescent birth rates of 1.7% (0.85×[–0.18/8.82]). The real minimum wage would then explain about 8.8% of the decline in adolescent births rates from 2007 to 2010, which is about half as much as the unemployment rate's explanatory power. Although my results also find the unemployment rate to be a powerful predictor of adolescent fertility, the minimum wage has a robust effect on adolescent birth rates independent of the unemployment rate.

This study also adds to the bigger picture of the health effects of minimum wage policies. Because the intention of the minimum wage was to create a minimum standard of living to protect the health and well-being of workers, as Leigh notes in his August 2016 *AJPH* editorial, the lack of research on the health effects of the minimum wage is surprising.[28] Albeit sparse, research presents consistent findings of improved health effects from minimum wage increases. For example, increases in the minimum wage are associated with decreases in body mass index,[29] lower levels of unmet medical needs,[30] reduced risk of child maltreatment,[10] improvements in birth outcomes,[31,32] and decreases in premature mortality.[33] This study adds to this emerging literature by showing decreased adolescent fertility in response to minimum wage raises.

Although I used state-level aggregate data rather than individual or household level data, the quasiexperimental approach I used provides a plausible causal interpretation of the effect of minimum wages on adolescent fertility. Using quarterly rather than annual measures of minimum wages and fertility better captures precision in the timing of fertility changes. This is important for 2 reasons. First, minimum wage policy changes often go into effect in July or October, which would introduce noise in an annual measurement of a state's minimum wage. Second, quarter-year fixed effects better account for the seasonal variation in adolescent fertility.

TABLE 3—Effect of Real Minimum Wage on Birth Rates of Women Aged 30–54 Years: United States, 2003–2014

Variable	Model 1, Total	Model 2, Total
Real minimum wage in 2014 dollars, b (SE)	−0.02 (0.02)	−0.02 (0.02)
R^2	0.972	0.980
Mean of dependent variable	7.40	

Note. The sample size was n = 2142. Birth rate of women aged 30–54 years was the dependent variable. I estimated the models using ordinary least squares: n = (51 states) × (42 quarters) = 2142. The robust SE is clustered at the state level. Model 1 includes state and quarter-year fixed effects, and model 2 adds state-specific quadratic time trends.

*$P < .05$; **$P < .01$.

Public Health Implications

The minimum wage continues to be one of the most contentious political debates, and nearly all arguments surround employment and poverty effects. My results suggest that more attention should be paid to public health outcomes. Because infants of adolescent mothers generally have worse birth outcomes than do children of older mothers, minimum wages may also affect infant health. Indeed, previous research indicates that following minimum wage bumps, infant health, including birth weight, gestational age, and postneonatal mortality, is improved.[31,32] Although the authors of these studies attribute

some of the improvements to increased wages and better maternal care during pregnancy, changes in maternal demographics may be another mechanism through which minimum wages affect infant health.

Low income is linked to many adverse health outcomes, and the early life environment has lasting health impacts.[34] This study adds to a developing literature evaluating the effects of income-support policies on health behaviors and outcomes. The minimum wage and other antipoverty policies may have longer-term health gains not explored in this analysis. AJPH

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HUMAN PARTICIPANT PROTECTION

Human participant protection was not required for this study because no human participants were involved.

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