The Power of the IUD: Effects of Expanding Access to Contraception Through Title X Clinics

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Abstract

We estimate the effect of Colorado's Family Planning Initiative, which provided funds to Title X clinics to offer long-acting reversible contraceptives to low-income women. We find substantial effects on childbearing, concentrated among women in zip codes within 7 miles of clinics: the initiative reduced births by approximately 20 percent for 15–19 year olds. We also estimate effects of extensive media coverage in 2014 and 2015, and find a substantial increase in LARC insertions, extended effects on births among 15–17 year olds living greater than 7 miles from clinics, and significant reductions in births among 20–24 and 25–29 year olds.

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1 Introduction

Even though more U.S. women are using contraception today than at any other point in history, there is reason to believe that barriers to access may still play an important role (Bailey and Lindo, 2018). Nearly half of today's pregnancies are unintended (Finer and Zolna, 2016) and one-third of today's births are from unintended pregnancies (Buckles, Guldi, and Schmidt, 2019).

Moreover, the fact that one-third of unintended pregnancies are to women using some form of contraception (National Center for Health Statistics, 2014) highlights that a relatively small share of women are using the most effective forms of contraception: long-acting reversible contraceptives (LARCs). LARCs, a category comprised of intrauterine devices and subdermal implants, completely eliminate the possibility of user errors and thus have failure rates less than 1% (versus birth control pills, injectables, patches, rings, and condoms, which have failure rates of 6–18%).[1] For this reason, there is a great deal of enthusiasm for expanding access to long-acting reversible contraceptives (LARCs).

Though several medical organizations have called on LARCs to be more widely promoted—including the American College of Obstetricians, Gynecologists' Committee on Adolescent Health Care, the American Academy of Pediatrics, and the Center for Disease Control and Prevention—only 12% of women, and only 5% of teenagers, chose a LARC in 2012 (Bailey and Lindo, 2018). Notably, 49% of residents in obstetrics/gynecology training programs use LARCs (Zigler, Peipert, Zhao, Maddipati, and McNicholas, 2017), and 65% of participants in a contraception counseling program chose a LARC when it was offered at no cost (Secura, Allsworth, Madden, Mullersman, and Peipert, 2010), implying that financial, information, or personal autonomy barriers impede higher usage rates.

In this paper we examine the impact of an initiative that provided funds to Title X family planning clinics so they could make LARCs available to low-income women for free or at reduced costs, in addition to their traditional offerings which would include more-common

[1] LARCs are inserted by a doctor and do not require anything of the user. Notably, researchers have actually found evidence of negative unintended consequences of expanding access to less effective forms of contraception in some instances. For example, see Buckles and Hungerman (2018) on condoms and Pfeifer and Reutter (2020) on emergency contraception.

forms of contraception.[2] Specifically, we analyze the effects of the Colorado Family Planning Initiative (CFPI), a program that allowed Title X clinics in Colorado to substantially expand the provision of LARCs to their low-income clients beginning in 2009.

Whereas earlier work has shown that the initiative reduced the overall teen birth rate for counties with Title X clinics (Lindo and Packham, 2017), in this study we leverage more granular data and more recent years of data to answer several new questions. First and foremost, we assess the geographic "reach" of the initiative by considering the degree to which the effects decrease with distance to clinics. In so doing, we contribute to the broader literature on the effects of travel distance on important activities, including health care utilization and civic participation. This literature includes studies evaluating the effects of distance to a hospital (Currie and Reagan, 2003; Buchmueller, Jacobson, and Wold, 2006), several studies of the effects of reproductive health care clinic closures (Lu and Slusky, 2016, 2019; Packham, 2017; Fischer, Royer, and White, 2018; Lindo, Myers, Schlosser, and Cunningham, Forthcoming), and a recent study of assigned polling locations on voter turnout (Cantoni, 2020). We also go beyond earlier work by addressing the following questions: Are there effects on high-school-aged teenagers? On older teenagers and women in their twenties? Do the effects vary across race and ethnicity? Did the extensive media coverage that began in 2014 alter the reach of the program? Is there any evidence of impacts on newborns' health outcomes or abortion?

We answer these questions using two separate administrative datasets on contraception use and births. After providing evidence that the initiative led to increases in LARC use by 28,000 women aged 15–29, at least in part due to a reduction in pill use, we estimate the effects on births using a difference-in-differences design that compares changes in births for women in zip codes closest to Title X clinics to changes in births for women in zip codes farther away. We use a non-parametric approach to identify which zip codes were most affected by the initiative and find that the effects are largely concentrated among women in zip codes within 7 miles of Title X clinics. We find that the initiative reduced births by approximately 20 percent for 15–17 year olds and 18–19 year olds living in such zip codes. Averaging across all years, we find no evidence of significant effects on births among older women, or women living in more distant

[2]This distinguishes our study from Bailey (2012), Lu and Slusky (2019), and Packham (2017), all of which examined policies that primarily would have affected access to more common forms of contraception.

zip codes. However, when focusing on the period of time after the initiative received extensive media attention, we observe a trend break in the number of LARC insertions; that the effects on births among 15–17 year olds extend out to those living a greater distance from clinics; and that there are significant effects on births among 20–24 and 25–29 year olds. On average, these statistics correspond to 6,800 fewer unintended births due to the program. In other analyses, we also find some suggestive evidence that effects vary across zip code characteristics and that the CFPI reduced the number of births that typically involve relatively intensive hospital care. We also conduct an analysis of abortion, the results of which are often imprecise, but which provide suggestive evidence that the initiative also reduced unintended pregnancies among teenagers that otherwise would have ended in abortion.

These results have several implications for policy. First, the magnitude of the effects indicates that expanding free and low-cost access to LARCs through Title X clinics can reduce unintended pregnancy for a large share of young women who live close to such clinics.[3] Second, reducing barriers to highly effective contraceptives can help women from a broad range of ages—from 15–29—avoid unintended pregnancy.[4] Notably, the effects are especially prominent for 15–17 year olds and also 18–19 year olds, which suggests that the initiative may have improved women's ability to invest in their high school and post-high-school education and thus have important implications for their economic circumstances.[5] This is especially important, as these age groups maintain the highest rates of unintended pregnancies. Third, our results indicate that estimates of the effect for all women living in a county with a clinic (e.g., in Lindo and Packham (2017)) mask much larger effects for women who live closest to a clinic. Finally, since 58.9 percent of Colorado women live in zip codes at a distance beyond which we find significant effects of the initiative, our results highlight that there is more scope for clinics

[3]Reductions in unintended pregnancy are implied by any reduction in births that results from women voluntarily opting for more effective methods of contraception. We present evidence to support the idea that women chose highly effective contraceptive as a result of the CFPI below.

[4]We focus on these age ranges as they make up over 75 percent of clients at Colorado Title X clinics and have relatively high birth rates compared to women over the age of 29. We find no effects of the program on LARC take-up or childbearing for women aged 30–34.

[5]It is broadly accepted that expanding access to birth control pills and abortion during the 1960s and 1970s reduced childbearing and increased women's educational attainment, wages, and labor force participation, while reducing dependence on public assistance and improving resources in households with children. See Bailey and Lindo (2018) for a review of this literature.

to provide services to a broader share of the population.[6] These findings have particularly important policy implications in light of recent federal guidelines that propose cutting funding to clinics offering abortion in addition to providing Title X services.

2 Background

This section reviews the effectiveness and uptake of long-acting reversible contraceptives before providing background information on the Colorado Family Planning Initiative. To do so, we borrow heavily from the discussion in Lindo and Packham (2017) and we refer readers to that study for further details.

2.1 Long-Acting Reversible Contraceptives (LARCs)

LARC methods include intrauterine devices (IUDs) and subdermal implants.[7] During the first year of typical use, fewer than 1 in 1,000 women using an IUD or implant become pregnant, due to the fact that LARCs eliminate the potential for user-compliance error as they require nothing of the user after insertion.[8]

Despite the relative ease and effectiveness of LARCs, take-up is relatively low. Only 5.8 percent of adolescents and women aged 15–19 have ever used an implant or IUD, and only 14 percent of U.S. women chose a LARC in 2014 (Guttmacher Institute, 2018). Reported barriers to use include patients' lack of familiarity, lack of access, and/or misconceptions about safety.[9] For young women especially, who may face social stigma or large transportation costs, scheduling and attending the procedure itself may also serve as a deterrent. Insertion is uncomfortable and sometimes painful, and women can experience side effects, such as menstrual pain

[6] On average, there are about 19 zip codes per county in Colorado. Zip codes represent about 13 percent of population in a given county.

[7] IUDs are small, T-shaped devices inserted into the uterus to prevent pregnancy, while implants are a thin, matchstick-sized plastic rod inserted under the skin of the non-dominant upper arm.

[8] For comparison, oral contraceptives and condoms and have typical-use effectiveness rates of only 91 percent and 82 percent, respectively, and for oral contraceptives, the risk of contraceptive failure is 55 percent higher among women younger than 20 years old (Dinerman, Wilson, Duggan, and Joffe, 2012; Grady, Hayward, and Yagi, 1986).

[9] Such safety concerns may be a result of the reputation of the Dalkon Shield, an IUD introduced in the 1970s, which increased women's risk for pelvic inflammatory disease and caused an array of severe injuries, leading the U.S. Food and Drug Administration to ban the device in the 1974 (Bailey and Lindo, 2018).

and bleeding, spotting, headaches, nausea, and mood changes (Grimes, 2007).[10] Moreover, for women wishing to become pregnant in the near future, alternative methods of contraception that do not require a visit to the doctor (for removal) to restore their ability to become pregnant may be more attractive.

Importantly, the high upfront costs of the devices may also create large barriers to uptake. LARCs can cost upwards of $500 out-of-pocket. While the Affordable Care Act, which requires insurers to cover all FDA-approved contraceptives, has reduced or eliminated concerns about costs for some women since 2011, there is an exemption for employers with a religious or moral objection that was expanded in 2017. Moreover, these contraceptives mandates may not be as impactful for women that rely on their parents' health insurance if they are worried about confidentiality.[11] As a result, the costs of LARCs continue to be highly salient for many women.

In addition to these demand-side concerns, from the provider's perspective there also exist barriers that contribute to the low rate of LARC use among U.S. women. First, doctors and nurses may themselves be unaware or misinformed about LARC technology, and they must be trained on proper LARC insertion/removal to provide them to patients. Second, health clinics that provide free and low-cost contraceptives often cannot afford to offer LARCs to every client. As a result, a large proportion of Title X clinics do not offer LARCs at all, and those that do usually have to offer them to clients selectively. For example, just 61 percent of Title X clinics offered implants, 65 percent offered the copper IUD and 67 percent offered a hormonal IUD in 2015 (Zolna and Frost, 2016).

2.2 The Colorado Family Planning Initiative (CFPI)

In 2009 the Colorado Department of Public Health and Environment (DPHE) established the CFPI in an effort to lower the state's unintended pregnancy rate through family planning.

[10] Based on their clinical trials, the five IUDs available on the U.S. market (Mirena, Paragard, Sklya, Liletta, and Kyleena) have discontinuation rates due to adverse reactions between 12 percent and 22 percent. As a point of comparison, clinical trials for the commonly prescribed birth control pill, Ortho Tri Cyclen, have had discontinuation rates due to adverse reactions between 11 and 21 percent.

[11] According to a recent survey, 68 percent of teens stated that their primary reason for not using birth control is because they are afraid that their parents might find out (The National Campaign to Prevent Teen and Unplanned Pregnancy, 2015).

Over the course of the initiative, the Colorado DPHE received $23 million in funding from the Susan Thompson Buffett Foundation to expand family planning services, and, in particular, to provide free LARC methods to low-income women visiting Title X clinics. All of Colorado's 28 agencies applied for and received funding, which was distributed to 68 Title X clinics across the state from 2009–2015.[12,13]

While the specifics of each agency's implementation strategy varied, they generally committed to spend their funds on the following objectives: supplying free IUDs and contraceptive implants to low-income women; equipping staff and providers with more knowledge about LARC insertion, promotion, and counseling; and providing technical assistance for billing, coding, and clinic management.[14]

The foundation allocated funding directly to Title X agencies, which receive federal and state funds to provide free or low-cost family planning counseling, sexually transmitted disease screening, and contraceptives. The expansion within the existing network of Title X family planning clinics offered a number of advantages. Due to existing contracts with agencies within the network, the Colorado DPHE was able to expedite the funding process and make use of clinic networks and infrastructure in place to better facilitate collaboration, while current Title X regulations and protocols support high-quality health care and the ongoing collection of data. Since many Title X clinics already had waiting lists of women seeking these expensive devices, the goal of the CFPI was to focus efforts on the unmet demand for highly effective contraceptives and expand access more broadly.

Moreover, Title X clinics are specifically aimed at providing services to low-income women, who may face the largest hurdles to obtain LARCs. Colorado Title X guidelines require all con-

[12]Due to the declared success of the program, additional public funding for LARCs was appropriated in 2016 after the depletion of private funds.

[13]Money was allocated proportionally to agencies based on their number of clients and the predicted number of LARC insertions in the following year. Because financial data is organized by agency and not clinic, we are unable to track allocation of Title X dollars across zip codes. Nonetheless, we note that CFPI funding was relatively stable across years for each agency and we do not find much evidence to support the notion that the funding for clinics in lower-populated zip codes was larger or led to greater uptake of LARCs in these areas. In particular, we note that independent clinics, which accounted for 29.5 percent of total CFPI funding from 2009-2011, also accounted for approximately 29 percent of LARC insertions.

[14]Additionally, the CFPI offered general assistance to Title X agencies to increase LARC usage and supported the provision of vaginal rings, tubal ligations, and vasectomies. However, the use of the ring remained fairly constant among clients after the CFPI was implemented, and tubal ligations and vasectomies are extremely rare among young women. Take-up of rings among Colorado Title X clients aged 15–29 is about 7 percent, while take-up of ligations and vasectomies is less than 0.5 percent.

traceptive methods and exam fees be incorporated into a schedule of discounts, or sliding fee schedule. Anyone reporting that their income is at or below 100 percent of the poverty level pays nothing for any service, and no client is denied services because of an inability to pay. In Colorado, 90 percent of Title X clients report incomes below this level, meaning that nearly all clients pay nothing for contraceptives and doctor visits.[15] Prior to the CFPI, the high upfront costs of LARCs paired with the fact that clinics provided their services for free meant that widespread provision of LARCs was prohibited. In the first year of the program, 20 out of 28 Colorado Title X agencies offered IUDs for the first time, and 16 agencies offered the implant for the first time. In the following year, all Colorado agencies offered IUDs and all but one agency offered subdermal implants, suggesting that the CFPI funding was crucial in allowing clinics to offer LARCs as a contraception option to all women.

3 Empirical Approach

We use data on contraceptive use and childbearing from two separate administrative datasets. These data allow us to observe the number of women visiting Colorado Title X clinics and their contraception choices before and after the CFPI, and to analyze trends in births by age, race, and ethnicity. Below, we provide a detailed description of the data used in our analysis as well as our strategies for estimating the causal effects of the CFPI.

3.1 Data

To understand how Title X clients' contraception choices changed in response to the CFPI, we use administrative family planning agency-level data from the Colorado Department of Public Health and Environment (DPHE). These data include information on primary contraceptive methods used by clients at the time they left the clinic (for various age groups) aggregated to the clinic agency-by-year level, as well as the total number of LARC insertions per year. These data span from 2008 to 2015, which allows us to see client's contraceptive choices, including whether or not they chose a LARC, from one year prior to the CFPI through the seventh year

[15] Agencies must accept verbal communication of income and no verification is required.

of the program.

To estimate the effect of the initiative on births for various groups defined by age, race, and ethnicity, we use restricted-access birth data from the Colorado DPHE. These data include a record of every birth to Colorado residents from 2003 to 2016. Critically, these data provide mothers' zip codes of residence, which allows us to conduct a richer and more granular analysis than Lindo and Packham (2017). These data also include information on mother's race, ethnicity, and age in addition to measures of infant health. For our analysis we assign births to the year of conception based on the mother's last menstrual period to construct a measure of births conceived in a particular year. Moreover, while nearly all of our analyses focus on outcomes measured from birth records, we also consider effects on abortions using county-level data on abortions by age group collected by the Colorado Department of Public Health and Environment for 2004–2016.[16,17]

Because all Colorado Title X agencies accepted CFPI funding, our primary identification strategy uses distance from a zip code's population centroid to the nearest Title X clinic to establish treatment status. This approach is motivated by several recent studies documenting the significant effects of distance to women's health clinics on preventative health care utilization, abortion, contraception use and births (Lu and Slusky, 2016; Lindo, Myers, Schlosser, and Cunningham, Forthcoming; Packham, 2017; Quast, Gonzalez, and Ziemba, 2017; Fischer, Royer, and White, 2018; Lu and Slusky, 2019). Namely, as distance to a clinic increases, the likelihood that a woman will seek family planning and health services decreases. To measure the distance from a zip code centroid to the nearest Title X clinic, we geocoded the addresses of each Title X clinic in the state using archived directories of Colorado clinics from 2009–2012 and calculated travel distances to these locations.[18]

To control for time-varying zip-code-level economic conditions, we use data from the American Community Survey (ACS), which contains annual estimates of poverty rates and unemployment. Because population data by race and age is unavailable by zip code, we ad-

[16]These data do not separate counts by 15–17 year olds and 18–19 year olds; therefore any analysis of abortions by age group will consider 15–19, 20–24, and 25–29 year olds.

[17]In the event that a zip code's total abortion count is censored, we assume that the number of abortions is zero. However, our estimates are not sensitive to this choice. We discuss this further in Section 4.7.

[18]We calculated total travel distance from zip code centroids to clinic coordinates using the *geonear* package for Stata, which draws on Google Maps API data (Picard, 2010).

ditionally include yearly population counts from the National Cancer Institute's Surveillance, Epidemiology, and End Results Program (SEER) to construct county-level measures of demographics, including the fraction of 15–17, 18–19, 20–24, and 25–29 year olds, the fraction of each age group that are Black, the fraction Hispanic, and demographic fractions by single age.

3.2 Identification Strategies

Our approach for estimating the effects of the Colorado Family Planning Initiative is a difference-in-differences design that uses zip codes that are farther from Title X clinics as the comparison group for zip codes closest to clinics receiving funding. In our preferred specifications, we use a data-driven approach to define our treated zip codes as those within 7 miles of a Title X clinic, although we perform additional tests to provide evidence that our results are not sensitive to this choice of distance cutoff.[19] The identifying assumption underlying this approach is that the proportional changes in births in the comparison zip codes provide a good counterfactual for the proportional changes that would have been observed in the treated zip codes in the absence of the CFPI.

We begin our analysis by estimating Ordinary Least Squares (OLS) models of the following form:

$$Births_{zt} = \alpha_z + \alpha_t + \beta X_{zt} + \theta CFPI_{zt} + \epsilon_{zt} \quad (1)$$

where $Births_{zt}$ measures births in zip code z in year t using the inverse hyperbolic sine (IHS) of the count.[20] $CFPI_{zt}$ is an indicator variable that takes a value of one in all years after the CFPI began for zip codes defined to be "near" a Title X clinic and zero otherwise, α_z are zip code fixed effects to control for systematic differences across zip codes, and α_t are year fixed effects to control for shocks to births that are common to all zip codes in each year. All analyses allow errors to be correlated within zip codes over time when constructing standard-error estimates.[21] We note that because we are estimating effects within Colorado at the zip-code-level, our approach will account for state-level policies with common effects across Colorado zip codes, potentially including changes to over-the-counter emergency contraception availability,

[19] Results from a range of distances are discussed below in Section 4.2.

[20] This transformation takes on the form $sinh_z^{-1} = ln(z + \sqrt{1 + z^2})$.

[21] Our estimates are more conservative using this approach as opposed to clustering at the county level.

parental notification laws, or expansions in Medicaid.[22]

We analyze the IHS of birth counts as our outcome variable because doing so allows θ to be interpreted as an elasticity and, unlike a standard log transformation, the IHS is defined for observations that have zero counts. However, below we also discuss results from Poisson as well as WLS models.

Moreover, we focus on birth *counts* rather than *rates* due to a lack of annual data on zip-code populations. However, we provide support for the validity of this approach with an ancillary analysis of population flows based on data from the American Community Survey. We focus on estimates based on OLS models because they are more precise than estimates based on weighted-least-squares models, which is consistent with the discussion of weighting in Solon, Haider, and Wooldridge (2015).

We also report estimates that consider how the effects evolve over time with models of the following form:

$$Births_{zt} = \alpha_z + \alpha_t + \beta X_{zt} + \sum_{k=0}^{7} \theta_k CFPI_{z,t-k} + \epsilon_{zt} \tag{2}$$

where $CFPI_{z,t-k}$ is an indicator variable that takes a value of one k years after the CFPI began for zip codes defined to be "near" a Title X clinic and zero otherwise. All other terms are unchanged from Equation 1.

We consider how the effects to vary over time for several reasons. First, the nature of contraceptive choice, sexual activity, and childbearing all would suggest that effect may grow over time after the program's implementation, even when we assign births to their year of conception. In particular, the share of sexually active women using LARCs is expected to increase over time as they visit clinics and, more generally, become increasingly aware of this option. Second, the program was rolled out at the state level starting in fiscal year 2008 (i.e. July 2008), with money distributed to agencies each year.[23] Although the donated funds ceased after the summer of 2015, the state decided to continue funding the program on its own

[22]This is especially important in light of recent work showing that parental notification laws have the potential to affect birth and abortion rates for minors (Joyce, Kaestner, and Colman, 2006; Myers and Ladd, 2020; Joyce, Kaestner, and Ward, 2020).

