Publicly Supported Family Planning Services in the United States, 2016: Methodological Appendix

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Introduction

This document describes the detailed methodology used in *Publicly Supported Family Planning Services in the United States: Likely Need, Availability and Impact, 2016,* to collect, tabulate and estimate the:

1. Number of U.S. **women who likely need public support for contraceptive services and supplies** in 2016 according to age groups, income level, race and ethnicity at the national, state and county levels;

2. Number of U.S. **women who received contraceptive services at all publicly supported family planning providers** in 2016 according to the type of publicly supported provider visited at the national and state levels; and

3. **Impact of publicly supported contraceptive care** in 2016 at the national and state levels in terms of:
   - Numbers of pregnancies that were avoided by use of contraception;
   - Numbers of negative health outcomes related to chlamydia, gonorrhea, HIV and HPV that were prevented by testing and vaccinations provided during visits for contraceptive services;
   - Net public cost savings that accrue from preventing these pregnancies and negative health outcomes.

1. Women who likely need public support for contraceptive services and supplies

The data, methodology and definitions used to produce estimates of the number of women who likely need public support for contraceptive services and supplies for all U.S. states and counties are similar to those used in prior Guttmacher reports.[1–9] In this report, we have revised some of our terminology and definitions to more explicitly state what each indicator is measuring.

This analysis produces estimated numbers of women who likely need public support for contraceptive services and supplies by age-group (younger than 18, aged 18–19, aged 20–29 and aged 30–44) and by income level (family income of <100%, 100–137%, 138–199% and 200–249% of the federal poverty level). We disaggregated income categories in order to allow users to estimate the likely need for publicly supported services according to income levels that are different from the ones used here.

Estimates are produced by combining 2016 population data from the U.S. Census Bureau with information on poverty and marital status from the 2014–2016 American Community Surveys (ACS) and characteristics of women from the 2011–2015 National Survey of Family Growth (NSFG).

Specifically, we calculated the proportion of women in various population groups who met certain criteria indicating their likelihood of seeking contraceptive services from the 2011–2015 NSFG, a nationally representative cross-sectional survey of 11,300 women aged 15–44 conducted by the U.S. National Center for Health Statistics. Women were included in the

analysis if they had ever had consensual sex, were fecund, and were neither pregnant nor trying to become pregnant for the entire year (see Key Definitions). The proportion of women likely to seek contraceptive services by each age by marital status by income level by race and ethnicity group were then applied to county-level estimates of the number of women in each of these population groups.

KEY DEFINITIONS

Women Who Have Potential Demand for Contraceptive Services and Supplies
Women are counted as having potential demand for contraceptive services and supplies if they are aged 13–44 and meet the following criteria:

- they have ever had voluntary penile-vaginal sexual intercourse;
- they are able to or believe they are able to conceive (we include women for whom neither they nor their partner(s) have been contraceptively or noncontraceptively sterilized, and who do not believe that they are unable to conceive for any other reason); and
- they are neither pregnant nor trying to become pregnant during all of the given year.

Because the objective is to estimate the potential annual demand for contraceptive services and supplies, these estimates differ from other estimates of women at risk of unintended pregnancy in the following ways. They 1) exclude women who rely on contraceptive sterilization to prevent pregnancy; and, 2) take into account a woman's contraceptive and pregnancy status over a full year, rather than only considering her status at the time of the survey.

Women Who Likely Need Public Support for Contraceptive Services and Supplies
Some women who have the potential to seek contraceptive services and supplies have difficulty obtaining care because they cannot afford private-sector prices for care or because they have special needs, such as a requirement for confidentiality. Women are considered to have a likely need for public support for contraceptive care if they meet the above criteria, plus at least one of the following:

- they are aged 20 or older with a family income below 250% of the federal poverty level (less than $50,400 for a family of three in 2016); or
- they are younger than 20, with any family income level.

The income level used in this definition was set based on Title X eligibility guidelines, which classify patients whose income is under 250% of the federal poverty level as eligible for reduced-fee services. Patients whose income is under 100% of the federal poverty level (less than $20,160 for a family of three in 2016) are eligible for free services. Eligibility for adolescents is based on their own (not their parents') resources, so most are eligible for free services.

County-level Population Estimates

Two hundred population groups for each county were used in the estimation procedure. These were defined by age (13–14, 15–17, 18–19, 20–29 and 30–44), marital status (married and living with spouse vs. all other categories), race and ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and other or multiple races) and family income as a percentage of the federal poverty level (less than 100%, 100–137%, 138–199%, 200–249% and 250% or more). In addition, geographic groups were defined by the county's metropolitan status (central city, metropolitan area outside of a central city and nonmetropolitan) and census

region (Northeast, Midwest, South and West). This level of detail was necessary to increase the accuracy of our estimates when combining national proportions of likely need with county-level population counts for each demographic group.

To estimate the population of reproductive-aged women in each group in each county, we started with published 2016 U.S. Census Bureau reports[10] of the number of women in each county by age and race and ethnicity.[11] We then divided the age and race and ethnicity groups according to women's marital status and income-level groupings based on distributions from the 2014–2016 ACS.[12–17] The combined three-year data set was used instead of the 2016 one-year data set to ensure large enough sizes in each of the 200 cells to create reliable proportions. Separate publicly available, person-level files were merged within each year, and the resulting data files from each year were appended to create the final three-year (2014–2016) data set. Survey weighting remained unchanged.

However, because the ACS uses geographical units called PUMAs (Public Use Microdata Area)* instead of counties, and PUMAs and counties are not directly analogous (for example, a single county may contain multiple PUMAs or a single PUMA may be comprised of multiple counties), we used data obtained through the Geocorr 2014: Geographic Correspondence Engine run by the Missouri Census Data Center at the University of Missouri. This web-based tool produces crosswalk data listing the associations between particular geographic units.[13] Specifically, we applied the Geocorr-generated *PUMA to county allocation factor,* a variable that describes what portion of the PUMA's total population is represented by the intersection of a PUMA and a county,[18] to distribute the population of women in each county reported in the census data. The county-level proportions of women by marital and poverty status calculated from the county-aggregated ACS data were then directly applied.

