HHS Public Access

Author manuscript

Health Aff (Millwood). Author manuscript; available in PMC 2023 December 01.

Published in final edited form as:

Health Aff (Millwood). 2022 December ; 41(12): 1754–1762. doi:10.1377/hlthaff.2022.00066.

Expanded contraceptive access increased women's college completion in Colorado

Sara Yeatman,
Professor of Health and Behavioral Sciences at University of Colorado Denver and faculty affiliate at the CU Population Center (CUPC)

James M. Flynn,
doctoral student in economics at University of Colorado Boulder

Amanda Stevenson,
Assistant Professor of Sociology at University of Colorado Boulder and faculty affiliate at CU Boulder's Institute of Behavioral Science (IBS) and CUPC

Katie Genadek,
Research Economist at the U.S. Census Bureau and faculty affiliate at University of Colorado Boulder

Stefanie Mollborn,
Professor of Sociology at Stockholm University and faculty affiliate at University of Colorado Boulder

Jane Menken
Professor Emeritus at University of Colorado Boulder

Abstract

Public subsidies for contraception are often justified by claims regarding their benefits for women's lives, yet there is limited contemporary evidence supporting these arguments. Beginning in 2009 the Colorado Family Planning Initiative abruptly expanded access to the full range of contraceptive methods through Colorado's Title X family planning clinics. Using eleven years of American Community Survey data linked to decennial censuses, we assessed whether exposure to the program led to improvements in women's college completion. Exposure to the Colorado Family Planning Initiative at high school ages was associated with a 1.8–3.5-percentage-point population-level increase in women's on-time bachelor's degree completion, which represents a 6–12 percent increase in women obtaining their degrees compared with earlier cohorts. Federal and state policies restricting or expanding access to the full range of contraceptive methods can affect women's attainment of higher education in addition to their reproductive health.

An earlier version of this article was presented at the Population Association of America Annual Conference, held virtually, April 2021.

Introduction

During the last fifty years, access to contraception in the US has been supported by dedicated public funding through the Title X federal family planning program. Benefits for women's lives are often cited as a key rationale for the program, yet there is limited contemporary evidence to support the claim that access to contraception affects important outcomes, such as attainment of higher education, at the population level. A bachelor's degree is increasingly critical for accessing the middle class in the US and has substantial benefits for health and socioeconomic trajectories. It is associated with higher lifetime earnings, intergenerational mobility, longer life expectancy, and reduced morbidity.[1–4]

Studies of the initial expansion of oral contraception in the 1960s and 1970s found that access to contraception affects college completion.[5,6] However, the impact of the introduction of the first hormonal method of contraception differs from the impact of expanded contraceptive access in the contemporary US. Current arguments that access to contraception improves women's college outcomes tend to rely on evidence demonstrating a negative relationship between family planning programs and early fertility combined with research showing a link between early fertility and lower educational attainment.[7,8] Teenage mothers disproportionately come from socioeconomically disadvantaged groups, however, and this underlying disadvantage predicts educational outcomes.[7] Such selection biases impede our understanding of whether expanded access to modern contraception has a causal impact on college completion.[9,10]

There are multiple pathways through which access to contraception could influence a young woman's on-time college completion. A primary potential pathway is the prevention of childbearing in adolescence and early adulthood. Avoiding early childbearing can free up time and money that could instead be used in pursuit of high school or college education. Research has shown that giving birth during the teenage years reduces educational attainment, with the strongest impact seen among those least likely to experience a teenage pregnancy.[7,11] Furthermore, childbearing after high school but before receipt of a bachelor's degree diminishes and delays college completion.[12,13]

Access to contraception could also influence on-time college completion through nonfertility pathways. Researchers have hypothesized that having the opportunity to reliably prevent childbearing may increase educational attainment by improving women's mental health or by expanding the confidence of women and their families that investments in education will yield benefits. Such influences may be particularly relevant for understanding college enrollment decisions and persistence to degree.[14,15]

At the same time, there are social forces that may work in opposition to these articulated pathways. The first is selection bias operating on early childbearing, as young women with the highest probabilities of teenage childbearing have comparatively few opportunities for socioeconomic advancement.[7,16] Second, early motherhood is not always detrimental to young women's educational attainment. Instead, the birth of a child can increase a mother's commitment to education for the sake of her child.[17]

In this study we assessed whether expanded access to contraception in adolescence led to an increase in college completion for young women. We used a natural experiment afforded by the Colorado Family Planning Initiative, implemented in late 2009, to estimate the population-level impact of expanded contraceptive access on women's "on-time" (by ages 22–24) completion of a bachelor's degree.

