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Cohort Abortion Measures for the United States

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The usual summary measure of the incidence of abortion in a population is the *period total abortion rate*—constructed by summing age-specific probabilities of abortion at a given time.¹ The procedure is precisely analogous to the construction of a period total fertility rate, and gives the average number of abortions a woman would have had by the end of her childbearing years if she experienced those specific rates at each age (Henshaw and Kost 2008; Henshaw 1998; Tietze and Bongaarts 1982). As with fertility, abortion can also be measured over the childbearing years of an actual birth cohort—yielding a *cohort total abortion rate*. The period rates illuminate women's experience across ages in a given year, and the cohort rates shift attention to women's experiences as they age. As such, the cohort rates require many years of data—more than 30—a span that until now was unavailable for the United States.

Because period measures refer to specific years, they are poor approximations of the cohort experience in times of change. Abortion rates in the United States have changed considerably since abortion was legalized by the Supreme Court in 1973. For example, in 1990, the abortion rate for women aged 18–19 was 57.9 abortions per 1,000 women; in 2004 it was 31.9 per 1,000. For women aged 20–24 in 1990, the rate was 56.7 abortions per 1,000 women; in 2004, 39.9 per 1,000 (Henshaw and Kost 2008). The 18-year-olds in 1990 were 24-year-olds in 1996. The period measure approach applies the 1990 rate for 24-year-olds—56.7—when in fact they experience the 1996 rate—49.3.

Abortion rates are a cohort phenomenon for two reasons. First, cohort members influence each other's demographic behavior, including induced abortion. Women who are considering an abortion seek counsel and resources from their peers (Faria, Barrett, and Goodman 1985; Foster et al. 2012). Second, a woman's attitude partly determines her willingness to have an abortion, and many public opinion researchers argue that attitudes are cohort phenomena (Stoker and Jennings 2008). In this article I seek to answer two questions. What empirical findings are revealed by cohort abortion analyses? What is the best means by which to translate between period and cohort abortion rates? Demographic translation details the interplay between period and cohort measures for both repeatable and singular events and formalizes it mathematically (Ryder 1980; Keilman 2006; Goldstein and Wachter 2006).

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¹Throughout this article, abortion refers to induced abortion.

I track the changing abortion experiences of women by race and ethnicity and outline their substantial differences in total rates and mean age of abortion. I find two surprising areas of stability. When abortion rates decline, beginning around 1990, rates for all race/ethnic groups decline at approximately the same rate such that the relationships between the groups remains stable. Second, even during the decline, the distribution of women who have one, two, or three or more abortions remains relatively stable. This is true when looking at both periods and cohorts,² although, given data limitations, the conclusion regarding cohorts is more tenuous. I also consider racial differences in abortion rates from period and cohort perspectives. Using insights from the literature on demographic translation, I characterize the relationship between cohort and period abortion experiences.

Figure 1 shows age-specific abortion rates from 1973 to 2004 and the period total abortion rate for the same interval. It further shows projected rates, which are discussed below. The period total abortion rate increases until around 1980, plateaus for about a decade, spikes just before 1990, and then declines. The increase is attributed to expanding access after legalization of abortion in 1973.

The decline in period total abortion rates largely reflects a decline in abortions to women under age 25. The decline at these young ages is ascribed to two factors. The first is the increased use of contraception, especially of more effective methods (Santelli et al. 2007; Mosher and Jones 2010), which resulted in a decrease in unintended pregnancies among teenagers (Finer and Henshaw 2006; Mosher and Jones 2010). Second, fewer of those unintended pregnancies ended in abortion; instead women were more likely to carry the pregnancy to term. In 1994, 47 percent of unintended pregnancies among women aged 15–19 ended in abortion; by 2001 the proportion had dropped to 40 percent. Among women aged 20–24 in 1994, the comparable decline was from 55 percent to 49 percent (ibid.).