Only 8% of PUMAs were directly analogous to one county. The remaining PUMAs either represented parts of a larger county or contained two or more small counties. In a small number of instances, there were women in the census data in a specific age or race or ethnic group within a county for whom there were no analogous PUMA data in the ACS sample. For example, there are some non-Hispanic black women aged 15–17 living in a small county in North Dakota, but there were no corresponding non-Hispanic black women aged 15–17 sampled in the corresponding PUMA in the ACS. Therefore, we could not calculate the county-level proportions of these women in each marital and poverty status group. In these instances, we calculated state-level marital and poverty status proportions for each group and applied those proportions to the county-level census data.

Estimating Women's Potential to Seek Contraceptive Services and Supplies

Using data from the 2011–2015 NSFG for each of the 200 age, race and ethnicity, poverty and marital status groups, we estimated the proportion of women who had ever had voluntary intercourse and were fecund; and the proportion of sexually experienced, fecund women who during some portion of the year were neither pregnant nor trying to get pregnant. In some

*PUMAs are used in various U.S. Census Bureau data sets (including the decennial census Public Use Microdata Sample (PUMS) data, the ACS PUMS data and ACS period estimates). They nest within states or equivalent entities and must be geographically contiguous. They each comprise about 100,000 residents, so some are exactly analogous to counties, some comprise more than one small county, and some represent parts of a large county (which may be divided into several PUMAs).

cases, separate estimates were also made according to which region women lived in and whether it was a metropolitan, suburban or rural area.

These estimates were made using a series of stratified logistic regression models. Model selection was performed using 10-fold cross-validation, using the *crossfold* package in Stata.[19] Because a woman's potential to seek contraceptive services varies according to her age and marital status, all analyses (including model selection) were performed separately for unmarried adolescents, unmarried adults and married adults. When logistic regression was not appropriate, we estimated proportions from similar groups, or used other information to inform the estimates (described below).

Sexually experienced and fecund. In this analysis, we are estimating women's potential risk of becoming pregnant over an entire year and therefore we include all women who have ever had penile-vaginal sexual intercourse. Women were considered to be infecund (unable to become pregnant) if they said they were sterile because of an operation or for any other reason, if their husband or cohabiting partner was sterile or if they believed they were subfecund (they said it was difficult for them to become pregnant). Generally, most infecundity is due to women's use of contraceptive sterilization. A report of subfecundity, however, may not mean that it is impossible for a woman to become pregnant. Indeed, 47% of women who said it was difficult for them to become pregnant were using a reversible contraceptive. Therefore, subfecund women were included if they were using a contraceptive method.

All women younger than 15 were considered to be fecund. For these women, we used information on age at first intercourse in the 2011–2015 NSFG to estimate the proportions who had ever had sex according to race and poverty status. For women aged 13–14, our estimates ranged from 8% for nonblack adolescents to 14% for black adolescents. All married women aged 15–19 were considered to have ever had sex and to be fecund.

For unmarried women aged 15–19, we estimated the proportions of those who had ever had sex and who were fecund using logistic regression analysis. The model indicated that the proportions were highest for older adolescents (those aged 18–19), and non-Hispanic white and non-Hispanic black women. Depending on race and ethnicity, the proportion of unmarried women aged 15–17 who were sexually active and fecund varied between 14% and 31%; among unmarried women aged 18–19, the proportions varied from 50% to 62%.

A separate logistic regression analysis was used to estimate the proportion of unmarried adult women aged 20–44 who were sexually active and fecund. Among unmarried women aged 20–29, proportions ranged from 70% to 87% depending on poverty status, region and location. The proportions of unmarried women aged 30–44 who were sexually active and fecund ranged from 43% to 70%. (The proportions of older women are lower because of their use of sterilization.)

All adult married women were assumed to be sexually active. We used a separate logistic regression analysis to estimate the proportions of adult married women who were fecund. Proportions varied by age, race and ethnicity, poverty status, region and location. Among younger married women (aged 20–29), the proportions of those who were fecund varied from 83% to 96%; among older married women (aged 30–44), they varied from 32% to 72%.

Not pregnant or trying to become pregnant. Separate analyses were conducted to estimate group proportions for married and unmarried adults and for unmarried adolescents. According to logistic regression analysis, the proportion of married adult women who were not currently pregnant or trying to become pregnant varied little between 90% and 93%. While higher, the

proportions among unmarried adult women had similarly small variation between 96% and 97%. Unmarried adolescents were near universally not currently pregnant or trying to become pregnant (99.8–100%). The number of married adolescents was too small to conduct a separate logistic regression analysis; instead, all groups were assigned the average proportion of 88% not currently pregnant or trying to become pregnant.

Although the time that women are infertile because of pregnancy and the immediate postpartum period lasts less than 12 months, some women spend a number of months trying to get pregnant and for some, the period during which they are not likely to seek contraceptive services and supplies can span the entire year.

To convert the point-in-time proportions from the NSFG logistic regression analysis to the proportion who were pregnant or seeking pregnancy for an entire calendar year, we used Dryfoos's[1] estimates of the number of months required for each live birth, which take into account pregnancy loss and the time needed to conceive. These vary by age and are 17.3 months for women aged 15–19, 16.3 for those aged 20–29 and 21.7 for those aged 30–44. Women categorized as pregnant or trying to conceive for an entire calendar year are those who began to seek pregnancy before the beginning of the year, so that their period of being or trying to be pregnant encompassed the entire 12 months. For women aged 15–19, this would include those who started trying during the 5.3 months before the year began; the proportion who were pregnant or trying for the entire year would be 5.3 divided by 17.3, for a correction factor of .306. Accordingly, the proportion of adolescents who were pregnant or trying to be pregnant at a point in time was multiplied by .306 and the results were subtracted from 1.0 to get the proportion of women who, at some time during the year, were neither pregnant nor trying to conceive. The correction factor for women aged 20–29 was .264 and .447 for women aged 30–44.