[23]The Colorado DPHE disbursed funds to local agencies starting in July 2008; however, the first year of implementation of the CFPI did not begin until January 2009.

starting in 2016. Accordingly, we may expect that throughout the program's duration, effects accumulate as teens and older women continue to use LARCs and/or as information about the program spreads. At the same time, the effects on specific age groups may vary over time as women naturally age into other age groups. Finally, while the CFPI was not promoted publicly by the state during its rollout, in 2014 the Colorado DPHE released an internal report on the achievements of the initiative, which generated national news attention from 2014–2015 and which may have altered its effects.

As with any difference-in-differences design, the validity of our approach requires common trends in the outcome over time for the treatment and control groups (those near Title X clinics and those farther away, respectively). We provide support for this assumption with evidence that outcomes for these groups are not diverging from one another prior to the CFPI. We also examine data from the American Community Survey to test whether population flows constitute a threat to the validity of the identifying assumption.

4 Results

4.1 Effects of the CFPI on LARC Use

Before presenting our estimated effects on births, we first analyze how the CFPI affected LARC uptake by Title X clients. The top panel of Figure 1 shows the per capita increase in LARC use by age group for women visiting Title X clinics in Colorado. While LARC use increases over time following the CFPI for women of all ages, the most striking increases are for women under age 25, with some increases to women aged 25–29.

In the bottom panel of Figure 1 we also address the notion that the impact of LARCs on childbearing is likely to depend on both LARC usage and on historical rates of childbearing. In particular, we may expect to see that the CFPI has the largest proportional reduction in birth rates for groups of women where the number of LARC insertions was high relative to the number typically having children. Towards this end, the bottom panel of Figure 1 displays the number of Title X clients choosing a LARC relative to the number of births by age group in 2008. This figure shows that the youngest women have the highest ratio of LARC take-up rates

relative to historical birth rates.

To compare the overall pattern of LARC use with the use of other contraceptives, Figure 2 shows how the primary method of contraception used by women visiting Colorado Title X clinics evolved over time.[24] In 2008, the year before the initiative began, LARCs had a primary usage rate for teenagers and 20–29 year olds of less than 3 percent and 7 percent, respectively, which was lower than primary usage rates for condoms, injections, rings, and birth control pills. By 2015, LARC take-up among women under age 30 had risen to nearly 30 percent, surpassing all methods except oral contraceptives.[25]

This increase in LARC use is mirrored by a decline in the use of oral contraceptives, indicating that the initiative led to substitution of LARCs for oral contraceptives, at least in part.[26] That there is substitution along this margin has important implications for the effects on pregnancy. Most obviously, we would expect this sort of substitution to reduce unintended pregnancy, because LARCs are more effective than oral contraceptives. It also suggests that we would likely expect the effects to be smaller than if the program instead solely caused substitution away from condoms (as the primary form of contraception), because condoms are less effective than oral contraceptives.

We note that these statistics reflect annual Title X clinic *visitors*, and the long-acting quality of LARCs is expected to reduce the likelihood of a return visit to a clinic.[27] Therefore, the trend for LARC use evident in Figure 2 will almost certainly understate the degree to which LARC use increased over time among women served by Title X clinics. Assuming insertions were proportional across the age distribution of Title X clients, we estimate over 28,000 insertions for women aged 15–29 between 2009 and 2015.

To further demonstrate that the increases in LARC use in Colorado depart from trends in

[24]These statistics will understate condom use generally because condoms are frequently used as a secondary method of contraception.

[25]For a more explicit analysis of the substitution between oral contraceptives and LARCs, see Table A1 which displays the number and percent of clients aged 15–29 choosing each of these devices as their primary method of contraception over time. We note that between 2008–2015, 6,549 fewer Title X clients chose oral contraceptives and 7,272 more clients chose a LARC.

[26]This evidence is consistent with earlier work on the effects of the CFPI on teenagers (Lindo and Packham, 2017) and evidence on LARC takeup among teenagers across the United States when longer-acting methods—Norplant and Depo Provera—became available (Levine, 2001).

[27]If a patient visits a clinic more than once in a given year, we observe only the contraceptives chosen during the first visit.

use across the rest of the United States, Figure 3 depicts the difference between LARC usage among Colorado's Title X clinic clients and LARC usage among Title X clinic clients across the United States as a whole. Despite starting at a similarly low rate in 2008, LARC usage among women aged 15–29 visiting Title X clinics across the United States only grew to approximately 13 percent by 2015 versus nearly 30 percent for women aged 15–29 visiting Title X clinics in Colorado.[28]

4.2 Estimates of the Geographic Reach of the Initiative on Births

As described in Section 3.2, to estimate the effects of the CFPI on births we rely on an estimation strategy that compares changes in births for women residing in zip codes near Title X clinics, who we expect to be affected by expanded access to LARCs, to changes in births for women residing in more distant zip codes who are less likely to be affected. Because it is not clear *a priori* which zip codes should be considered "near" to Title X clinics in this context, we use a non-parametric data-driven approach to answer this question in a similar spirit to Muralidharan and Prakash (2017).

Specifically, we use the difference-in-differences model (Equation 1) to estimate the effects using a rolling distance-window to define the treated group while maintaining a constant comparison group. We sequentially consider "treated" zip codes h to $h + 5$ miles from a Title X clinic for $h = 0, 1, ...15$ and use a comparison group comprised of zip codes greater than 20 miles from a Title X clinic. In so doing, we generate 16 separate difference-in-differences estimates, each intended to measure the effect on childbearing for a different set of zip codes defined based on their distance from a Title X clinic. The results are shown in Figure 4, with separate panels for the estimated effects on births for different age groups.

As expected, we see significant estimated effects for the specifications in which the treatment group is comprised of zip codes that are especially near Title X clinics. For example, the very first estimate plotted in Panel A indicates that the CFPI reduced births to 15–17 year olds by approximately 10 percent for zip codes in the distance bin 0–5 miles. The estimated effect

[28]The CFPI appears to have had a much smaller impact on contraception use among older women. For female Title X clients in Colorado over the age of 29, LARC use increased to 24.4 percent in 2015 versus 12.3 percent for clients across the US. It is for this reason that we focus our remaining analyses on women aged 15–29.

becomes larger when we consider women in zip codes 1–6 miles but then shrinks towards zero as we evaluate the effects on women living farther and farther away from clinics. The estimated effect on births to 15–17 year olds is no longer statistically significant at the five-percent level when we consider those 7–12 miles from a clinic. The pattern of estimates is similar when we instead consider births to 18–19 year olds (Panel B). There is relatively little evidence from this analysis that births are affected for 20–24 year olds or to 25–29 year olds regardless of their distance from clinics (Panels C and D).

Overall, these estimates imply that the geographical reach of the CFPI—in terms of having a measurable impact on birth rates for some groups of women—was approximately 7 miles.[29] These results determine our definition for treatment and control groups in our subsequent analyses. In particular, in most of our main analyses, we define the treatment group as those zip codes within 7 miles of a Colorado Title X clinic, and compare changes in births in these zip codes to changes in births in zip codes further than 7 miles from a clinic. Because clinics did serve some women living in more-distant zip codes, this approach can be viewed as estimating a lower bound of the true treatment effects. We also note that any estimates based on this research design will represent intent-to-treat estimates, because only a small share of the population is treated; thus, our estimates will likely understate the effects of the program on the women it actually served.

To provide context for the zip codes we consider "treated" and "untreated," we provide summary statistics separately for each set of zip codes in Table 1 and we depict these zip codes in Figure A1. Notably, treated zip codes have higher average birth counts in all years, which in large part reflects the fact that these zip codes also are more typically more highly populated. This table additionally reports travel distance information and travel time information, although these variables do not change over the sample period.[30] While the zip codes in the treatment group may be up to 7 miles from a clinic, on average they are 3.6 miles to their nearest clinic which corresponds to a 9 minute drive. Zip codes further than 7 miles are an average of 22.2

[29] Average distance to the nearest neighboring zip code is 18 miles, although for some zip codes the nearest neighbor is less than 0.25 miles away from the zip centroid. Therefore, for more urban zip codes, it is not the case that this treatment definition will simply compare a treated zip code to its bordering zip codes.

[30] Driving time is calculated using the *geonear* command in Stata 15, which is based on information from Google Maps API.

miles from the nearest clinic, corresponding to 53 minutes of driving time.

4.3 Graphical Evidence of Trends

Before discussing our preferred estimates of the effects of the CFPI on childbearing, we first present graphical evidence to support our main results and the validity of our research design. In Figure 5 we present event-study-styled graphs showing difference-in-differences estimates of the effects on the IHS of births by age group over time, including periods of time prior to its implementation.[31] In each panel, the black circles represent the estimated effects at different points in time from a baseline model controlling for zip-code and year fixed effects.[32] The comparison group includes all Colorado zip codes farther than 7 miles from a clinic. The figure also shows estimates based on a model that additionally controls for time-varying measures of demographics and economic conditions (gray squares).[33] Additionally, in an attempt to compare zip codes that are most alike, we also show estimates from a third specification that limits the analysis to zip codes within 15 miles of a clinic (blue diamonds). Effectively, this approach involves a comparison of zip codes within 7 miles of a clinic to zip codes 7–15 miles from a clinic. Finally, the figure also shows estimates from a specification that includes year, zip and county-by-year fixed effects to allow for zip codes in separate counties to experience differential shocks by county over time (green triangles). Essentially, this specification uses other zip codes *within the same county* as the comparison group for each zip code within 7 miles of a clinic.

Although precise magnitudes are difficult to discern from Figure 5, the results as a whole reveal some clear patterns. Specifically, the sets of estimates indicate that births in treated and control zip codes followed a similar trajectory prior to the adoption of the CFPI, which provides support for our common trends assumption. This evidence is particularly strong for the 15–17 and 18–19 year old age groups, which is where we find strongest and clearest evidence of impacts on births.

[31] Alternatively, we present event study graphs for just our preferred specification with 95% confidence intervals in Figure A2.

[32] In estimating the effects over time, the year prior to the implementation of the CFPI, 2008, serves as the omitted category.

[33] These controls include zip-code-level unemployment rates and poverty rates and county-level fractions of individuals aged 15–29 by age, ethnicity, and race.

There is also some suggestive evidence of effects for older women during the sixth and seventh years of the CFPI, something we explore in greater detail below. That said, we note that the estimated effects in the pre-period are more volatile and less precisely estimated for the older age groups which may weaken confidence in the estimates for these groups to some degree.

4.4 Main Results

In Table 2 we present our main results. They are based on the difference-in-differences model specified by Equation 2 and, motivated by our analysis of the "geographic reach" of the CFPI, they use women in zip codes more than 7 miles from a clinic as the comparison group for women in zip codes within 7 miles of a clinic. Specifically, all estimates are based on a model that includes year and zip code fixed effects; the estimates shown in even columns are based on a model that additionally controls for time-varying demographic and economic characteristics. As before, we separately estimate the effects for women aged 15–17, 18–19, 20–24, and 25–29. Because the outcome is the IHS of births counts, approximate percent effect estimates can be calculated from coefficient estimates based on $100 \times (e^{(coefficient)} - 1)$.

Columns 1–2 and 3–4 present results for 15–17 year olds and 18–19 year olds, respectively. In columns 1–2, the estimates are negative and statistically significant for all years, and indicate that the CFPI reduced childbearing for women aged 15–17 living within 7 miles of a clinic by 22.2 percent over 7 years. Estimates shown in columns 3–4 indicate a similar, albeit slightly smaller, effect for women aged 18–19. Specifically, they indicate that the CFPI decreased births for women aged 18–19 living within 7 miles of a clinic by 19.5 percent.[34] As a point of comparison, Lindo and Packham (2017) documented effects of approximately 6 percent for 15–19 year olds residing in counties with Title X clinics. These earlier estimates obviously masked substantial heterogeneity in the effects, which depend on how far teenagers live from clinics. We also find that the effects become larger throughout the duration of the program,

[34] We note that women can travel to different states for services and it is possible that some residents of Colorado might do so. Unfortunately, we do not have zip-code-level data on these clinics outside of Colorado and do not know the extent to which Colorado women travel to them. To account for this, we have estimated the effects omitting zip codes that are: (i) further than 14 miles from a Colorado Title X clinic and (ii) border a county in a neighboring state with a Title X clinic. Estimates are similar to our main results, indicating a 17–19 percent drop in birth rates for women aged 15–19. See Table A2 in the appendix for these additional results.

suggesting that as more women receive LARCs, more unintended pregnancies are prevented over time.

In columns 5–8, we present estimates for women in their twenties. Consistent with the graphical evidence from Figure 5, there is not any clear evidence of effects for women aged 20–24 or women aged 25–29 in the short run. However, we do see evidence of significant effects (with point estimates ranging from 12–17 percent) on 20–24 year olds 6–7 years after the implementation of the CFPI. Similarly, there is also evidence of significant effects (with point estimates ranging from 8–11 percent) on 25–29 year olds 6–7 years after the implementation of the CFPI.

Overall, the estimates in Table 2 demonstrate that the CFPI had large and immediate impacts on births to high-school aged teenagers and older teenagers. While the CFPI also appears to have reduced births to women in their twenties, these effects are not evident until many years after the CFPI was implemented. There are two potential explanations for these delayed effects: (i) younger women with LARCs are simply aging into these cohorts in later years; and/or (ii) older women who would have had unintended births were slower to participate in the program. We explore this finding in greater detail below.

We have also investigated the effects using weighted least squares (WLS) models, which shed light on how the CFPI may have differentially affected zip codes with dissimilar population sizes.[35] These estimates, compared to our OLS estimates, are shown in Table A3. Notably, these alternative estimates are less precise than our main results. They are also smaller in magnitude, which suggests that there are relatively large effects for zip codes with relatively small populations.

We explore this potential heterogeneity directly in Table A4 by presenting separate estimates for "low population zip codes" and "high population zip codes," respectively, as suggested by Solon, Haider, and Wooldridge (2015).[36] These results show that the estimated effects for low population zip codes are similar to our main results and indicate reductions in birth rates for women aged 15–19, shedding additional light on why the OLS estimates are

[35]Cells are weighted by the zip code's female population according to the 2010 ACS.

[36]We define low-population zip codes as those with fewer than 15,100 total women in an effort to balance the subgroups by population. As a result, the "low-population" group will contain more zip codes but the same number of total females (i.e. 169,000) as the "high-population" group.

relatively large in magnitude as compared to the WLS estimates.[37] For additional context for these results, summary statistics for low- and high-populated counties are shown in Table A5. They indicate that the "low-population" group of zip codes has a higher percent of White individuals and fewer households living in poverty. We examine further heterogeneity along these lines next.

In Table 3 we analyze how much the effects of the CFPI vary across race and ethnicity. We have also evaluated effects separately by zip code poverty rate, and urbanicity to further explore the degree to which the effects vary across different types of zip codes.[38] Estimates for White mothers are similar to our main results, and indicate a 14.9 percent reduction for women aged 15–17 and a 16.0 percent reduction for women aged 18–19. Across all age groups, the estimated effects for Hispanic women are larger than average, ranging from 4.5–22.5 percent, although, in most cases, estimates are not statistically different from estimates for White mothers. While estimated effects for Black mothers are similar to Hispanic mothers aged 15–17, we find no evidence of effects for Black women aged 18–19, and estimates for Black women aged 20–24 are smaller than the estimated effects for White and Hispanic women. However, we note that only about 7 percent of Colorado Title X clients are Black, compared to 30 percent and 45 percent for White and Hispanic clients, respectively.

We note that it is not clear *a priori* which of these groups are expected to be affected most by the initiative, because of the complex set of mechanisms involved in contraception access, contraception use, sexual activity, and decisions to have an abortion. Taken together, our findings suggest that young women living near Title X clinics that are low-income but do not face the largest hurdles in terms of transportation or financial resources therefore may be more likely to take up the program. Or, alternatively, unintended pregnancies for other groups

[37] We have also estimated Poisson models, the results of which are shown in Table A6 and which are analogous to those in Table A3. These estimates are less precise for the youngest teens aged 15–17, which is unsurprising given that several zip codes experience zero births from this age group in a given year. Nonetheless, these estimates indicate a 13.8–15.0 percent reduction in births to 15–17 year olds 3–4 years after the program's initiation, and an average overall 11.4 percent and 10.2 percent reduction in births to 18–19 year olds and 20–24 year olds, respectively.

[38] See Tables A7 and A8. These results also indicate that the CFPI reduced births to teens living in both high- and low-poverty areas. However, effects for women aged 18–29 are concentrated in low-poverty zip codes. Estimates also indicate statistically similar reductions in birth rates in both rural and urban areas. We note that this is an alternative definition of zip code population size, and that our above definition of "less populated" zip codes overlaps with both rural and urban zip code categories.

of women may be more likely to result in abortion.

4.5 Validity and Robustness of Main Results

In this section we summarize a set of sensitivity checks to provide additional support for our main identifying assumption. We present the full description of our methodologies and these results in Appendix B.

First, we investigate population flows and a measure of predicted births, as a way to gauge whether our estimates are large in comparison to what we would expect in the absence of the intervention. These results (shown in Table B1) are generally close to zero and are never statistically significant.

Second, we test the robustness of our estimates to alternative measures of distance. We first use "as the crow flies" and driving distance calculations as well as treatment definitions spanning 0–5 and 5–10 miles, instead of within 7 miles. Estimates are similar across each specification.[39] We also show the results from placebo tests in which we construct placebo treatment indicators based on whether a zip code is within 7 miles of a McDonald's or a Starbucks. The resulting estimates (shown in Tables B4 and B5) are reassuring as a whole and generally support the notion that the distance to Title X clinics is driving our results.

Additionally, we test whether our findings might be biased by Title X clinic openings or closures during our sample period. To do so, we provide estimates from models that drop zip codes which experienced Title X clinic openings and closures during this time period. The resulting estimates are shown in Table B6. They indicate that clinic openings and closings are not responsible for our main results.

Finally, we address the possibility that other policy changes, such as Medicaid expansion and/or the Affordable Care Act (ACA) are instead responsible for the declines in childbearing. To explore the relevance of these coverage expansions in our context, we first analyze per capita client Title X caseloads over the program period in Colorado and the rest of the US, and present these trends in Figure B1. Overall, client caseloads for women aged 15–29 in Colorado track those across the U.S. Although client caseload increases in Colorado at the

[39] See Table B2 and Table B3.

start of the program, it peaks in 2010, then declines between 2010 and 2015, indicating that changes in insurance coverage are unlikely to have drawn a new set of clients to these clinics. Moreover, we examine retail and prescription sales data from Symphony Health Solutions' Pharmaceutical Audit Suite and find little to no evidence that the CFPI affected sales outside of Title X clinics of any particular type of contraceptive, including LARCs, (e.g. Figure B2). This provides additional support for the notion that the CFPI led to changes in contraceptive use, including significant take-up of LARCs by Title X clients, and resulted in a subsequent decline in unintended childbearing by women aged 15–29.

4.6 Exploring the Role of Advertising and Awareness

Though the CFPI was implemented in 2009 and eventually received international news coverage, it was not covered by any local, national, or international media outlets for many years.[40] The program's exposure changed after the Colorado DPHE released an internal report on the achievements of the initiative and published an academic paper in *Perspectives on Sexual and Reproductive Health* in 2014, one year before the initiative was set to run out of funding.[41] This sparked media attention to the program beginning in July 2014 and included a CNN story with the headline "Colorado teen birthrate drops 40% with low-cost birth control" (Schmidt, 2014). In more local news, the Denver Post published three pieces about the program between July 2014 and March 2015, including coverage of House Bill 1194, in which lawmakers gained attention for wearing IUD-replica earrings (Draper, 2014a,b; Frank, 2015a).

The following summer, the purported success of the CFPI from the Colorado DPHE again generated new media coverage, including a front-page story in the New York Times on July 6, 2015 with the headline "Colorado Finds Startling Success in Effort to Curb Teenage Births,"

[40]The initiative was not marketed by the state and we have only been able to find a single media mention of the initiative prior to 2014, which was in the context of an article published 5/6/2013 in *Windsor Now!* headlined "Plan B still banned from county clinics." The Colorado Family Planning Initiative was simply mentioned in this article as having been approved by Weld county commissioners at the same hearing where the commissioners said they would stand by their prior decision to keep Plan B out of county health clinics. Aside from this article, there were 8 county meeting notes made public that contained a mention of the CFPI—none of these meeting notes detailed or advertised the program beyond mentioning it, and the notes do not seem to have been shared on any form of social media.

[41]The Susan Thompson Buffett Foundation provided funding for the CFPI from July 2008–June 2015, with all funds expiring in the summer of 2015.

and a widely circulated Vox article two days later (Walker, 2015; Lopez, 2015).[42] This coverage was sustained through 2015 and 2016 as policy-makers vigorously debated whether to provide funding to continue the program.[43]

Consistent with the idea that this media coverage amplified the effect of the initiative, our main results, shown in Table 2, suggest heightened effects in 2014 and 2015. Specifically, the widespread coverage of the program aligns with our finding that the CFPI had significant effects on the number of births to women in their twenties only in its sixth and seventh years, and not before.

