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Declines in Crime and Teen Childbearing: Identifying Potential Explanations for Contemporaneous Trends

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Abstract

Objectives—The previous 25 years have witnessed remarkable upheavals in the social landscape of the United States. Two of the most notable trends have been dramatic declines in levels of crime as well as teen childbearing. Much remains unknown about the underlying conditions that might be driving these changes. More importantly, we do not know if the same distal factors that are responsible for the drop in the crime rate are similarly implicated in falling rates of teen births. We examine four overarching potential explanations: fluctuations in economic opportunity, shifting population demographics, differences in state-level policies, and changes in expectations regarding health and mortality.

Methods—We combine state-specific data from existing secondary sources and model trajectories of violent crime, homicides, robberies, and teen fertility over a 20-year period from 1990 to 2010 using simultaneous fixed-effects regression models.

Results—We find that 4 of the 21 predictors examined - growth in the service sector of the labor market, increasing racial diversity especially among Hispanics, escalating levels of migration, and the expansion of family planning services to low-income women – offer the most convincing explanations for why rates of violent crime and teen births have been steadily decreasing over time. Moreover, we are able to account for almost a quarter of the joint declines in violent crime and teen births.

Conclusions—Our conclusions underscore the far reaching effects that aggregate level demographic conditions and policies are likely to have on important social trends that might, at first glance, seem unrelated. Furthermore, the effects of policy efforts designed to target outcomes in one area are likely to spill over into other domains.

1. INTRODUCTION

The previous 25 years have witnessed a number of remarkable changes in the social and demographic landscape of the United States. Two of the most notable have been dramatic declines in levels of crime as well as teen childbearing. Both rates of violent crime and births to women aged 15–19 decreased from 758 per 100,000 and 38 per 1,000 in 1991, respectively, to 404 per 100,000 and 25 per 1,000 in 2010, respectively (Martin et al. 2015; United States Department of Justice, Federal Bureau of Investigation 2011; United States Department of Justice, Federal Bureau of Investigation 2012). These declines represented a substantial shift in the long-term pattern of increase beginning in the 1960s and '70s for crime and the 1950s and '60s for teen childbearing followed by consistently high levels during the 1980s.

Although much attention has been paid to macro-level changes in crime and teen childbearing in both the popular press and scholarly literatures, the apparent co-occurrence of these declines has been relatively neglected in the extant studies. Much remains unknown about the underlying social conditions that are driving the decline of both demographic trends (Baumer and Wolff 2014a; Lauritsen and Heimer 2010; McCall et al. 2010; Santelli and Melnikas 2010). And perhaps more importantly, we do not know if the same distal factors that are responsible for the drop in the crime rate are similarly implicated in falling rates of teen births. This paper represents a concerted effort to gain a more nuanced understanding of why, in the United States, the 1990s and 2000s witnessed not one, but two, unexpected and unprecedented declines in key demographic indicators that are typically used to assess the overall health and wellbeing of a society.

2. APPROACHES TO UNDERSTANDING THE DECLINE IN TEEN CHILDBEARING

Empirical efforts designed to examine the sizeable declines in teen births during the 1990s and 2000s focus on either proximate or distal determinants, with the former often relying on macro-level data and the latter shedding light on micro-level processes (Santelli and Melnikas 2010). Proximate mechanisms shown to influence teen childbearing fall into three categories: frequency or initiation of sexual activity, contraceptive utilization, and abortion availability. Prior research has revealed that abortion rates among teens dropped precipitously during the period of time during which teen childbearing was also declining (Kost and Henshaw 2012); thus, increased reliance on abortion is an unlikely explanation for falling teen birth rates. However, changes in frequency of sexual contact as well as contraceptive utilization during the 1990s and 2000s points to more plausible proximate pathways through which teen childbearing declined. The proportion of sexually active teens witnessed sizeable declines from 37.9% in 1995 to 30.6% in 2006–2010 (Abma & Sonnenstein 2001; Kearney & Levine 2015; Martinez et al. 2011;) and the percentage of sexually active teens who report using contraception at last intercourse increased from 70.7% in 1995 to 85.6% in 2006–2010 (Abma & Sonnenstein 2001; Kearney & Levine 2015; Martinez et al. 2011;).

Although identifying the proximate mechanisms through which teens have been able to avoid childbearing is critical, these more immediate determinants do not reflect the broader social and economic context in which teen childbearing occurs. To contextualize recent declines in the teen birth rate during the 1990s and 2000s from a more macro-level perspective, prior research has identified three possible distal determinants – economic opportunity, demographic composition, and state-level policies (Kearney & Levine 2015; Moore et al. 2014).

Findings from this literature have been mixed but a few cautious conclusions can be drawn. First, of these three distal determinants, shifts in state-level policies seem to account for the greatest proportion of recent declines in teen childbearing. Policies designed to increase access to family planning services, improve access to and funding for high quality education, and restrict welfare benefits and accessibility appear to be most strongly associated with falling rates of teen births, while policies tailored to restrict access to comprehensive sex education or abortion services do not appear to explain much, if any, of recent declines in teen childbearing (Beltz et al. 2015; Kearney & Levine 2015). Second, the association between economic opportunities and teen childbearing remains unclear and depends on the type of measure used as well as the specific population under study. Increasing levels of employment provide families with more financial resources and a more hospitable socioeconomic climate in which to have children (Becker 1960; Becker & Lewis 1973); however, a tighter labor market, especially among women, increases the opportunity costs associated with childbearing and could result in postponing births or forgoing them altogether (Butz & Ward 1980; Heckman & Walker 1990).

3. APPROACHES TO UNDERSTANDING THE DECLINE IN CRIME

The crime decline in the US has been the subject of extensive debate, investigation, and controversy. Although the trend became apparent in the late 1990s, spurring considerable interest, consensus on the factors responsible for the remarkable drop in crime remains elusive. We briefly review the data on crime trends with respect to timing and geography and then turn to the extant hypotheses and findings on the factors that may account for crime rate trends.

Crime in the US dropped precipitously from the early 1990s through the 2000s. After a period of volatility during the 1980s, rates of homicide, robbery, and motor vehicle theft exhibited substantial declines beginning in the early 1990s (Baumer and Wolff 2014a). These patterns appear to hold for both Uniform Crime Report (UCR) and National Crime Victimization Survey data and exhibit little variation when disaggregated by gender and race/ethnicity (Lauritsen and Heimer 2010). Given the salience of violent crime as captured by the homicide rate, the typical estimate of the crime decline's initiation has focused on the early 1990s. The pattern of crime decline appears to vary by crime type, however. For instance, rates of intimate partner homicide, rape, burglary, and theft began declining in the early 1980s, substantially earlier than homicide and robbery rates (Baumer and Wolff 2014b).

Estimates of the timing of the crime decline also vary geographically, with some US cities exhibiting earlier start times (e.g., New York City) than others (Fagan et al. 1998; Messner et al. 2005). However, the data indicate that, irrespective of timing, the crime decline was a remarkably general phenomenon from the standpoint of geography. Crime declines occurred in the vast majority of US cities. Moreover, mounting evidence of crime decline across a number of countries in addition to the US during roughly comparable periods indicates that the decline was not specific to the US context and may have been influenced by globally relevant changes. Few studies, however, have investigated the consistency of the crime decline at lower levels of aggregation, such as the neighborhood. Studies of specific sites have found evidence of variability in crime declines across tracts (e.g., Chicago [Kirk and Papachristos 2011]). The availability of longitudinal data at the neighborhood (e.g., census tract) level is limited, precluding analysis of national trends in neighborhood level crime rates.

Explanations for the crime decline have focused on a host of factors. Baumer and Wolff (2014a) classify explanations into three categories: those that focus on 1) changes in the propensity to offend, 2) changes in the prevalence of motivated offenders or constraints on 5 potential offenders, and 3) changes in the prevalence of situations or settings (physical or social) that facilitate or impede crime. Propensity arguments focus on cohort-based conditions that may have resulted in decreases in predispositions to offend among youth and young adults during the period of the crime decline. These include regulatory changes leading to reduced exposure to lead toxicity (e.g., limitations on lead emissions in gasoline; Nevin 2007), the timing of abortion legalization in the early 1970s, and changes in parenting practices potentially resulting in enhanced emphasis on self-control among youth (Eisner 2008). Although propensity arguments might account for both crime and teen childbearing declines, extant research has not offered evidence of substantial change in self-control levels during the period of the decline (Cook and Laub 2002).