Racial differences in period rates of abortion are considerable. Many of the differences in abortion rates reflect differences in pregnancy rates. Hispanics have the highest pregnancy rates among women living in the US, followed closely by blacks. Black women have the highest rates of unintended pregnancy and the highest rates of terminating those pregnancies through abortion. White and Hispanic women have similar rates of terminating unintended pregnancies, but because white women have both fewer pregnancies and fewer unintended pregnancies, they have a lower abortion rate (Finer and Henshaw 2006). In addition to documenting the abortion experience of cohorts of women, this inquiry looks at the relationship between period abortion rates and cohort abortion rates. It thus extends the demographic translation literature from fertility (Ryder 1980 among others), marriage (Keilman 2006), and mortality (Goldstein and Wachter 2006) into a new arena.

There is another line of research on period and cohort rates that has not yet been applied to abortion research. This research examines the causal mechanisms of demographic phenomena and explores whether those mechanisms operate in the period or on the cohort.

²That is, the period total abortion rate is composed of women who are having their first, second, or third (or higher-order) abortion, and this distribution does not change markedly from period to period; and the cohort total abortion rate for a given cohort is composed of women who have had one, two, or three or more abortions in their lifetime, and this distribution is relatively constant across cohorts.

The argument as related to fertility is characterized by Ryder's (1980, 1986) case for the centrality of the cohort, whereby early-life events affect women's childbearing targets and timing. Opposing the cohort approach is the argument by Ní Bhrolcháin (1992) that over a restricted interval of time the variance in fertility is observed in the period, and there is little evidence for age-period effects influencing the cohort. More recently, both cohort and period explanations have been proposed to account for low fertility (e.g., Kohler, Billari, and Ortega 2002; McDonald 2006; Goldstein, Sobotka, and Jasillioniene 2009).

Abortion, though closely related to fertility, is a distinct phenomenon and the lessons from the debate on fertility should not be applied directly to abortion. There is reason to believe that abortion is at least in part a cohort phenomenon. Individuals' behavior and attitudes with regard to demographic events are subject to social influence. This has been demonstrated across a wide range of examples, such as use of contraception (Rosero-Bixby and Casterline 1993; Rogers and Kincaid 1981), ethnic self-identity (Hout and Goldstein 1994), teenage pregnancy (Crane 1991), attitudes toward nontraditional family behavior (Rindfuss et al. 2004), and abortion outside of the United States (Johnson-Hanks 2002). This social influence primarily occurs within the cohort.

Women take into account a number of factors, both personal and practical, when deciding whether to have an abortion. These include relationship status and stability, career and education goals, and caring for dependents (Finer et al. 2005). If a woman does choose to have an abortion, she must call upon certain resources, which may include money to pay for the procedure and for nonmedical costs such as travel-related expenses, childcare, and the need to compensate for lost wages. Under these circumstances women primarily consult members of their own cohort (Faria, Barrett, and Goodman 1985; Foster et al. 2012). The information, counsel, and resources they receive from their peers will depend, in part, on how many of them have had abortions themselves.

In addition, a woman's decision to have an abortion and her confidence in her choice depend on several factors, including her attitude toward abortion (Allanson and Astbury 1995; Foster et al. 2012). That attitudes are cohort phenomena is a dominant theory in public opinion research (Brooks and Bolzendahl 2004; Stoker and Jennings 2008). As the theory argues, individuals' attitudes fluctuate early in life but then crystallize in early adulthood and persist throughout the life course (Alwin and Krosnick 1991; Sears and Funk 1999). Those attitudes are in part formed by early-life events that leave lasting impressions (Sears and Valentino 1997). This is particularly true for abortion, where individuals' attitudes are among the most stable (Norlander and Wilcox 1999; Hout and Hastings 2012; Cowan 2013).