To further assess the role of advertising, we explore the share of clients having a LARC inserted at Title X clinics in Colorado. Specifically, in Figure 6 we display LARC insertions per female Title X client for each year, 2009–2015.[44] Notably, "insertion" in this context is different from "usage" (as reported in Figure 1) because usage statistics reflect both new and existing LARCs at time a woman leaves a clinic. As shown in Figure 6, the number of LARC insertions per Title X client initially grew slowly (by 3.1 percent from 2009–2010), then grew steadily by 7.3–9.8 percent annually from 2010–2014 before it increased by nearly 16 percent from 2014 to 2015. This jump is consistent with the idea that the significant media attention in 2015 created new interest for women visiting Colorado's Title X clinics to obtain a LARC.[45] It is also important to note, however, that the CFPI *was* covered by some media outlets in the

[42]Other outlets covering the program included the Washington Post, Denver Post, NPR, and The Guardian (Sullivan, 2014; Lopez, 2015; Frank, 2015b; Popovich, 2015; Horsley, 2015).

[43]To investigate the timing and reach of the media coverage, we documented the number of news articles containing the phrase "Colorado Family Planning Initiative" using NexisUni, a large international news archive. Prior to July of 2014, a total of 9 unique news articles were released containing the phrase, but 8 of these were county meeting notes; the ninth was a local newspaper article about the county's decision to keep Plan B out of its Title X clinics. This article briefly mentioned the Colorado Family Planning Initiative, but did not go into detail about the program, and the article was not shared on social media platforms. In the second half of 2014, 34 articles were released including the phrase "Colorado Family Planning Initiative"; in 2015 61 additional unique articles containing the phrase were released. A histogram depicting the distribution of articles between 2008 and 2016 is shown in Figure A3. The pattern of social media engagement—as measured by clicks from Facebook, shares on Twitter, pins on Pinterest, and posts and clicks on Reddit from the app BuzzSumo—is similar, in that engagement was largely nonexistent prior to 2014 and grew substantially in 2014 and 2015. Most notably, the aforementioned 2014 CNN article was shared over 17,000 times and the aforementioned Vox article was shared over 2.5 million times.

[44]Unfortunately, these data are not available after 2015. They also do not include separate counts by age group; thus, we focus on the numbers overall.

[45]We note that although client caseloads are not increasing in Colorado in 2015, women seeking LARCs typically represent a relatively small share ($<16\%$) of women visiting clinics for reproductive health care (including for other forms of contraception, STI testing, wellness visits, etc.). Therefore, older women already visiting clinics may have switched over to a LARC from another contraceptive as a result of the media coverage.

second half of 2014 and we do not see any evidence of a trend break between 2013 and 2014. As such, these results suggest that there was a delayed effect of the 2014 coverage and/or that the 2015 reporting was more impactful. Indeed, the 2015 spike may have been in part (or entirely) due to increased awareness of the possibility that clinics would have to stop providing LARCs without additional funding.

As a third and final approach to assessing whether the effect of the CFPI was different after extensive media coverage, we re-examine the geographic reach of the initiative with a focus on that period of time. This analysis is similar to that discussed in Section 4.2, where we showed that the initiative reduced births for women up to 7 miles from clinics when evaluating all years after the CFPI was implemented; here we instead focus on the estimated effects for 2014 and 2015, separately. In particular, we estimate Equation 1 using a dataset containing all pre-CFPI years and only the relevant post-initiative year (i.e. 2014 or 2015) in an effort to parse out the year-by-year reach of clinics.

These results, shown in Figure 7, offer several additional insights. First, they indicate that the geographic reach, in terms of reducing births for 15–17 year olds, was larger in 2015 than in 2014. In 2014, the estimates are statistically significant for each 5-mile treatment group that we consider until we evaluate women in zip codes 5–10 miles from a clinic. In 2015, the estimated effects are larger in magnitude and continue to be statistically significant until we evaluate women in zip codes 12–17 miles from a clinic. The results shown in Figure 7 also provide stronger evidence of effects on births of 20–29 year olds in 2015 than in 2014, which mirrors our results shown in Table 2.

As a whole, these analyses provide several new pieces of evidence to suggest that media coverage of the initiative increased awareness of the availability of LARCs to providers, counselors, parents and especially women interested in obtaining these highly effective devices through Title X clinics. This evidence suggests that this "advertising" expanded the impact of the program to women in their 20s and also to high-school-aged teenagers living relatively far away from clinics. Taken together with our main results, these findings can inform policy discussions on how the spread of information can encourage highly effective contraception use

and how far women are willing or able to travel for low-cost contraceptives.[46]

4.7 Estimated Effects on Abortion

Thus far we have shown that the CFPI decreased childbearing for women aged 15–29. These findings indicate that access to highly effective contraceptives decreased unintended pregnancies that otherwise would have resulted in births. It is important to note that these estimated effects may understate the effects on unintended pregnancy overall, particularly if the program also reduced unintended pregnancies that otherwise would have resulted in abortions.[47] This is not a trivial issue given that 29 percent of pregnancies to teenagers—and 26 percent of pregnancies to women aged 20–24—end in abortion (Kost, Maddow-Zimet, and Arpaia, 2017).

To investigate whether the CFPI also reduced unintended pregnancies that would have been terminated, in this section we present difference-in-differences-type estimates for abortion rates by age group (15–19, 20–24, 25–29).[48] For this analysis we use annual *county*-level abortion counts to construct a measure of abortion rates, again using the inverse hyperbolic sine transformation.[49] Moreover, we measure a county's exposure to the CFPI based on the percent of its population living within 7 miles of a Title X clinic.[50] Our empirical model includes both county fixed effects and year fixed effects and clusters standard error estimates at the county level.

Estimated effects for all years leading up to—and following—the implementation of the CFPI are presented in Figure A4 in the appendix, while estimates from our preferred model (excluding lead terms) are presented in Table 4. In general, the estimates are too imprecise to draw any strong conclusions. As we would expect, the estimates are more precise in Table 4

[46]Other studies highlighting the potential for media to influence childbearing include studies of popular television programs (La Ferrara, Chong, and Duryea, 2012; Kearney and Levine, 2015b; Trudeau, 2016) and access to high-speed internet (Guldi and Herbst, 2017).

[47]We also note that only one Title X clinic in Colorado is affiliated with an abortion provider—Boulder Women's Health. When we omit the zip code containing this clinic in addition to the surrounding zip codes, the results are statistically indistinguishable from our main results at the 1 percent level.

[48]Separate breakdowns for younger (15–17) and older (18–19) are not available for this analysis.

[49]Specifically, this measure is constructed as $IHS(count) - IHS(population)$ as we could typically do if evaluating the natural log of a rate variable.

[50]This county-level measure of exposure is constructed as the fraction of people in a county that live in a zip code whose population centroid is within 7 miles of a clinic.

(than in Figure A4) where they indicate a statistically significant effect on teenagers. However, to some degree the event-study-type estimates in Figure A4 raise the possibility that this may be in part due to somewhat differential trends prior to the CFPI. As a whole, we interpret the results of this analysis as providing suggestive evidence of effects on teenage abortion rates. A more cautious interpretation is that we cannot rule out very large or very small effects on abortion rates.[51,52]

4.8 Estimated Effects on the Composition of Births

To provide an even more comprehensive picture of the health effects of the CFPI, we extend our analysis to study whether the CFPI affected births that tend to involve relatively high hospital costs. Specifically, we use the same empirical strategy as our main results, but focus on births involving low birth weight (less than 2500 grams), very low birth weight (i.e. less than 1500 grams), or low Apgar scores (less than 9).[53] The results of this analysis are shown in Table 5.[54]

Estimates in column 1 largely reinforce our main findings—that the CFPI reduced births to women aged 15–29 by 8.2 percent, with larger effects in later years. Estimates in columns 2–4 indicate that the CFPI also had effects on births that typically involve above-average hospital care. In particular, the CFPI reduced the number of low birthweight infants by 12.6 percent, and very low birthweight infants by 9.4 percent. This corresponds to approximately nearly 500 fewer infants that may require extra care in the hospital per year.[55]

Estimates in column 4 indicate that the CFPI reduced the number of infants scoring 1–8 on

[51] We have also estimated effects using alternative definitions for censored values. When we allow suppressed observations take the value of 1 or 2, instead of 0, estimates for women aged 15-19 indicate declines in abortion rates ranging 20–22 percent. Estimates for women aged 20-24 indicate reductions ranging from approximately 23–35 percent. For women aged 25-29, estimates are negative and statistically insignificant, mirroring our main results. Moreover, when we drop counties that have any suppression, we find that abortion rates for women aged 15–19 fall by nearly 33 percent.

[52] We have similarly used the procedure described above to analyze effects on county-level gonorrhea rates to evaluate whether lowering the cost of obtaining contraceptives increases more risky sexual behavior. Estimates are fairly imprecise, and statistically insignificant, although we are able to rule out that the program led to more than a 23 percent increase in STIs.

[53] The Apgar is a test score scaled from 1–10 and serves as a measure of the status of the newborn immediately after birth. Nearly 82 percent of infants in our sample score either a nine or ten. Scores between four and seven indicate that some assistance for breathing and/or resuscitation might be required.

[54] Corresponding event study figures can be found in Figure A5 in the appendix.

[55] This is based on the fact that approximately 6.3 births to women aged 15–29 are considered low birthweight, while 0.9 births to women aged 15–29 are considered very low birthweight, per zip code, per year, on average.

the Apgar test by 26.5 percent 6-7 years after the program's initiation, suggesting that the CFPI led to an improvement in the overall health of infants born to women aged 15–29. As a whole, the estimates in Table 5 demonstrate that the CFPI reduced births that tend to involve relatively high hospital costs.[56]

5 Conclusion

In this paper, we document the effects of expanding access to highly effective contraceptives through the lens of the Colorado Family Planning Initiative, which provided free LARCs to low-income women at Title X clinics. Using zip-code-level Natality data, we show that the initiative reduced birth rates for women living in within 7 miles of a Title X clinic until the initiative received extensive media coverage. Afterwards, the effects extended to women living farther away from clinics and to non-teenagers. Despite the fact that any Title X client was eligible to participate in the program, we see little to no effects for women living farther than 12 miles from a clinic.

As a whole, our estimated effects correspond to nearly 6,800 fewer births to women aged 15–29 over 7 years, with nearly half of these births to women in low population zip codes.[57] Moreover, we find that the effects on births are largest for women between ages 15–17 and 18–19. Given the number of LARC insertions over the program period, these estimates fall within the range of feasibility based on rates of contraception failure and abortion for teens. For example, typical use effectiveness is 85 percent for condoms. If we assume all Title X clients switch from condoms to LARCs, these statistics coupled with an average abortion rate of 50 percent for this age group would correspond to 28,000 x 0.85 = 23,800 prevented pregnancies, or 11,900 prevented births from LARC take-up.[58,59] Of course, not all teens are switching

[56]Though the point estimates typically suggest the effect is larger for these types of births than births overall, the standard errors are too large to reject that the effects are the same at conventional levels of statistical significance. We have also investigated the effects on these outcomes by age group. These results, shown in Table A9, indicate that the youngest women are driving the effects observed in Table 5.

[57]In particular, performing the same back-of-the-envelope estimation using just the low-population zip codes examined in our analysis of heterogeneity, we calculate approximately 3,325 unintended births would have occurred in the absence of the CFPI.

[58]These numbers come from data on the total number of LARC insertions from 2009–2015. While insertion data are not available by age group, if we assume that the same ratio of visitors using LARCs to cumulative LARC insertions holds, we calculate approximately 28,000 insertions to women aged 15–29 between 2009 and 2015.

[59]This assumed abortion rate of 50 percent does not take into account that abortion rates appear to be falling

from condoms to LARCs. For example, in our Colorado Title X client data, we observe many teens switching from oral contraceptives. Therefore, if we alternatively believe that all teens choosing a LARC switched from oral contraceptives, we would expect 5,040 pregnancies, or 2,520 births. Additionally, the data suggest that while a majority of women are switching to LARCs from birth control pills, some women also switch from condoms. In fact, about 400 fewer women aged 15–29 report using condoms as their primary method each year during the sample period. Thus, if we expect some combination of women choosing LARCs instead of oral contraceptives, condoms, or no method, the range of births we would expect to decline as a result of the program is 2,520–11,900, which contains our estimated effect (and obviously has strong overlap with the 95-percent-confidence interval for our main estimates).

Based on spending and births averted, we find that the CFPI cost $1,932 per birth, which is cheaper than other related interventions. According to Madden, Barker, Huntzberry, Secura, Peipert, and McBride (2018), Missouri's Contraceptive CHOICE Project averted 483 births, but cost $4 million, leading to a cost of over $8,200 per birth. Moreover, expanding Medicaid has been shown to reduce teen births by 4 percent (Kearney and Levine, 2009), but costs an average of $6,800 per birth to do so. Furthermore, although the federal government spends approximately $50 million annual on abstinence-based sex education, there is little evidence that such programs reduce teen childbearing, and may increase STIs in some states (Carr and Packham, 2016). Therefore, we note that contraception-focused interventions like the CFPI are highly cost-effective as compared to other policies.

Along similar lines, we find suggestive evidence of impacts on abortion for women in these age groups, which suggests that the effects on births likely understate the effects on unintended pregnancy. Given that we observe significant effects on both high-school-aged and post-high-school-aged women, we believe an important next step may be to investigate whether these effects translate into impacts on women's educational and economic outcomes. Underscoring the importance of these questions, a large body of research has demonstrated the remarkable ways in which improving women's ability to control childbearing can affect educational attain-

differentially for this age group over the same time period nor consider the notion that the teens that are likely to take up highly effective contraceptive devices may abort at different rates than those choosing to forego contraception.

ment, wages, and labor force participation, while reducing dependence on public assistance and improving resources in households with children.[60]

Our findings highlight that the effects of funding Title X clinics can be substantial, and that advertising may help them extend their reach, particularly when women may not be aware of the full range of services and contraceptives that the clinics offer. As such, our findings complement recent work documenting statistically significant but imprecise evidence that LARC use can be increased through social media (Byker, Myers, and Graff, 2017). Our work also complements earlier work demonstrating that expanding low-income women's access to family planning services can significantly reduce childbearing. In particular, researchers have demonstrated that Medicaid waivers in the early 1990s to mid-2000s had significant effects on teen childbearing (Kearney and Levine, 2015a) and non-teen childbearing (Kearney and Levine, 2009), and also that the county-level rollout of Title X reduced and delayed childbearing (Bailey, 2012).[61] Finally, we note that these findings imply that contraceptive-focused policy interventions may be best suited to help women living in the nearby vicinity, but are less effective for those with increased travel distance.

This line of research is especially relevant in light of recent federal policy changes that have cut family planning funding and allowed more employers to deny contraception in their health insurance plans. Our results, which demonstrate how access to highly effective contraception affects unintended pregnancy in the modern context, suggest that such policies are likely to increase childbearing and perhaps abortion. Given the well-established link between childbearing and women's long-run outcomes, it will become increasingly important for future research to evaluate the effects of these policies on a wide range of outcomes.

[60] See Goldin and Katz (2002), Bailey (2006), Guldi (2008), Bailey (2009), Bailey (2012), Bailey, Guldi, and Hershbein (2013), Myers (2017), Bailey, Malkova, and McLaren (2019), and Beauchamp and Pakaluk (2019). Also see Bailey and Lindo (2018) for a review. These results are consistent with recent studies examining the effects of teen childbearing using research designs that exploit variation driven by miscarriages (Ashcraft, Fernández-Val, and Lang, 2013) and based on the precise timing of the pregnancy relative to expected graduation dates (Schulkind and Sandler, 2019). These studies find that teen childbearing has detrimental effects on women's educational and economic outcomes though these effects are much smaller than simple comparisons would suggest.

[61] Along similar lines, research investigating the effects of *reduced* funding to family planning clinics in Texas, which caused many clinics to close, finds significant increases in birth rates caused by the funding cuts (Packham, 2017; Lu and Slusky, 2019).

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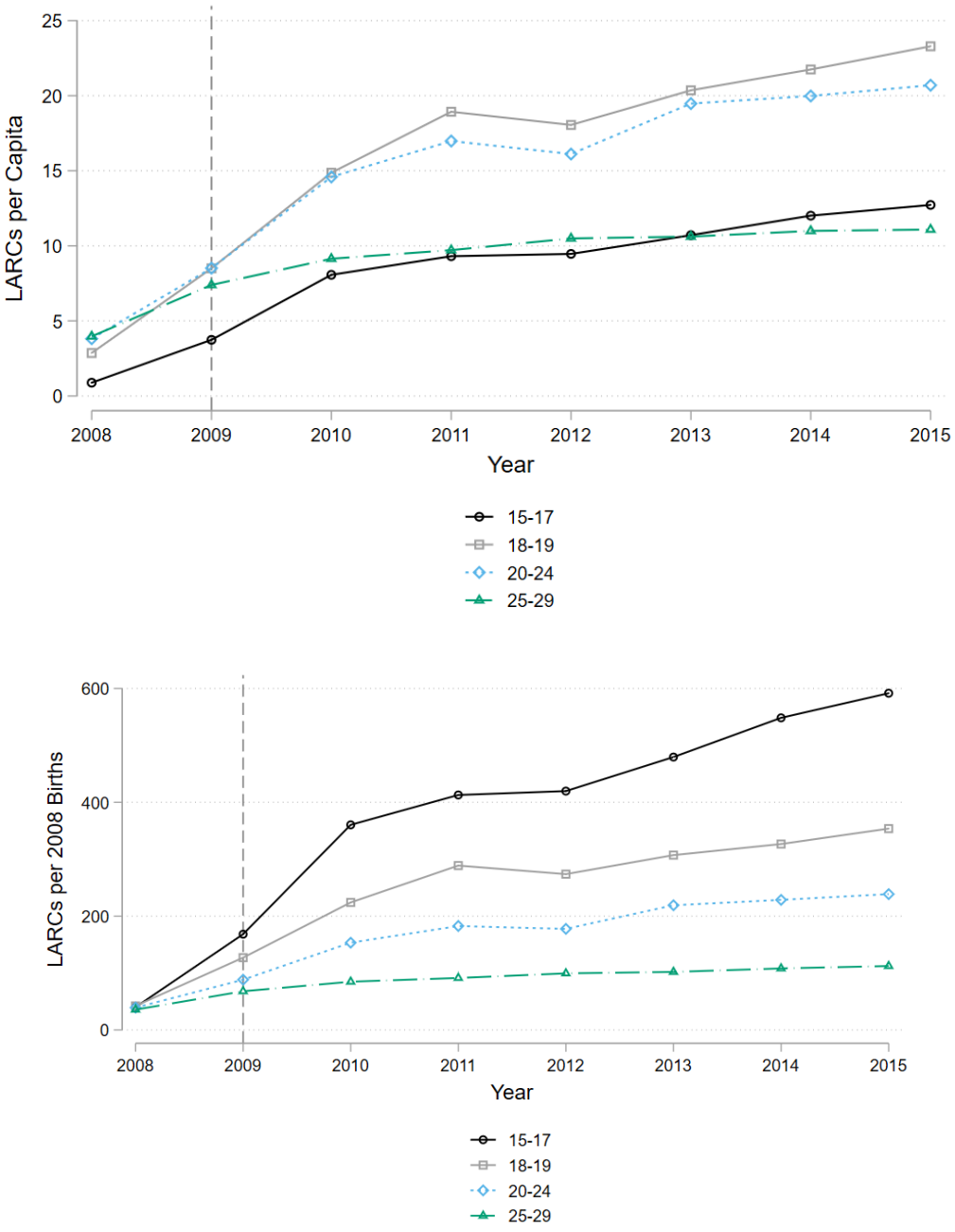
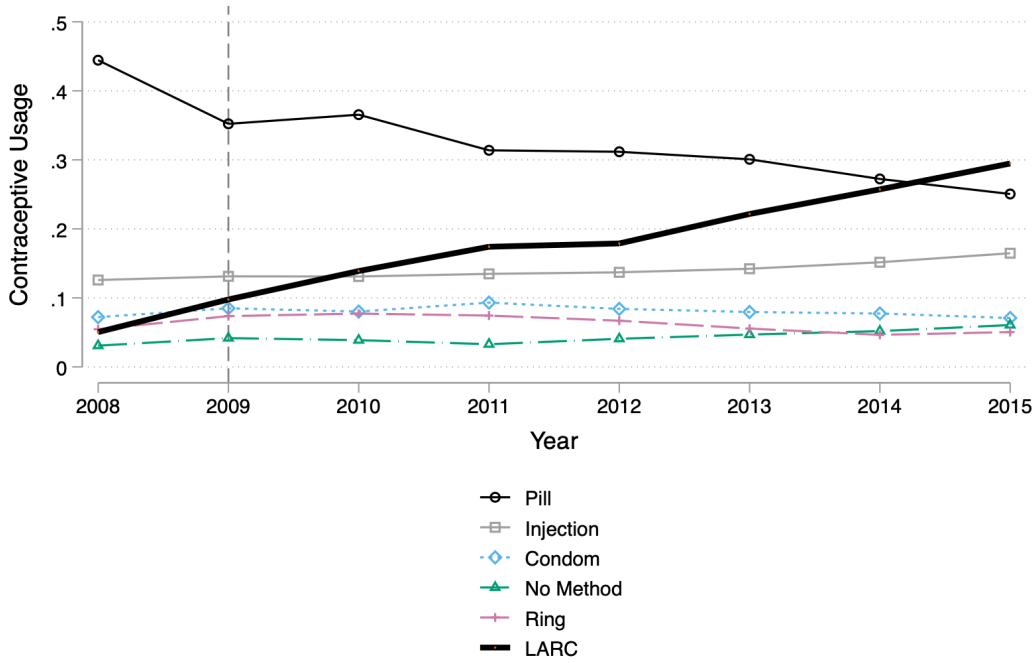
Figure 1
Number of Female Title X Clients Choosing a LARC, By Age



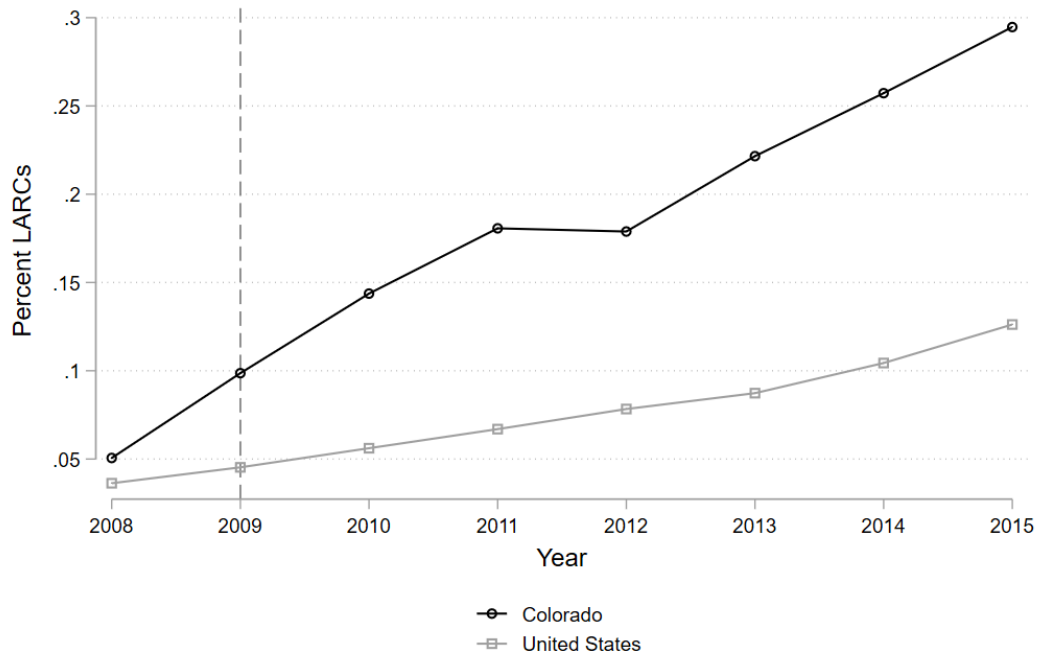
Notes: Authors' calculation based on annual data on Colorado Title X contraception usage by age and method provided by the Colorado Department of Public Health and Environment (DPHE). Zip-code-level population data are from the 2010 American Community Survey. The vertical line, drawn at 2009, represents the year Colorado's Family Planning Initiative was implemented. The top panel displays the number of LARCs chosen by Colorado Title X clients per capita, by age group, from 2008–2015, while the bottom panel displays the number of LARCs chosen by Colorado Title X clients per births in 2008, according to natality data from the Colorado DPHE.