The Colorado Family Planning Initiative provided funding, training, social marketing, and provider support to ensure that all Title X family planning clinic clients in Colorado could choose any method of contraception approved by the Food and Drug Administration (FDA) without medically unnecessary barriers and at low or no cost.[18] The five full years during which the Colorado Family Planning Initiative was implemented (2010–14, "peak Colorado Family Planning Initiative") saw a dramatic increase in the use of long-acting reversible contraceptives (LARCs) and a corresponding dramatic reduction in birth and abortion rates for 15–19-year-olds.[19,20] Recently performed research found that the Colorado Family Planning Initiative increased women's high school completion statewide by 1.7 percentage points.[21] Importantly, women at risk of not completing high school may not be the same young women whose college completion is most likely to be affected by contraceptive access.[3,22] Thus, in the current study, we examined the next major milestone in human capital formation: completing a four-year college degree.

Study Data and Methods

Research Design

We used restricted data from two full-count decennial censuses (2000 and 2010) and eleven years of the American Community Survey (2009–19) to create an individual-level longitudinal data set containing demographics, educational attainment, and state of residence during adolescence. These data were linked at the individual level, using the Census Bureau–provided Protected Identification Key. Data on women both inside and outside Colorado allowed us to compare levels of on-time bachelor's degree completion for birth cohorts of young women with improved contraceptive access through the Colorado Family Planning Initiative with completion by earlier cohorts who experienced no change in contraceptive access.

We took an intent-to-treat approach, which means that we estimated the effect of the Colorado Family Planning Initiative on young women residing in Colorado at program initiation regardless of whether they directly used the program and regardless of whether they remained in Colorado for the duration of the study period. This allowed us to estimate the population-level impact of expanded access to contraception and not simply the effect among self-selected users of the program.

We used an event-study design to identify the impact of exposure to the Colorado Family Planning Initiative in high school on college completion.[23] We used American Community Survey data to measure educational attainment at ages 22–24, which provided a measure of on-time bachelor's degree (which we refer to as "college completion"). The American Community Survey is a nationally representative survey that samples approximately 3.5 million addresses yearly, covering approximately 1.5 percent of the population. We

examined changes in the percentage of women who attained an on-time bachelor's degree over time, comparing women in Colorado from distinct birth cohorts with women in comparison places across the same birth cohorts. As illustrated in online appendix A,[24] our approach draws on data from women in eight single-birth-year cohorts (1987–94).

Adolescence is a period of heightening sexual activity, when reliable access to contraception could still affect high school completion as well as college planning, enrollment, and completion. We defined birth cohorts 1987–90 as pretreated cohorts because women born in these years were ages 19–22 in 2010, at the start of peak Colorado Family Planning Initiative—too old to have been exposed to the program during high school. We defined birth cohorts 1992–94 as treated cohorts because they were ages 15–17 at the start of peak Colorado Family Planning Initiative, and thus were exposed to the program in high school if they resided in Colorado. Women in these treated cohorts who remained in Colorado would also have been exposed to peak Colorado Family Planning Initiative from age eighteen to age twenty-two. The 1991 birth cohort was age eighteen in 2010—between high school and college age—and therefore, we separated this cohort from the pretreated and treated cohorts.

Because the Colorado Family Planning Initiative was statewide, our area of exposure was all of Colorado. The census linkage was used to identify state of residence during adolescence. For women born in 1987–91, we used state of residence in 2000, when these women were ages 8–12. For women born 1992–94, we used state of residence in 2010, when these women were age 15–17. Results were not sensitive to changes in the census used for cohorts at the cut points. Although the ages at which state of residence was identified varied across cohorts, all cohorts' state of residence was determined before high school completion, and thus preceded migration that could be related to our outcome of interest. This is important because many young adults move out of state for college and work after high school.[25] In our data, 26.3 percent of respondents who were identified as being in Colorado at the relevant census were residing in another state when they responded to the American Community Survey. Migration in the other direction was even more common—33.1 percent of 22–24-year-olds in Colorado at the time of the American Community Survey were residing in another state during adolescence (see appendix F). Had we used a cross-sectional approach to exposure, we would have erroneously included in-migrants who were not exposed to the Colorado Family Planning Initiative during adolescence. A cross-sectional approach would also not address the selectivity of migration, which is relevant for our analysis, as young adults who migrated across state lines were more educated, on average, than nonmovers.

A key assumption of our event-study design is that the change in the outcome over time would have been the same in the intervention and comparison places in the absence of the Colorado Family Planning Initiative. Therefore, our principal comparison was between women in Colorado during adolescence and women who resided in states that had similar levels and trends in on-time bachelor's attainment in the period before the Colorado Family Planning Initiative. We identified so-called parallel trend states as those that were not statistically different in level or slope of on-time bachelor's attainment for women during 1987–90. This approach identified nine states: Delaware, Hawaii, Kansas, Maine, Nebraska,

North Dakota, Ohio, South Dakota, and Wisconsin. We also compared Colorado with all other US states ("rest of the US").