With respect to changes in situations and settings, the decline of drug markets – particularly for crack cocaine – in the 1990s has been hypothesized to contribute to reductions in violent crime (Levitt 2004). More generally, changes in routine activities such as a retreat to the private sphere (resulting in enhanced guardianship of the home) and enhanced security practices (target hardening) may have influenced declines in some crimes (Cook and MacDonald 2011). Yet, these explanations are difficult to extend to the case of teen childbearing, suggesting that they may have little utility as explanations for shared patterns of decline in teen childbirth and crime.

Baumer and Wolff's second category of explanations – changes in motivation and constraint – encompasses a number of period-based economic and demographic influences that may be more plausibly extended to understanding teen childbearing patterns as well. These include improved subjective economic conditions (Rosenfeld 2009; Rosenfeld and Fornango 2007), changes in patterns of migration and immigration (Sampson 2008), the implementation of and effects of state-level policies (Levitt 2004; Lin 2009), and fluctuations in mortality rates during the relevant period (Masters et al. 2014). We next turn to an extended discussion of these potential mechanisms.

4. POTENTIAL JOINT EXPLANATIONS FOR RECENT TRENDS IN CRIME & TEEN CHILDBEARING

Given that the overarching objective of this paper is to identify social and economic forces that were *jointly* influencing recent declines in crime and teen childbearing in the 1990s and 2000s and there is little overlap among proximate determinants that are understood to shape whether and how quickly both outcomes fell, we focus on four potential distal explanations that are relevant to the time period under study. These include changes in economic opportunity; demographic shifts in population composition; state-level policy initiatives; and expectations concerning health and wellbeing. We discuss each of these potential explanations below.

4.1 Changes in Economic Opportunity

The period from 1990 to 2010, which is when rates of crime and teen births were declining most precipitously, was a time best characterized as one of economic booms and busts. The business cycle, in a temporal sense, was changing quite rapidly. However, during much of this period, the U.S. economy was expanding. The unemployment rate fell from a high of 6.82 in 1992 to a low of 4.3 in 2007 (Bureau of Labor Statistics 2015). The recession that occurred during the early 1990s was over by mid-decade when rates of crime and teen births began their decent. Although there was an economic contraction following September 11, 2001, it was relatively short-lived and followed by a period of sustained economic growth, largely driven by the expansion of the housing market. The last three years of the time period under study (2008–2010) witnessed the beginning of the Great Recession and is the only segment which was characterized by both a dramatic downturn in the economy as well as continued declines in both crime and teen childbearing. One explanation for why these aggregate trends might still be continuing unabated during a time of severe economic contraction might be that individual behavior has not yet caught up with macro-level conditions. This remains an empirical question and can be tested as more data becomes available.

Although crime has been shown to decrease during periods of economic expansion (Rosenfeld and Fornango 2007; Zimring 2007), the link between shifts in the labor market and early fertility time remains a bit more complex. Typically, fertility is thought to be procyclical whereby birth rates increase during times of economic growth (Jones and Schoonbroodt 2010). However, there is some debate as to whether or not teen fertility follows this same overarching pattern. Notably, Colen et al. (2006) find that during the 1990s, older African American teens between the ages of 18 and 19 exhibited countercyclical fertility, or fewer births, during periods of economic expansion. Since most studies do not differentiate between younger or older teens in addition to racial/ethnic background, it remains unclear whether this pattern of countercyclical fertility is specific to older African American teens or is indicative of a more pronounced shift in the association between economic growth and teen childbearing.

Another important aspect to consider with respect to how economic opportunity might jointly influence crime and teen childbearing concerns the role of female employment,

which has been increasing steadily over time (Blau & Kahn 2005; Goldin 2006). Women's increased labor market participation is thought to produce two effects on subsequent fertility, the balance of which is difficult to determine (Dehejia & Lleras-Muney 2004). First, expanding job market opportunities for women, similar to those for men, may increase the amount of socioeconomic resources available to a given family, thus encouraging higher rates of fertility at the aggregate level. Alternatively, increased female labor market participation is likely to raise the opportunity costs associated with childbearing for women due to foregone or suppressed wages, thus leading to lower rates of fertility. With respect to crime, expansions in employment opportunities are generally associated with lower aggregate crime rates (Freeman 1999; Lochner 2004; Raphael & Winter-Ebmer 2001). Rarely, however, is the effect of female labor market attachment on crime assessed since crime is thought to be primarily a male event. Increases in female employment might lead to higher rates of crime if (a) wages were suppressed enough to offset the positive effects of labor force participation and (b) women's labor market participation resulted in lower levels of social control, either at the neighborhood or family level (Browning et al. 2005; Leavitt 2004).

In order to identify potential distal determinants that can explain the simultaneous decline in crime and teen childbearing, we consider other aspects of the economic landscape that were changing rapidly during the 1990s and 2000s. While earlier decades witnessed the loss of high paying, unionized blue collar employment which was especially important to working-class men, by the turn of the century, it became clear that these jobs were not coming back (Holzer et al. 2011). Subsequently, individuals, particularly those in low-income communities where rates of crime and teen childbearing are highest, had two work-related options. Seek employment in the ever-expanding service sector which was dominated by nonunion positions that required little skill or training or attend college – at least for a year or two.

A lack of unionized representation in the workplace, an increasingly mechanized work environment, and a lack of opportunity for advancement meant that workers could be easily replaced or not hired in the first place if they posed any sort of risk to the employer. This could include missing work due to dealing with competing demands of raising young children or having a criminal record, even one obtained as a result of nonviolent property crimes. Moreover, during this time period, employers had an increased ability to conduct background checks on workers due to improvements in electronic record keeping systems at places of employment and government agencies. Thus, the negative consequences of engaging in either criminal behavior or teen childbearing on labor market outcomes were likely to have increased during the 30-year period under study.

Another aspect of economic opportunity that might have led to lower rates of crime and teen childbearing is increasing educational attainment among women (DiPrete & Buchmann 2013). The percentage of women who graduated from college increased from 21% in 1990 to 30 in 2010 (Snyder and Dillow 2015). Moreover, since the early 1990s, educational attainment has become a more important predictor of socioeconomic status as only the college-educated have seen their wages rise while individuals without a college degree have witnessed stagnant or falling wages (Autor et al. 2006). This is especially true for women

and racial/ethnic minorities who are at increased risk of encountering discriminatory practices in hiring and occupational advancement (Pager and Shepherd 2008). In a rapidly globalizing economy that was being dominated by service sector employment at one extreme and highly skilled white-collar jobs at the other, a college education is necessary, although not sufficient, to achieve social and economic security.

Increased educational attainment has been shown to be negatively associated with both crime and teen childbearing, at both the individual and aggregate levels (Campbell et al. 2014; Lochner and Moretti 2004). Not only do gains in education improve opportunities for employment with higher wages, opportunities for advancement, and upward mobility – all circumstances characteristics that are likely to drive down the crime rate, they also increase the opportunity costs of engaging in criminal activity or having a teen birth.

What remains less clear is what happens to these aggregate trends when school completion becomes more pronounced among women compared to men, as is now the case (DiPrete and Buchmann 2013). Increased educational attainment for women, who are often primary breadwinners in low-income families, is likely to drive down rates of teen childbearing and participation in criminal activity due to improved access to socioeconomic resources. However, if men and women are directly competing for jobs, as is more likely in an economy dominated by employment in the service sector, improved educational outcomes among women relative to men might inadvertently and eventually result in higher levels of crime among working-class men who have already been economically marginalized by the loss of relatively high paying, unionized, manufacturing jobs. Furthermore, women's educational attainment coupled with steadily increasing rates of women's labor force participation could result in less familial and societal oversight of children's and adolescents' risk taking behaviors, which has been linked to earlier engagement in sexual and criminal activity (Browning et al. 2005).

4.2 Demographic Shifts Altering Population Composition

The 1990s and 2000s witnessed distinct demographic changes, some of which transformed the population of the United States in ways that represented reversals of previous trends. For the purpose of gaining a deeper understanding of why both rates of crime and teen births decline precipitously during this time period, we will focus on three shifts in population characteristics, all of which served to relocate certain subpopulations to different regions of the country as well as reduce concentrated disadvantage and minority population concentration in central cities. These include migration of African Americans from the Rustbelt to the Sunbelt, gentrification of inner cities and expanding minority populations in the suburbs, and increased rates of international immigration, especially from countries in Central and South America as well as East and South Asia. We discuss these in detail below.