Figure 2
Primary Form of Contraceptive Used By Females Aged 15–29 Visiting Title X Clinics in Colorado



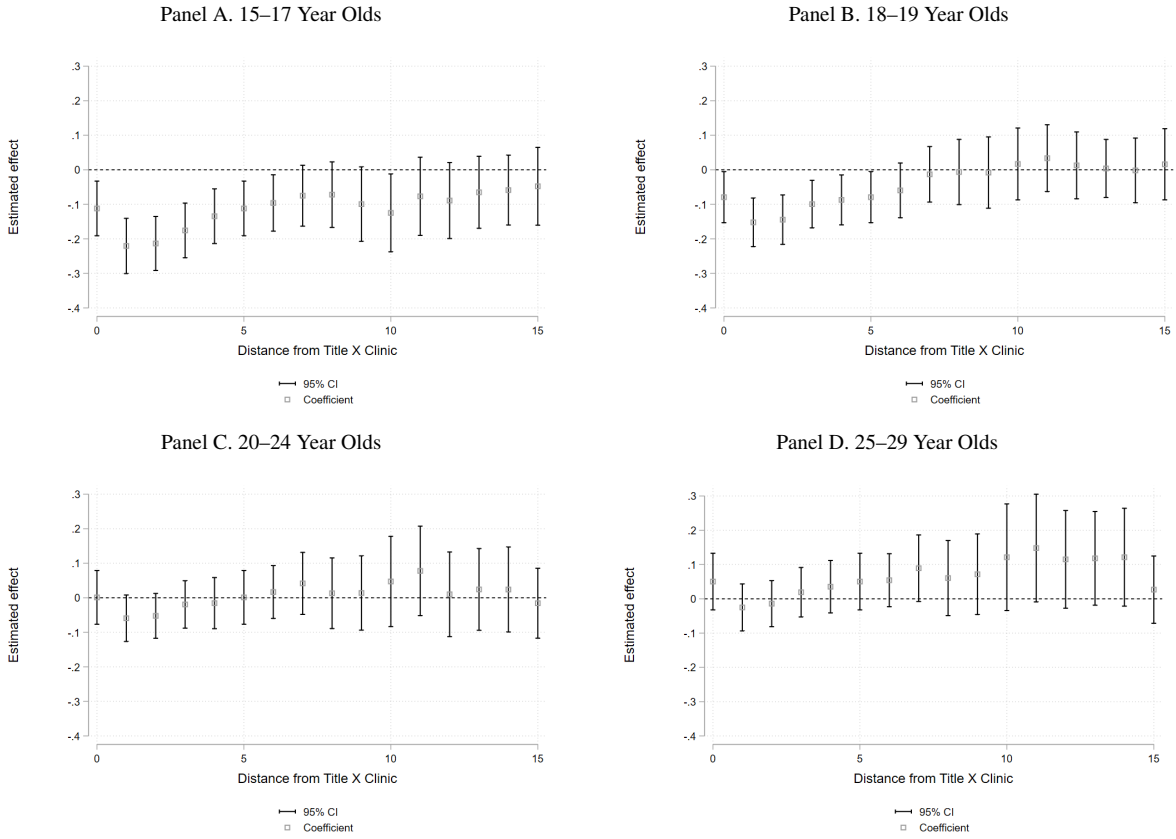
Notes: Authors' calculation based on annual data on Colorado Title X contraception usage by age and method provided by the Colorado Department of Public Health and Environment. The vertical line, drawn at 2009, represents the year Colorado's Family Planning Initiative was implemented.

Figure 3
Percent Female Clients Aged 15–29 Visiting Title X Clinics Choosing a LARC, Colorado versus United States



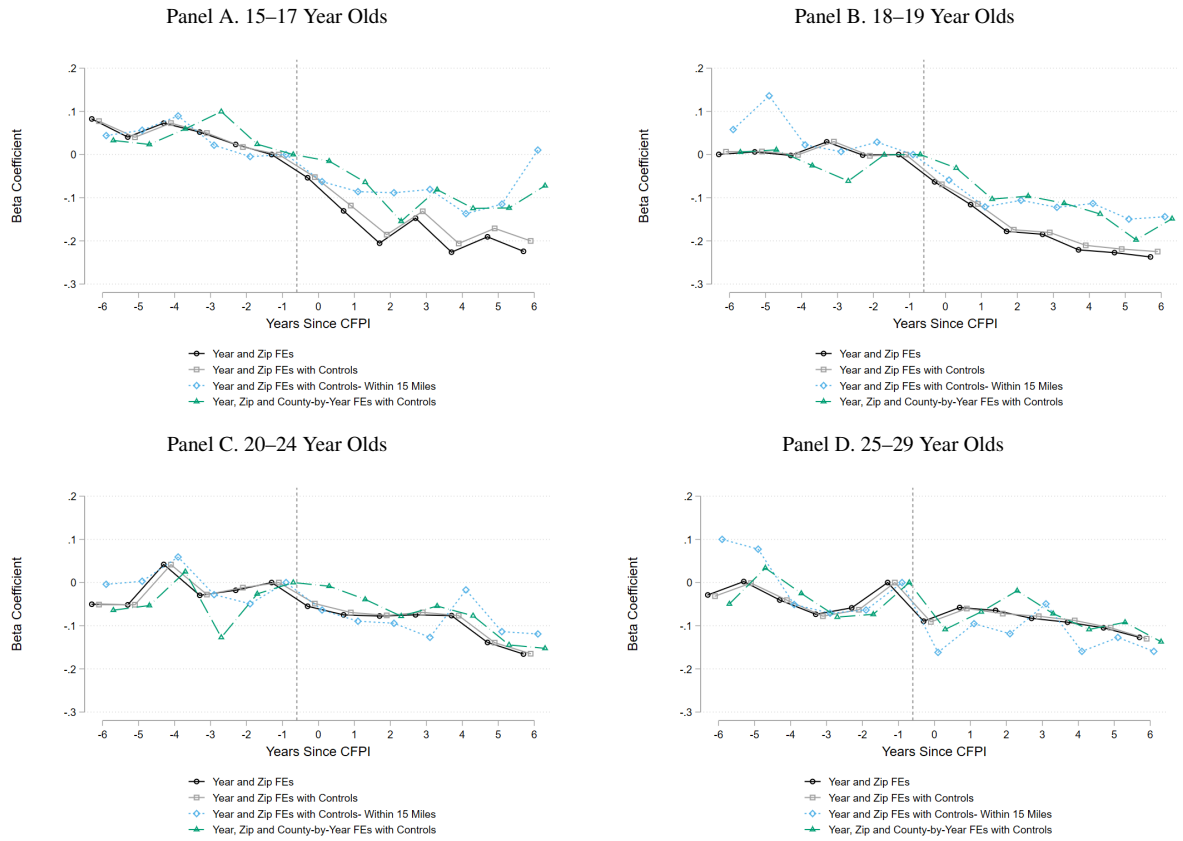
Notes: Numbers for Colorado are based on annual data on Colorado Title X contraception usage by age and method provided by the Colorado Department of Public Health and Environment. Numbers for the United States overall are from the Department of Health and Human Services Title X Family Planning Annual Reports, United States 2008–2015. The vertical line, drawn at 2009, represents the year Colorado's Family Planning Initiative was implemented.

Figure 4
Estimated Effects of the CFPI on Births by Rolling 5-Mile Distance Bins



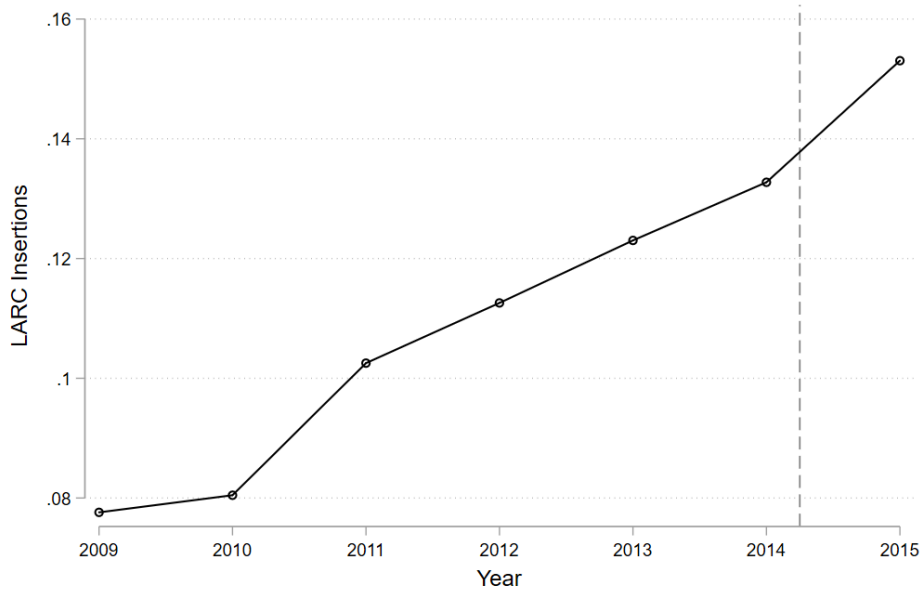
Notes: Coefficients and their respective 95% confidence intervals are generated from a regression estimated using OLS-IHS transformation, as specified in Equation 1, using rolling 5-mile distance bins to define treatment. A x-axis value of "i" where $i = 0, 1, ...15$ indicates an estimate from a difference-in-differences analysis comparing changes in births in zip codes within i and $(i + 5)$ miles of a Title X clinic to changes in zip codes between $(i + 5)$ and 20 miles from a clinic. Zip codes greater than 20 miles from a Colorado Title X clinic are omitted from this analysis. Standard errors are clustered at the zip-code level.

Figure 5
Difference-in-Differences Estimates of the Effects of the CFPI on Births



Notes: Coefficients are generated from estimating our main difference-in-differences model, as specified in Equation 2. The vertical line, drawn before 2009, represents the year Colorado's Family Planning Initiative was implemented. The treatment group includes zip codes within 0–7 miles of a Title X clinic. The control group includes zip codes further than 7 miles from a clinic. Estimates are relative to 2008.

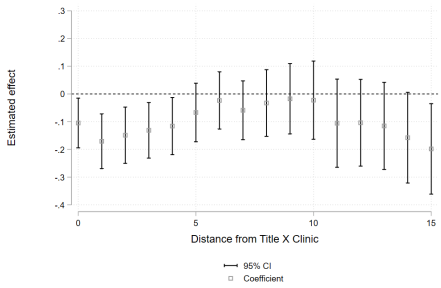
Figure 6
LARC Insertions Per Client



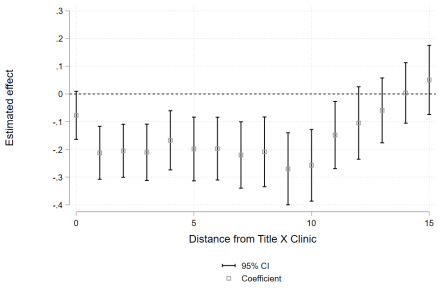
Notes: Authors' calculations based on LARC insertion data from the Colorado Department of Public Health and Environment. The vertical line, drawn before 2015, represents the initiation of media coverage.

Figure 7
Estimated Effects of the CFPI on Births by Rolling 5-Mile Distance Bins, 2014–2015

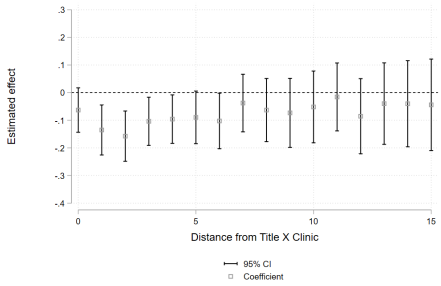
Panel A. 15–17 Year Olds, 2014



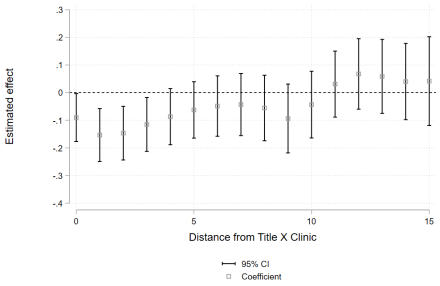
Panel B. 15–17 Year Olds, 2015



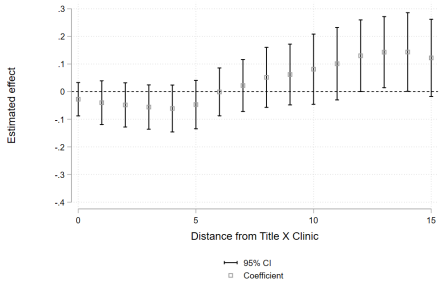
Panel C. 18–19 Year Olds, 2014



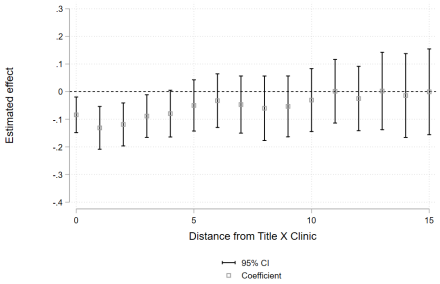
Panel D. 18–19 Year Olds, 2015



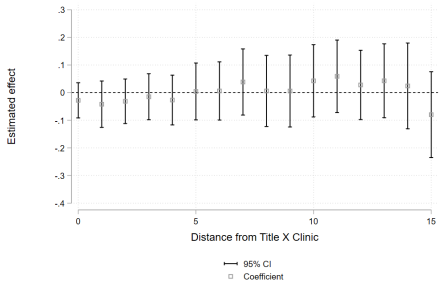
Panel E. 20–24 Year Olds, 2014



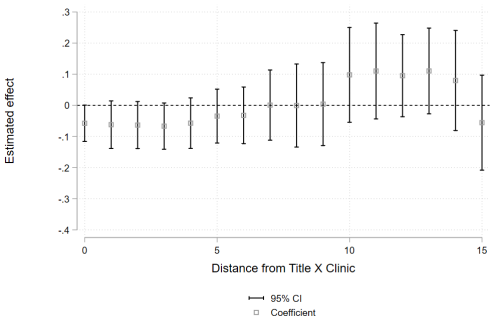
Panel F. 20–24 Year Olds, 2015



Panel G. 25–29 Year Olds, 2014



Panel H. 25–29 Year Olds, 2015



Notes: Coefficients and their respective 95% confidence intervals are generated from a regression estimated using OLS-IHS transformation, as specified in Equation 1, using rolling 5-mile distance bins to define treatment. A x-axis value of "i" where $i = 0, 1, ...15$ indicates an estimate from a difference-in-differences analysis comparing changes in births in zip codes within i and $(i+5)$ miles of a Title X clinic to changes in zip codes between $(i+5)$ and 20 miles from a clinic. Zip codes greater than 20 miles from a Colorado Title X clinic are omitted from this analysis. Standard errors are clustered at the zip-code level.

Table 1
Summary Statistics

	Within 7 Miles	Over 7 Miles
Pre-Treatment (2003–2008)		
Births to Females aged 15-17	7.74	1.79
Births to Females aged 18-19	14.37	3.99
Births to Females aged 20-24	51.61	15.55
Births to Females aged 25-29	58.72	19.50
Percent Poverty Rate	11.56	12.06
Unemployment Rate	0.05	0.05
Population (County)	41888	15678
Percent Hispanic (County)	21.24	18.15
Percent Black (County)	4.80	2.24
Percent White (County)	70.96	77.50
Travel Distance to Nearest Title X Clinic	3.62	34.87
Driving Time to Nearest Title X Clinic	9.24	53.80
Post-Treatment (2009–2015)		
Births to Females aged 15-17	3.89	0.98
Births to Females aged 18-19	9.02	2.79
Births to Females aged 20-24	39.56	13.25
Births to Females aged 25-29	55.48	19.18
Percent Poverty Rate	13.41	14.13
Unemployment Rate	0.07	0.07
Population	53140	20531
Percent Hispanic (County)	22.50	19.63
Percent Black (County)	5.07	2.65
Percent White (County)	69.25	75.52
Travel Distance to Nearest Title X Clinic	3.62	34.87
Driving Time to Nearest Title X Clinic	9.24	53.80

Notes: Birth data are from the Colorado Department of Public Health and Environment. Unemployment rates are from the BLS. Zip-Code-level population data are from the 2010 ACS. Column 1 shows the means for treated zip codes in our sample, i.e., Colorado zip codes within 7 miles of a Title X clinic. Column 2 displays the means for the comparison zip codes, i.e., zip codes in Colorado further than 7 miles from a Title X clinic.

Table 2
The Effect of CFPI on Births

	15–17 Year Olds		18–19 Year Olds		20–24 Year Olds		25–29 Year Olds	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Effect of Initiative in First Year	-0.099**	-0.091**	-0.069	-0.074*	-0.037	-0.029	-0.056	-0.052
	(0.044)	(0.044)	(0.043)	(0.044)	(0.038)	(0.039)	(0.037)	(0.037)
Effect of Initiative in Second Year	-0.176***	-0.165***	-0.121***	-0.127***	-0.057	-0.052	-0.025	-0.020
	(0.047)	(0.048)	(0.045)	(0.045)	(0.039)	(0.040)	(0.040)	(0.040)
Effect of Initiative in Third Year	-0.251***	-0.233***	-0.183***	-0.183***	-0.060	-0.063	-0.031	-0.038
	(0.049)	(0.049)	(0.044)	(0.044)	(0.039)	(0.039)	(0.037)	(0.037)
Effect of Initiative in Fourth Year	-0.193***	-0.182***	-0.190***	-0.188***	-0.057	-0.059	-0.050	-0.047
	(0.052)	(0.052)	(0.046)	(0.046)	(0.045)	(0.045)	(0.040)	(0.040)
Effect of Initiative in Fifth Year	-0.271***	-0.259***	-0.226***	-0.220***	-0.059	-0.067	-0.059	-0.058
	(0.061)	(0.061)	(0.052)	(0.053)	(0.046)	(0.046)	(0.045)	(0.045)
Effect of Initiative in Sixth Year	-0.236***	-0.225***	-0.233***	-0.225***	-0.121***	-0.134***	-0.072	-0.079*
	(0.060)	(0.061)	(0.051)	(0.052)	(0.042)	(0.043)	(0.045)	(0.047)
Effect of Initiative in Seventh Year	-0.269***	-0.252***	-0.243***	-0.229***	-0.148***	-0.159***	-0.094**	-0.104**
	(0.058)	(0.058)	(0.053)	(0.054)	(0.043)	(0.044)	(0.041)	(0.042)
Average effect	-0.213	-0.201	-0.181	-0.178	-0.077	-0.080	-0.055	-0.057
P-value (test average effect = 0)	0.000	0.000	0.000	0.000	0.012	0.009	0.075	0.070
Average effect in years 6-7	-0.253	-0.238	-0.238	-0.227	-0.134	-0.146	-0.083	-0.091
P-value (test average effect in years 6-7 = 0)	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.021
Observations	7644	7644	7644	7642	7644	7644	7644	7644
Controls	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Estimates are based on restricted Natality files by zip code for the state of Colorado from 2003–2015. The outcome variable is the inverse hyperbolic sine of births for the listed age group, which takes on the form $sinh_z^{-1} = ln(z + \sqrt{1 + z^2})$. Estimates can be used to approximate effects using the formula $100 \times (e^{(coefficient)} - 1)$. All specifications include year and zip code fixed effects. Controls include zip-code-level unemployment rates and poverty rates and county-level fractions of individuals aged 15–29 by age, ethnicity, and race, the percent of each age group who are Hispanic, and the percent of each age group who are Black. Standard errors are clustered at the zip-code level.