Statistical Analysis

To conduct our event study, we fitted individual-level regression models of attainment using data on women in birth cohorts 1987–94. For ease of interpretation and to allow for state-level clustering, we used ordinary least squares regressions.[26] Models included indicators of Colorado residence during adolescence for each cohort, which was our main estimator. We used the 1990 cohort, which was the last fully pretreated cohort in the event study, as the comparison. Models included the state-level unemployment rate, as the period under study includes the Great Recession; age and state fixed effects; and cohort fixed effects that account for secular trends across treated and untreated cohorts. Estimating equations and details on the analysis are available in appendix C.[24] Models were weighted using the American Community Survey–provided sample weights adjusted to account for group-level differences (cohort, age, racial and ethnic group) in Protected Identification Key assignment and linkage rates between the American Community Survey and census (76.8 percent of women from our cohorts in the American Community Survey data were linked to the relevant census; see appendix I). Each Colorado birth cohort consisted of between 950 and 1,100 women.

Another key assumption of our event-study approach is that there were no other policies introduced in Colorado during the period under study that could explain observed changes in college completion. We identified two candidate policies: a 2009–10 expansion of concurrent enrollment in Colorado that widened access to courses that could be taken for both high school and college credit[27] and a 2013 policy that expanded eligibility for in-state college tuition to undocumented residents.[28] We addressed the possibility that these policies might explain the increase in college completion that we documented in two ways. First, although we expected the concurrent enrollment policy to affect young men and women roughly equally,[29] the impact of the Colorado Family Planning Initiative on on-time bachelor's attainment should predominately benefit women. Women's education is more likely to be curtailed through the aforementioned pathways, and fathers of teenage pregnancies tend to be older than their partners, which makes the Colorado Family Planning Initiative less likely to affect their on-time college completion.[30] Thus, we conducted a triple-difference analysis to determine whether college completion increased across all Colorado residents or only for young women, as we would expect if it were being caused by the Colorado Family Planning Initiative. The estimating equation and details of the analysis are available in appendix C.[24] Second, we re-ran the analysis, limiting the sample to individuals who were born in the US and thus would not have been affected by the change in undocumented residents' access to in-state tuition.

Limitations

Our study had several limitations. First, women's college completion was measured at ages 22–24, which were the oldest ages for which data are currently available for the treated cohorts. Many adults in the US complete college later, particularly young mothers,[13] so our study design missed some women's subsequent attainment of a bachelor's degree.

Nonetheless, the sequencing of motherhood and education is important, with greater benefits accruing when college precedes childbearing,[31,32] making our focus on this age range appropriate. Second, our linkage of census and American Community Survey data, although essential for the careful identification of exposure, introduced potential bias to our sample because of missing linkages. We minimized this bias by adjusting the American Community Survey sampling weights for differential linkage rates by demographic characteristics.

Study Results

Exhibit 1 shows trends in women's on-time bachelor's degree across the three populations. Colorado's trend in college completion was generally flat between the 1987 and 1990 birth cohorts. These women were ages nineteen and older at the start of peak Colorado Family Planning Initiative. The Colorado 1991 cohort experienced a decline in college completion relative to pretrends, which was mirrored among Colorado men and thus unlikely to be related to the Colorado Family Planning Initiative (see appendix B).[24] Starting in the 1992 birth cohort, the oldest cohort to be exposed to the Colorado Family Planning Initiative at high school ages, there was a sizeable increase in women's college completion in Colorado that continued through the 1994 cohort.

Exhibit 2 presents the results of three event-study models estimating the effects of women's exposure to the Colorado Family Planning Initiative on attaining an on-time bachelor's degree. Point estimates comparing women in Colorado with women in parallel trend states and women in the rest of the US were similar, although confidence intervals were unsurprisingly larger for the former. Relative to the 1990 cohort, there was little variation in on-time bachelor's completion among Colorado women not exposed to the Colorado Family Planning Initiative at high school ages in Colorado compared with either comparison group. Beginning with the 1992 birth cohort (the oldest exposed to the Colorado Family Planning Initiative at high school age), there was a large percentage point increase observed in Colorado relative to comparison places (versus parallel trend states: 3.79, $p < 0.001$; versus rest of US: 3.21, $p < 0.001$). The percentage point increase was smaller for the 1993 birth cohort (versus parallel trend states: 3.01, $p = 0.036$; versus rest of US: 2.23, $p < 0.001$) and no longer statistically different for the 1994 birth cohort (see exhibit 3).

The triple-difference model included a third comparison to men, which accounted for Colorado-specific patterns across treated cohorts. This comparison erased the decrease in college completion among the 1991 cohort, as this decline was present among both Colorado women and men and showed a sustained increase in college completion among women in Colorado exposed to the Colorado Family Planning Initiative. Relative to Colorado men and similar cohorts in the parallel trend states, Colorado women in cohorts 1992–94 experienced 3.34-, 4.62-, and 2.52-percentage-point increases, respectively ($p < 0.001$ for all). Although the previous specifications showed that women in other states had caught up to Colorado women by the 1994 cohort, gains made among Colorado women relative to Colorado men persisted in this cohort. Exhibit 3 also shows that estimates limited to US-born women were of similar magnitudes and patterns.