Final Step to Generate Number of Women with the Potential to Seek Contraceptive Services and Supplies

To derive our final estimates of the number of women with the potential to seek contraceptive services and supplies, we applied the estimated proportion of women with the potential to seek contraceptive services and supplies for each age, race and ethnicity, marital status and poverty group to the number of women per county in each group. In addition, depending on which variables were most important in the 10-fold cross-validation model, some of the proportions of women with the potential to seek services varied according to the region of the country and whether the county was classified as a center city, a metropolitan area outside of a central city or a nonmetropolitan county.

As with all estimates, a certain amount of error in our figures is unavoidable. Although the population counts on which the estimates are based should be generally accurate, groups in some areas were undercounted, as mentioned above. In addition, the estimated proportions of women who are fecund, sexually experienced, and not pregnant or trying to become pregnant for each demographic group within counties are based on national and regional data and may differ from the actual proportions for groups within counties.

The detailed national-, state- and county-level data on the number of women with potential demand for services or likely need for public support for contraceptive services in 2016 can be found in the Guttmacher Institute's online county-level Data Center at https://data.guttmacher.org/counties.

2. Women Receiving Publicly Supported Contraceptive Services

We estimated the total number of female patients receiving contraceptive services from publicly supported clinics in 2015 through primary data collection. The methodology for conducting this data collection effort is described below. We then updated national and state estimates of female patients receiving contraceptive services from clinics for 2016, and the detail for that effort is also described below. Further, we describe our methodology for estimating the number of women who receive contraceptive services from private doctors that is paid for by public sources, primarily Medicaid. The detailed national-, state- and county-level data for 2015 can be found in the Guttmacher Institute's online county-level Data Center at https://data.guttmacher.org/counties.

2015 Census of Publicly Supported Clinics Providing Contraceptive Services

Data collection. We identified all publicly supported agencies and clinics that provided contraceptive services in 2015, and collected data for each clinic, specifically the total number of female contraceptive patients served in 2015, the number of those patients who were younger than 20 and whether the clinic received Title X funds. To identify agencies and clinics fitting our definition of a clinic providing publicly supported contraceptive services, we began with the universe of clinics identified in our 2010 census of publicly supported clinics.[9] We updated addresses and added potential new clinics from the following sources: the online directory of Title X–funded clinics and the online directory of Planned Parenthood health centers.[20,21] During this round of the clinic census, we were able to obtain the majority of data through requests to three large administrative agencies that oversee thousands of clinics: the Office of Population Affairs (OPA) in the U.S. Department of Health and Human Services, which provided data for the majority of clinics that receive Title X support; the Health Resources and Services Administration (HRSA), which provided data for the majority of federally qualified health centers (FQHCs) providing contraceptive services; and the Indian Health Service (IHS), which provided data for the majority of IHS sites that provide contraceptive services. The procedures followed to obtain data from each of these entities and the data qualifications that required follow-up with some individual agencies or clinics are described below. Additional data collection activities were conducted with sites that did not report to any of these entities and are also described below.

- *Title X-supported clinics*. In July 2016, we requested data on the number of contraceptive patients served at all Title X–supported clinics in 2015 from OPA. Although OPA does not typically collect these data at the clinic level, they had recently completed a large sustainability survey of all sites in 2016 that included this information. After receiving approval from OPA to obtain a portion of the sustainability survey results, we received 2015 clinic-level patient counts for a large proportion of all Title X sites in August 2016. For each clinic, OPA provided Guttmacher with the total number of female contraceptive patients served in 2015 and, when possible, the number of adolescent women receiving such care. We then matched the OPA clinic list to our database of clinics and conducted extensive follow-up directly with Title X grantees, and in some cases with the clinics themselves, to resolve a variety of inconsistencies or missing data. These included cases where patient counts for clinics were missing, counts were inconsistent, aggregate counts from agencies instead of individual clinics were reported, clinic addresses could not be matched to our database, and when additional information was needed about clinic openings or closures in order to identify if a clinic saw patients in a given year. After completing all follow-up, patient counts for some 2,291 Title X–funded clinics were

obtained directly from the OPA survey, while patient counts for 1,409 Title X clinics were obtained through other sources (Table A1).

- *Federally qualified health centers.* In April 2016, we requested that the Bureau of Primary Care at HRSA provide us with a special tabulation of data from the Uniform Data System (UDS), a standardized reporting system that collects data from all health centers and "look-alikes" that receive federal funding to provide comprehensive primary care services to underserved populations. After obtaining approval from HRSA for our data request, and waiting for the final 2015 UDS file to be released and our special tabulation processed, we received data in November 2016. The data file we received contained counts of contraceptive patients served in 2015 for 1,272 FQHC agencies with at least one clinic that provided contraceptive care to 10 or more patients in 2015 (in the 50 U.S. states and the District of Columbia). The agencies in the data file were then matched to a list of FQHC agencies and clinics downloaded from the HRSA website that might potentially provide contraceptive services, as well as a list of FQHC agencies and clinics generated from our database of sites known to provide publicly supported contraceptive services.

The data we received from the UDS were tabulated at the agency, not clinic, level. To address this, we developed a series of strategies to assign or distribute the data among each agency's clinics. First, for FQHC agencies with only one clinic (271 agencies), we assigned the total agency contraceptive patient count to that one clinic. For FQHC agencies with two or more clinics and fewer than 50 female family planning patients (65 agencies), we distributed the contraceptive patient counts evenly across those clinics after confirming that each site did provide family planning services in 2015. FQHC agencies with two or more clinics and more than 50 female family planning patients (936 agencies) were sent a short survey listing all of the agency's clinics known to us and including the aggregate number of contraceptive patients reported by HRSA for the entire agency. We requested that the agency administrator provide any needed corrections to the clinic list and provide a percentage distribution of contraceptive patients among the center's clinics. Some 460 agencies responded to the survey and provided information to distribute the agency's patient counts across a total of 1,458 clinics. Data for 2,459 FQHC clinics came from either the agencies that had only one or two clinics and fewer than 50 total patients, or the agencies that failed to respond to the survey even after extensive follow-up. For cases in this last category, we distributed the patient counts evenly across that agency's active sites or used the distribution of patients by clinic from the previous (2010) clinic census. Before distributing the counts, we confirmed that each site provided family planning services in 2015 by telephone or online investigation. Data for the remaining FQHCs came from a variety of sources (Table A1).