*, **, and *** indicate statistical significance at the ten, five, and one percent levels, respectively.

Table 3
The Effect of CFPI on Births by Race and Ethnicity

	15–17 Year Olds			18–19 Year Olds			20–24 Year Olds			25–29 Year Olds		
Panel (a)	White (1)	Black (2)	Hispanic (3)	White (4)	Black (5)	Hispanic (6)	White (7)	Black (8)	Hispanic (9)	White (10)	Black (11)	Hispanic (12)
Effect of Initiative in First Year	-0.087**	-0.091**	-0.097**	0.040	0.006	-0.089**	-0.008	0.034	-0.065*	-0.002	0.005	-0.076**
	(0.043)	(0.044)	(0.043)	(0.042)	(0.004)	(0.042)	(0.039)	(0.039)	(0.039)	(0.036)	(0.039)	(0.038)
Effect of Initiative in Second Year	-0.134***	-0.165***	-0.168***	-0.127***	-0.002	-0.097**	-0.073*	-0.057	-0.046	0.010	0.023	-0.021
	(0.050)	(0.048)	(0.046)	(0.047)	(0.007)	(0.047)	(0.041)	(0.038)	(0.042)	(0.040)	(0.040)	(0.037)
Effect of Initiative in Third Year	-0.163***	-0.233***	-0.235***	-0.184***	0.006*	-0.146***	-0.063	-0.086**	-0.057	0.012	-0.011	-0.054
	(0.045)	(0.049)	(0.050)	(0.049)	(0.004)	(0.045)	(0.043)	(0.040)	(0.036)	(0.038)	(0.045)	(0.039)
Effect of Initiative in Fourth Year	-0.138***	-0.182***	-0.223***	-0.188***	0.006	-0.227***	-0.078*	-0.118***	-0.110**	-0.025	-0.018	-0.066
	(0.051)	(0.052)	(0.049)	(0.052)	(0.004)	(0.045)	(0.044)	(0.040)	(0.043)	(0.039)	(0.043)	(0.043)
Effect of Initiative in Fifth Year	-0.170***	-0.259***	-0.320***	-0.177***	0.002	-0.253***	-0.131***	0.002	-0.152***	-0.038	0.014	-0.050
	(0.053)	(0.061)	(0.060)	(0.052)	(0.005)	(0.052)	(0.047)	(0.043)	(0.052)	(0.046)	(0.041)	(0.042)
Effect of Initiative in Sixth Year	-0.150***	-0.225***	-0.290***	-0.216***	0.006	-0.234***	-0.119**	-0.072*	-0.181***	-0.079*	0.033	-0.004
	(0.054)	(0.061)	(0.055)	(0.053)	(0.004)	(0.051)	(0.046)	(0.042)	(0.045)	(0.044)	(0.044)	(0.042)
Effect of Initiative in Seventh Year	-0.204***	-0.252***	-0.244***	-0.268***	0.003	-0.241***	-0.157***	-0.085**	-0.214***	-0.105**	0.082*	-0.044
	(0.059)	(0.058)	(0.053)	(0.061)	(0.005)	(0.050)	(0.046)	(0.043)	(0.045)	(0.042)	(0.049)	(0.046)
Average effect	-0.149	-0.201	-0.225	-0.160	0.004	-0.184	-0.090	-0.055	-0.118	-0.033	0.018	-0.045
P-value (test average effect = 0)	0.000	0.000	0.000	0.000	0.369	0.000	0.002	0.043	0.000	0.289	0.509	0.112
Average effect in years 6-7	-0.177	-0.238	-0.267	-0.242	0.004	-0.238	-0.138	-0.079	-0.198	-0.092	0.058	-0.024
P-value (test average effect in years 6-7 = 0)	0.000	0.000	0.000	0.000	0.348	0.000	0.001	0.029	0.000	0.016	0.133	0.525
Observations	7644	7644	7644	7642	3885	7642	7644	7644	7644	7644	7644	7644

Notes: Estimates are based on restricted Natality files by zip code for the state of Colorado from 2003–2015. The outcome variable is the inverse hyperbolic sine of births for the listed age group and for the listed subgroup, which takes on the form $sinh_z^{-1} = ln(z + \sqrt{1 + z^2})$. Estimates can be used to approximate effects using the formula $100 \times (e^{(coefficient)} - 1)$. All specifications include year and zip code fixed effects, and demographic and economic controls. Standard errors are clustered at the zip-code level.

*, **, and *** indicate statistical significance at the ten, five, and one percent levels, respectively.

Table 4
The Effect of CFPI on Abortion Rates
County-level Analysis Based on Share of the Population Within 7 miles of a Title X Clinic

	15–19 Year Olds		20–24 Year Olds		25–29 Year Olds	
	(1)	(2)	(3)	(4)	(5)	(6)
Effect of Initiative in First Year	-0.177	-0.333***	-0.051	-0.093	0.124	0.047
	(0.126)	(0.119)	(0.177)	(0.183)	(0.146)	(0.198)
Effect of Initiative in Second Year	-0.302*	-0.426***	-0.076	-0.112	-0.019	-0.018
	(0.158)	(0.136)	(0.169)	(0.171)	(0.166)	(0.174)
Effect of Initiative in Third Year	-0.120	-0.257	-0.151	-0.128	0.044	0.073
	(0.173)	(0.224)	(0.181)	(0.192)	(0.251)	(0.276)
Effect of Initiative in Fourth Year	-0.263	-0.346*	-0.260	-0.218	-0.020	-0.023
	(0.221)	(0.191)	(0.173)	(0.199)	(0.180)	(0.177)
Effect of Initiative in Fifth Year	-0.527***	-0.544***	-0.195	-0.120	-0.075	-0.080
	(0.178)	(0.168)	(0.169)	(0.174)	(0.222)	(0.192)
Effect of Initiative in Sixth Year	-0.176	-0.205	-0.193	-0.159	-0.063	0.022
	(0.243)	(0.220)	(0.196)	(0.206)	(0.214)	(0.238)
Effect of Initiative in Seventh Year	-0.162	-0.246	-0.155	-0.119	-0.180	-0.103
	(0.233)	(0.271)	(0.183)	(0.213)	(0.199)	(0.216)
Average effect	-0.247	-0.337	-0.154	-0.136	-0.027	-0.012
P-value (test average effect = 0)	0.054	0.007	0.209	0.288	0.866	0.947
Average effect in years 6-7	-0.169	-0.225	-0.174	-0.139	-0.121	-0.040
P-value (test average effect in years 6-7 = 0)	0.399	0.307	0.305	0.465	0.513	0.850
Observations	370	370	463	463	409	409
Controls	No	Yes	No	Yes	No	Yes

Notes: Estimates are based on restricted zip-code-level abortion data from the Colorado Department of Public Health and Environment for the state of Colorado from 2004–2015. The outcome variable is the difference between the inverse hyperbolic sine transformations of abortions by age group and female population for the relevant age group. The fraction treated indicates the percent of the population living in zip codes within 7 miles of a clinic. All specifications include year and county fixed effects. Controls include county-level unemployment rates and poverty rates and county-level fractions of individuals aged 15–29 by age, ethnicity, and race, the percent of each age group who are Hispanic, and the percent of each age group who are Black. Standard errors are clustered at the county level.

*, **, and *** indicate statistical significance at the ten, five, and one percent levels, respectively.

Table 5
The Effect of CFPI on Births Typically Involving Relatively High Costs

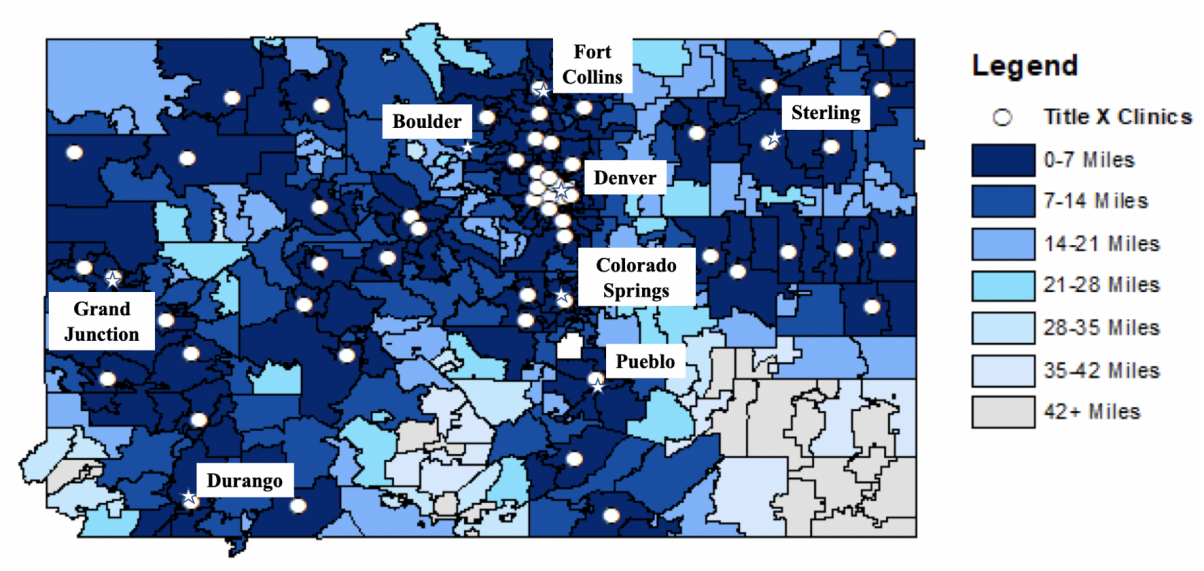
	All Births	Low Birthweight	Very Low Birthweight	5-Min. Apgar Score < 9
	(1)	(2)	(3)	(4)
Effect of Initiative in First Year	-0.048	-0.058	-0.045	0.032
	(0.035)	(0.051)	(0.064)	(0.055)
Effect of Initiative in Second Year	-0.056	-0.066	-0.091	0.086
	(0.039)	(0.058)	(0.064)	(0.055)
Effect of Initiative in Third Year	-0.078**	-0.155***	-0.034	-0.048
	(0.039)	(0.050)	(0.052)	(0.063)
Effect of Initiative in Fourth Year	-0.051	-0.135**	-0.104	0.000
	(0.044)	(0.057)	(0.067)	(0.058)
Effect of Initiative in Fifth Year	-0.073	-0.096*	-0.011	-0.054
	(0.048)	(0.052)	(0.061)	(0.057)
Effect of Initiative in Sixth Year	-0.115**	-0.142**	-0.158**	-0.164***
	(0.046)	(0.060)	(0.064)	(0.062)
Effect of Initiative in Seventh Year	-0.132***	-0.182***	-0.185***	-0.306***
	(0.042)	(0.051)	(0.058)	(0.060)
Average effect	-0.079	-0.119	-0.090	-0.065
P-value (test average effect = 0)	0.020	0.000	0.004	0.123
Average effect in years 6-7	-0.124	-0.162	-0.172	-0.235
P-value (test average effect in years 6-7 = 0)	0.002	0.000	0.000	0.000
Observations	7644	6355	6355	6355

Notes: Estimates are based on restricted Natality files by zip code for the state of Colorado from 2003–2015. The outcome variable is the inverse hyperbolic sine of births for the listed age group, which takes on the form $sinh_z^{-1} = ln(z + \sqrt{1 + z^2})$. Estimates can be used to approximate effects using the formula $100 \times (e^{(coefficient)} - 1)$. All specifications include year and zip code fixed effects, and demographic and economic controls. "Total Births" include all births to women aged 15-29. "Low Birthweight" indicates the number of infants within a zip code born under 2500 grams. "Very Low Birthweight" indicates the number of infants within a zip code born under 1500 grams. "5-Min. Apgar Score < 9" measures the number of infants scoring less than a 9 out of 10 on the 5-Minute Apgar test.

*, **, and *** indicate statistical significance at the ten, five, and one percent levels, respectively. Standard errors are clustered at the zip-code level.

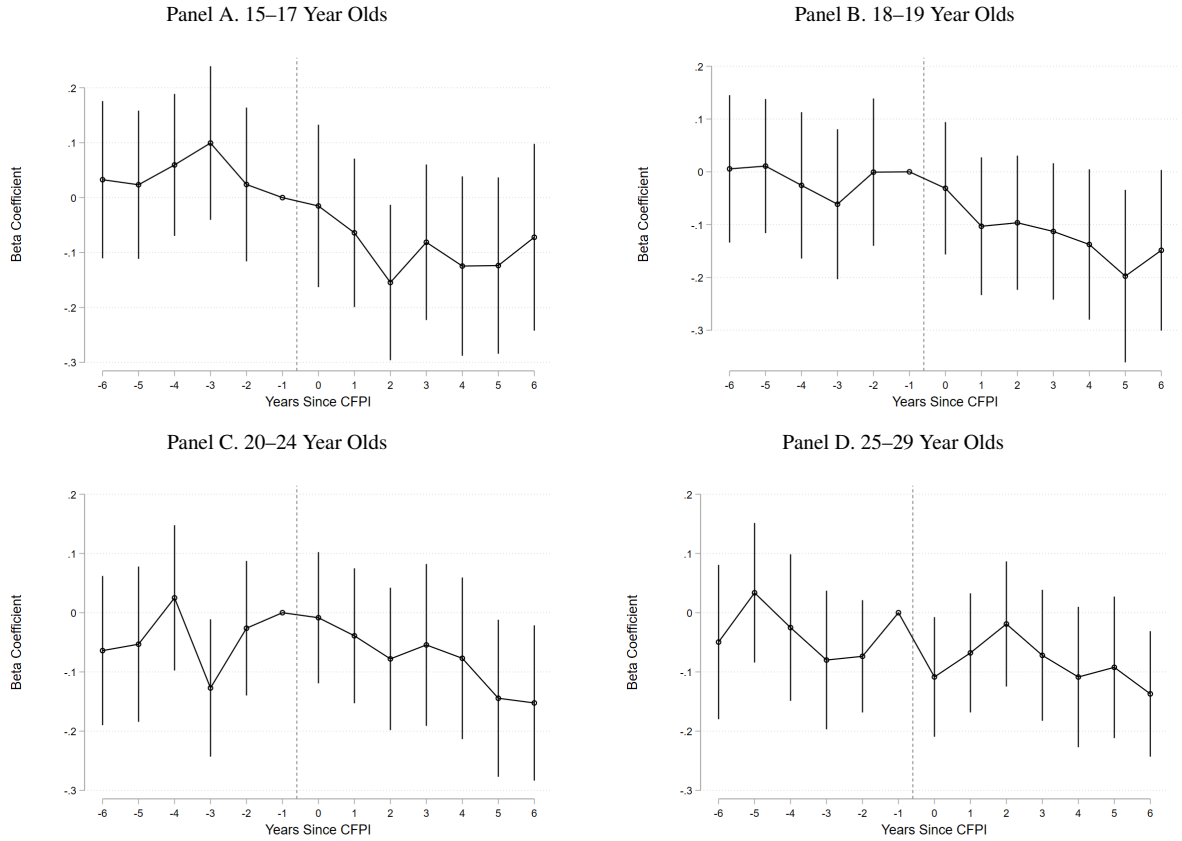
Appendix A. Additional Tables and Figures

Figure A1
Distance from Population Centroid to Nearest Title X Clinic



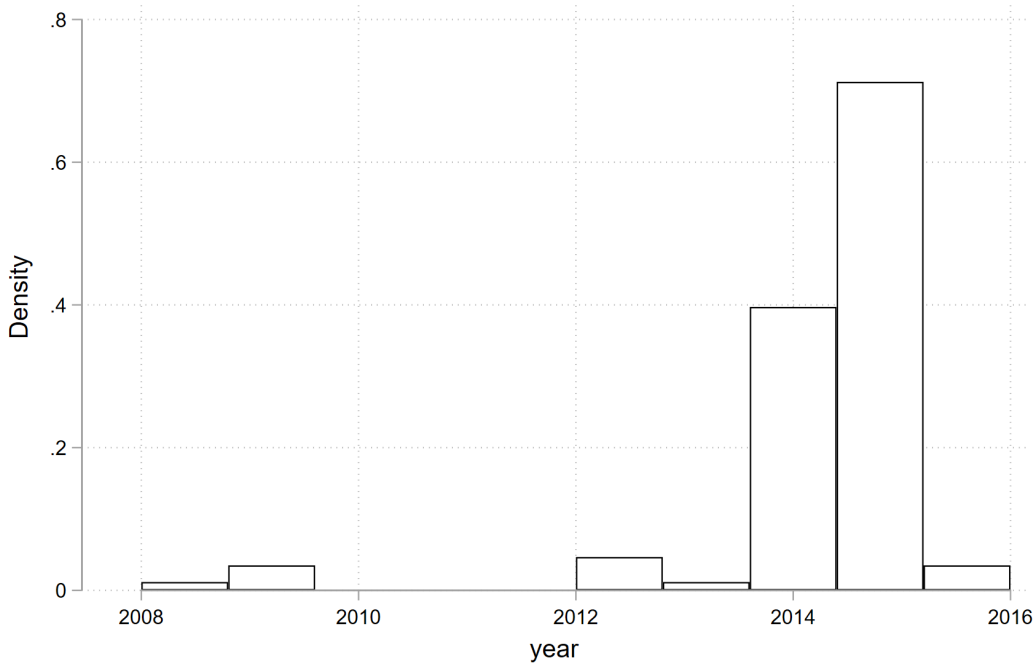
Notes: Stars indicate the labeled city centriod. "Distance" indicates distance, in miles. Authors' calculation of zip-code centroid distance to the nearest clinic is based on geocoded data of Title X clinics from the Colorado Department of Public Health and Environment directory.

Figure A2
Difference-in-Differences Estimates of the Effects of the CFPI on Births,
with 95% Confidence Intervals



Notes: Coefficients and their respective 95% confidence intervals are generated from estimating our main difference-in-differences model, as specified in Equation 2. The vertical line, drawn before 2009, represents the year Colorado's Family Planning Initiative was implemented. The treatment group includes zip codes within 0–7 miles of a Title X clinic. The control group includes zip codes further than 7 miles from a clinic. All specifications include year and zip code fixed effects, county linear time trends, and demographic and economic controls. Estimates are relative to 2008.

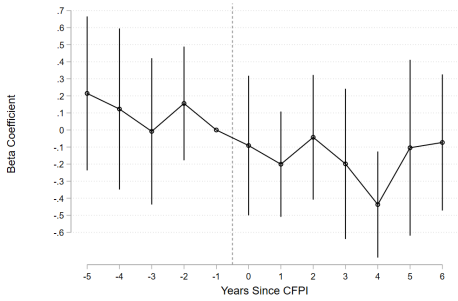
Figure A3
News Articles Covering the CPFI, Over Time



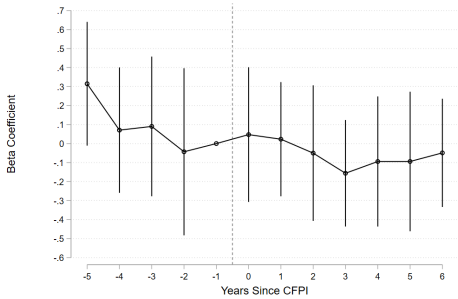
Notes: Authors' calculation based on news articles released containing the phrase "Colorado Family Planning Initiative" using NexisUni, a large international news archive. See `https://www.lexisnexis.com/en-us/support/nexis-uni/default.page` for more details on web scraping and archiving.