Supplementary analyses in the appendix[24] confirmed that our primary results were not sensitive to changes in model specification or comparison populations. As a robustness test we estimated a synthetic control model, which yielded similar results to the event study, showing a sizeable increase in bachelor's attainment among the 1992–94 cohorts compared with estimated trends in a synthetic version of Colorado. See appendix E.[24] We also estimated the primary event study using only cross-sectional American Community Survey data without the census linkage that differentiated residence during adolescence from residence at ages 22–24. These estimates, which do not capture location at the time of the Colorado Family Planning Initiative implementation and are thus subject to both error and bias because of selective migration, were inconsistent in their identification of the impact of the Colorado Family Planning Initiative on attainment of a bachelor's degree. See appendix F.[24]

Thus far, our design has focused on exposure during the high school years, but the Colorado Family Planning Initiative could potentially have affected college completion for birth cohorts 1987–91. These cohorts were 18–22 in 2010, which is too old for the Colorado Family Planning Initiative to have affected their high school completion but young enough for it to have affected their college experience. We tested this possibility by conducting an event study for college-age exposure. This event study found no consistent effect relative to any comparator. See appendix G.[24]

Finally, to clarify whether college initiation or persistence was the main mechanism for the increase in college completion, we assessed the impact of the Colorado Family Planning Initiative on having ever attended college and on being currently enrolled in college. The analysis that focused on having ever attended college identified similar increases as those for college completion. In contrast, analyses of being currently enrolled at ages 22–24 found only a consistent increase for the 1994 cohort, which may explain the weakened impact on college completion for this cohort, as many were still enrolled. Together, these supplementary analyses offer suggestive evidence that college initiation rather than college persistence was the principal driver of the increases in college completion we document. See appendix H.[24]

Discussion

This study found that Colorado's expansion of contraceptive access through its Title X network led to a population-level increase in women's college completion. As opposed to earlier contraceptive expansions, such as the introduction of the oral contraceptive pill, the Colorado Family Planning Initiative expanded contraceptive access by making it easier for women to get any FDA-approved method of contraception, including LARCs, at low or no cost through a Title X clinic. Exposure to the Colorado Family Planning Initiative at high school age was associated with an increase in women's on-time college completion of between 1.8 and 3.5 percentage points. Our findings translate to an average 6–12 percent increase in women's level of college completion compared with the 1990 baseline cohort and to an additional 2,300 Coloradan women in the three birth cohorts we studied completing a four-year degree by ages 22–24.

Such a large increase in women's on-time college completion is notable, particularly as the Colorado Family Planning Initiative did nothing to change the myriad structural barriers that prevent many low-income women, who make up the subpopulation most likely to access contraception from a Title X clinic, from enrolling and persisting in college. Education is a fundamental cause of health and a key determinant of later socioeconomic outcomes.[1,33] In demonstrating that exposure to the Colorado Family Planning Initiative increased women's on-time attainment of a bachelor's degree, this study provides critical evidence that access to contraception not only gives women control over their fertility but also improves their lives in additional important ways.

Title X clinics are a critical source of the most effective contraception for adolescents and young women.[34] In recent years the Title X family planning program, which was first introduced by President Nixon in 1970, has been affected by policy changes. Restrictions put in place in 2019 led to a constriction of the Title X network and the inclusion of providers who offered only limited methods.[35] In 2021 the federal government reversed these changes.[36] Our results suggest that policies expanding or contracting access to the full range of contraceptive methods will reverberate beyond reproductive health and fertility to affect women's prospects for higher education. Policy makers should consider this breadth of consequences when considering changes to Title X policy or other policies influencing contraceptive access.

Our study design precluded us from distinguishing the specific pathways through which expanded contraceptive access improves college graduation. Our approach assumed, and our supplementary analyses confirmed, that exposure to the Colorado Family Planning Initiative during the high school ages was critical for improving women's college completion. The effect size we detected is somewhat larger than that estimated for the impact of the Colorado Family Planning Initiative on high school completion among a younger cohort who were first exposed to the Colorado Family Planning Initiative at ages 13–15.[21] Some women for whom exposure to the Colorado Family Planning Initiative facilitated high school graduation may have gone on to college as a result of averted teenage births. The Colorado Family Planning Initiative may have also helped women delay fertility in their late teens and early twenties in ways that facilitated their timely college initiation and completion. The effect sizes we detect, however, are unlikely to be accounted for by changes in fertility alone. Thus, we suspect that part of the impact of the Colorado Family Planning Initiative on college completion worked through increasing women's and their families' confidence that investments in higher education would not be derailed by an unanticipated pregnancy.