Clearly there are also period effects on abortion rates. As mentioned above, the use of effective contraception was partially responsible for the decline in abortion rates since 1990. In addition, women in the US face significant, and increasing, barriers in gaining access to abortion services. In 2011, more than half of American women of reproductive age lived in a state with four or more major restrictions (Gold and Nash 2012). These barriers include the closing of a major facility and state legislation mandating a waiting period. Whether these barriers affect abortion rates is empirically difficult to determine (Henshaw and Finer 2003),

but this possibility is plausible given that over half of unintended pregnancies in the United States end in live birth (Finer and Zolna 2011) and presumably some of those mothers would have had an abortion had services been more accessible. Alternatively, a period shock might increase abortion rates. After New York State liberalized its abortion law in 1970, there was a sharp decrease in fertility rates in New York City, particularly for unmarried women, attributed to increased access to abortion (Tietze 1973).

Observed and projected data

Data on the total number of abortions in the United States from 1973 to 2004 come from the Guttmacher Institute, based on their abortion provider surveys (see Henshaw and Kost 2008 for details). The few girls under age 14 who have abortions are included with the counts for girls aged 14, and women over age 44 who have abortions are included with the counts for women aged 40–44. Data on the characteristics of women who obtain abortions—age, race/ethnicity, and number of prior abortions—are from the annual abortion surveillance reports from the Centers for Disease Control and Prevention (CDC), available from 1979 to 2004. From 1979 to 2004, the CDC's racial/ethnic categories were white and black/other; from 1990 to 2005, the CDC had an additional set of categories: non-Hispanic white, non-Hispanic black, and Hispanic. In the analyses decomposed by race/ethnicity, girls who had an abortion when they were aged 15 and under are placed in the age 15 group.

Not all states report to the CDC, most importantly California; others report incompletely and this incomplete reporting differs over time. For the distributions of abortion by age, I use the adjusted rates published by the Guttmacher Institute. They adjust for incomplete reporting and apply the adjusted CDC distributions to their national rates. They assume that the distribution of abortions not reported by patient characteristics is identical to the distribution of reported abortions. This is a standard assumption in US abortion research (see Henshaw and Kost 2008) and is validated by reference to surveys of abortion patients.

With regard to race/ethnicity-specific rates by age, the unadjusted CDC distributions are applied to the aforementioned age-specific abortion rates. Some of the race/ethnicity age-specific rates are found in the literature (e.g. Ventura, Abma, and Mosher 2009), and I calculated the remaining rates using the same procedures. The adjustments change the distributions of abortions by patient characteristics only slightly (Henshaw and Kost 2008).

The observed data extend for over thirty years; the majority of birth cohorts, however, are still in their childbearing years when the observed data conclude. To complete these cohorts, I forecast the age-specific abortion rates using the Lee–Carter method (Lee and Carter 1992). (The Appendix describes the Lee–Carter method and its present use for forecasting abortion in the US.) While the abortion rates of women aged 25–44 are relatively constant over time, the cohort total abortion rates for later birth cohorts depend on projections from more variable age-specific rates. This greater uncertainty mainly affects birth cohorts 1980 to 1990. Excluding these birth cohorts from the analyses would not alter the substantive argument that there are marked differences in cohort total abortion rates by birth cohort.

To examine the lifetime distribution of abortions among women who have them, I use the National Survey of Family Growth (NSFG), cycles 5 (1995), 6 (2002), and 7 (2006–08).

The NSFG is a probability survey conducted among non-institutionalized residents of the United States aged 15–44. I examine only women aged 40–45 in each cycle. Abortion underreporting in the NSFG is considerable and well-documented (Jones and Kost 2007 among others). In cycles 6 and 7, respondents answered the questions in a face-to-face interview and then had an opportunity to re-answer some of the pregnancy questions using audio computer-assisted self-interview (ACASI) technology, which has been shown to reduce underreporting. I have excluded the ACASI answers from my analysis to maintain interview method consistency across the three cycles of the NSFG. The analyses rely on two assumptions, discussed below, regarding underreporting.

Results

Cohort analyses for the total population and decomposed by race/ethnicity

Figure 2 shows cohort total abortion rates for women born between 1959 and 1990. The total rates increase until they peak with the 1969 birth cohort at 817 abortions per 1,000 women. The rates then fall by some 228 abortions or 28 percent of the 1969 rate. Hence, with regard to abortion incidence, the women of the 1969 birth cohort had a distinctly different abortion experience than their daughters.