- *Indian Health Service (IHS) clinics*. In June 2016, we contacted IHS to request client counts for all U.S. clinics that receive IHS funding and are under one of the IHS service areas. After signing a data agreement and presenting our proposal to several internal IHS committees, including their IRB, as well as completing required information systems security awareness training for all research staff assigned to handle IHS data, we received data in January 2017. We received clinic-level data on the number of contraceptive patients served in 2015 for some 450 IHS sites that served 10 or more contraceptive patients. We used IHS patient data alone for 379 clinics; for an additional 71 clinics, we used IHS data in combination with data from other sources described in this report to estimate the number of contraceptive patients served.

- *Independent mailing*. To obtain patient data for the remaining sites that provide publicly supported contraceptive services and do not report to any of the above administrative agencies, we separately surveyed over 800 additional agencies or administrative entities. These included

all hospitals and other (nonaffiliated) agencies listed in our updated database of clinics, Planned Parenthood affiliates that were not Title X grantees, a small number of other clinics for which the Title X grantees could not provide data, and a few Title X grantees and state family planning administrators in states where data was lacking from the other sources surveyed. After one mailing and extensive telephone follow-up, client counts were received from Title X grantees or state family planning administrators for 1,456 clinics; the majority of these clinics were located in California and reported on by the California state health department. In addition, data were reported for some 1,202 clinics from individual agencies or clinics.

Table A1. Number and percentage of clinics providing publicly supported contraceptive services in 2015 by source for data on patients served

	Total clinics		Title X clinics		Non–Title X clinics		Total FQHCs	
Data source	N	%	N	%	N	%	N	%
OPA sustainability survey	2,291	21%	2,291	62%	—	—	509	9%
HRSA (single clinic or even distribution across sites)	2,459	23%	92	2%	2,367	34%	2,459	42%
HRSA (agency-provided distribution across sites)	1,459	14%	74	2%	1,385	20%	1,458	25%
HRSA and other sources	424	4%	114	3%	310	4%	424	7%
IHS only	379	4%	5	0%	374	5%	44	1%
State or grantee respondent (mostly California)	1,456	14%	141	4%	1,315	19%	590	10%
Agency or clinic respondent	1,202	11%	800	22%	402	6%	117	2%
Data estimated	1,038	10%	183	5%	855	12%	228	4%
Total	10,708	100%	3,700	100%	7,008	100%	5,829	100%

Notes: FQHC=federally qualified health center. OPA=Office of Population Affairs. HRSA=Health Resources and Services Administration. IHS=Indian Health Service.

Totals by reporting source. We identified a total of 3,105 agencies and 10,708 clinics that provided publicly subsidized family planning services in 2015. After taking into account all adjustments, we estimated that 6,746,290 women received services from publicly funded family planning clinics in the 50 states and District of Columbia; 1,196,690 of these women were younger than 20.

The number of female contraceptive patients for 2015 was reported for 90% (9,670) of all family planning clinics. Counts for 2,291 clinics were reported by OPA; counts for 3,978 clinics were reported by HRSA; and counts for 379 clinics were reported by IHS. For additional sites, counts for 250 clinics were reported solely by Title X grantees; 1,206 clinics solely by non–Title X state family planning administrators; 1,142 clinics by individual agencies themselves; and 424 clinics had data provided by multiple sources (primarily OPA and HRSA, but also combinations of data from OPA, HRSA, Title X grantees and IHS).

After confirming that the remaining 10% of clinics (1,038) had provided family planning services in 2015, we used two methods to estimate how many patients they had served. First, we used agency-provided counts from the 2010 enumeration of patients for 6% of clinics (605). For the

remaining 4% of clinics (433), no earlier data were available, so we imputed counts using the average number of patients served by other clinics in the same region and of the same Title X funding status, metropolitan status and provider type. Among all 1,038 sites for which client numbers were estimated, one-third were hospitals (355), and the remainder were health departments (251), FQHCs (228) or other clinics (191). The latter group were typically independent sites that do not report to any umbrella organization.

Limitations and adjustments. Less than 1% of the data we received was applicable to a reporting period other than calendar year 2015, usually a fiscal year that included part of 2015; we used the data provided, assuming that the number of patients served during the 2015 calendar year would have been similar to the number served during a partly overlapping 12-month fiscal year.

Overall, 9% of all female contraceptive patients enumerated were served at the 10% of sites for which client data were either estimated with 2010 data (6%) or imputed (3%). For adolescents, the total proportion estimated was 18%. This proportion is higher than that for all women because there were more clinics without adolescent client counts. HRSA, for example, provided the total number of patients for an agency, but could not specify how many patients were younger than 20. Some other clinics were also unable to provide counts for those younger than 20. For these sites, we used the ratio of adolescent patients to all patients in 2010 and applied that to the total client count in 2015 for that clinic (14%). If these data were not available, then we used estimated 2010 data (less than 1%) or the average percentage of patients who were adolescents at similar sites to estimate the number of adolescent patients served (4%).

Women Served at Clinics in 2016

We estimated the number of U.S. women who received contraceptive services and supplies at publicly supported family planning clinics in 2016 using multiple sources. For the number of patients receiving contraceptive care at Title X–funded family planning clinics, we used 2016 Title X program data, tabulated by state, excluding men and those served in U.S. territories.[22] These clinics accounted for 58% of the total and 54% of adolescent female family planning clinic patients.