Comparing our results with prior work attributing a smaller 2–4 percent increase in college completion to the introduction of the oral contraceptive pill[5,6] highlights the role of historical context and innovation type in shaping the magnitude of any effect of contraceptive shocks on life course outcomes. As a medical innovation diffusing at a time when the concept of modern fertility control was new and women's engagement in the labor force and education was more constrained, the pill's introduction was fundamentally different than the change we study here. Reestimates of the pill's impact on births point to smaller effects than previously estimated, which may explain its more modest impact on college attainment.[37] In contrast, an expansion of Title X services at a historical moment

when nearly all women use contraception at least sometimes could be more consequential because of its greater accessibility for adolescents, because of existing unmet demand for more expensive and longer-acting methods, and because higher education is now normative for women. In addition, our study focused on on-time college completion, whereas these older studies measured women's college completion at or after age thirty, which allowed for women who may have delayed college because of early fertility time to catch up.

A secondary contribution of our study is in demonstrating the importance of using longitudinal data to examine the impacts of policies, especially those aimed at adolescents. Early adulthood is "demographically dense,"[38] a period of rapid and frequent change, and educational and labor force transitions are the life events most closely linked to migration.[25] Using longitudinal data allowed us to carefully define exposure to the Colorado Family Planning Initiative as residence in Colorado during high school ages and to follow exposed individuals through early adulthood regardless of intervening mobility. When we adopted a cross-sectional approach to our analysis, we did not find a consistent program impact, presumably because of the high levels of in- and out-migration during young adulthood.

Conclusion

An initiative designed to improve women's access to all contraceptive methods—and particularly the most effective ones—through Colorado's Title X clinics led to a population-level increase in women obtaining bachelor's degrees. At a time when some US states are expanding public subsidies for contraception while others seek to restrict them,[39,40] our finding provides important contemporary evidence that access to contraception benefits women's lives.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This work has been supported by the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD; Grant No. R01 HD101480), the William and Flora Hewlett Foundation, and the NICHD-funded University of Colorado Population Center (Grant No. P2C HD066613). The authors are grateful to Joshua Sanders for data management and scientific computing, to Liyang Xie, Leslie Root and Abigail Humphreys for constructive comments on earlier drafts, and to Stephanie Chamberlin for research assistance. The content is solely the responsibility of the authors and does not necessarily represent the official views of the US Census Bureau or the National Institutes of Health. All results were approved for release by the Disclose Review Board of the US Census Bureau (Data Management System No. P-7515912, Disclosure Review Board Approval Nos. CBDRB-FY22-ERD002–08, CBDRB-FY22-ERD002–012, and CBDRB-FY22-ERD002-013).

References

1. Tamborini CR, Kim C, Sakamoto A. Education and lifetime earnings in the United States. Demography. 2015;52(4):1383–407 [PubMed: 26100983]
2. Case A, Deaton A. Life expectancy in adulthood is falling for those without a BA degree, but as educational gaps have widened, racial gaps have narrowed. Proc Natl Acad Sci U S A. 2021;118(11):e2024777118 [PubMed: 33836611]
3. Torche F Is a college degree still the great equalizer? Intergenerational mobility across levels of schooling in the United States. Am J Sociol. 2011;117(3):763–807.