Beginning in the 1980s but gaining momentum in the 1990s and subsequent decades, Americans moved from the Rustbelt cities of the Northeast and Midwest to the Sunbelt cities of the South and West. This was especially true of African Americans and represented a reversal of population flows that began with the Great Migration (Frey 2004; Frey et al. 2005). During the post-World War II period, African Americans began to leave the South, particularly rural areas, and move to Northeastern and Midwestern cities, both to escape the

overly oppressive social constraints of Jim Crow and to obtain work in the expanding manufacturing economy (Tolnay 2003). This interstate migration, coupled with the flight of white families from central cities to surrounding suburbs in the late 1960s and 1970s, resulted in the creation of large swathes of cities, especially those located in the Rustbelt, that were characterized by concentrated poverty, political and economic divestment, and a sizeable African American population. These are also sociodemographic condition in which high rates of crime and teen childbearing tend to occur (Peterson and Krivo 2010). However, during the 1980s and 1990s, African Americans, largely in response to economic stagnation, particularly in the manufacturing sector, began a period of reverse migration back to the Southeast, but also to the West, that continues today (Hunt et al. 2008; Sharp and Iceland 2013).

In addition to the outmigration of African Americans from central cities, particularly in the Northeast and Midwest, recent decades have also witnessed increased gentrification in these same communities. Young, primarily White, urban professionals have begun to flock to inner city neighborhoods in places as diverse as Boston, Chicago, Washington DC, New York City, and Los Angeles (Freeman 2006; Pattillo 2007), bringing their lifestyles, tastes, and preferences with them and changing the demographic landscapes of the areas in which they settle. These area-based population fluctuations are the result of migration that occurs both within a state but also across state lines. Gentrification often leads to the displacement of long-term residents, an influx of social and economic capital into a neighborhood once dominated by divestment and blight, and increasing political power and influence. All of these macro-level changes have been shown to drive down both rates of crime and teen childbearing (Papachristos et al. 2011).

The final demographic shift that could be driving, at least in part, rapidly falling levels of crime and teen childbearing is the rapid growth of the immigrant population. First, the absolute and relative numbers of immigrants within the United States have increased dramatically over the course of the previous two decades from 19.8 million or 8% in 1990 to 40 million or 13% in 2010 (Migration Policy Institute 2015). A large proportion of these international migrants hail from countries in Central and South America as well as East and South Asia (Waters et al. 2007). Second, the geographic distribution of immigrants is becoming more dispersed as receiving destinations diversify from traditional gateways to new destinations, especially in the South and Midwest (McConnell 2008). This diversification has also occurred on a subregional basis as immigrants, especially Hispanics, have begun to flock to small and medium sized cities (Massey 2008) as well as to suburban and even rural areas (Crowley et al. 2015).

Foreign-born residents, on average, exhibit lower violent crime rates than the native-born, particularly during the peak ages for criminal activity (Sampson et al. 2005; Sampson 2008; Stowell et al. 2009). In addition, large immigrant populations also contribute to lower crime rates by helping to foster informal social control efforts and revitalizing local economies in the neighborhoods in which they settle (Martinez et al. 2010; Martinez and Valenzuela 2006).

The link between immigration and teen childbearing is likely to be more convoluted as the patterning of childbearing among Asians and Asian-Americans is similar to that of native-born Whites while overall levels of fertility tend to be higher and fertility timing tends to be earlier among Hispanics than native-born Whites (Martin et al. 2015). Persistent high fertility among women born to Hispanic migrants, even in the face of increasing socioeconomic attainment and English language utilization, has been taken as evidence of segmented assimilation (Haller et al. 2011; Lichter et al. 2012). However, others note that rates of fertility between Hispanics and nonHispanic Whites are converging over time and elevated fertility among Hispanics is likely a methodological artifact of relying on period measures to capture cohort differences over time (Parrado 2011; Parrado and Morgan 2008).

In sum, we expect these recent demographic shifts to result in more racial/ethnic diversity, expanded immigrant populations, increasing levels of urbanicity, particularly in Sunbelt states of the Southeast and Southwest, and lower levels of concentrated poverty, especially in rustbelt states of the Northeast and Midwest. These provide potential explanations for the drastic declines in crime and teen childbearing that occurred during the 1990s and 2000s that go beyond typical economic opportunity arguments and highlight the role of changing population characteristics.

4.3 Impacts and Effects of State-level Policy Changes

Much of the prior literature that has examined potential explanations for declines in either crime or teen childbearing focuses on the role that state-level policy initiatives play in shaping the social, economic, and political milieu in which these macro-level trends emerge. State-level policies are important to consider since they can affect the behavior of large numbers of individuals in a relatively short period of time and often have unintended consequences. We have selected a number of state-level policies to examine in the current study based on our reading of previous research, which considered each outcome independently, as well as our own judgments concerning the policies that are most likely to simultaneously impact crime and teen childbearing, thus offering potential joint explanations for recent declines in both macro-level social indicators. These include state-level policies regarding policing and sentencing, abortion availability, welfare reform, access to family planning services. We briefly consider how state-specific policy initiatives might influence levels of teen childbearing and crime below.

One of the most pronounced findings from recent research is that policies designed to increase access to family planning services, most notably among women living in or near poverty (Yang & Gaydos 2010), are associated with lower levels of teen childbearing (Beltz et al. 2015; Moore et al. 2014). This has primarily been accomplished by using waivers to expanding Medicaid coverage to include family planning services (Kearney & Levine 2015). Different types of waivers exist. Some expand coverage to women whose benefits ran out due to time limits while others expand coverage to women whose incomes are too high to qualify for Medicaid but below a standard federal poverty threshold. However, prior studies suggest that compared to duration-based waivers, income-based waivers are more strongly associated with fluctuations in the teen birth rate (Kearney & Levine 2009; 2015).

A small but growing body of literature examines the association between state-level policies regarding the provision and scope of public assistance benefits. Many of these studies specifically seek to determine the extent to which changes ushered in during the era of welfare reform (PWORA was passed in 1996) are associated with subsequent declines in teen childbearing. Findings from these research efforts are decidedly mixed (Beltz et al. 2015), with some investigators reporting lower teen birth rates in states with stricter rules regarding TANF provision to minors unless they reside with a parent, guardian, or other adult relative (Lopoo & Deliere 2006), while others find little evidence that the early implementation of TANF or utilization of family cap restrictions occurred in states that witnessed the most pronounced declines in teen childbearing (Kearney & Levine 2015).

Also pertinent to a discussion of potential joint explanations for recent declines in crime and teen childbearing are state-level policies that limit women's access to abortion services. Although abortion became legalized at the federal level following the *Roe vs. Wade* supreme court decision in 1973, renewed efforts to reduce the number of abortions performed in the U.S., which gained traction during the early 1990s and continue unabated today, are primarily being enacted at the state level. These can include stricter parental notification laws, the enactment of mandatory delay periods, and restrictions on Medicaid funding for abortion services. Taken as a whole, there is little empirical evidence to suggest that state-level abortion restrictions are associated with either significantly higher or lower rates of teen childbearing (Kearney & Levine 2015; Levine 2004). However, there is suggestive evidence that these policies, especially parental involvement notification laws, might partially account for declining rates of teen births among certain demographic subgroups, specifically White women (Guldi 2008; Joyce 2006).

With respect to explaining falling rates of violent crime, abortion availability has been invoked in a slightly different manner with some investigators claiming that the legalization of abortion in the early 1970s can be linked to subsequent declines in violent crime during the 1990s and 2000s. This was thought to have occurred primarily through reductions in unwanted births (Donohue & Levitt 2001). However, the validity of these findings have been widely challenged by those who have shown that the association between abortion legalization and the drop in crime is driven primarily by unmeasured period effects, most notably the crack-cocaine epidemic (Joyce 2004).