The number of women served at other publicly supported clinics—those clinics that do not receive Title X funds—was estimated by starting with the published state tabulations for women served by such clinics in 2015.[23] We then projected the state-level change in the number of patients served at these sites between 2015 and 2016 using data from HRSA on the number of women aged 15–44 who were served in 2015 and 2016 at FQHCs.[24] We calculated the percentage change between years using the HRSA data and applied the state-level percentage change to the 2015 number of contraceptive patients served in each state to estimate the number served in 2016. Because women served at FQHCs constitute nearly half of all women served at non–Title X–funded clinics (48%), we determined that this projection method was better than using data from Title X clinics to estimate the change in non–Title X clinics, as had been done in previous reports.[25]

Women Receiving Medicaid-Funded Contraceptive Services from Private Providers

We estimated the national number of women receiving Medicaid-funded contraceptive services from private providers using information from the 2011–2015 NSFG[26] on the type of provider respondents reported visiting for contraceptive services and how they reported paying for their visit. Among the 25 million women who reported receiving at least one contraceptive service in the prior 12 months, 73% (18.7 million women) reported receiving that care at a private provider's office; 17% (3.2 million women) of those who went to a private provider reported that their contraceptive visit had been paid for by Medicaid. A previous Guttmacher report[27] used data from the 2002 and 2006–2010 NSFG to make similar estimates for 2001 and 2010. Recent analyses of the 2011–2015 NSFG uncovered some inconsistencies in how women report their insurance status and their payment source for contraceptive services. To account for these inconsistencies, we constructed a corrected payment source variable for the current analysis. To be consistent across years, we have revised our 2001 and 2010 estimates of the number of women using Medicaid for contraceptive services at private providers based on the corrected payment source variable, and these numbers are somewhat higher than the previously published numbers. There are no data available to estimate the number of women who receive Medicaid-funded contraceptive services from private providers by state.

3. Impact of Providing Publicly Supported Contraceptive and Related Services

Overall Approach

We estimated the numbers of pregnancies postponed or avoided by use of contraception and the numbers of negative health outcomes related to chlamydia, gonorrhea, HIV and HPV prevented by testing and vaccinations provided during family planning visits. For each of the specified services, we first estimated the number of individuals who received the service from publicly supported providers in 2016. We included male patients when estimating the impact of chlamydia, gonorrhea and HIV testing. Next, we calculated how many individuals obtained a direct health benefit from that service that they would not have obtained in the absence of publicly funded care. We did this by comparing the health outcomes for individuals who received publicly supported services with the outcomes for individuals in a hypothetical situation in which publicly funded services were not available. For the hypothetical scenario, we assumed that patients would shift to a less effective mix of methods or that receipt of noncontraceptive preventive services would be delayed for some patients (specific assumptions for each service are detailed below).

We then estimated the overall costs and the costs that would have been paid for from public sources for providing care for medical conditions that would have ensued had family planning services not been available. We did this by estimating and then summing the public costs saved for each service to obtain the total amount of public cost savings. This total was then compared with the total public cost of providing publicly funded family planning and related sexual and reproductive health services in 2016. Finally, we subtracted the latter from the former to get net public savings. See Table A2 for a summary of the parameters used in this analysis and described below.

Time frames. Data on services provided and actual costs were for 2016. Because many benefits of the services provided extend beyond a single year, the analysis for each specific service depended on assumptions about how many years of benefits would accrue from services provided in 2016. HIV and cancer prevention services, for example, have lifetime benefits; because these services avert diseases that would have been identified and treated years or decades later, any analysis of their benefits must use an extended time frame. By contrast, services that prevent curable STIs have more limited, episodic benefits: They avert negative health consequences and treatment costs that would have occurred only a few months or years later, and they do not prevent future infections. In estimating the benefits of contraceptive care in helping women and couples prevent pregnancies, we used a five-year time frame.

Expected receipt of services in the absence of publicly funded care. We assumed that, in the absence of publicly funded family planning services, many of the women and men who made a visit in 2016 and obtained contraceptive and related services would be less likely to make such visits. As a result, some women would switch to less effective, over-the-counter contraceptive methods and some would switch to no method. Our analysis therefore compares the actual contraceptive method mix for a national sample of recipients of public-sector family planning care with the likely hypothetical contraceptive method mix for these women in the absence of publicly funded services. The hypothetical method-mix scenario was based on the behavior of similar women who did not use publicly funded services, but were eligible do so. Both scenarios were calculated using the 2011–2015 NSFG (see below for details).[26]

In addition, we assumed that without access to publicly funded services, many women who forgo family planning visits will also forgo receipt of related services, such as screening for STIs and cervical cancer and HPV vaccination. We assumed that all women in our comparison group who continued to use short-acting prescription methods (10% were estimated to use oral contraceptives, injectables, or the hormonal patch or ring) would also obtain related screening and vaccination services in a timely manner. Among the remaining 90% of women in our comparison group who were expected to use long-acting[†] or nonprescription methods or no method in the absence of access to publicly funded services, we assumed that 21% would make a visit for preventive services, including screening and vaccination. We based this proportion on the observed behavior of similar women in the NSFG.[26] Thus, benefits and cost savings for STI and cervical cancer screening and for HPV vaccination were estimated for the 72% of female patients who, in the absence of publicly funded services, would likely forgo preventive gynecologic visits for these screening and vaccination services. For male patients, we assumed that in the absence of publicly funded services, 100% would forgo care.

[†]This varies from the methodology used in our prior analysis, which assumed that all women using prescription methods in the comparison group would continue to receive preventive services. As use of long-acting methods has increased, and most women in the comparison group who were expected to use long-acting methods likely received those methods prior to losing access to publicly funded care, we did not think our original assumption could be justified. Instead, we moved women using long-acting methods to the group that may or may not obtain preventive services and looked at the actual service use of such women in the NSFG to determine the percentage likely to use or forgo care.