4. Zajacova A, Lawrence EM. The relationship between education and health: reducing disparities through a contextual approach. Annu Rev Public Health. 2018;39:273–89 [PubMed: 29328865]
5. Hock H The pill and the college attainment of American women and men [Internet]. Tallahassee (FL): Florida State University; 2007 Oct 9 [cited 2022 Oct 6]. Available from: https://coss.fsu.edu/econpapers/wpaper/wp2007_10_01.pdf
6. Ananat EO, Hungerman DM. The power of the pill for the next generation: oral contraception's effects on fertility, abortion, and maternal & child characteristics. Rev Econ Stat. 2012;94(1):37–51 [PubMed: 22389533]
7. Kane JB, Philip Morgan S, Harris KM, Guilkey DK. The educational consequences of teen childbearing. Demography. 2013;50(6):2129–50 [PubMed: 24078155]
8. Bailey MJ. Reexamining the impact of family planning programs on US fertility: evidence from the war on poverty and the early years of Title X. Am Econ J Appl Econ. 2012;4(2):62–97 [PubMed: 22582135]
9. Bailey MJ, Lindo JM. Access and use of contraception and its effects on women's outcomes in the U.S [Internet]. Cambridge (MA): National Bureau of Economic Research; 2017 Jun [cited 2022 Oct 6]. (NBER Working Paper No. 23465). Available from: https://www.nber.org/papers/w23465
10. Stange K A longitudinal analysis of the relationship between fertility timing and schooling. Demography. 2011;48(3):931–56 [PubMed: 21717236]
11. Diaz CJ, Fiel JE. The effect(s) of teen pregnancy: reconciling theory, methods, and findings. Demography. 2016;53(1):85–116 [PubMed: 26753548]
12. Hofferth SL, Reid L, Mott FL. The effects of early childbearing on schooling over time. Fam Plann Perspect. 2001;33(6):259–67 [PubMed: 11804435]
13. Augustine JM. Exploring new life course patterns of mother's continuing secondary and college education. Popul Res Policy Rev. 2016;35(6):727–55 [PubMed: 28042192]
14. Goldin C, Katz LF. The power of the pill: oral contraceptives and women's career and marriage decisions. J Polit Econ. 2002;110(4):730–70.
15. Raley RK, Kim Y, Daniels K. Young adults' fertility expectations and events: associations with college enrollment and persistence. J Marriage Fam. 2012;74(4):866–79 [PubMed: 23729862]
16. Geronimus AT. Teenage childbearing and social and reproductive disadvantage: the evolution of complex questions and the demise of simple answers. Fam Relat. 1991;40(4):463–71.
17. Edin K, Kefalas M. Promises I can keep: why poor women put motherhood before marriage. Berkeley (CA): University of California Press; 2005.
18. Colorado Department of Public Health and Environment. Taking the unintended out of pregnancy: Colorado's success with long-acting reversible contraception. Denver (CO): Colorado Department of Public Health and Environment; 2017.
19. Lindo JM, Packham A. How much can expanding access to long-acting reversible contraceptives reduce teen birth rates? Am Econ J Econ Policy. 2017;9(3):348–76.
20. Kelly A, Lindo JM, Packham A. The power of the IUD: effects of expanding access to contraception through Title X clinics. J Public Econ. 2020;192:104288.
21. Stevenson AJ, Genadek KR, Yeatman S, Mollborn S, Menken JA. The impact of contraceptive access on high school graduation. Sci Adv. 2021;7(19):eabf6732 [PubMed: 33952524]
22. Bailey MJ, Dynarski SM. Gains and gaps: changing inequality in US college entry and completion [Internet]. Cambridge (MA): National Bureau of Economic Research; 2011 Aug [cited 2022 Oct 6]. (NBER Working Paper No. 17633). Available from: https://www.nber.org/papers/w17633
23. Cunningham S Causal inference: the mixtape. New Haven (CT): Yale University Press; 2021.
24. Appendix located below.
25. Horowitz J, Entwisle B. Life course events and migration in the transition to adulthood. Soc Forces. 2021;100(1):29–55 [PubMed: 34334827]
26. Hellevik O Linear versus logistic regression when the dependent variable is a dichotomy. Qual Quant. 2009;43(1):59–74.
27. Buckley P, Pendergast P, Klopfenstein K, Ramsay L, Poast K, Vente M, et al. Does concurrent enrollment improve college access, success, time-to-degree, and earnings? Denver (CO): Evaluation and Action Lab at the University of Denver; 2020. (Report No. 19-15A).

28. Grosz M, Hines A. In-state tuition policies and the college decisions of undocumented students: evidence from Colorado. Educ Finance Policy. 2022;17(2):232–54.
29. Colorado Commission on Higher Education, Colorado Department of Education. Annual report on concurrent enrollment: for 2010–2011 school year; 2012.
30. Barber JS, Kusunoki Y, Gatny H, Melendez R. The relationship context of young pregnancies. Law Inequal. 2017;35(2):175–97 . [PubMed: 29622858]
31. Augustine JM, Negraia DV. Can increased educational attainment among lower-educated mothers reduce inequalities in children's skill development? Demography. 2018;55(1):59–82 . [PubMed: 29282645]
32. Miech RA, Shanahan MJ, Boardman J, Bauldry S. The sequencing of a college degree during the transition to adulthood: implications for obesity. J Health Soc Behav. 2015;56(2):281–95 . [PubMed: 26022787]
33. Masters RK, Link BG, Phelan JC. Trends in education gradients of 'preventable' mortality: a test of fundamental cause theory. Soc Sci Med. 2015;127:19–28 . [PubMed: 25556675]
34. Darney BG, Biel FM, Hoopes M, Rodriguez MI, Hatch B, Marino M, et al. Title X improved access to most effective and moderately effective contraception in US safety-net clinics, 2016–18. Health Aff (Millwood). 2022;41(4):497–506 . [PubMed: 35377749]
35. Office of the Assistant Secretary for Health, Office of the Secretary, Department of Health and Human Services. Compliance with statutory program integrity requirements. Fed Regist. 2019;84(42):7714–91.
36. Office of the Assistant Secretary for Health, Office of the Secretary, Department of Health and Human Services. Ensuring access to equitable, affordable, client-centered, quality family planning services. Fed Regist. 2021;86(192):56144–80.
37. Myers CK. The power of abortion policy: reexamining the effects of young women's access to reproductive control. J Polit Econ. 2017;125(6):2178–224.
38. Rindfuss RR. The young adult years: diversity, structural change, and fertility. Demography. 1991;28(4):493–512 [PubMed: 1769399]
39. Guttmacher Institute. State family planning funding restrictions [Internet]. New York (NY): Guttmacher Institute; 2021 [last updated 2022 Sep 1; cited 2022 Oct 6]. Available from: https://www.guttmacher.org/state-policy/explore/state-family-planning-funding-restrictions
40. Guttmacher Institute. Medicaid family planning eligibility expansions [Internet]. New York (NY): Guttmacher Institute; 2021 [last updated 2022 Sep 1; cited 2022 Oct 6]. Available from: https://www.guttmacher.org/state-policy/explore/medicaid-family-planning-eligibility-expansions