Figure 3 displays projected cohort total abortion rates by birth cohort from 1964 to 1990. The data are decomposed into white and minority rates for the birth cohorts 1964 to 1989 and into non-Hispanic black, non-Hispanic white, and Hispanic rates for the birth cohorts 1975 to 1990. The figure also shows the cohort total abortion rate for the population as a whole. Minority women have higher cohort total abortion rates than whites across the entire time series. Both minority and white women have a downward-trending cohort abortion rate overall, but minority women experience an initial ascent followed by a steeper descent. This largely reflects differences in the experience of women aged 15–24. White women of these ages had stable or falling abortion rates from 1979 to 1992, while the rates for minority women increased substantially during this time period. After 1992, both groups of women had declining age-specific rates. As a result, cohort total abortion rates for minority women show an increase followed by a rapid decrease and a gradual decline, as opposed to white women whose rates show a gradual decline throughout.

Until 1990, some Hispanic women were categorized as white and others as minority. These categorizations moderated the extremes of both the minority and white groups, since Hispanic cohort total abortion rates lie in between the rates for non-Hispanic whites and non-Hispanic blacks. When only two racial categories are used, some Hispanic women are categorized as white and raise the rates of that group and some Hispanic women are categorized as minority and lower the rates of that group.

All three groups—non-Hispanic white, non-Hispanic black, and Hispanic—have declining cohort total abortion rates for 1975 to 1990, according to observed and projected rates. It is particularly noteworthy that the downward trends for minority, white, non-Hispanic black, and Hispanic women all move in parallel. Non-Hispanic whites have a slightly aberrant trend with a steeper decline. Over this period, cohorts of non-Hispanic whites will see a 41

percent drop in their cohort total abortion rate, compared to a 22 percent decline for Hispanics and a 17 percent decline for non-Hispanic blacks.

Lastly, comparing the race-specific and the total population rates gives a sense of each race's contribution to the total population abortion rates. Minority women have much higher rates of abortion than white women; when the population is decomposed by race/ethnicity, it is apparent that non-Hispanic blacks have the highest rates of abortion, followed by Hispanics and non-Hispanic whites. While racial and ethnic minority women disproportionately contribute to the total abortion rate, the different sub-populations contribute more evenly to numbers of abortions. This is a result of the different sizes of the particular populations. For example, non-Hispanic whites in the 1990 birth cohort are projected to have the lowest cohort total abortion rate of just under 250 per 1,000 women. Non-Hispanic blacks are projected to have a rate about six times higher, at just over 1,500 per 1,000 women. But when these women began their childbearing years, non-Hispanic white women outnumbered non-Hispanic black women four to one. As a result, the two groups' cohort total abortion counts are much closer to each other.

Across the birth cohorts 1964 to 1990, younger women were decreasing their abortion rates more sharply than older women. The result was a rise in the mean age of abortion, as can be seen in Figure 4, which reports the mean age of abortion for all abortions regardless of whether they are first abortions or higher-order abortions. The range of the cohort mean age of abortion for the total population was between 24 years (1967 cohort) and 26 years (1990 birth cohort). The largest year-to-year change was 1.5 months. The cohort mean age of abortion is relatively stable, a finding that is convenient for the subsequent analyses on demographic translation. Differences in mean age of abortion by race are also modest. The greatest disparity is between non-Hispanic blacks and non-Hispanic whites, at just over 1.5 years for the 1990 cohort. The mean age of abortion for Hispanic women remained relatively constant while that for non-Hispanic white and non-Hispanic black women rose during the same time period. Thus, while Hispanic women's cohort mean age of abortion was similar to that of non-Hispanic black women at the beginning of the period, it ended up closer to the mean age of non-Hispanic whites.

Distribution of abortions among women

Another question is what proportion of women have what proportion of abortions. Complete data from the cohort perspective are not available, but piecing together the full time-series from the period perspective and the limited data from the cohort perspective suggests stability of proportions over time.