Figure A4
Estimated Effects on Abortion Rates by the Fraction of the Population Living within 7 Miles of a Title X Clinic

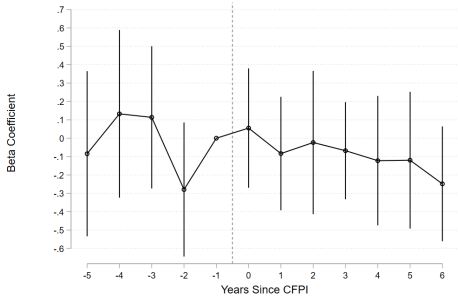
Panel A. 15–19 Year Olds



Panel B. 20–24 Year Olds

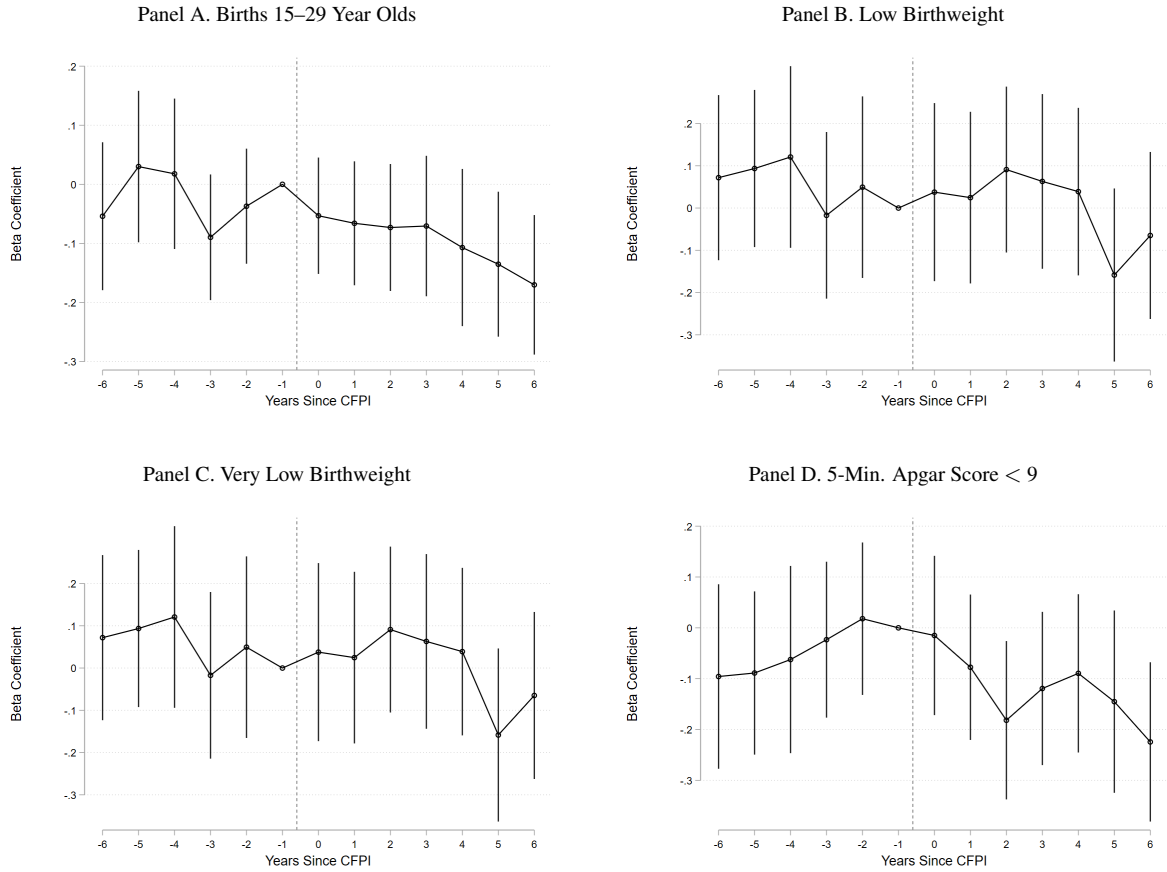


Panel C. 25–29 Year Olds



Notes: County-level abortion data are from the Colorado Department of Public Health and Environment. The outcome variable is the difference between the inverse hyperbolic sine transformations of abortions by age group and female population for the relevant age group. Coefficients are generated from estimating our main difference-in-differences model, as specified in Equation 2, using a continuous measure—the fraction of population in zip codes within 7 miles of a Title X clinic—to measure exposure to the CFPI. Controls include county-level unemployment rates, poverty rates, fractions of individuals aged 15–29 by age, ethnicity, and race, the percent of each age group who are Hispanic, and the percent of each age group who are Black. The vertical line, drawn before 2009, represents the year Colorado's Family Planning Initiative was implemented. Estimates are relative to 2008.

Figure A5
Estimated Effects of the CFPI on Births by Rolling 5-Mile Distance Bins



Notes: Coefficients and their respective 95% confidence intervals are generated from estimating our main difference-in-differences model, as specified in Equation 1. The vertical line, drawn before 2009, represents the year Colorado's Family Planning Initiative was implemented. The treatment group includes zip codes within 0–7 miles of a Title X clinic. The control group includes zip codes further than 7 miles from a clinic. All specifications include year and zip code fixed effects, county linear time trends, and demographic and economic controls. Estimates are relative to 2008.

Table A1
Primary Form of Contraceptive Used By Females Aged 15–29 Visiting Title X Clinics in Colorado, LARCs and Oral Contraceptives

	LARCs		Oral Contraceptives	
Year	Number	Percent	Number	Percent
2008	1597	0.051	14090	0.446
2009	3634	0.098	13097	0.352
2010	5692	0.139	14970	0.365
2011	6820	0.179	12293	0.312
2012	6909	0.179	12039	0.312
2013	7901	0.222	10726	0.301
2014	8409	0.257	8903	0.272
2015	8869	0.295	7541	0.296

Notes: Authors' calculation based on annual data on Colorado Title X contraception usage by age and method provided by the Colorado Department of Public Health and Environment. "Number" displays the raw number of clients choosing the listed device in the corresponding year. "Percent" indicates the percent of women aged 15–29 choosing the listed device in the corresponding year.

Table A2
The Effect of CFPI on Births, Omitting Zip Codes Bordering Counties with Title X Clinics in Neighboring States

	15–17 Year Olds		18–19 Year Olds		20–24 Year Olds		25–29 Year Olds	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Effect of Initiative in First Year	-0.100**	-0.092**	-0.081*	-0.085*	-0.035	-0.025	-0.074**	-0.071*
	(0.044)	(0.045)	(0.043)	(0.044)	(0.038)	(0.039)	(0.037)	(0.037)
Effect of Initiative in Second Year	-0.174***	-0.163***	-0.123***	-0.128***	-0.047	-0.041	-0.020	-0.015
	(0.047)	(0.048)	(0.045)	(0.045)	(0.040)	(0.040)	(0.040)	(0.040)
Effect of Initiative in Third Year	-0.243***	-0.226***	-0.175***	-0.176***	-0.051	-0.055	-0.037	-0.043
	(0.049)	(0.050)	(0.044)	(0.044)	(0.039)	(0.039)	(0.038)	(0.038)
Effect of Initiative in Fourth Year	-0.182***	-0.172***	-0.186***	-0.185***	-0.048	-0.053	-0.050	-0.046
	(0.053)	(0.052)	(0.047)	(0.047)	(0.045)	(0.045)	(0.040)	(0.040)
Effect of Initiative in Fifth Year	-0.264***	-0.251***	-0.229***	-0.224***	-0.050	-0.060	-0.062	-0.057
	(0.061)	(0.061)	(0.053)	(0.053)	(0.046)	(0.046)	(0.045)	(0.046)
Effect of Initiative in Sixth Year	-0.226***	-0.215***	-0.233***	-0.227***	-0.110**	-0.128***	-0.078*	-0.084*
	(0.061)	(0.062)	(0.051)	(0.052)	(0.043)	(0.044)	(0.045)	(0.047)
Effect of Initiative in Seventh Year	-0.256***	-0.237***	-0.232***	-0.221***	-0.138***	-0.155***	-0.095**	-0.104**
	(0.058)	(0.059)	(0.053)	(0.054)	(0.043)	(0.044)	(0.041)	(0.042)
Average effect	-0.207	-0.194	-0.180	-0.178	-0.068	-0.074	-0.060	-0.060
P-value (test average effect = 0)	0.000	0.000	0.000	0.000	0.027	0.018	0.058	0.057
Average effect in years 6-7	-0.241	-0.226	-0.233	-0.224	-0.124	-0.142	-0.086	-0.094
P-value (test average effect in years 6-7 = 0)	0.000	0.000	0.000	0.000	0.001	0.000	0.025	0.017
Observations	7410	7410	7410	7408	7410	7410	7410	7410
Controls	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Estimates are based on restricted Natality files by zip code for the state of Colorado from 2003–2015. The outcome variable is the inverse hyperbolic sine of births for the listed age group, which takes on the form $sinh_z^{-1} = ln(z + \sqrt{1 + z^2})$. Estimates can be used to approximate effects using the formula $100 \times (e^{(coefficient)} - 1)$. All specifications include year and zip code fixed effects. Controls include zip-code-level unemployment rates and poverty rates and county-level fractions of individuals aged 15–29 by age, ethnicity, and race, the percent of each age group who are Hispanic, and the percent of each age group who are Black. Standard errors are clustered at the zip-code level. The sample omits Colorado zip codes that are further than 14 miles from an in-state Title X clinic and border a county in a neighboring state containing a Title X clinic.

*, **, and *** indicate statistical significance at the ten, five, and one percent levels, respectively.

Table A3
The Effect of CFPI on Births, OLS and WLS Estimates

	15–17 Year Olds		18–19 Year Olds		20–24 Year Olds		25–29 Year Olds	
	OLS	WLS	OLS	WLS	OLS	WLS	OLS	WLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Effect of Initiative in First Year	-0.091**	-0.019	-0.074*	-0.069	-0.029	-0.009	-0.052	-0.063**
	(0.044)	(0.069)	(0.044)	(0.045)	(0.039)	(0.035)	(0.037)	(0.029)
Effect of Initiative in Second Year	-0.165***	-0.023	-0.127***	-0.087*	-0.052	-0.079**	-0.020	-0.016
	(0.048)	(0.070)	(0.045)	(0.049)	(0.040)	(0.037)	(0.040)	(0.032)
Effect of Initiative in Third Year	-0.233***	0.002	-0.183***	-0.076	-0.063	-0.039	-0.038	-0.046
	(0.049)	(0.074)	(0.044)	(0.055)	(0.039)	(0.040)	(0.037)	(0.033)
Effect of Initiative in Fourth Year	-0.182***	-0.018	-0.188***	-0.046	-0.059	-0.042	-0.047	-0.019
	(0.052)	(0.071)	(0.046)	(0.057)	(0.045)	(0.039)	(0.040)	(0.031)
Effect of Initiative in Fifth Year	-0.259***	-0.022	-0.220***	-0.042	-0.067	-0.044	-0.058	-0.035
	(0.061)	(0.086)	(0.053)	(0.059)	(0.046)	(0.038)	(0.045)	(0.032)
Effect of Initiative in Sixth Year	-0.225***	0.083	-0.225***	-0.071	-0.134***	-0.070*	-0.079*	-0.047
	(0.061)	(0.088)	(0.052)	(0.058)	(0.043)	(0.039)	(0.047)	(0.038)
Effect of Initiative in Seventh Year	-0.252***	0.096	-0.229***	-0.105	-0.159***	-0.095**	-0.104**	-0.060*
	(0.058)	(0.090)	(0.054)	(0.069)	(0.044)	(0.046)	(0.042)	(0.035)
Average effect	-0.201	0.014	-0.178	-0.071	-0.080	-0.054	-0.057	-0.041
P-value (test average effect = 0)	0.000	0.807	0.000	0.079	0.009	0.091	0.070	0.150
Average effect in years 6-7	-0.238	0.090	-0.227	-0.088	-0.146	-0.082	-0.091	-0.053
P-value (test average effect in years 6-7 = 0)	0.000	0.255	0.000	0.117	0.000	0.038	0.021	0.117
Observations	7644	7644	7642	7642	7644	7644	7644	7644

Notes: Estimates are based on restricted Natality files by zip code for the state of Colorado from 2003–2015. The outcome variable is the inverse hyperbolic sine of births for the listed age group, which takes on the form $sinh_z^{-1} = ln(z + \sqrt{1 + z^2})$. Estimates can be used to approximate effects using the formula $100 \times (e^{(coefficient)} - 1)$. All specifications include year and zip code fixed effects, and demographic and economic controls. Population weights for weighted least squares specifications in Columns 2, 4, 6, and 8 include the zip code-level female population from 2010, according to the American Community Survey. Standard errors are clustered at the zip-code level.

*, **, and *** indicate statistical significance at the ten, five, and one percent levels, respectively.

Table A4
The Effect of CFPI on Births, Balancing Total Female Population Across Zip Code Subgroups

	15–17 Year Olds		18–19 Year Olds		20–24 Year Olds		25–29 Year Olds	
	Low Pop. (1)	High Pop. (2)	Low Pop. (3)	High Pop. (4)	Low Pop. (5)	High Pop. (6)	Low Pop. (7)	High Pop. (8)
Effect of Initiative in First Year	-0.112**	0.125	-0.101*	0.016	-0.045	0.026	-0.042	-0.058**
	(0.056)	(0.135)	(0.059)	(0.058)	(0.048)	(0.043)	(0.048)	(0.025)
Effect of Initiative in Second Year	-0.193***	0.144	-0.127**	0.012	-0.060	-0.049	-0.025	-0.009
	(0.060)	(0.129)	(0.058)	(0.069)	(0.050)	(0.050)	(0.049)	(0.042)
Effect of Initiative in Third Year	-0.285***	0.201	-0.207***	-0.078	-0.079	-0.082	-0.027	-0.084**
	(0.060)	(0.159)	(0.055)	(0.076)	(0.048)	(0.076)	(0.046)	(0.033)
Effect of Initiative in Fourth Year	-0.192***	0.112	-0.225***	0.027	-0.108*	-0.023	-0.054	-0.036
	(0.062)	(0.117)	(0.060)	(0.097)	(0.057)	(0.049)	(0.050)	(0.032)
Effect of Initiative in Fifth Year	-0.257***	0.077	-0.266***	-0.005	-0.102*	0.007	-0.062	-0.021
	(0.074)	(0.149)	(0.068)	(0.088)	(0.058)	(0.053)	(0.058)	(0.036)
Effect of Initiative in Sixth Year	-0.227***	0.191	-0.269***	-0.047	-0.163***	-0.058	-0.085	-0.033
	(0.075)	(0.182)	(0.066)	(0.084)	(0.055)	(0.059)	(0.060)	(0.041)
Effect of Initiative in Seventh Year	-0.252***	0.206	-0.252***	-0.052	-0.180***	-0.032	-0.091*	-0.005
	(0.068)	(0.171)	(0.066)	(0.114)	(0.057)	(0.061)	(0.051)	(0.042)
Average effect	-0.217	0.151	-0.207	-0.018	-0.105	-0.030	-0.055	-0.035
P-value (test average effect = 0)	0.000	0.172	0.000	0.761	0.007	0.482	0.169	0.210
Average effect in years 6-7	-0.239	0.199	-0.260	-0.050	-0.172	-0.045	-0.088	-0.019
P-value (test average effect in years 6-7 = 0)	0.000	0.198	0.000	0.588	0.001	0.430	0.078	0.612
Observations	6552	1092	6550	1092	6552	1092	6552	1092

Notes: Estimates are based on restricted Natality files by zip code for the state of Colorado from 2003–2015. The outcome variable is the inverse hyperbolic sine of births for the listed age group, which takes on the form $sinh_z^{-1} = ln(z + \sqrt{1 + z^2})$. Estimates can be used to approximate effects using the formula $100 \times (e^{(coefficient)} - 1)$. All specifications include year and zip code fixed effects, and demographic and economic controls. "Low Pop." represents a subsample of Colorado zip codes with less than 15,100 total females, according to the 2010 American Community Survey, while "High Pop." represents zip codes with more than 15,100 females. Both groups maintain a population totaling approximately 169,000 females. Standard errors are clustered at the zip-code level.

*, **, and *** indicate statistical significance at the ten, five, and one percent levels, respectively.

Table A5
Summary Statistics by Zip Code Population Size

	Low Pop. *($N = 504$)*	**High Pop.** *($N = 84$)*
Total		
Population	6822.03	39854.56
Female Population	3365.13	20069.71
Percent		
Female	0.48	0.50
White	0.88	0.78
Black	0.02	0.05
Hispanic	0.15	0.25
Owns Home	0.71	0.62
Renting	0.29	0.38
Households with Kids	0.26	0.32
In Poverty	12.30	15.39

Notes: Zip-Code-level population data are from the 2010 ACS. Column 1 shows the means for small Colorado zip codes, defined as those with less than 15,100 total females. Column 2 displays the means for higher-population zip codes, i.e., zip codes in Colorado with more than 15,100 total females. Both groups maintain a population totaling approximately 169,000 females.

Table A6
The Effect of CFPI on Births, Poisson Estimates

	15–17 Year Olds		18–19 Year Olds		20–24 Year Olds		25–29 Year Olds	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Effect of Initiative in First Year	-0.046	-0.029	-0.009	-0.006	-0.081**	-0.071**	-0.035	-0.028
	(0.061)	(0.061)	(0.039)	(0.040)	(0.032)	(0.033)	(0.026)	(0.025)
Effect of Initiative in Second Year	-0.058	-0.032	-0.123***	-0.115***	-0.130***	-0.119***	-0.015	0.001
	(0.068)	(0.070)	(0.042)	(0.041)	(0.033)	(0.032)	(0.030)	(0.027)
Effect of Initiative in Third Year	-0.170**	-0.138*	-0.074	-0.077	-0.063*	-0.053	-0.031	-0.011
	(0.068)	(0.071)	(0.050)	(0.048)	(0.035)	(0.033)	(0.033)	(0.030)
Effect of Initiative in Fourth Year	-0.158**	-0.150**	-0.154***	-0.160***	-0.099**	-0.094***	-0.042	-0.018
	(0.073)	(0.072)	(0.048)	(0.048)	(0.039)	(0.035)	(0.032)	(0.028)
Effect of Initiative in Fifth Year	-0.130	-0.121	-0.141**	-0.130**	-0.122***	-0.116***	-0.044	-0.012
	(0.097)	(0.096)	(0.055)	(0.055)	(0.038)	(0.034)	(0.034)	(0.030)
Effect of Initiative in Sixth Year	0.059	0.066	-0.127***	-0.128***	-0.107***	-0.109***	-0.047	-0.013
	(0.084)	(0.082)	(0.046)	(0.048)	(0.041)	(0.039)	(0.037)	(0.032)
Effect of Initiative in Seventh Year	-0.075	-0.063	-0.178***	-0.179***	-0.151***	-0.156***	-0.069**	-0.033
	(0.085)	(0.083)	(0.064)	(0.060)	(0.045)	(0.044)	(0.033)	(0.030)
Average effect	-0.082	-0.067	-0.115	-0.114	-0.107	-0.102	-0.040	-0.016
P-value (test average effect = 0)	0.093	0.163	0.001	0.000	0.001	0.001	0.148	0.499
Average effect in years 3-7	-0.008	0.001	-0.153	-0.153	-0.129	-0.133	-0.058	-0.023
P-value (test average effect in years 3-7 = 0)	0.906	0.986	0.001	0.000	0.002	0.001	0.083	0.429
Observations	5304	5304	6097	6095	6877	6877	7137	7137
Controls	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Estimates are based on restricted Natality files by zip code for the state of Colorado from 2003–2015. The outcome variable is the count of births for the listed age group. All specifications include year and zip code fixed effects. Controls include zip-code-level unemployment rates and poverty rates and county-level fractions of individuals aged 15–29 by age, ethnicity, and race, the percent of each age group who are Hispanic, and the percent of each age group who are Black. Standard errors are clustered at the zip-code level.

*, **, and *** indicate statistical significance at the ten, five, and one percent levels, respectively.

Table A7
The Effect of CFPI on Births by Zip Code Poverty Rate

	15–17 Year Olds		18–19 Year Olds		20–24 Year Olds		25–29 Year Olds	
	Low Pov. (1)	High Pov. (2)	Low Pov. (3)	High Pov. (4)	Low Pov. (5)	High Pov. (6)	Low Pov. (7)	High Pov. (8)
Effect of Initiative in First Year	-0.115	-0.062	-0.078	-0.050	-0.033	-0.036	-0.082	-0.032
	(0.081)	(0.056)	(0.080)	(0.053)	(0.059)	(0.052)	(0.070)	(0.041)
Effect of Initiative in Second Year	-0.126	-0.166***	-0.199**	-0.065	-0.135**	-0.004	-0.145**	0.083*
	(0.090)	(0.055)	(0.088)	(0.052)	(0.061)	(0.052)	(0.066)	(0.049)
Effect of Initiative in Third Year	-0.184**	-0.252***	-0.219***	-0.149***	-0.131*	-0.021	-0.033	-0.056
	(0.076)	(0.067)	(0.079)	(0.054)	(0.067)	(0.046)	(0.065)	(0.046)
Effect of Initiative in Fourth Year	-0.134	-0.185***	-0.134*	-0.230***	-0.188**	0.045	-0.077	-0.040
	(0.083)	(0.067)	(0.074)	(0.058)	(0.074)	(0.058)	(0.072)	(0.046)
Effect of Initiative in Fifth Year	-0.226**	-0.255***	-0.139	-0.261***	-0.195**	0.021	-0.140*	-0.014
	(0.114)	(0.073)	(0.089)	(0.067)	(0.082)	(0.057)	(0.084)	(0.052)
Effect of Initiative in Sixth Year	-0.152	-0.256***	-0.339***	-0.155***	-0.270***	-0.024	-0.161*	-0.046
	(0.106)	(0.078)	(0.098)	(0.059)	(0.078)	(0.050)	(0.087)	(0.051)
Effect of Initiative in Seventh Year	-0.275**	-0.225***	-0.335***	-0.159**	-0.280***	-0.075	-0.194***	-0.031
	(0.110)	(0.069)	(0.091)	(0.066)	(0.079)	(0.052)	(0.069)	(0.052)
Average effect	-0.173	-0.200	-0.206	-0.153	-0.176	-0.013	-0.119	-0.019
P-value (test average effect = 0)	0.010	0.000	0.000	0.000	0.001	0.701	0.052	0.528
Average effect in years 6-7	-0.214	-0.241	-0.337	-0.157	-0.275	-0.050	-0.178	-0.038
P-value (test average effect in years 6-7 = 0)	0.025	0.000	0.000	0.005	0.000	0.249	0.013	0.373
Observations	3796	3848	3796	3846	3796	3848	3796	3848

Notes: Estimates are based on restricted Natality files by zip code for the state of Colorado from 2003–2015. The outcome variable is the inverse hyperbolic sine of births for the listed age group, which takes on the form $sinh_z^{-1} = ln(z + \sqrt{1 + z^2})$. Estimates can be used to approximate effects using the formula $100 \times (e^{(coefficient)} - 1)$. All specifications include year and zip code fixed effects, and demographic and economic controls. "Low Pov." zip codes are zip codes with poverty rates at or below the 2010 Colorado median poverty rate. "High Pov." zip codes are defined as zip codes with poverty rates above the 2010 Colorado median poverty rate. Standard errors are clustered at the zip-code level.