Increases in the size of local police forces and rising rates of incarceration are also cited as potential explanations for the recent decline in violent crime (Levitt 2004). In addition to intensified supervision and surveillance, more police officers deter criminals from committing offenses, including those that may result in violence (Levitt 2004; Lin 2009; Marvell and Moody 1996). Longer sentence lengths and the subsequent growth of the prison population is thought to not only deter potential criminals, it also incapacitates would-be offenders and prevents them from committing violent crime (Levitt 2004). On the other hand, scholars suggest that the deterrent effects of police strength and incarceration are overstated and punitive state policies may, in fact, be associated with higher levels of violence. For example, recent research suggests that police practices, not the size of police force, are associated with lower violent crime rates (Weisburd and Eck 2004). Large police forces that are perceived as abusive or non-responsive cannot engender the trust of local

communities and may be unable to prevent violence in particularly high crime areas (Kirk and Matsuda 2011). Additionally, although imprisonment removes potential offenders, it can hamper efforts at informal social control by removing breadwinners from the community and disrupting families and social networks (Clear 2007).

4.4 Expectations Regarding Health & Wellbeing

The link between expectations regarding life chances and individual behavior has been argued as a potential explanation for both teen childbearing and participation in criminal activity (Duncan et al. 1998; Sampson and Laub 2005; Wilson and Daly 1997; Young 2006). It is thought that young men and women who view their futures as ones containing the possibility of achievement, success, and reward for hard work will be less likely to engage in risk taking behaviors since the consequences of their actions can derail lifecourse trajectories concerning educational attainment, occupational achievement, and family formation. One such aspect of life chances that might be particularly pertinent to the current study concerns how societal expectations regarding health and wellbeing, specifically life expectancy, might account for the simultaneous declines in teen childbearing and crime that occurred during the 1990s and 2000s.

Although connections between mortality and fertility have long been studied by demographers, the effect of accelerated mortality schedules on fertility timing, particularly teen childbearing, has been made explicit by Geronimus' weathering hypothesis, which posits that low-income, African American women experience accelerated aging as a result of social, economic, and political exclusion (Geronimus 2001). A wide range of studies, many of which were conducted using aggregate data, provides empirical support for this lifecourse approach to understanding the negative health effects of exposure to macro-level social and economic hardship (Love et al. 2010; Osypuk & Acevedo-Garcia 2008; Rich-Edwards et al. 2003; Walsemann et al. 2008). The weathering hypothesis has been further substantiated by more recent research that examines the biological pathways involved in accelerated aging such as inflammatory markers (Geronimus et al. 2006) and telomere shortening (Geronimus et al. 2010), which more specifically delineates the linkages between macro- and micro-level health insults and their cumulative impacts on wellbeing.

Of particular interest to the current study, a correlate of the weathering hypothesis suggests that teen childbearing might be more common in low-status communities as a response to high rates of disease, disability, and death. This is borne out by research that has consistently found significant associations between macro-level health indicators, including mortality, and age at first birth (Geronimus et al. 1999; Harding 2003; Kearney & Levine 2012). We argue that these mortality measures, at least in part, reflect expectations regarding life changes *operating on a societal level*. This approach is different from those typically advanced by economists in which individuals are thought to directly weight the costs and benefits of engaging in a particular behavior (Becker 1993). Instead, we view the relationship between life chances, as they are shaped by mortality profiles, and subsequent outcomes as one that is communicated through nuanced social influences concerning acceptable behavior among highly constrained choices. For example, in high-poverty communities where steady employment, college attendance, and upward mobility are rare

and require a great deal of sacrifice across an entire social network that is already strapped for cash, teen childbearing does not bring with it the same negative consequences, for both mother and child, as it might when it (rarely) occurs to young women with more advantageous socioeconomic profiles (Furstenberg 2007). Similarly, in high poverty communities, where Black men without a high school diploma face a 60% lifetime chance of being incarcerated (Pettit & Western 2004) and relatively few job prospects, participating in criminal activity might come with a starkly different set of tradeoffs than those faced by middleclass youth.

The final decade of the 20th century and the first decade of the 21st century witnessed rapid fluctuations in all-cause and cause-specific mortality, particularly among certain subgroups. For example, following the introduction of highly active anti-retroviral therapy (HAART) in 1994, death rates due to HIV/AIDS declined precipitously (Crum et al. 2006; Rubin et al. 2010) as did mortality attributable to homicide following the peak of the crack/cocaine epidemic in the late 1980s and early 1990s (Harper et al. 2012). These changes were particularly pronounced across several high-poverty, inner city neighborhoods in which rates of violent crime and teen childbearing are likely to be more common and, in part, contributed to slight decreases in Black/White disparities in mortality (Geronimus et al. 2010; Harper et al. 2007; Harper et al. 2014). However, these positive gains in life expectancy were offset by a remarkably distinct trend in which life expectancy among middle-age, working-class Whites actually decreased over the time period (Case and Deaton 2015; Montez et al. 2011). We would expect reductions in HIV/AIDS and homicide mortality to be positively associated with reductions in teen childbearing and violent crime as expectations regarding health and wellbeing improved. Given the recent finding concerning increases in mortality among working-class Whites of middle age, however, this strength of this relationship might be attenuated.

To determine the extent to which the macro-level social conditions discussed, in detail, above influenced recent declines in both crime and teen childbearing in the United States, we combine state-specific data from various sources and model these changes over a 20-year period from 1990 to 2010 using simultaneous fixed-effects regression models. To our knowledge, this is the first empirical effort specifically designed to identify if distal determinants driving decreases in crime are similar to those responsible for declines in teen childbearing. We describe the sources from which our data have been obtained and the analytical strategy employed to generate our results below.

5. DATA AND METHODS

5.1 Description of the Data

Since no existing dataset contains information regarding the possible predictors identified above, we compiled extant information from a number of state and federal sources. We used state- and year-specific violent crime rates, calculated per 100,000 of the population, to capture the extent to which levels of crime fluctuated between 1990 and 2010. These were obtained from Uniform Crime Reports (UCR). UCR Part 1 violent crimes combine information on murders, aggravated assaults, forcible rapes, and robberies known to the police. Similarly, we captured macro-level changes in teen childbearing by calculating state-

and year-specific birth rates for women aged 15 to 19, which were also expressed per 100,000 of the population. This measure was calculated using birth certificate data from the National Center for Health Statistics for the denominator as well as population counts (for decennial census years) and population estimates (for intercensal years) from the U.S. Census Bureau. The decision to exclude births to teens below the age of 15 was made since these are rare occurrences, represent outcomes among a select population, and are more likely to be the result of extreme risk taking or sexual assault.

Although total violent crime rates do not provide an exact comparison to age-specific birth rates since they include crimes committed by individuals over the age of 19, the decision to employ overall as opposed to age-specific crime rates was made, a priori, due to a number of important considerations. First and foremost, rates of violent and criminal activity are highest among individuals between the ages of 15–24 and individual criminal activity peaks during late adolescence and early adulthood (BJS 2014; Hirschi and Gottfredson 1983). This relationship has remained consistent over time, as changes in nationwide homicide rates are highly correlated with changes in the national age structure, with declines in violent crime following declines in the percentage of the population under the age of 24 (Fox and Piquero 2003). Furthermore, while age-specific homicide rates are available at the state-level, age-specific rates of robbery, aggravated assault, and forcible rape are more difficult to obtain and are much less reliable. Second, the fathers of children born to teen mothers are often older (in their early to mid 20s) than their romantic partners (Ilo et al. 1999; Klein 2005; Lindberg et al. 1997). Some studies estimate that approximately two-thirds of adolescent births occur to post-school aged fathers (Males and Chew 1996). Thus, it is likely that by comparing overall rates of violent crimes to teen births, we will be examining social phenomena that are occurring to similarly aged populations. Finally, since this is, to our knowledge, the first study to examine potential simultaneous explanations for recent declines in crime and teen childbearing, we did not want to unduly limit our outcomes to overly restrictive age-ranges (ie. 15–17 year-olds vs. 18–19 year-olds) or specific types of criminal activity (ie. homicides, robberies, or assaults). Instead, we leave these more fine-grained distinctions to future research efforts.