Figure 5 shows the period distribution of prior abortions for women having abortions in a given year from 1973 to 2004. The period total abortion rate per 1,000 women is also shown. Throughout the time series, most abortion patients are having their first abortion. Given the relatively high rates of illegal abortion before in 1973 (see Krannich 1980 for a review), it is possible that these early reports are women indicating their first legal abortion.

Taking the data at face value, many women at the beginning of the time series are having their first abortion, although this proportion steadily declines until 1990. From 1990 to 2004,

the entire distribution achieves stability. Just over 50 percent of abortion patients each year from 1990 to 2004 were having their first abortion and just over a 25 percent were having their second; 12 percent of women who had an abortion were having their third, and 8 percent their fourth or more.

Abortion distribution by cohort is also static, as one would predict given the stability of the period measures. To capture the distribution of abortions across cohorts of women, I turn to the oldest women who have participated in three waves of the NSFG. The underreporting of abortion in the survey is well-documented (e.g., Jones and Kost 2007). I am not interested in the total number of abortions, for which the underreporting would pose a severe challenge. Rather, I am interested in the distribution of abortions by women's prior abortion experience. I make two assumptions about underreporting. The first is that the underreporting occurs randomly among women with different numbers of prior abortions: women who have had one abortion under-report at the same rate as women who have had more. Second, underreporting by abortion order is uniform across birth cohorts. For example, equal numbers of women who have had four abortions report they had three across the birth cohorts 1951–1967. Under this assumption, the rates of underreporting may differ by abortion order but not by birth cohort.

Table 1 shows the distribution of the lifetime number of abortions among women who had any abortion for the birth cohorts 1951–1967. The data are from three rounds of the NSFG where I analyzed the responses from women aged 40–45 in each cross-section. I report them unweighted in five-year age groups. These data also show stability, in that approximately the same proportion of women had one, two, three, and four or more abortions across these cohorts. Stability is most likely to occur if my assumptions above were correct. If the assumptions were incorrect, stability would occur only if underreporting occurred in such a manner as to create stability from changing rates, an improbable scenario.

The women represented in Table 1 entered reproductive age at the beginning of the era of legalized abortion in the US. During this time access was growing, the period total abortion rate was rising, and the period distribution measures had not yet reached stability. Quickly, however, the distribution of abortions across women began to approach their stable values. In 1974, the first year after legalization, 85 percent of abortion patients were having their first abortion. Within ten years, that number dropped to 60 percent and remained relatively stable thereafter. Most of the decline occurred within six years following legalization. The period rates of abortion distribution among women rapidly reached stability, so even the women who reached reproductive age in the early years of legalized abortion show this stability across cohorts.

Demographic translation

Demographic translation attempts to reconcile the cohort and the period viewpoints by examining whether one can approximate the other for a given phenomenon and time. In a time of changing rates, no period rates are precisely identical to cohort rates, hence I examine whether there is a set of period abortion rates that approximate the cohort abortion rates. This is helpful for two reasons: first, it assists in understanding the rates and their patterns; second, it allows researchers to estimate cohort levels before the cohort is no longer

at risk for a given event—in this case, women are no longer at risk of having an abortion at the end of the childbearing years. My discussion of demographic translation presents findings for the whole population. For the sake of parsimony, the data decomposed by race/ethnicity are excluded; the conclusions from the population as a whole apply to the decomposed population, although the translation does not perform quite as well.³

Figure 6 demonstrates that the period total abortion rate from the year in which the cohort reaches the mean age of abortion approximates the cohort total abortion rate. This is a common finding in the demographic translation of fertility (Vallin and Caselli 2006). For each cohort included in the series, 1959 through 1990, I calculated its own mean age of abortion. I then averaged the 23 cohort mean ages of abortion, which was 25. I compared the cohort abortion rates for each cohort with those of the year in which those women turned 25. As an example, the figure compares the cohort total abortion rate for women born in 1960 to the period rates for 1985, the year in which those women turned 25. This mimics an approach used in demographic translation research on fertility (Ryder 1964; Vallin and Caselli 2006).