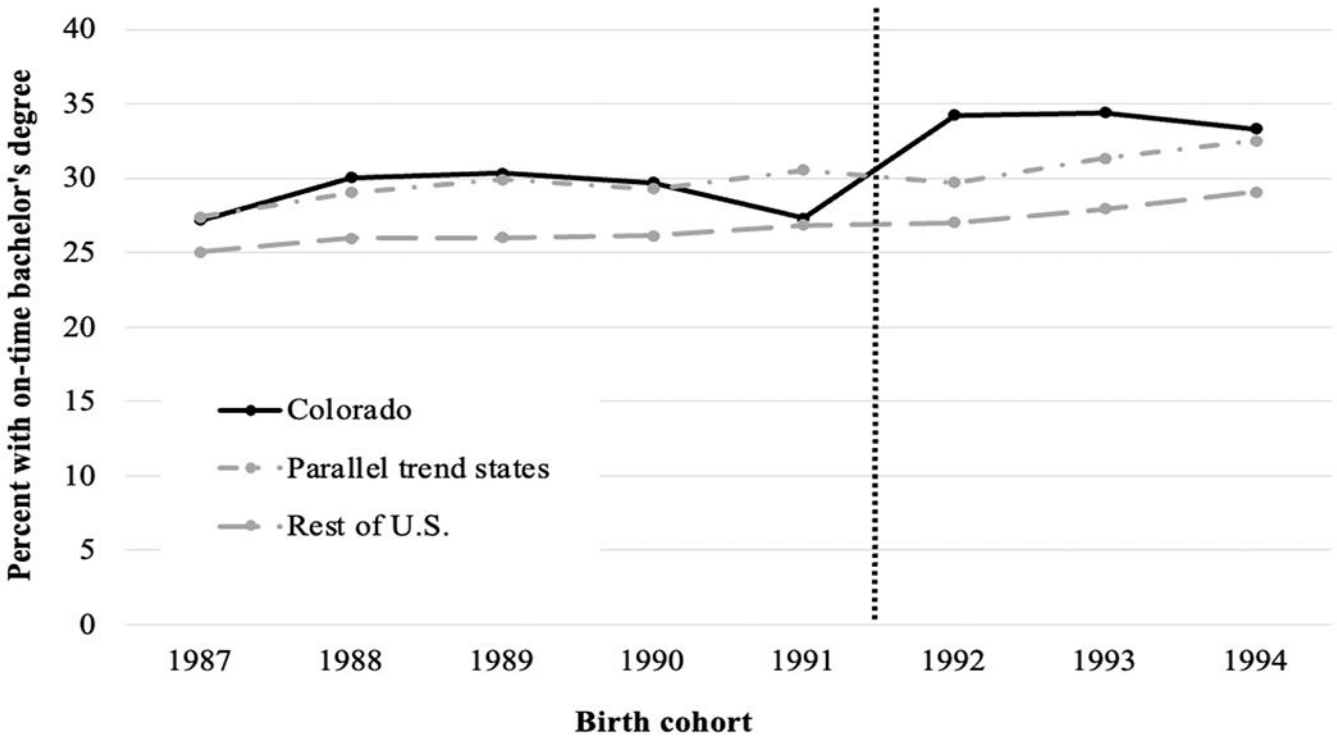

Exhibit 1. Single-year birth cohort trends in women's on-time bachelor's degree completion for Colorado, parallel trend states, and the rest of the US, 2009–19 (birth cohorts 1987–94)

Source: Authors' analysis of 2000 and 2010 decennial census and 2009–19 American Community Survey 1-year data. For more information on sampling and estimation methods, confidentiality protection, and sampling and nonsampling errors in the American Community Survey, see Census Bureau. Code lists, definitions, and accuracy [Internet]. Washington (DC): Census Bureau; [cited 2022 Oct 6]. Available from: https://www.census.gov/programs-surveys/acs/technical-documentation/code-lists.html.

Notes: Groups are by state of residence during adolescence. The dashed vertical line denotes exposure to the CFPI during high school ages, with cohorts to the left of the line not exposed and those to the right of the lines exposed. All results were approved for release by the Census Bureau, Data Management System number P-7515912 and approval numbers CBDRB-FY22-ERD002-008 and CBDRB-FY22-ERD002-012. CFPI is Colorado Family Planning Initiative.