Table A2. Summary of selected parameter values and medical cost estimates for estimating benefits and cost savings at the national and state levels, 2016

Parameter	National level		State level*	Source(s)
	Females	Males		
Parameter values and adjustments for estimating benefits				
Benefits from contraceptive use				
Percent using a method	0.86	—		22
Cost adjustment for births that do not generate public cost savings	0.73	—		30
Benefits from noncontraceptive services				
Adjustment to account for patients who would receive care without public funding	0.72	1.00		26
Chlamydia, gonorrhea and their sequelae				
Proportion of clients tested for:				
– chlamydia	0.51	0.66	✓	22
– gonorrhea	0.50	0.69	✓	22
Proportion of tested clients who are positive:				
– chlamydia	0.05	0.07	✓	37
– gonorrhea	0.01	0.01	✓	37
Proportion of positive clients who are treated: chlamydia and gonorrhea	0.96	0.96		39
Proportion of treated clients who were symptomatic: chlamydia and gonorrhea	0.20	0.20		45,46
Absolute reduction in probability of sequelae due to treatment:				
– chlamydia and gonorrhea, symptomatic cases	0.15	0.02		40
– chlamydia and gonorrhea, asymptomatic cases	0.08	0.02		40
Adjustment to chlamydia costs averted to account for gonorrhea coinfection	0.93	0.93		41
Adjustment to gonorrhea costs averted to account for chlamydia coinfection	0.79	0.90		41
Adjustment to account for reinfection: chlamydia and gonorrhea	0.70	0.70		41
Number of cases of STI averted in population per STI case treated	0.50	0.50		41
Probability of a new case of HIV attributable to chlamydia	0.0011	0.0011		41
Probability of a new case of HIV attributable to gonorrhea	0.0007	0.0007		41
Adjustment for time frame for STI-attributable HIV infections	0.25	0.25		41
Adjustment for partner overlap (heterosexuals)	0.75	0.75		41
Proportion of women with pelvic inflammatory disease who:				
– experience pelvic pain	0.19	—		47
– experience ectopic pregnancy	0.09	—		47
– become infertile	0.17	—		47
HIV				
Ratio of HIV tests performed per family planning clients served	0.26	0.58	✓	22, 48–50
Proportion of tested clients who are positive: HIV (overall)	0.00243	0.00243	✓	48–50
Proportion of tested clients who are positive: HIV (sex-specific)	0.00120	0.00671	✓	48–50
Adjustment to account for women who would be tested without public funding	0.72	—		30
Adjustment to account for HIV infections previously known	0.63	0.63		51
HIV transmissions averted per 100 persons newly aware of their infection	7.80	7.80		52
Years of transmissions averted from testing	3	3		53
Pap and HPV testing				
Proportion of female clients tested	0.19	—	✓	22
Number of cervical cancer cases averted per 100,000 women tested:				
– Pap-only testing regimen	110	—		57
– Pap plus HPV testing regimen	162	—		57
Number of cervical cancer deaths averted per 100,000 women tested:				
– Pap-only testing regimen	51	—		57
– Pap plus HPV testing regimen	73	—		57
Proportion of women tested using Pap-only testing regimen	0.30	—		58

Continued next page

Table A2. Continued

Parameter	National level		State level*	Source(s)
	Females	Males		
HPV vaccines				
Ratio of HPV injections provided to female clients served	0.01	—		63, 64
Proportion of female clients aged 15–17 vaccinated receiving:				
– 3 doses	0.63	—		65
– 2 doses	0.22	—		65
– 1 dose	0.15	—		65
Proportion of female clients aged 13–14 vaccinated receiving:				
– 3 doses	0.56	—		65
– 2 doses	0.18	—		65
– 1 dose	0.25	—		65
Effectiveness of regimen for clients aged 15–17:				
– 3-dose regimen	0.97	—		66
– 2-dose regimen	0.87	—		66
– 1-dose regimen	0.78	—		66
Effectiveness of regimen for clients aged 13–14:				
– 3-dose regimen	0.97	—		66
– 2-dose regimen	0.97	—		66
– 1-dose regimen	0.78	—		66
Adjustment factor to account for exposure to HPV prior to vaccination	0.35	—		70
Cases averted per 100,000 women vaccinated:				
– abnormal cervical cell cases	50,000	—		71
– precancer cases	10,000	—		71
– cervical cancer cases	540	—		71
– cervical cancer deaths	155	—		71
Ratio of other HPV-attributable cancers averted per cervical cancer case averted:				
– vulvar cancers	0.25	—		72
– vaginal cancers	0.06	—		72
– anal/rectal cancers	0.37	—		72
– oropharyngeal cancers	0.20	—		72
Direct medical costs (in 2016 $), discounted to year of service				
Pregnancy and birth				
Average public cost per birth for:				
– prenatal care, delivery, infant care to 12 months	12,004	—	✓	74, 76
– care for child, 13–60 months	10,117	—	✓	77
Average public cost per miscarriage	1,177	—	✓	77
Sexually transmitted infections				
Average cost per case:				
– pelvic inflammatory disease	4,926	—		80
– epididymitis	—	1,458		80
– chlamydia	435	36		40
– gonorrhea	423	94		40
– HIV	364,875	364,875		81
Cancers				
Average cost per case averted by testing:				
– cervical cancer	19,948	—		83, 84, 85
Average cost per case averted by vaccines:				
– cervical dysplasia	469	—		87
– precancer	1,471	—		83
– cervical cancer	18,882	—		83, 85
– vulvar cancer	7,360	—		83, 90
– vaginal cancer	8,282	—		83, 86
– anal/rectal cancer	12,563	—		83, 91
– oropharyngeal cancer	14,557	—		83, 92

Continued next page

Table A2. Continued

Parameter	National level		State level*	Source(s)
	Females	Males		
Medical costs paid for with public funds				
Proportion of costs that are public:				
– births and miscarriages	0.95	—	✓	30
– chlamydia and gonorrhea	0.43	0.43	✓	78
– HIV	0.75	0.75		82
– precancer	0.53	—	✓	22, 78
– cervical cancer	0.34	—	✓	78, 86
– vulvar cancer	0.65	—	✓	78, 86
– vaginal cancer	0.65	—	✓	78, 86
– anal/rectal cancer	0.53	—	✓	78, 86
– oropharyngeal cancer	0.55	—	✓	78, 86

*Indicates that state-specific values are used in the analysis.