Despite the rough similarity at the endpoints, there are notable differences between the two lines. The comparison between the 1970 cohort rate and the 1995 period rate reveals the widest difference, 105 abortions per 1,000 women. During much of the time span covered, the cohort total abortion rate exceeded the period rate as a result of the modest increase in the mean age of abortion. The average discrepancy over this time period exceeds 40 abortions per 1,000 women. Translation theory implies that the two curves will be the same only under strict conditions, namely that the cohort abortion rate is a linear function of time while the age schedule and cohort mean age are not. These conditions do not hold here. Despite the differences between the curves, however, this is a reasonably close translation.

In order to compare period and cohort total abortion rates, as in Figure 6, one needs an estimate of the cohort mean age of abortion. A period mean age of abortion can only be equal to the cohort mean age under strict and unlikely conditions—for example, that all women have their abortions at the same age (Keilman 2006 outlines all the conditions.) If researchers wish to make cohort estimates before the conclusion of women's childbearing years, they should exploit the narrow range and stability of the cohort mean age of abortion and forecast it. This attempt at demographic translation for abortion reveals that the period rates for the year of cohort mean age of abortion are an adequate translation tool, with reservations. Further, forecasting the cohort mean age of abortion should provide the appropriate benchmark by which to translate between cohort and period rates.

The cohort mean age of abortion also serves as an adequate translation tool for the population decomposed by race/ethnicity. It performed well for white women, non-Hispanic whites, and Hispanic whites. It performed less well for the population as a whole and poorly for minority and non-Hispanic black women.

³These analyses are available from the author on request.

Policy and political implications

Beginning with the 1970 cohort, abortion rates in the US appear to have declined dramatically, although gauging the extent of the decline relies in part on projecting the age-specific rates. During this time period women's increased use of more effective contraception lowered rates of unintended pregnancy. This likely explains some of the decrease in abortion rates.

Lowering unintended pregnancy rates should be the most politically palatable approach to decreasing abortion rates. Women with medical insurance are more likely to use highly effective contraception (Culwell and Feinglass 2007), and mandated coverage of contraception also increases use (Sonfield et al. 2004), as do other measures to decrease the cost of contraception (Secura et al. 2010; Postlethwaite et al. 2007). The 2010 Affordable Care Act currently mandates that health plans (with a few notable exceptions) cover all contraceptives approved by the US Food and Drug Administration without cost-sharing; this benefit was first implemented in August 2012 (Department of Health and Human Services 2011). If one assumes this increases use of highly effective contraception, the resulting decrease in unintended pregnancy will lead to further declines in the abortion rate by decreasing women's need for abortion.

Cohort abortion measures enable scholars analyzing the social and political components of abortion in the United States to incorporate incidence as an explanatory variable. Research on public opinion vis-à-vis abortion (Evans 2002; Hoffman and Johnson 2005; Jelen and Wilcox 2003; Killian and Wilcox 2008), the role of abortion in political polarization (Hout 1999; DiMaggio, Evans, and Bryson 1996; Mouw and Sobel 2001; Evans, Bryson, and DiMaggio 2001; Evans 2003; Baldassarri and Gelman 2008), social movements related to abortion (Staggenborg 1991; Doan 2007; Rohlinger 2006; Ferree et al. 2002), and the role of political institutions in shaping legal policy (Halfmann 2011) does not yet incorporate incidence. I propose that the incidence rates of abortion over a woman's lifetime, provided above, be employed to further our understanding of the social and political components of abortion.