We employed a number of state- and year-specific indicators to capture macro-level social and economic conditions identified as potential explanations for simultaneous declines in crime and teen childbearing witnessed during the 1990s and 2000s. The first group of independent variables was selected to reflect changes in economic opportunities for each state i during each year t over the 20-year time period of interest. We capture overall fluctuations in the business cycle and increasing levels of women's employment using the male unemployment rate and the female labor force participation rate, respectively, both of which were obtained from the Bureau of Labor Statistics (BLS) local area unemployment statistics (LAUS) data. To measure the shift from a manufacturing economy to a service based economy, we calculate the proportion of nonfarm workers employed in the service sector. We conducted sensitivity analyses using an absolute as opposed to a relative measure of this variable (the number of nonfarm workers employed in service sector jobs) and found our results remained consistent across indicator specification. We selected the relative version of this predictor for ease of interpretability. Finally, we assess increases in women's educational attainment using female college graduation rates which enumerate the

percentage of female high school graduates with a college degree. These three remaining indicators were obtained from the March release of the Current Population Survey (CPS), which contains data collected on an annual basis and reflects the experiences of a random sample of noninstitutionalized adults in the U.S.

To assess demographic changes to population characteristics that resulted in rising levels of urbanization, reductions in concentrated poverty, expanded racial/ethnic diversity, and increased migration, we incorporated a number of state- and year-specific indicators. They are as follows: percentage of the population living in urban areas (ie. metropolitan statistical areas or MSAs); percentage of families below the federal poverty threshold; percentage of the population that is NonHispanic White, NonHispanic Black, or Hispanic; and percentage of the population that is foreign born. Data used to determine urbanicity and immigrant status¹ was obtained from the March release of the Current Population Survey (CPS). All other demographic variables were calculated using population counts for 1990, 2000, and 2010 as well as population estimates for intercensal years, both of which are available from the U.S. Census Bureau.

We incorporate eight different variables to capture either the implementation or the impact of changes to state-level policies enacted during the 1990s and/or 2000s that might have influenced the simultaneous declines in teen childbearing and crime witnessed during these two decades. To measure the combined effect of increased policing efforts and trends toward more severe sentencing, we relied on the incarceration rate. Using data from the Bureau of Justice Statistics we calculate the number of prisoners under state jurisdiction per 100,000 of the population. We employ three distinct indicators to assess the availability of abortion services. These reflect whether or not there are mandatory waiting periods, Medicaid funding restrictions, or parental notification laws in a given state and year. The potential influence of changes stemming from welfare reform is also measured via three indicators: whether or not the state implemented a waiver prior to the passage of PWORA, whether or not they relied on family caps to limit welfare benefits, and the average TANF benefit for a family of three, which was adjusted for inflation using the CPI-U index and presented in 2010 dollars.

We determine expectations regarding health and wellbeing, particularly those stemming from population-based disparities in life expectancy, using male and female rates of all-cause mortality. All rates are calculated by dividing the total number of deaths to residents of state i in year t by the state- and year-specific male or female population and are expressed as per 100,000 of the population. Although cause-specific death rates would have allowed us to estimate how declines in mortality from certain diseases or sources, such as HIV/AIDS, homicide or suicide, drug overdose, or lung cancer, were associated with falling rates of crime and teen childbearing, we were unable to do so because of small sample sizes in certain state- and year-specific cells.

¹Because CPS data for the foreign-born population is not available before 1994, we use U.S. Census estimates for 1990 and interpolate the values for 1991–1993.

5.2 Analytic Approach

We rely on standard econometric panel data methods that can exploit the variation across both states and years to identify macro-level social and economic conditions that are significantly associated with subsequent declines in teen childbearing and violent crime. We fit a series of ordinary least squares (OLS) regressions in which the dependent variables, state- and year-specific rates of teen births and violent crimes, are jointly estimated using Zellner's seemingly unrelated regression equations (SUR) (Wooldridge 2010; Zellner 1962). Seemingly unrelated regression allows for multiple models to be estimated concurrently by generating contemporaneous cross-equation correlations in the error terms. Thus, it enables us to estimate the proportion of the shared variance between the two outcomes of interest that can be jointly explained by specific subsets of independent variables, which is a primary objective of this study. This analytic approach is particularly useful when there is conceptual and empirical interdependence between multiple dependent variables and investigators seek to compare effect sizes across models (Moody and Marvell 2009; Steffensmeier et al. 2010).

We have identified 20 independent variables, described in detail above, to capture macro-level conditions that might help to account for the simultaneous decline in teen childbearing and crime witnessed during the 1990s and 2000s. These are entered as groups of explanatory variables in successive models. To more rigorously control for potential confounding, both observed and unobserved, we also include state and year fixed effects in all regression analyses. A fixed-effects approach allows us to estimate changes in rates of teen childbearing or violent crime within each state over time. We are essentially using each state as its own comparison group. Thus, we are able to account for time-invariant state-specific characteristics that are associated with both the predictor and the outcomes. Because we enter year as well as state fixed-effects we can also control for unobserved temporal trends that do not vary from state to state. To account for the presence of heteroskedasticity and serial correlation, we generate robust standard errors using the Huber/White correction method and cluster at the level of the state (Bertrand et al. 2004). Moreover, we tested for stationarity using the Levin-Lin-Chu (2002) as well as the Im-Pesaran-Shin (2003) tests and found little evidence to suggest this assumption had been violated.

First, we estimate a baseline regression model that simultaneously predicts rates of teen births and violent crime using only state and year fixed effects. This provides us with an initial estimation of the unexplained correlation between the two dependent variables. In the next three models, we successively enter in groups of predictors selected to capture macro-level changes in economic opportunity, demographic characteristics, state-level policies, as well as health and wellbeing in addition to state and year fixed effects (Models 1 – 4). Finally, we fit a full model (Model 5) that includes all explanatory variables, including state and year fixed effects. All independent variables are lagged by a period of one year to more accurately account for the time period between conception and birth for teen childbearing as well as provide additional support for causal interpretations of our findings by helping to rule out reverse causality. All statistical analyses were conducted using Stata/MP 14.1.

We decide to limit the time period under study to the years between 1990 and 2010 for several reasons. Although rates of teen births and crime had declined prior to 1990, it was not until this decade that we witnessed a pronounced and extended temporal decrease in both

outcomes of interest which continued relatively unabated until recently. Furthermore, many of the potential explanations for simultaneous declines in teen births and violent crime that we investigate in the current study did not fully emerge until the 1990s. These include state-level policy changes that impacted levels of incarceration, abortion availability, welfare benefits, and access to family planning services as well as increased racial/ethnic diversity stemming from demographic shifts in population characteristics, particularly in the sunbelt cities of the Southeast and Southwest. Finally, data availability and consistency limited our ability to extend our analyses to decades prior to the 1990s. This was especially true of the percent foreign born, which was captured using CPS data and only available for intercensal years from 1994 onward.

5. RESULTS

The decline in both violent crime and teen births, on a national level, can clearly be seen in Fig. 1. Levels of violent crime reached a peaked in 1993 at 614 per 100,000, while rates of teen childbearing hit their highest level of 2,899 per 100,000 two years prior in 1991. Both indicators rapidly descended over the next two decades. The rate of decline appears to slow in the early 1990s and 2000s, both of which were periods of short-lived economic stagnation. Thus, according to this simple graphic, it appears that criminal activity as well as teen fertility are countercyclical rather than procyclical.

Descriptive statistics for all independent and dependent variables are presented in Table 1. The violent crime rate averaged 452 per 100,000 over the 20-year period between 1990 and 2010, while the mean teen birth rate hovered around 2,227 per 100,000. The mean male unemployment rate was 5.7%, revealing the overall strength of the economy during this time period. The average size of the manufacturing sector across both states and years was slightly above 12%, while the average size of the service sector was much larger at 64%. Although the mean female graduation rate was more than 25%, there was a substantial amount of state-level variation in this indicator with a minimum value of 11% and a maximum value of 46%.

The percent of the state population that resided in urban as opposed to rural areas averaged 69%, reflecting a long-standing temporal trend whereby Americans migrate from farms to cities. The racial/ethnic composition of our sample closely mirrors that of national estimates during the 1990s and 2000s (Humes et al. 2011), with 86% of the population being classified as nonHispanic White, 11% as nonHispanic Black, 9% as Hispanic, and more than 8% as foreign born.

The average incarceration rate across all 50 states for this 20 year period was 335 per 100,000 but, reflecting regional and temporal trends in policing and sentencing, varies widely from a low of 73 per 100,000 to a high of 860 per 100,000. Three state-level policies were common across states during the time period of interest. 70% of states reported Medicaid funding restrictions on abortions as well as TANF waivers, while 60% passed parental notification laws. Mandatory delays and TANF family caps were less widespread with 29% and 32% of states, respectively, enacting these policies. Only 14% of states relied on family planning waivers to expand access to contraception to low-income women. As

expected, mean rates of all-cause mortality were substantially lower among women compared to men (831 deaths per 100,000 vs. 870 deaths per 100,000) but varied widely with minimum values ranging from 453 to 1189 per 100,000 for men and from 301 to 1184 per 100,000 for women.