*, **, and *** indicate statistical significance at the ten, five, and one percent levels, respectively.

Table A8
The Effect of CFPI on Births by Urbanicity

	15–17 Year Olds		18–19 Year Olds		20–24 Year Olds		25–29 Year Olds	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Effect of Initiative in First Year	-0.128	-0.052	0.026	-0.136**	0.030	-0.007	-0.060	-0.102*
	(0.119)	(0.057)	(0.122)	(0.057)	(0.097)	(0.053)	(0.102)	(0.054)
Effect of Initiative in Second Year	-0.234*	-0.108*	0.006	-0.115**	0.055	-0.087	-0.119	-0.017
	(0.129)	(0.061)	(0.114)	(0.058)	(0.084)	(0.054)	(0.080)	(0.058)
Effect of Initiative in Third Year	-0.277**	-0.148**	-0.186*	-0.131**	-0.042	-0.091	-0.089	-0.032
	(0.126)	(0.067)	(0.097)	(0.058)	(0.087)	(0.056)	(0.091)	(0.058)
Effect of Initiative in Fourth Year	-0.073	-0.150**	-0.118	-0.173***	0.016	-0.091	-0.142	-0.029
	(0.100)	(0.065)	(0.107)	(0.062)	(0.099)	(0.062)	(0.087)	(0.058)
Effect of Initiative in Fifth Year	-0.139	-0.242***	-0.259*	-0.160**	-0.078	-0.037	-0.072	-0.050
	(0.117)	(0.078)	(0.139)	(0.063)	(0.112)	(0.060)	(0.109)	(0.061)
Effect of Initiative in Sixth Year	-0.173	-0.135*	-0.261*	-0.154**	-0.063	-0.167***	-0.139	-0.045
	(0.150)	(0.076)	(0.133)	(0.067)	(0.107)	(0.060)	(0.115)	(0.065)
Effect of Initiative in Seventh Year	-0.245**	-0.120	-0.093	-0.189***	-0.024	-0.190***	-0.060	-0.136**
	(0.113)	(0.078)	(0.126)	(0.068)	(0.112)	(0.058)	(0.096)	(0.061)
Average effect	-0.181	-0.136	-0.127	-0.151	-0.015	-0.096	-0.097	-0.059
P-value (test average effect = 0)	0.036	0.006	0.076	0.000	0.825	0.030	0.138	0.236
Average effect in years 6-7	-0.209	-0.127	-0.177	-0.172	-0.043	-0.179	-0.100	-0.091
P-value (test average effect in years 6-7 = 0)	0.080	0.061	0.108	0.004	0.669	0.001	0.297	0.119
Observations	3757	3887	3755	3887	3757	3887	3757	3887

Notes: Estimates are based on restricted Natality files by zip code for the state of Colorado from 2003–2015. The outcome variable is the inverse hyperbolic sine of births for the listed age group, which takes on the form $sinh_z^{-1} = ln(z + \sqrt{1 + z^2})$. Estimates can be used to approximate effects using the formula $100 \times (e^{(coefficient)} - 1)$. All specifications include year and zip code fixed effects, and demographic and economic controls. Zip code-level classifications on urbanicity can be found at https://ruralhealth.und.edu/ruca and were created from USDA census tract data, by the University of North Dakota's Center for Rural Health. "Rural" zip codes include micropolitan areas, small towns, and rural areas, while "Urban" zip codes include metropolitan areas. Standard errors are clustered at the zip-code level. *, **, and *** indicate statistical significance at the ten, five, and one percent levels, respectively.

Table A9
The Effect of CFPI on Births Typically Involving Relatively High Costs, by Age Group

	15–19 Year Olds				20–24 Year Olds				25–29 Year Olds			
	(1) All Births	(2) Low Birthweight	(3) Very Low Birthweight	(4) 5-Min. Apgar Score < 9	(5) All Births	(6) Low Birthweight	(7) Very Low Birthweight	(8) 5-Min. Apgar Score < 9	(9) All Births	(10) Low Birthweight	(11) Very Low Birthweight	(12) 5-Min. Apgar Score < 9
Effect of Initiative in First Year	-0.081*	0.002	-0.022	-0.025	-0.029	-0.062	-0.056	0.070	-0.052	-0.055	-0.042	0.113**
	(0.042)	(0.059)	(0.046)	(0.063)	(0.039)	(0.061)	(0.055)	(0.059)	(0.037)	(0.059)	(0.060)	(0.055)
Effect of Initiative in Second Year	-0.128***	-0.135**	-0.035	-0.033	-0.052	-0.183***	-0.061	0.034	-0.020	0.048	-0.066	0.150**
	(0.043)	(0.059)	(0.045)	(0.065)	(0.040)	(0.068)	(0.056)	(0.069)	(0.040)	(0.059)	(0.061)	(0.059)
Effect of Initiative in Third Year	-0.211***	-0.314***	-0.117***	-0.225***	-0.063	-0.097	-0.053	0.052	-0.038	-0.105*	0.062	0.042
	(0.046)	(0.062)	(0.040)	(0.065)	(0.039)	(0.062)	(0.051)	(0.064)	(0.037)	(0.060)	(0.060)	(0.063)
Effect of Initiative in Fourth Year	-0.167***	-0.239***	-0.098**	-0.310***	-0.059	-0.196***	-0.121**	-0.007	-0.047	0.008	0.035	0.068
	(0.046)	(0.062)	(0.041)	(0.069)	(0.045)	(0.063)	(0.055)	(0.069)	(0.040)	(0.061)	(0.063)	(0.060)
Effect of Initiative in Fifth Year	-0.209***	-0.317***	-0.070	-0.254***	-0.067	-0.079	-0.023	-0.037	-0.058	-0.015	0.039	0.018
	(0.054)	(0.067)	(0.045)	(0.069)	(0.046)	(0.063)	(0.054)	(0.066)	(0.045)	(0.058)	(0.054)	(0.059)
Effect of Initiative in Sixth Year	-0.197***	-0.260***	-0.125***	-0.350***	-0.134***	-0.204***	-0.060	-0.155**	-0.079*	-0.043	-0.081	-0.079
	(0.056)	(0.069)	(0.041)	(0.064)	(0.043)	(0.064)	(0.052)	(0.069)	(0.047)	(0.065)	(0.061)	(0.067)
Effect of Initiative in Seventh Year	-0.204***	-0.296***	-0.060	-0.435***	-0.159***	-0.230***	-0.172***	-0.363***	-0.104**	-0.106*	-0.044	-0.172***
	(0.058)	(0.068)	(0.044)	(0.073)	(0.044)	(0.067)	(0.052)	(0.075)	(0.042)	(0.058)	(0.054)	(0.060)
Average effect	-0.171	-0.223	-0.075	-0.233	-0.080	-0.150	-0.078	-0.058	-0.057	-0.038	-0.014	0.020
P-value (test average effect = 0)	0.000	0.000	0.002	0.000	0.009	0.000	0.004	0.209	0.070	0.258	0.658	0.636
Average effect in years 6-7	-0.200	-0.278	-0.093	-0.392	-0.146	-0.217	-0.116	-0.259	-0.091	-0.075	-0.062	-0.125
P-value (test average effect in years 6-7 = 0)	0.000	0.000	0.005	0.000	0.000	0.000	0.005	0.000	0.021	0.122	0.158	0.019
Observations	7642	6353	6353	6353	7644	6355	6355	6355	7644	6355	6355	6355

Notes: Estimates are based on restricted Natality files by zip code for the state of Colorado from 2003–2015. The outcome variable is the inverse hyperbolic sine of births for the listed age group, which takes on the form $sinh_z^{-1} = ln(z + \sqrt{1 + z^2})$. Estimates can be used to approximate effects using the formula $100 \times (e^{(coefficient)} - 1)$. All specifications include year and zip code fixed effects, and demographic and economic controls. "Total Births" include all births to women aged 15-29. "Low Birthweight" indicates the number of infants within a zip code born under 2500 grams. "Very Low Birthweight" indicates the number of infants within a zip code born under 1500 grams. "5-Min. Apgar Score < 9" measures the number of infants scoring less than a 9 out of 10 on the 5-Minute Apgar test.

*, **, and *** indicate statistical significance at the ten, five, and one percent levels, respectively. Standard errors are clustered at the zip-code level.

Appendix B. Descriptions of Sensitivity Analysis

In this section we provide a more detailed discussion of each of our robustness checks referred to in Section 4.5.

Addressing Population Flows

In our analysis, we address the possibility that differential trends in population flows and/or zip code demographics might be confounding our estimated effects. However, we first note the evidence we provided for the common trends assumption (Figure 5) suggests that it is unlikely that pre-existing trends in population flows and/or demographics are driving our results. To provide further evidence along these lines, we use data from the two most recent decennial censuses to show that treated and comparison zip codes did not change differently between 2000 and 2010, by evaluating the difference-in-differences in demographics across these years. Ideally we would examine the same set of years that we examine in our main results; however, this analysis is constrained by the availability of Census data.

We additionally show a measure of predicted births based on these population estimates, as a way to gauge whether our estimates are large in comparison to what we would expect in the absence of the intervention. We present these estimates in Table B1. We note that the coefficients are transformed to represent the change expected over one year.

Specifically, we estimate predicted births using a two-step procedure. First, we use 2010 data to evaluate the inverse-hyperbolic-sine of the number of births in each zip code as a function of the aforementioned variables. Second, we estimate the *predicted* inverse-hyperbolic-sine of the number of births for each zip code in 2000 and 2010 based on the coefficient estimates from step one combined with the observed demographics. As mentioned in the above text, we find no statistically significant effects on the number of women 15-29 years old or the share of 15-29 year old women who are White, Black, or Hispanic. We also find no statistically significant effects on the predicted number of births based on these variables. That said, we recognize that a lack of power means that we cannot rule out economically significant effects at conventional levels of statistical significance.

Robustness to our Treatment Definition

Second, we test how robust our analyses are to the definition of distance: we compare estimates using "as the crow flies" distance and driving time in minutes, as well as estimates defining the treatment group as zip codes within 0–5 miles or 0–10 miles of a Title X clinic. We present these estimates in Table B2 and Table B3. In particular, Panel A of Table B2 demonstrates the estimates using 7 miles from a Title X clinic "as the crow flies" as the treatment cutoff, while Panel B uses 10 minutes of driving time (which is closest to 7 miles of driving distance) as the treatment cutoff. In Table B3 we show what the estimated effects are if we instead defined the treatment group as zip codes within 0–5 miles or 0–10 miles of a Title X clinic. Across specifications for all age groups, estimates are consistent with our baseline results.

Next, to test whether our distance measure is picking up something unrelated to proximity to a Title X clinic, we also construct placebo tests in which we drop all treated zip codes (those that are within 7 miles of a clinic), and create "placebo treatment indicators" based on whether a zip code is within 7 miles of a McDonald's or a Starbucks. We then run the analysis on births, using distance to a McDonald's or Starbucks (rather than within 7 miles of a distance to a Title

X clinic) as our determinant for whether a zip code is considered treated or comparison. We present these estimates in Tables B4 and B5. The set of estimates as a whole are reassuring and show no evidence of effects on younger women in the first six years of the initiative. In contrast to our main results, these estimates show no evidence of an effect on 15–17 year old women in the first six years of the initiative, and show no evidence of an effect on 18–19 year old women in any years following the implementation of the initiative. Finally, in comparison to our main results, these estimates do not indicate any reductions in fertility for older women in the sixth and seventh years of the initiative.

We address the notion that our estimates may be biased given the Title X clinic openings and closures during our sample period. In particular, the Colorado Department of Public Health and Environment reports 7 openings from 2009–2015, while two clinics closed. Openings include the Denver Health affiliated opening in 2009, a Tri-County Health Department opening in 2011, 3 openings across the city of Denver affiliated with the Denver health clinic in 2012, and 2 Denver openings affiliated with the Colorado Coalition for the Homeless in 2012. Closures between 2010–2012 include Title X clinics in Stratton and Crested Butte. In Table B6, we provide estimates from models that drop zip codes which experienced Title X clinic openings and closures during this time period. Estimates are statistically similar across all age groups, indicating that these zip codes are not solely responsible for the main results. Due to the location of the closures, we also consider a specification that omits all Denver zip codes, which provides even more conservative estimates of the initiative.

Examining Concurrent Policy Changes

Finally, we address the possibility that other policy changes, such as Medicaid expansion and/or the Affordable Care Act (ACA) are instead responsible for the declines in childbearing. For example, enrollment in Colorado's health insurance exchange began in late 2013, for coverage beginning in 2014. Medicaid expansion occurred simultaneously, with caseloads of non-pregnant, single adults increasing from 10,634 to 241,392 between 2012 and 2015, and the rate of uninsured low-income adults decreasing from 36 to 21 percent (Colorado Department of Health Care Policy & Financing, 2019). To explore how relevant these coverage expansions are in our context, we first analyze per capita client Title X caseloads over the program period in Colorado and the rest of the U.S., and present these trends in Figure B1.

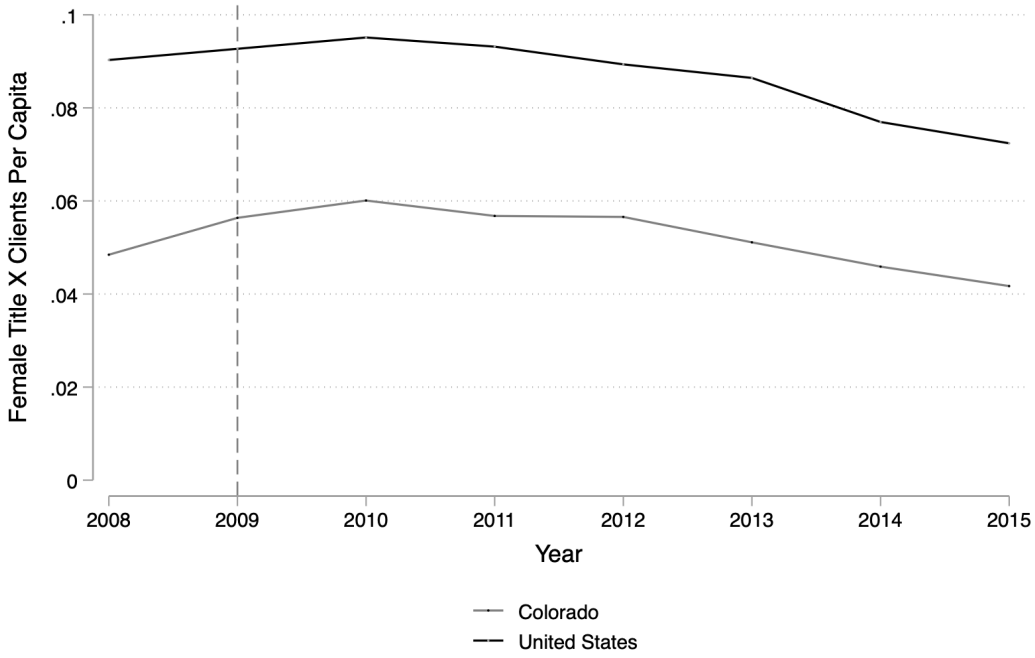
Overall, client caseloads for women aged 15–29 in Colorado track those across the US. Although client caseload increases in Colorado at the start of the program, it peaks in 2010, then declines between 2010 and 2015, indicating that changes in insurance coverage is unlikely to have drawn a new set of clients to these clinics. This may be due to the fact that Title X clinics are targeted towards low-income women and do not require any insurance or proof of income, suggesting that women who could not afford private reproductive health care services were already aware of and/or using these services prior to Medicaid expansion. Alternatively, as discussed above, between 2009–2012, there were 7 new clinic openings across the state, including a Denver Health affiliate opening in 2009, a Tri-County Health Department opening in 2011, 5 other openings across the city of Denver in 2012. If Title X clinics were experiencing excess demand before the start of the initiative, these openings may explain the overall relative increase in client caseload during this period.

Moreover, we also investigate whether sales of contraceptive devices outside of Title X clinics changed as a result of these policy changes, which may indicate that the decline in childbearing seen in years 2013–2015 was due to reductions in the upfront costs to family planning services that women faced across the state. In particular, we use quarterly, state-level

data from the Symphony Health Solutions' Pharmaceutical Audit Suite, which is a database containing point-of-sale claims data from U.S. retail and pharmacy prescriptions.We note that prescription data does not contain devices obtained at Title X clinics, unless the individual had the prescription sent to a retail pharmacy or if the clinic itself contains a retail pharmacy. Notably, this database will understate the extent to which LARCs are received, given that many women obtain these devices at a doctor's office, rather than a pharmacy. Nonetheless, we are able to track whether other types of contraceptives more likely to be sold in a pharmacy, such as oral contraceptives, change differentially after the policy changes. (For more information for more information on these data and how trends in contraceptive take-up changed after the implementation of the ACA, see Bullinger and Simon (2019).)

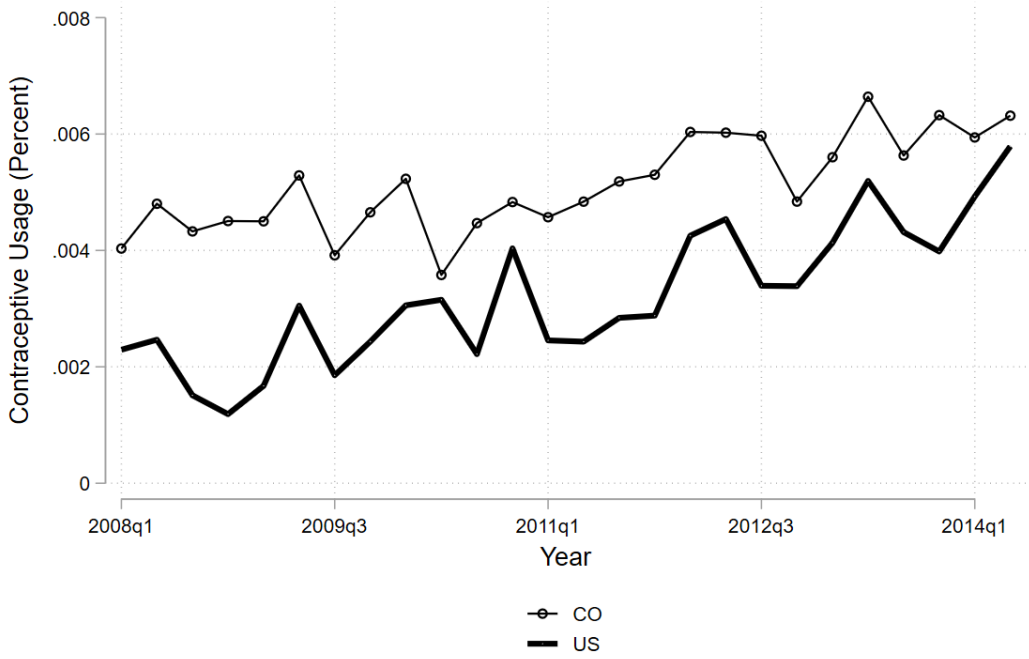
In Figure B2, we present the total LARC sales in Colorado and the rest of the U.S. per women aged 15–44. We find little to no evidence that retail sales outside of Title X clinics of any particular type of contraceptive, including LARCs, dramatically increased in Colorado over time after the expansion of contraceptive coverage.

Figure B1
Female Clients Aged 15–29 Visiting Title X Clinics, Colorado versus United States



Notes: Numbers for Colorado are based on annual data on Colorado Title X contraception usage by age and method provided by the Colorado Department of Public Health and Environment. Numbers for the United States overall are from the Department of Health and Human Services Title X Family Planning Annual Reports, United States 2008–2015. The vertical line, drawn at 2009, represents the year Colorado's Family Planning Initiative was implemented.

Figure B2
Prescription Contraceptives Sales



Notes: Numbers for Colorado and the U.S. are from quarterly, state-level data from the Symphony Health Solutions' Pharmaceutical Audit Suite, containing point-of-sale claims data from U.S. retail and pharmacy prescriptions. Prescriptions are sold outside of Title X clinics. The vertical line, drawn at 2009, represents the year Colorado's Family Planning Initiative was implemented.