Limitations

Most of the findings presented here are dependent primarily on forecasts. These forecasts are specifically projections, not predictions. I am not arguing that these trends are what the future holds, but rather projecting rates into the future based on available data. The abortion rates of women aged 25–44 are quite stable, and as such I have more confidence in the projections for these ages than for younger women. My projections are used to complete the cohort experience of women who are in their childbearing years at the end of data collection, in 2004. Thus, only the later birth cohorts rely on projections for younger ages. For example, abortion rates for women aged 18 in 2004 rely on projections for ages 19–44, whereas rates for women aged 35 in 2004 rely on projections for ages 36–44. Any number of changes could alter these projections, such as an increase in the use of highly effective contraception or a change in legal access to abortion. Further increases in the mean age of childbearing would also affect abortion rates because some childless women use abortion as a means to

delay childbearing and because such delays would delay the onset of sterilization, the most effective form of contraception.⁴

Conclusion and future research needs

I have drawn on more than 30 years of data to undertake a cohort analysis of abortion. The analysis revealed large differences in abortion experience by cohort. One would expect abortion to be, at least in part, a cohort phenomenon because the decision to have an abortion is affected by social influence within the cohort and is dependent on a woman's attitude toward abortion, which is shaped by interaction with other members of her age cohort.

The analysis also revealed that the period abortion rates from the year corresponding to the cohort's mean age of abortion are a good approximation of the completed cohort experience. Women's mean age of abortion has increased modestly and has remained close to 25 years of age. Hence, once a cohort reaches age 25, the period rates from that year approximate the cohort's completed experience without having to wait the additional 20 years required for them to conclude childbearing. Alternatively, the mean age of abortion can be forecast and cohort estimates derived from the period rates of that year.

Future research should proceed along four avenues. The first is to conduct periodic re-evaluations of the cohort abortion experience of women. Every few years, scholars produce more research on period abortion rates; that research should now include a cohort perspective. This is particularly valuable given how few complete cohorts are analyzed here. Second, the debate regarding period versus cohort causal analyses of demographic rates should be extended from mortality and fertility to include abortion. The two examples of stability—that the decline in abortion rates affected racial/ethnic groups similarly and that the distribution of abortions across women has likely remained stable within the decline—should be interrogated empirically and theoretically. As more cohorts in the National Survey of Family Growth complete their childbearing years, one can gain greater insights into this distribution. Further, one should ask whether this stability in the relationship between the rates for different racial/ethnic groups is a result of broad public health campaigns or a process of social influence across racial/ethnic groups. Lastly, use of effective contraception decreases the demand for abortion. Provisions in the Affordable Care Act remove a major disincentive to women's use of effective contraception. Researchers should identify further barriers that may arise after the Affordable Care Act is fully implemented.

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⁴I thank a reviewer for this insight.

Appendix: Application of the Lee–Carter forecasting method to age-specific abortion rates

The Lee–Carter method, though developed for projecting mortality in the United States, has been extended to fertility and is intrinsically well suited for forecasting abortion in the US. It employs time-series methods and decomposes the age schedule into an age-profile and a time-variant parameter. The time-variant parameter outlines deviations from the age-profile when the overall level of the event changes.

The Lee–Carter model in this application takes the form:

$$\ln(T_{x,t}) = a_x + b_x k_t + e_{x,t}$$

where $T_{x,t}$ is the projected age-specific abortion rate and a_x is an age-specific component that is independent of time and indicates the average shape of the age-profile. The second element is the product of a parameter that varies with time and captures the general level of the event (k_t) and a coefficient that is age-specific and indicates how the age-specific rate will vary given the change in the overall rate (b_x). Lastly, there is an age- and time-specific error term.

The observations from different age and time periods have different precisions because of the different number of events that occur. In light of this heteroskedasticity, I have obtained a_x , b_x , and k_t by weighted least squares. The weights are abortion counts (Wilmoth 1993). Two constraints are placed: the sum of the squared b_x coefficients equals one, and the sum of the k_t parameters equals zero. By fitting the model to historical data, I obtained estimates for the age-specific and time-varying parameters. The time-varying parameter, k_t , was then forecast using a random walk with drift. These forecast values were combined with the estimated age-specific parameters to calculate future age-specific rates (Lee 2000; Lee and Carter 1992).

I fit this application of Lee–Carter to data from 1980 to 2004 for the total population, from 1980 to 2004 for the race-specific data, and from 1990 to 2005 for the race/ethnicity-specific data. Age-specific abortion rates increased from 1973 to 1980, at which point they stabilized and began to fall around 1990. The increase is attributed to national legalization in 1973 but is unlikely to affect trends after 2004, hence is excluded from the data on which the forecast is based.