Findings from fixed effects, seemingly unrelated regression analyses are presented in Table 2. Results from Model 1 suggest that changes to the macro-level economic landscape helped shaped trajectories of violent crime or teen childbearing during the 1990s. Somewhat surprisingly, rising rates of female labor force participation are positively associated with increases in rates of teen childbearing, while increases in the proportion of women with a college degree are negatively associated with rates of violent crime. However, only one predictor, size of the service sector, was *jointly* associated with both outcomes of interest in the predicted direction. For every one percentage-point increase in the number of service sector jobs, teen births and violent crimes decreased by 46 and 12 per 100,000, respectively. The correlation between the outcomes decreases from 0.540 in the baseline model, when only fixed effects are included in regression analyses, to 0.517 in Model 1. Thus, accounting for these 4 indicators of economic opportunity explains 4% of the shared variation in teen childbearing and violent crime.

Turning our attention toward results presented in Model 2 of Table 2, we find that three of the six indicators selected to capture recent demographic trends are jointly associated with teen childbearing and crime in predicted directions. All three reflect changes to the racial/ethnic composition of state populations as they become more diverse. The size of the nonHispanic White population is positively associated with both teen childbearing and crime, such that declines among nonHispanic Whites are likely to occur in conjunction with falling rates of teen births and violent crimes; however, the magnitude of these coefficients is quite small. More noticeable is the relationship between the proportion of the population that is Hispanic or immigrant and declines in teen childbearing as well as crime. For every one percentage-point increase in the Hispanic or immigrant segment of the state population, we can expect rates of teen births to decrease by 12 and 13 per 100,000, respectively, and violent crimes to decrease by 5 and 18 per 100,000, respectively. Although results concerning the association between the size of the foreign born population and teen childbearing are only marginally significant, they still should be considered noteworthy due to multicollinearity between immigrant and Hispanic status. When we estimate Model 2 without percent Hispanic, point estimates for percent foreign born increase to -21.04 (8.55) and -20.80 (4.84), both of which are statistically significant at the 0.05 level. Our second set of predictors chosen to reflect recent demographic changes in state-level population characteristics explains more than 10% of the shared variation in teen childbearing and violent crime. This is more than twice the amount that can be attributed to economic opportunity indicators (4%).

Findings regarding state-level policies likely to impact the macro-level social milieu in which teen childbearing and violent crime occurs are shown in Model 3. States that implemented TANF waivers and Medicaid family planning waivers experienced significant fluctuations in both rates of teen childbearing and violent crime, albeit in opposite directions. States that relied on TANF waivers to adjust stringent welfare-to-work

requirements witnessed rates of teen births and violent crimes *increase* by 92 and 46 per 100,000. Compared to states that did not implement Medicaid family planning waivers, those that did experienced declines in teen births and violent crimes of 100 and 71 per 100,000, respectively. The magnitude of these results suggest that expanding access to contraception through policies specifically designed to impact the lives of low-income women is an effective way to improve a diverse set of social conditions among women as well as men. Similar to the predictive power of the economic opportunity model (Model 1), changes driven largely by state-level policies account for almost 6% of the correlation between recent declines in teen childbearing and crime since the shared variance in the outcomes decreased from 0.540 to 0.505.

Model 4 presents findings related to expectations regarding health and wellbeing, specifically mortality. Both male and female mortality are significantly and positively associated with fluctuations in both outcomes of interest over this 20-year time period, such that as death rates decrease, we should expect rates of teen childbearing and violent crime to fall as well. For every 100 fewer male deaths in a given state, rates of teen childbearing and violent crime decline by 117 and 109 per 100,000, respectively. Similarly, for every 100 fewer female deaths in a given state, rates of teen childbearing and violent crime decline by 118 and 107 per 100,000, respectively. After accounting for state-specific temporal trends in male and female mortality, the proportion of the shared variance in teen childbearing and violent crime that could be explained almost reached 6% since the correlation between the outcomes decreased from 0.540 to 0.509.

When all predictors are simultaneously entered into regression analyses (Model 5), results remain consistent with a few notable exceptions. First, net of the effects of all other covariates in the model, the association between the size of the service sector and violent crime now only reaches marginal significance. Second, among state-level demographic characteristics, poverty rates now predict subsequent fluctuations in both outcomes of interest, such that a 1 percentage-point decrease in the number of families living below the federal poverty level is associated with 8.7 and 6.2 per 100,000 fewer teen births and violent crimes, respectively. Third, the only policy that retains its simultaneous impact on both teen childbearing and crime in the hypothesized direction in the full model (Model 5) is that which concerns Medicaid family planning waivers. States that expanded access to family planning and contraceptive services in this manner had, on average, 81 and 62 per 100,000 fewer teen births and violent crimes, respectively, than states that did not expand access via Medicaid waivers. Finally, the association between male mortality and teen childbearing is attenuated and rendered marginally significant once we account for all other covariates in Model 5. After simultaneously adding all predictors into regression analyses, the proportion of the shared variation between teen childbearing and violent crime that is explained increases by 23% as the correlation across outcomes decreases from 0.540 to 0.416. Therefore, all four types of potential explanations for recent declines in teen childbearing and crime, taken together, account for a substantial portion of these simultaneous trends.

Considering the large number of independent variables in our regression models, many of which are correlated with one another, and the inclusion of state- and year-fixed effects, we consider Model 5 to be a very stringent test of the value of specific predictors. Instead, we

present findings from the full regression model primarily as a means to determine how much of the shared variation between teen childbearing and violent crime can be accounted for by potential explanations considered in the current study.

6. DISCUSSION

Our results point to three potential explanations for the simultaneous declines in teen childbearing and violent crime witnessed throughout much of the 1990s and 2000s. These include the growth of a service based economy; increased racial/ethnic diversity and migration; and improved access to family planning services, specifically for low-income women. Rather than one type of state-level characteristic (economic opportunity, population demographics, state-level policies, or health and mortality) accounting for much of the temporal trends across both outcomes of interest, we find support across all four subgroups of predictors. This is also supported by results regarding the proportion of the shared variance across teen childbearing and violent crime that could be explained by each model. The first four models, in which each group of predictors was entered one at a time, explained similar proportions of the correlation across equation-specific error terms.

One aspect of the macro-level landscape that we thought might explain, at least in part, dramatic declines in teen childbearing and crime was the changing structure of the U.S. workforce from one that offers a wide range of jobs in the manufacturing sector to one that is dominated by service sector employment. We hypothesized that the loss of unionized manufacturing jobs, which hit working-class men with lower levels of educational attainment particularly hard, as well as the ubiquitous rise of low-wage service sector employment would lead to less teen childbearing and crime, primarily through rising opportunity costs. Our results lend support to the claim that expansions in the service sector of the labor market are associated with significant decreases in rates of teen births and violent crime. We also conducted sensitivity analyses to investigate the extent to which declines in the manufacturing sector, as opposed to as well as in addition to gains in the service sector, impacted our results and found little evidence that reductions in manufacturing jobs could help explain the simultaneous recent declines in teen childbearing and violent crime.

Although the analyses presented here suggest that these changes in the U.S. labor market are associated with recent declines in teen childbearing and crime, we cannot identify the specific social and economic conditions that would give rise to such an association. We can, however, consider potential explanations for this compelling finding. Manufacturing jobs that were characterized by steady employment, competitive wages and benefits, and opportunities for advancement provided working-class men and their families a baseline level of economic security and a pathway into the middle-class. While these jobs began to erode during the 1980s, they were vanishing from the economic landscape at breakneck speed during the 1990s and 2000s (Hollister 2011; Holzer et al. 2011). Furthermore, the impact of the loss of manufacturing jobs was exacerbated by the Great Recession of the late 2000s that hit the automobile industry and related supply companies particularly hard and contributed to falling housing costs in lower middle class neighborhoods (Hout et al. 2011; Hurd & Rohwedder 2010). Over the 20-year time period of interest these stable

manufacturing jobs were rapidly being replaced by service sector employment opportunities, which are often characterized by fluctuating work schedules, relatively low wages and few benefits, and little, if any, job security.