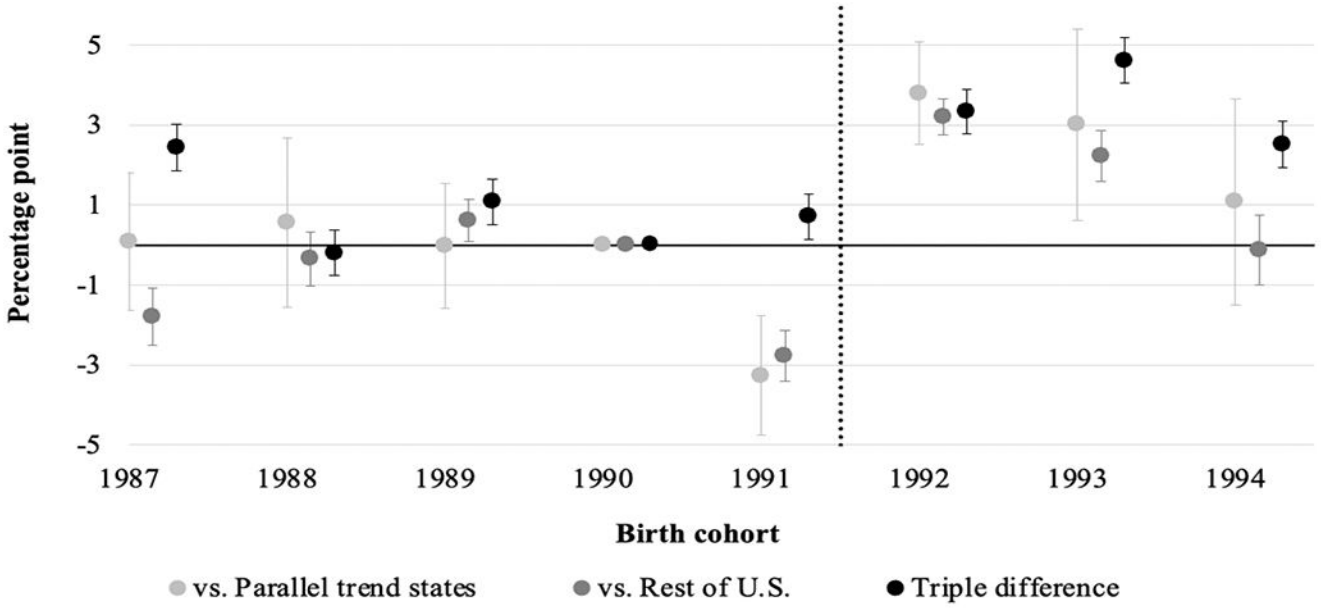

Exhibit 2: Event-study estimates of the effects of Colorado Family Planning Initiative (CFPI) exposure on women's on-time bachelor's degree completion, 2009–19 (birth cohorts 1987–94)

Source: Authors' analysis of 2000 and 2010 decennial census and 2009–19 American Community Survey 1-year data.

Notes: The figure shows the percentage point estimates and 95% confidence intervals from three separate event-study models estimating the effects of the CFPI on on-time bachelor's degree completion for different birth cohorts. "Parallel trend states" and "Rest of US" indicate estimates from models that compare women in Colorado during adolescence with women in parallel trends states and women in the rest of the US, respectively. "Triple difference" indicates estimates from a triple-differences model that compares women in Colorado with men in Colorado and with men and women in parallel trend states. The dashed vertical line denotes exposure to the CFPI during high school ages, with cohorts to the left of the line not exposed and those to the right of the lines exposed. Estimating equations and model output are available in appendices C and D. (See note 24 in the text) All results were approved for release by the Census Bureau, Data Management System number P-7515912 and approval numbers CBDRB-FY22-ERD002-008 and CBDRB-FY22-ERD002-012.

Exhibit 3:

Percentage point increase in on-time bachelor's completion among Colorado women by birth cohort, primary models and select robustness checks, 2009–19 (birth cohorts 1987–94)

	Colorado women versus parallel trend state women	Colorado women versus rest of US women	Triple difference: Colorado women versus Colorado men versus parallel trend states	Triple difference: US-born sample only
Treated birth cohorts				
1992	3.79****	3.21****	3.34****	2.67****
1993	3.01**	2.23****	4.62****	4.36****
1994	1.08	−0.12	2.52****	2.52****
Average percentage point increase	2.63	1.77	3.49	3.18

Source: Authors' analysis of 2000 and 2010 decennial census and 2009–19 American Community Survey 1-year data.

Notes: Results estimated from 4 event-study models that include age and state fixed effects and standard errors clustered at the state level. Estimating equations and model output are available in online appendices C and D (see note 24 in the text). Average percentage point increase was estimated as the mean across the 3 single-year birth cohorts. All results were approved for release by the Census Bureau, Data Management System number P-7515912 and approval numbers CBDRB-FY22-ERD002-008 and CBDRB-FY22-ERD002-012.

**** $p < 0.001$

** $p < 0.05$