Three techniques were used to test the appropriateness of these forecasts. The first was to examine the fitted values for the entire period 1980–2004. It has an average error from the observed data of .009 abortions per 1,000 women and an absolute maximum error of 4.37 abortions per 1,000 women. For all age groups, over 99 percent of the variance in the observed data is explained by the fitted data. The rates are forecast to 2034, at which point the youngest birth cohort on which I have data will have completed its childbearing years. The forecasted rates fit common-sense extrapolations, as can be seen in Figure 1. Second, I examined the 95 percent confidence bands on the forecasted rates, which are narrow, though, as expected, they widen over time. Third, I examined the residuals by age and time (not shown here). The residuals are homoskedastic. The Lee–Carter method was also

employed for forecasting age-specific abortion rates by race; it performed well, though somewhat less so for the minority group and non-Hispanic blacks because of their volatility. As with all forecasts, future changes in the trends may render these forecasts inaccurate.⁵

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⁵The focus of this inquiry is on the completed cohort rates, and I compare them to unadjusted synthetic cohort rates. A discussion of tempo-adjusted period rates for abortion is available from the author on request.

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FIGURE 1.

Age-specific abortion rates, observed and projected, United States, 1973–2035 and period total abortion rate by age groups 14–44

NOTE: Observed age-specific rates are from 1973 to 2004; projected rates are from 2005 to 2035.

SOURCE: Henshaw and Kost 2008; author's calculations.

FIGURE 2.

Observed and projected cohort total abortion rate for women aged 14–44, born 1959 to 1990, United States

NOTE: The observed age-specific rates are from 1973 to 2004. The dashed line represents cohort total abortion rates that are dependent on projected age-specific abortion rates for women under age 25.

SOURCE: Henshaw and Kost 2008; author's calculations.

FIGURE 3.

Observed and projected cohort total abortion rates by race/ethnicity for women aged 15–44, born 1964 to 1990, United States

NOTE: White and minority rates for birth cohorts 1964–89; non-Hispanic black, non-Hispanic white, and Hispanic rates for birth cohorts 1975–90. The observed age-specific rates are from 1979 to 2005: white and minority rates from 1979 to 2004 and non-Hispanic black, non-Hispanic white, and Hispanic rates from 1990 to 2005.

SOURCES: Henshaw and Kost 2008; Centers for Disease Control and Prevention, "Abortion surveillance—United States," *Morbidity and Mortality Weekly Report*; author's calculations.

FIGURE 4.

Observed and projected cohort mean ages of abortion by race/ethnicity for women aged 15–44, born 1964 to 1990, United States

NOTE: See note to Figure 3.

SOURCES: See Figure 3.

FIGURE 5.
Percent distribution of abortions by abortion order (left scale) and period total abortion rate
(right scale), United States, 1973–2004
SOURCE: Henshaw and Kost 2008.

FIGURE 6.

Comparison of the cohort total abortion rate for birth cohorts 1959–1990 and the period total abortion rate for the year in which women in these cohorts reached the mean age of abortion, United States

NOTE: The observed age-specific rates are from 1973 to 2004.

SOURCE: Henshaw and Kost 2008; author's calculations.

TABLE 1

Percent distribution of lifetime abortions among women aged 40–45 who have had any abortions, birth cohorts 1951–1967, United States

Lifetime abortions	1951–55	1958–61	1962–67
1	67.1	66.2	68.2
2	23.3	24.0	22.1
3	5.1	5.4	6.2
4+	4.5	4.4	3.6

NOTE: Owing to underreporting, these data should be interpreted as indications of stability only, and should not be taken as true values of the distribution of abortions across women. Women from the 1962 birth cohort were included in Cycle 6 and Cycle 7 of the NSFG. These analyses only look at them from Cycle 7.

SOURCES: National Survey of Family Growth: Cycle 5 (1995; N=1,701), Cycle 6 (2002; N=822), Cycle 7 (2006–08; N=886).