The negative association between the size of service sector and teen childbearing follows accepted patterns concerning procyclical fertility – namely, that as economic opportunity contracts, so do overall rates of fertility (Currie and Schwandt 2014; Jones and Schoonbroodt 2010). There is some empirical evidence to suggest, however, that this overarching trend differs for older African American teens (Colen et al. 2006). The relationship between size of the service sector and violent crime is less straight forward since we expect crime rates to increase when economic opportunities contract (Crutchfield 2014; Leavitt 2004). One explanation for this curious finding is that we control for other aspects of economic opportunity including male unemployment, women's labor market participation, and female college graduation rates. Thus, the quizzical association between number of service sector jobs and violent crime could be, at least in part, a statistical artifact of overcontrolling. To determine if this was the case, we ran seemingly unrelated regression models with size of the service sector as the only predictor, besides state and year fixed effects, and obtained similar results to those presented in Model 1, Table 2.

One of the most robust results of the current study concerns the diversification of the U.S. population – specifically the growing numbers of Hispanics and immigrants of all racial/ethnic backgrounds. We find evidence that states that experienced the greatest growth among Hispanics and immigrants also witnessed the most dramatic declines in crime and teen childbearing during the 1990s and 2000s. This finding is particularly timely given that rising rates of immigration are being hotly debated in the public realm and Hispanic immigrants are more frequently settling in new destination cities, many of which are located in states with little racial/ethnic diversity.

Although rates of crime are typically lower among Hispanics and immigrants of all racial/ethnic backgrounds (Martinez & Valenzuela 2006; Sampson 2008), rates of teen childbearing tend to be higher among Hispanics than nonHispanic Whites. One possibility for our unexpected findings concerning the negative association between percent Hispanic and teen birth rates could be increasing immigration among Hispanics to new destination cities, which tend to be located in Southeastern portion of the U.S. where rates of teen childbearing are typically higher than the rest of the country (Hamilton et al. 2013). Hispanics in new destination tend to be older, better educated, and more financially stable than Hispanics in traditional destinations (Lichter and Johnson 2009; Suro and Singer 2002) – all characteristics that are typically associated with lower rates of teen births. This unexpected and somewhat quizzical finding should be explored in greater depth in future studies.

Of all the state-level policies we examined, improved access to family planning services for low-income women appeared to be most strongly associated with recent declines in both teen childbearing and crime. This finding is consistent with others reported in the teen childbearing literature (Kearney & Levine 2009, 2015; Yang and Gaydos 2010) and is further corroborated by previous studies that show increased contraceptive utilization,

particularly with long-lasting methods with low failure rates, among teens during the 1990s and 2000s (Kearney & Levine 2015). The impact of expanded family planning services on levels violent crime is less straightforward and requires additional empirical inquiry.

At least some of the negative association between Medicaid waivers and violent crime is likely attributable to increased socioeconomic resources among women who have greater control over their reproductive capabilities. This claim is bolstered by our finding that reductions in the proportion of families in poverty, which are often headed by women, were associated with declines in both teen childbearing and violent crime. In order to take advantage of increasing economic opportunities, women must be able to decide if and when they will be having children. Another explanation emerges from arguments concerning reductions in the propensity to offend which emphasizes the role of social control, at either the neighborhood or family level, in explaining decreasing risk taking behavior or criminal activity (Browning et al. 2005; Leavitt 2004). However, this explanation is not supported by prior research that fails to show substantial increases in levels of self-control during the period of time within which crime rates were declining most precipitously (Cook and Laub 2002). Our finding concerning Medicaid family planning waivers taken in conjunction with results regarding women's educational attainment underscore the important role that women are likely to play in explaining recent declines in both teen childbearing and crime. We should stop characterizing crime primarily as a male problem and teen childbearing primarily as a female one. Rather, both outcomes are likely to occur at a complicated nexus of social conditions that impact men and women, alike.

Although the findings presented offer important insights into the unprecedented declines in violent crime and teen childbearing that occurred during the last two decades in the U.S., they should be viewed in light of the following limitations. Due to the longitudinal nature of our research question and our desire to examine the entire 20-year time period, we were restricted to using data at the state-level as opposed to lower levels of aggregation (e.g. county, city, or census tract). It is likely that state-level indicators mask important variation in both predictors and outcome variables that we are unable to capture and account for in our analytic strategy. Given that our modeling approach capitalizes on geographic (as well as temporal) fluctuations in outcome variables, more precisely capturing these changes is likely to result in more robust findings that are less biased toward the null. Furthermore, small cell sizes for certain predictors and outcomes, especially particular types of violent crimes, could prevent breaking down regression models into more finely grained units of analysis.

The need to restrict the period under study to the 20 years between 1990 and 2010 should also be considered carefully when viewing our results in a larger research context. Rates of crime and teen childbearing experienced declines prior to 1990, although this point in time marked the beginning of a unique period during which both outcomes witnessed dramatic and sustained decreases over time. We caution, however, relying on results presented here to explain temporal trends in teen childbearing and crime before 1990. Given that many of the state-level conditions we consider either did not occur prior to this decade (ie. welfare reform) or were much less pronounced (racial/ethnic diversification of state-specific populations), the potential reasons for simultaneous declines in teen births and violent crime

we identified in the current study might not account for much, if any, of similar temporal trends during earlier decades such as the 1970s and 1980s.

Reliance on official crime statistics is not without its shortcomings. Because the UCR only contains crimes reported to the police, it may underestimate the actual numbers of events especially those that tend to be underreported to law enforcement (Baumer and Lauritsen, 2010). States and local agencies may also differ with respect to how they report crimes to the FBI (Perkins and Larurin, 2014). However, serious crimes, such as homicides and robberies, are the least under-reported and are more likely than less violent crimes to be reported consistently across place or source (Baumer, 2002). Moreover, discrepancies between official- and self-reports for other crimes, including rapes and assaults, have declined significantly since 1990 (Baumer and Lauritsen, 2010). We also recognize that using all-cause mortality rates to predict changes in rates of violent crime is less than ideal due to the endogeneity inherent in this relationship stemming from homicide deaths being included in both indicators. The effects of this methodological shortcoming, however, are likely to be tempered by the fact that the proportion of violent crimes that is attributable to homicide tends to be exceedingly low. National statistics indicate that in 2013 murders and nonnegligent manslaughters only accounted for 4.5% of violent crimes (U.S. Department of Justice 2013).

This study represents, at least to our knowledge, the first attempt to identify possible joint explanations for the dramatic declines in teen childbearing and crime during the 1990s and 2000s. Due to data limitations, space constraints, the aggregate analytic approach, and the strength of evidence provided by prior studies that examined each outcome separately, we could not fully investigate all potential explanations. One notable exception is lead exposure. Blood lead levels are hypothesized to influence neural development during childhood, with implications for self-control, impulsivity, aggression, IQ, and other traits related to crime and risk-taking behavior (Needleman 1990; Nevin 2000; Reyes 2007). The impact of lead on the brain could have enduring influence on behavioral patterns across the life course, explaining the co-occurrence (at both the aggregate and individual level) of crime and risky sexual activity. Available data for estimating state-level trends in lead levels over the period we consider are not ideal. Some research has employed exposure to leaded gas as a proxy for overall lead exposure (Reyes 2007). However, lead contamination has been identified in paint, dust, soil and air and has multiple sources beyond leaded gas. Consequently, we do not model the independent impact of exposure to lead in the current analyses. Although a limitation, extant research examining the hypothesized mediating neuropsychological consequences of lead exposure (e.g., trends in relevant temperament measures in major national social surveys over the period of the crime and teen childbearing decline) do not offer compelling evidence of population declines in the prevalence of compromised self-control among children (Cook and Laub 2002). Nevertheless, future investigations will benefit from better data sources on patterns of change in lead exposure to more directly examine its influence on behavioral trends.

Finally, we do not investigate differences in our findings by key demographic subgroups such as race, age, or sex. This was done primarily out of empirical necessity. To our knowledge, this is the first research endeavor specifically designed to determine what macro

level social conditions might be jointly contributing to rapid declines in violent crimes and teen childbearing. It was imperative that we identify potential explanations before delving into how they might diverge across subgroups. Primarily due to space limitations and the limited availability of race-, age-, or sex-specific variables across the entire time period of interest, we chose to maximize the geographic and temporal variation in our data as opposed to focusing on subgroup differences. Given previous findings that illustrate predictors of teen childbearing or criminal behavior are highly dependent on other demographic characteristics (Colen et al. 2006) as well as recent social trends - such as mass incarceration (Alexander 2012), steady increases in nonmarital births (Wu 2008), and the reversal of the gender gap in educational outcomes (Buchmann et al. 2008) – that are likely to create or widen subgroup distinctions, we acknowledge this shortcoming and hope it will be addressed in future studies.