Benefits from Contraceptive Use

We estimated the numbers of pregnancies that were postponed or avoided among women who received contraceptive services from publicly supported providers in 2016, applying methodology similar to that used in previous estimates.[9,28–31]

Estimating actual and likely method mix scenarios. We used the 2011–2015 NSFG to estimate current contraceptive use among women who received care from publicly supported family planning providers, as well as women's hypothetical method mix in the absence of receiving services.[26] (Table A3)

Actual method mix of women receiving publicly supported contraceptive care. Using the 2011–2015 NSFG, we identified 1,444 respondents (representing 6.6 million women) who had received public-sector contraceptive care in the past year and who were using reversible methods at the time of the interview or who had received a tubal ligation in the prior 12 months. These included women who made a contraceptive visit either to a publicly supported clinic (64%) or to a private provider and had their visit covered by Medicaid (36%). We classified these women according to their current contraceptive method—oral contraceptives, hormonal patch or ring (42%); injectable (15%); IUD (14%); implant (4%); tubal sterilization in past year (7%); condoms (12%); fertility awareness-based methods (1%) or withdrawal/other (5%).

We then divided these women into 72 population groups based on their demographic characteristics: age (15–19, 20–24, 25–29, 30 and older), marital status (currently married, currently cohabiting, unmarried), income level (less than 100% of the federal poverty level, 100–199%, 200% or more) and race (black, nonblack). For each population group, we examined the distribution of women according to their current contraceptive method.

Hypothetical method mix in the absence of publicly supported care. We used information on similar women in the 2011–2015 NSFG[26] to approximate women's likely contraceptive behavior in the absence of publicly funded services. In this scenario, we selected women who were similar to those women who made a publicly supported contraceptive visit in the past year, but who were not currently using subsidized services. Specifically, this hypothetical scenario was based on an examination of the contraceptive use behavior of 7.5 million similar

women (1,540 respondents who were at risk for unintended pregnancy and either younger than 20 or aged 20–44 and below 250% of the federal poverty level) who made no family planning visit in the prior 12 months or who visited a private provider and paid for that visit themselves (excluding all women whose visits were paid for by public or private health insurance). For these women, we looked at the method mix according to each of the 72 age by marital status by race by poverty groups and applied their method mix to the corresponding number of women currently using publicly supported family planning services. The resulting hypothetical method mix is as follows: oral contraceptives, hormonal patch or ring (8%); injectable (1%); IUD (13%); implant (3%); tubal sterilization in the past year (1%); condoms (29%); spermicides (1%); natural family planning (4%); withdrawal (13%) and no method (28%).

Table A3. Distributions of women by contraceptive method use among women who received contraceptive care from a publicly funded provider in the prior year compared with similar women (eligible for and likely in need of publicly supported care) who did not receive any publicly supported care in the past year; method failure rates and expected pregnancies for each scenario

		Current analysis with 2011–2015 NSFG method mix data				Prior analysis using 2006–2010 NSFG	
Method	Failure rate	No. of women (000s)	Current method use among women using public services	Hypothetical method use among women likely to use public services	No method use	Current method use among women using public services	Hypothetical method use among women likely to use public services
Pill, patch and ring	7.2	2,747	42%	8%	0%	51%	8%
Injectable	4.0	996	15%	1%	0%	13%	2%
IUD	1.4	894	14%	13%	0%	10%	4%
Implant	1.4	272	4%	3%	0%	2%	1%
Tubal ligation in past year	0.5	484	7%	1%	0%	8%	0%
Condom	12.6	796	12%	29%	0%	13%	37%
Diaphragm/cervical cap	15.9		0%	0%	0%	0%	0%
Spermicide/sponge	28.0	9	0%	1%	0%	0%	1%
Natural family planning/ periodic abstinence	24.0	58	1%	4%	0%	0%	3%
Withdrawal/other	19.9	320	5%	13%	0%	4%	13%
No method	89.0	–	0%	28%	100%	0%	31%
Total	–	6,577	100%	100%	100%	100%	100%
Expected pregnancies per 1,000 users		–	43	293	887	62	350
Number of pregnancies averted per 1,000 users		–	–	249	844		288

Note: NSFG=National Survey of Family Growth.

Calculating Pregnancies Postponed or Avoided per 1,000 Method Users

For both the current use scenario and the hypothetical use scenario, we estimated the expected number of pregnancies by multiplying the proportion of women using each method (within each demographic group) by the first-year method-specific typical failure rate (i.e., the probability that a woman using a particular method will become pregnant during the first 12 months of use). The

number of pregnancies calculated for each group were then summed across all groups and methods, and adjusted for consistency with the actual number of pregnancies that occurred among women using contraceptive methods (see below), resulting in a total number of expected pregnancies for each method-mix situation.

Contraceptive failure rates. Typical first-year method-use failure rates were obtained from multiple sources;[9,32,33] whenever possible, group-specific failure rates were used (Table A3). For oral contraceptives, condoms and withdrawal, we used group-specific rates for income level (less than 100% of the federal poverty level, 100-200%, more than 200%). For the injectable, implant, spermicides, IUD and female sterilization, we applied the overall failure rate for all women to all groups. We estimated that the probability of pregnancy for a woman not using any method would vary from 80% to 95%, depending on the woman's age.[34]

Failure rate adjustment. Application of first-year failure rates to the distribution of women using specific methods at a particular point in time will not accurately predict the actual number of pregnancies that occur over a one-year period for a number of reasons. Some women may not have used the method for the entire 12 months; others may have used the method for much longer, resulting in lower failure rates. As was done in prior analyses,[9,28,29,31] we calculated an adjustment factor by comparing the actual number of pregnancies that occurred among contraceptive users in the United States in 2013 (the most recent year for which these data are available) with the hypothetical number that would be obtained by applying the first-year failure rates to all method users. To estimate how many of the total pregnancies in 2013[35] were among contraceptive users, we analyzed women's reports of contraceptive use prior to births and miscarriages in the 2011–2015 NSFG and women's reports of contraceptive use prior to pregnancies ending in abortion in Guttmacher's 2014 abortion patient survey.[36]