Table B1
Difference-in-Difference Estimates for Compositional Changes between Treated and Comparison Zip Codes, 2000–2010

IHS(Number of Women aged 15-29)	0.000
	(0.167)
Percent White (Non-Hispanic Women aged 15-29)	0.033
	(0.031)
Percent Black (Non-Hispanic Women aged 15-29)	-0.004
	(0.006)
Percent Hispanic (Women aged 15-29)	-0.019
	(0.013)
Predicted IHS(Births to Women aged 15-29)	-0.059
	(0.107)

Notes: Estimates are based on Census data for zip code demographics, showing the difference in differences between treated and comparison zip codes from 2000 to 2010. IHS represents the inverse-hyperbolic-sine transformation. The predicted IHS of births is calculated using estimated coefficients from a regression of IHS(birth count) on zip code demographics from 2010, then multiplying those coefficients by the observed demographics in 2000 and 2010. The regression using 2010 data to evaluate how demographics predict births takes the form of $IHS(births)_{zy} = \alpha + \beta_1 * IHS(No.Females15-29)_{zy} + \beta_2 * PctWhite_{zy} + \beta_3 * PctBlack_{zy} + \beta_5 * PctHispanic_{zy}$, where "$PctWhite$" is the percent of females aged 15-29 that are White, etc. This yields an estimated model for $Predicted\ IHS(births)_{zy} = -2.02 + 0.87 * IHS(No.Females15-29)_{zy} + 0.05 * PctWhite_{zy} + 0.21 * PctBlack_{zy} + .27 * PctHispanic_{zy}$.

*, **, and *** indicate statistical significance at the ten, five, and one percent levels, respectively.

Table B2
The Effect of CFPI on Births, Using Alternative Measures of Distance

	15–17 Year Olds		18–19 Year Olds		20–24 Year Olds		25–29 Year Olds	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. "As the Crow Flies" Distance								
Effect of Initiative in First Year	-0.076*	-0.068	-0.062	-0.066	-0.009	-0.001	-0.005	0.000
	(0.041)	(0.041)	(0.040)	(0.041)	(0.039)	(0.040)	(0.038)	(0.039)
Effect of Initiative in Second Year	-0.183***	-0.175***	-0.113***	-0.119***	-0.021	-0.015	-0.003	0.001
	(0.042)	(0.043)	(0.041)	(0.042)	(0.040)	(0.041)	(0.040)	(0.040)
Effect of Initiative in Third Year	-0.258***	-0.246***	-0.160***	-0.159***	-0.037	-0.040	-0.016	-0.023
	(0.046)	(0.046)	(0.042)	(0.042)	(0.041)	(0.041)	(0.040)	(0.040)
Effect of Initiative in Fourth Year	-0.175***	-0.167***	-0.155***	-0.152***	-0.017	-0.016	-0.050	-0.047
	(0.048)	(0.047)	(0.044)	(0.045)	(0.044)	(0.044)	(0.042)	(0.041)
Effect of Initiative in Fifth Year	-0.293***	-0.284***	-0.200***	-0.193***	-0.044	-0.055	-0.024	-0.023
	(0.054)	(0.054)	(0.047)	(0.048)	(0.045)	(0.044)	(0.045)	(0.045)
Effect of Initiative in Sixth Year	-0.259***	-0.252***	-0.203***	-0.194***	-0.110***	-0.121***	-0.029	-0.035
	(0.054)	(0.055)	(0.047)	(0.048)	(0.042)	(0.042)	(0.047)	(0.047)
Effect of Initiative in Seventh Year	-0.305***	-0.291***	-0.195***	-0.181***	-0.115***	-0.126***	-0.079*	-0.091**
	(0.052)	(0.053)	(0.049)	(0.049)	(0.042)	(0.043)	(0.043)	(0.043)
Average effect	-0.221	-0.212	-0.155	-0.152	-0.050	-0.054	-0.030	-0.031
P-value (test average effect = 0)	0.000	0.000	0.000	0.000	0.094	0.074	0.348	0.328
Average effect in years 6-7	-0.282	-0.272	-0.199	-0.188	-0.113	-0.124	-0.054	-0.063
P-value (test average effect in years 6-7 = 0)	0.000	0.000	0.000	0.000	0.002	0.001	0.165	0.113
Observations	7644	7644	7644	7642	7644	7644	7644	7644
Panel B. Driving Time (In Minutes)								
Effect of Initiative in First Year	-0.045	-0.036	-0.115**	-0.124**	-0.009	-0.001	-0.042	-0.038
	(0.051)	(0.052)	(0.048)	(0.048)	(0.045)	(0.045)	(0.036)	(0.036)
Effect of Initiative in Second Year	-0.153***	-0.134**	-0.007	-0.010	-0.036	-0.029	-0.050	-0.045
	(0.056)	(0.057)	(0.045)	(0.045)	(0.044)	(0.045)	(0.042)	(0.042)
Effect of Initiative in Third Year	-0.219***	-0.190***	-0.154***	-0.150***	-0.036	-0.034	-0.043	-0.044
	(0.059)	(0.060)	(0.052)	(0.052)	(0.040)	(0.040)	(0.039)	(0.039)
Effect of Initiative in Fourth Year	-0.161**	-0.138**	-0.162***	-0.154***	-0.060	-0.055	-0.063	-0.053
	(0.064)	(0.063)	(0.058)	(0.058)	(0.051)	(0.051)	(0.040)	(0.040)
Effect of Initiative in Fifth Year	-0.241***	-0.216***	-0.226***	-0.211***	-0.022	-0.022	-0.059	-0.055
	(0.074)	(0.075)	(0.064)	(0.064)	(0.053)	(0.053)	(0.048)	(0.048)
Effect of Initiative in Sixth Year	-0.204***	-0.178**	-0.156**	-0.137**	-0.055	-0.063	-0.045	-0.048
	(0.072)	(0.074)	(0.063)	(0.064)	(0.046)	(0.047)	(0.049)	(0.051)
Effect of Initiative in Seventh Year	-0.252***	-0.226***	-0.147**	-0.125**	-0.098*	-0.100*	-0.056	-0.061
	(0.071)	(0.073)	(0.062)	(0.063)	(0.050)	(0.052)	(0.044)	(0.045)
Average effect	-0.182	-0.160	-0.138	-0.130	-0.045	-0.043	-0.051	-0.049
P-value (test average effect = 0)	0.000	0.001	0.001	0.001	0.195	0.218	0.112	0.130
Average effect in years 6-7	-0.228	-0.202	-0.151	-0.131	-0.077	-0.081	-0.050	-0.055
P-value (test average effect in years 6-7 = 0)	0.001	0.003	0.007	0.020	0.075	0.069	0.222	0.197
Observations	7644	7644	7644	7642	7644	7644	7644	7644
Controls	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Estimates are based on restricted Natality files by zip code for the state of Colorado from 2003–2015. The outcome variable is the inverse hyperbolic sine of births for the listed age group, which takes on the form $sinh_z^{-1} = ln(z + \sqrt{1 + z^2})$. Estimates can be used to approximate effects using the formula $100 \times (e^{(coefficient)} - 1)$. All specifications include year and zip code fixed effects. Controls include zip-code-level unemployment rates and poverty rates and county-level fractions of individuals aged 15–29 by age, ethnicity, and race, the percent of each age group who are Hispanic, and the percent of each age group who are Black. Estimates in Panel A are from a model that defines treated zip codes as those within 0–7 miles "as the crow flies" of a Title X clinic, and comparison zip codes as those further than 7 crow flies miles from a Title X clinic. Estimates in Panel B are from a model that defines treated zip codes as those within 0–10 minutes driving time of a Title X clinic, and comparison zip codes as those further than 10 minutes from a Title X clinic. Standard errors are clustered at the zip-code level.

*, **, and *** indicate statistical significance at the ten, five, and one percent levels, respectively.

Table B3
The Effect of CFPI on Births, Using Within 5 miles, 7 Miles, and 10 Miles to Define Treated Zip Codes

	15–17 Year Olds			18–19 Year Olds			20–24 Year Olds			25–29 Year Olds		
	0–7 Miles	0–5 Miles	0–10 Miles	0–7 Miles	0–5 Miles	0–10 Miles	0–7 Miles	0–5 Miles	0–10 Miles	0–7 Miles	0–5 Miles	0–10 Miles
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Effect of Initiative in First Year	-0.091**	-0.079	-0.054	-0.061	-0.111**	-0.061	-0.010	-0.024	-0.007	0.010	-0.033	0.010
	(0.044)	(0.050)	(0.040)	(0.041)	(0.045)	(0.041)	(0.039)	(0.042)	(0.039)	(0.040)	(0.034)	(0.040)
Effect of Initiative in Second Year	-0.165***	-0.126**	-0.136***	-0.118***	-0.054	-0.118***	-0.028	-0.043	-0.028	0.020	-0.036	0.020
	(0.048)	(0.052)	(0.042)	(0.042)	(0.044)	(0.042)	(0.041)	(0.042)	(0.041)	(0.041)	(0.040)	(0.041)
Effect of Initiative in Third Year	-0.233***	-0.183***	-0.180***	-0.163***	-0.158***	-0.163***	-0.034	-0.040	-0.037	-0.007	-0.047	-0.007
	(0.049)	(0.054)	(0.046)	(0.042)	(0.049)	(0.042)	(0.040)	(0.038)	(0.040)	(0.040)	(0.036)	(0.040)
Effect of Initiative in Fourth Year	-0.182***	-0.159***	-0.095**	-0.153***	-0.154***	-0.153***	-0.008	-0.079*	-0.014	-0.030	-0.034	-0.030
	(0.052)	(0.060)	(0.047)	(0.044)	(0.053)	(0.044)	(0.044)	(0.047)	(0.044)	(0.041)	(0.038)	(0.041)
Effect of Initiative in Fifth Year	-0.259***	-0.247***	-0.224***	-0.185***	-0.218***	-0.185***	-0.037	-0.058	-0.044	-0.002	-0.070	-0.002
	(0.061)	(0.070)	(0.055)	(0.047)	(0.058)	(0.047)	(0.045)	(0.048)	(0.045)	(0.046)	(0.044)	(0.046)
Effect of Initiative in Sixth Year	-0.225***	-0.232***	-0.189***	-0.184***	-0.168***	-0.184***	-0.103**	-0.095**	-0.111***	-0.026	-0.058	-0.026
	(0.061)	(0.068)	(0.054)	(0.048)	(0.058)	(0.048)	(0.042)	(0.045)	(0.042)	(0.048)	(0.047)	(0.048)
Effect of Initiative in Seventh Year	-0.252***	-0.201***	-0.244***	-0.191***	-0.198***	-0.191***	-0.122***	-0.154***	-0.131***	-0.073*	-0.088**	-0.073*
	(0.058)	(0.066)	(0.053)	(0.049)	(0.060)	(0.049)	(0.044)	(0.046)	(0.044)	(0.043)	(0.041)	(0.043)
Average effect	-0.201	-0.175	-0.160	-0.151	-0.152	-0.151	-0.049	-0.070	-0.053	-0.016	-0.052	-0.016
P-value (test average effect = 0)	0.000	0.000	0.000	0.000	0.000	0.000	0.110	0.029	0.080	0.625	0.082	0.625
Average effect in years 6-7	-0.238	-0.217	-0.217	-0.188	-0.183	-0.188	-0.112	-0.124	-0.121	-0.050	-0.073	-0.050
P-value (test average effect in years 6-7 = 0)	0.000	0.000	0.000	0.000	0.001	0.000	0.003	0.003	0.002	0.208	0.061	0.208
Observations	7644	7644	7644	7642	7642	7642	7644	7644	7644	7644	7644	7644
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Estimates are based on restricted Natality files by zip code for the state of Colorado from 2003–2015. The outcome variable is the inverse hyperbolic sine of births for the listed age group, which takes on the form $sinh_z^{-1} = ln(z + \sqrt{1 + z^2})$. Estimates can be used to approximate effects using the formula $100 \times (e^{(coefficient)} - 1)$. All specifications include year and zip code fixed effects. Controls include zip-code-level unemployment rates and poverty rates and county-level fractions of individuals aged 15–29 by age, ethnicity, and race, the percent of each age group who are Hispanic, and the percent of each age group who are Black. Standard errors are clustered at the zip-code level.

*, **, and *** indicate statistical significance at the ten, five, and one percent levels, respectively.

Table B4
The Effect of CFPI on Births, Placebo Estimates Using Distance to McDonald's as a Treatment Indicator

	15–17 Year Olds	18–19 Year Olds	20–24 Year Olds	25–29 Year Olds
	(1)	(2)	(3)	(4)
Effect of Initiative in First Year	0.031	0.137	0.157*	0.172**
	(0.089)	(0.090)	(0.089)	(0.083)
Effect of Initiative in Second Year	0.056	-0.049	0.283***	0.170
	(0.067)	(0.085)	(0.093)	(0.105)
Effect of Initiative in Third Year	-0.048	-0.025	0.123	0.230**
	(0.083)	(0.080)	(0.105)	(0.101)
Effect of Initiative in Fourth Year	-0.103	-0.039	0.208**	0.167
	(0.083)	(0.098)	(0.095)	(0.122)
Effect of Initiative in Fifth Year	0.012	-0.109	0.143*	0.173
	(0.091)	(0.091)	(0.085)	(0.139)
Effect of Initiative in Sixth Year	-0.096	-0.022	0.207**	0.113
	(0.080)	(0.104)	(0.096)	(0.139)
Effect of Initiative in Seventh Year	-0.311***	-0.005	0.093	0.147
	(0.092)	(0.097)	(0.096)	(0.137)
Average effect	-0.066	-0.016	0.173	0.167
P-value (test average effect = 0)	0.193	0.787	0.023	0.113
Average effect in years 6-7	-0.203	-0.014	0.150	0.130
P-value (test average effect in years 6-7 = 0)	0.004	0.876	0.087	0.323
Observations	4797	4795	4797	4797
Controls	Yes	Yes	Yes	Yes

Notes: Estimates are based on restricted Natality files by zip code for the state of Colorado from 2003–2015. The treatment group of zip codes includes those within 7 miles of a McDonald's restaurant, excluding zip codes within 7 miles of a Title X clinic. The outcome variable is the inverse hyperbolic sine of births for the listed age group, which takes on the form $sinh_z^{-1} = ln(z + \sqrt{1 + z^2})$. Estimates can be used to approximate effects using the formula $100 \times (e^{(coefficient)} - 1)$. All specifications include year and zip code fixed effects. Controls include zip-code-level unemployment rates and poverty rates and county-level fractions of individuals aged 15–29 by age, ethnicity, and race, the percent of each age group who are Hispanic, and the percent of each age group who are Black. Standard errors are clustered at the zip-code level.

*, **, and *** indicate statistical significance at the ten, five, and one percent levels, respectively.

Table B5
The Effect of CFPI on Births, Placebo Estimates Using Distance to Starbucks as a Treatment Indicator

	15–17 Year Olds	18–19 Year Olds	20–24 Year Olds	25–29 Year Olds
	(1)	(2)	(3)	(4)
Effect of Initiative in First Year	-0.003	0.184*	-0.006	0.092
	(0.093)	(0.098)	(0.092)	(0.076)
Effect of Initiative in Second Year	0.026	-0.057	0.120	0.057
	(0.103)	(0.100)	(0.088)	(0.096)
Effect of Initiative in Third Year	0.003	-0.082	-0.009	0.182**
	(0.077)	(0.090)	(0.091)	(0.087)
Effect of Initiative in Fourth Year	-0.143	-0.005	0.041	0.110
	(0.089)	(0.112)	(0.106)	(0.110)
Effect of Initiative in Fifth Year	-0.007	-0.044	0.016	0.092
	(0.091)	(0.086)	(0.089)	(0.136)
Effect of Initiative in Sixth Year	-0.162*	0.117	0.127	-0.023
	(0.092)	(0.091)	(0.096)	(0.132)
Effect of Initiative in Seventh Year	-0.332***	0.020	-0.000	0.124
	(0.110)	(0.078)	(0.100)	(0.115)
Average effect	-0.088	0.019	0.041	0.091
P-value (test average effect = 0)	0.160	0.774	0.595	0.309
Average effect in years 6-7	-0.247	0.068	0.063	0.051
P-value (test average effect in years 6-7 = 0)	0.005	0.355	0.471	0.660
Observations	4797	4795	4797	4797
Controls	Yes	Yes	Yes	Yes

Notes: Estimates are based on restricted Natality files by zip code for the state of Colorado from 2003–2015. The treatment group of zip codes includes those within 7 miles of a Starbucks restaurant, excluding zip codes within 7 miles of a Title X clinic. The outcome variable is the inverse hyperbolic sine of births for the listed age group, which takes on the form $sinh_z^{-1} = ln(z + \sqrt{1 + z^2})$. Estimates can be used to approximate effects using the formula $100 \times (e^{(coefficient)} - 1)$. All specifications include year and zip code fixed effects. Controls include zip-code-level unemployment rates and poverty rates and county-level fractions of individuals aged 15–29 by age, ethnicity, and race, the percent of each age group who are Hispanic, and the percent of each age group who are Black. Standard errors are clustered at the zip-code level.

*, **, and *** indicate statistical significance at the ten, five, and one percent levels, respectively.

Table B6
The Effect of CFPI on Births, Omitting Zip Codes Affected by Colorado Title X Openings and Closures

	15–17 Year Olds			18–19 Year Olds			20–24 Year Olds			25–29 Year Olds		
	All	No Openings	No Closures	All	No Openings	No Closures	All	No Openings	No Closures	All	No Openings	No Closures
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Effect of Initiative in First Year	-0.091**	-0.091**	-0.091**	-0.074*	-0.069	-0.074*	-0.029	-0.028	-0.029	-0.052	-0.052	-0.052
	(0.044)	(0.045)	(0.044)	(0.044)	(0.044)	(0.044)	(0.039)	(0.038)	(0.039)	(0.037)	(0.037)	(0.037)
Effect of Initiative in Second Year	-0.165***	-0.167***	-0.165***	-0.127***	-0.133***	-0.127***	-0.052	-0.057	-0.052	-0.020	-0.020	-0.020
	(0.048)	(0.048)	(0.048)	(0.045)	(0.045)	(0.045)	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)
Effect of Initiative in Third Year	-0.233***	-0.238***	-0.233***	-0.183***	-0.187***	-0.183***	-0.063	-0.064*	-0.063	-0.038	-0.030	-0.038
	(0.049)	(0.050)	(0.049)	(0.044)	(0.045)	(0.044)	(0.039)	(0.038)	(0.039)	(0.037)	(0.037)	(0.037)
Effect of Initiative in Fourth Year	-0.182***	-0.191***	-0.182***	-0.188***	-0.188***	-0.188***	-0.059	-0.055	-0.059	-0.047	-0.037	-0.047
	(0.052)	(0.052)	(0.052)	(0.046)	(0.047)	(0.046)	(0.045)	(0.045)	(0.045)	(0.040)	(0.039)	(0.040)
Effect of Initiative in Fifth Year	-0.259***	-0.271***	-0.259***	-0.220***	-0.221***	-0.220***	-0.067	-0.065	-0.067	-0.058	-0.060	-0.058
	(0.061)	(0.061)	(0.061)	(0.053)	(0.053)	(0.053)	(0.046)	(0.045)	(0.046)	(0.045)	(0.045)	(0.045)
Effect of Initiative in Sixth Year	-0.225***	-0.230***	-0.225***	-0.225***	-0.231***	-0.225***	-0.134***	-0.140***	-0.134***	-0.079*	-0.067	-0.079*
	(0.061)	(0.062)	(0.061)	(0.052)	(0.052)	(0.052)	(0.043)	(0.043)	(0.043)	(0.047)	(0.045)	(0.047)
Effect of Initiative in Seventh Year	-0.252***	-0.258***	-0.252***	-0.229***	-0.237***	-0.229***	-0.159***	-0.161***	-0.159***	-0.104**	-0.101**	-0.104**
	(0.058)	(0.059)	(0.058)	(0.054)	(0.054)	(0.054)	(0.044)	(0.043)	(0.044)	(0.042)	(0.041)	(0.042)
Average effect	-0.201	-0.206	-0.201	-0.178	-0.181	-0.178	-0.080	-0.082	-0.080	-0.057	-0.053	-0.057
P-value (test average effect = 0)	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.008	0.009	0.070	0.092	0.070
Average effect in years 6-7	-0.238	-0.244	-0.238	-0.227	-0.234	-0.227	-0.146	-0.151	-0.146	-0.091	-0.084	-0.091
P-value (test average effect in years 6-7 = 0)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.029	0.021
Observations	7644	7618	7644	7642	7616	7642	7644	7618	7644	7644	7618	7644
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Estimates are based on restricted Natality files by zip code for the state of Colorado from 2003–2015. The outcome variable is the inverse hyperbolic sine of births for the listed age group, which takes on the form $sinh_z^{-1} = ln(z + \sqrt{1 + z^2})$. Columns 1, 4, 7, and 10 provide the baseline estimates for comparison, using all zip codes across the state of Colorado. Columns 2, 5, 8 and 11 omit zip codes which experienced Title X clinic openings from 2009–2015, and Columns 3, 6, 9 and 12 omit zip codes which experienced Title X closures. All specifications include year and zip code fixed effects. Controls include zip-code-level unemployment rates and poverty rates and county-level fractions of individuals aged 15–29 by age, ethnicity, and race, the percent of each age group who are Hispanic, and the percent of each age group who are Black. Standard errors are clustered at the zip-code level.

*, **, and *** indicate statistical significance at the ten, five, and one percent levels, respectively.