The end of the 20th century and the beginning of the 21st century was a time of rapid social, economic, and demographic change in the United States. Many changes were simultaneously occurring, not least of which was the abrupt reversal of a long-standing trend in both crime and teen fertility. To the surprise of many scholars, rates of violent crime and teen births began to rapidly decline during the early 1990s and continued to do so until recently. There have been concerted empirical efforts to discern what factors could be driving these important and unexpected macro-level trends, but all existing studies consider each outcome in isolation from the other. To our knowledge, this is the first inquiry specifically designed to uncover *joint* explanations for the drastic and simultaneous drop in crime and teen childbearing. To this end, we have identified four potential underlying causes that might be driving these quizzical trends – improved educational attainment among women, the loss of manufacturing jobs and the shift to a service economy; increasing racial/ethnic diversity, particularly among Hispanics and immigrants of all racial/ethnic backgrounds; and increased access to family planning services for low-income women.

Each one of these underlying explanations underscores the far reaching effects that policy initiatives to improve the lives of the most vulnerable members are likely to have for society as a whole. Moreover, policy efforts to reduce negative outcomes in one area are likely to spill over into other areas, even those we typically view as distinct and unrelated. For example, initiatives to reduce health disparities, especially those with a particular focus on improving male life expectancy, might also help women adhere to fertility timing schedules that allow them to take advantage of emerging economic opportunities or reduce rates of violent crimes in central city neighborhoods so that revitalization efforts can take hold. It is time for us to take a step back and adopt a more nuanced view of the intertwined web of social causes that are likely to produce some of the most unexpected and dramatic trends we see today. In so doing, hopefully we will be able to identify avenues for intervention that will impact a wider range of outcomes, be more cost effective, and result in fewer unanticipated negative consequences.

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Fig 1.
Rates of Violent Crime and Teen Childbearing in the U.S., 1990–2010

Descriptive Statistics for Potential Predictors of the Simultaneous Drop in Violent Crime and Teen Childbearing in the U.S., 1990–2010

Table 1

	Mean	SD	Min	Max	Across States SD	Across Years SD
<i>Dependent variables</i>						
Violent Crime Rate	452.37	224.42	65.40	1207.20	202.47	100.74
Teen Birth Rate	2227.46	719.03	756.71	4225.42	604.78	399.91
<i>Economic Opportunity</i>						
Male Unemployment Rate	5.70	2.09	2.00	15.80	1.03	1.83
Female Labor Force Participation Rate	60.57	4.39	43.50	71.20	71.20	71.20
Female College Graduation Rate	25.21	5.41	10.95	45.95	4.13	3.54
Size of Manufacturing Sector	12.26	5.09	2.22	26.35	4.58	2.30
Size of Service Sector	64.17	4.82	48.76	76.45	4.29	2.28
<i>Demographic Changes</i>						
% Urban Residents	69.05	20.14	17.64	100.00	19.61	5.33
% Families Below Poverty	12.52	3.55	4.50	26.40	3.10	1.79
% NonHispanic White	85.60	86.39	20.38	949.90	64.44	58.23
% NonHispanic Black	10.92	11.27	0.26	63.98	10.25	4.89
% Hispanic	8.88	10.66	0.43	59.62	9.54	4.93
% Foreign Born	8.17	6.67	0.72	31.23	6.37	2.15
<i>State-level Policies</i>						
Incarceration Rate	334.82	135.89	73.24	859.75	127.10	51.19
Mandatory delay	0.29	0.45	0.00	1.00	0.37	0.27
Medicaid Funding Restrictions	0.70	0.46	0.00	1.00	0.44	0.15
Parental Notification Laws	0.60	0.49	0.00	1.00	0.43	0.25
TANF Waiver	0.70	0.46	0.00	1.00	0.45	0.45
TANF Family Caps	0.32	0.47	0.00	1.00	0.34	0.32
Maximum TANF Benefit (2010 \$)	521.61	212.38	157.06	1436.09	198.84	79.49
Medicaid Family Planning Waiver	0.14	0.35	0.00	1.00	0.20	0.28
<i>Health & Mortality</i>						
Male All-Cause Death Rate	870.42	129.57	453.20	1188.70	126.11	34.49

	Mean	SD	Min	Max	Across States SD	Across Years SD
Female All-Cause Death Rate	831.34	134.82	301.00	1183.80	132.20	32.13
N	1,050	1,050	1,050	1,050	50	21

Results from Fixed-Effects Seemingly Unrelated Regression Models Predicting Violent Crime and Teen Childbearing, 1990–2010

Table 2

	Model 1				Model 2				Model 3				Model 4d				Model 5			
	Teen Childbirth		Violent Crime		Teen Childbirth		Violent Crime		Teen Childbirth		Violent Crime		Teen Childbirth		Violent Crime		Teen Childbirth		Violent Crime	
	b	SE	b	SE	b	SE	b	SE	b	SE	b	SE	b	SE	b	SE	b	SE	b	SE
Economic Opportunity																				
Male Unemployment Rate	−13.650	10.600	−1.555	5.083													−11.000	8.121	0.800	3.580
Female Labor Force Participation	19.839	8**	2.844	4.064													18.018	8***	5.034	2.517
Female College Graduation Rate	−4.413	3.816	−4.377	2.035	*												0.754	2.663	−1.184	1.685
Size of Service Sector	−46.452	13.545	−12.462	6.350	*												−40.690	8***	10.819	−11.125
Demographic Characteristics																				
% Urban Residents				5.477	*	2.222	3.906	8**	1.203								3.380	+	1.865	2.717
% Families Below Poverty				2.231		5.251	6.583	8**	2.520								8.678	*	4.241	6.295
% NonHispanic White				1.232	8**	0.432	0.189	8**	0.072								1.308	8**	0.437	0.208
% NonHispanic Black				−0.686		5.173	1.914	1.469									−5.102	4.991	−0.144	1.388
% Hispanic				−11.978	8**	3.642	−4.696	*	2.150								−10.903	8**	3.566	−4.090
% Foreign Born				−13.220	+	7.988	−17.729	8***	4.828								−5.992	6.575	−12.218	8**
State-level Policies																				
Incarceration Rate								0.352	0.339	0.242		0.196					0.562	*	0.245	0.249
Mandatory Delay								53.127	48.124	41.122	+	24.870					43.266	37.251	24.871	21.569
Medicaid Funding Restrictions								−138.186	+	81.102	−35.919	60.441					−69.242	72.888	−17.375	48.646
Parental Notification Laws								22.497	51.449	18.205	26.879						30.365	37.082	26.015	22.467
TANF Waiver								92.056	*	43.407	45.751	*	19.355				39.281	46.299	12.056	17.098
TANF Family Caps								−48.810	49.780	−28.062	28.654						10.247	43.591	2.071	23.549
Maximum TANF Benefit (2010 \$)								−0.135	0.229	−0.080	0.138						−0.018	0.184	−0.059	0.113
Medicaid Family Planning Waiver								−100.132	*	50.770	−70.646	8**	24.577				−80.856	*	40.680	−61.693
Health & Mortality																				
Male All-Cause Death Rate										1.174	*	0.530	1.091	8**	0.348		0.669	+	0.448	0.671
Female All-Cause Death Rate										1.183	*	0.585	1.067	8**	0.364		0.416	0.177		0.268
Baseline Correlation Explained		0.540					0.540								0.540				0.540	
Correlation Explained		0.517					0.485								0.509				0.416	
% Change in Correlation Explained		4.2%					10.1%								5.8%				23.0%	
N		1,050		1,050		1,050		1,050		1,050		1,050		1,050		1,050		1,050		1,050

Notes: All models include state and year fixed effects. Robust standard errors were calculated using the Huber/White correction method and clustered at the state level.

^a Predictors were entered into the regression model separately due to multicollinearity.

*** p < 0.001;
** p < 0.01;
* p < 0.05;
+ p > 0.10