We estimated that 44% of all pregnancies that women would have liked to postpone or avoid—1.18 million in 2011—occurred among women using a contraceptive method. However, if we apply the one-year method- and group-specific failure rates described above to the total population of 27.3 million current method users (according to group and method used), we would expect 2.30 million pregnancies. The difference between these two estimates is likely due to a number of factors, including women not using the method or being at risk over the entire year, as well as expected variation between first-year failure rates and the failure rate for women who have used the method for several years. To compensate, an overall adjustment factor was calculated as the ratio of actual to expected pregnancies (0.52). To improve the accuracy of our estimates, separate adjustment factors were calculated for women above (0.477) and below 200% of the federal poverty level (0.547) by separating both actual and expected pregnancies into two groups according to women's income level, and applying these adjustment factors to the pregnancies expected among each method- and group-specific population. Because we assumed that current users who stop using any method will remain sexually active and fecund, no adjustment was made to the calculation of pregnancies expected among women using no method.

Pregnancies postponed or avoided per 1,000 method users. Based on all of the above methods, we estimated the total number of pregnancies that would be expected among the sample of 6.6 million women reporting use of publicly supported contraceptive care in the 2011–2015 NSFG under actual method use and the hypothetical use scenario. We then divided those pregnancy totals by the number of women (and multiplied by 1,000) to get the number of pregnancies expected per 1,000 contraceptive patients under each scenario: 43 pregnancies per 1,000 women expected given the contraceptive method mix of current users

versus 293 pregnancies expected per 1,000 women given the hypothetical method mix for these same women in the absence of publicly supported services. Subtracting the former from the latter results in the number of pregnancies that are prevented per 1,000 users of publicly funded family planning care—249.

Note that the hypothetical scenario assumes that most women will make some attempt to prevent pregnancy in the absence of publicly funded services. For comparison, the number of pregnancies that would have been prevented if all current users switched to no method in the absence of public-sector care is estimated to be 844 pregnancies postponed or avoided per 1,000 method users. As in the past, we have included this extreme scenario simply for comparison.

In addition, Table A3 includes detail on the current and hypothetical method mix scenarios used in our analysis of 2010 data, which relied on the 2006–2010 NSFG. Comparing the current method use columns between the two periods, we find increased use of injectable and long-acting methods in the more recent period, resulting in a drop in the expected number of pregnancies from 62 to 43 pregnancies per 1,000 women using public services. However, the method mix for women in the hypothetical scenario (those who are likely to, but not currently using, publicly funded contraceptive services) also shifted over time, with more women calculated to use long-acting methods, resulting in a drop in the expected number of pregnancies from 350 to 293 pregnancies per 1,000 women. After subtracting the expected pregnancies among women using public services from those expected among the hypothetical group, the resulting number of expected pregnancies prevented per 1,000 women using public services dropped from 288 to 249; meaning that slightly fewer pregnancies are prevented among women using services, even though they are using more effective methods and having fewer pregnancies. This is likely a result of the lingering impact of publicly supported services among women who did not access services in the prior year, but are likely to do so in the future. Some of these women may have received a publicly supported long-acting method in the past, but this information is not available in the NSFG. As in other aspects of our methodology, we have taken the conservative approach and maintained the same criteria for selecting women in the hypothetical scenario as was used in prior rounds of this analysis.

Pregnancies Prevented Among Publicly Supported Patients in 2016

To estimate the overall impact of publicly supported family planning services in 2016, we applied the ratio of pregnancies prevented per 1,000 method users (249) to the number of patients served by publicly funded clinics in 2016 and to the number of Medicaid recipients receiving contraceptive services from private providers. However, one additional adjustment was made to the numbers of patients served by each source to account for the fact that not all patients actually obtain and use a reversible contraceptive method. In 2016, some 14% of patients at Title X clinics were classified as not using a contraceptive method, either because they were currently pregnant, trying to get pregnant or for some other reason.[22]. Some may have received contraceptive counseling, but did not adopt a method; others may have made a visit, but did not adopt a method because they were not actually at risk of unintended pregnancy. We therefore estimated method users to be 86% of the reported national and state totals of family planning patients for women served at all type of providers (Title X or non–Title X clinics and private providers serving Medicaid recipients). Information on women served by private providers paid for by Medicaid is available at the national level only; no state estimates are possible.

Finally, we multiplied the number of publicly supported contraceptive method users, nationally (for both clinic and private provider patients) and in each state (for clinic patients), by the ratio of pregnancies postponed or avoided per user to estimate the total number of pregnancies prevented in 2016. We classified these prevented pregnancies according to the outcomes that would have resulted (birth, abortion or miscarriage) using group-specific estimates of the distribution of unintended pregnancies according to outcome (for all women, for adolescents and for poor women). Overall, in 2013, 47% of pregnancies reported by women as mistimed or unwanted resulted in a birth, 34% in an abortion and 19% in a miscarriage. For adolescents, the distribution of such pregnancies by outcome was 52% births and 29% abortions; among women below the federal poverty level, it was 52% births and 32% abortions.[35]

Medical Benefits from Testing for Sexually Transmitted Infections

Chlamydia and gonorrhea testing. We estimated the direct medical benefits from testing for chlamydia and gonorrhea during family planning visits by first estimating the proportion of all family planning patients who would be tested for each STI during family planning visits at publicly funded providers, and among those, the proportion who would receive a positive test result. To estimate the proportion of all female patients who would test positive for each STI, we began with the reported number of female patients tested for chlamydia at a Title X–funded health center in 2016, by age (younger than 25, 25 or older) and state, and the total number of gonorrhea tests performed on female patients that year by state.[22] We estimated the number of female patients tested for gonorrhea in each state as 90% of the number of tests conducted. We based this estimate on the national ratio of female patients receiving chlamydia tests to total gonorrhea tests performed on female patients. We multiplied the number of women who received each test by age- and state-specific chlamydia positivity rates reported for women attending family planning clinics through the Infertility Prevention Project at the Centers for Disease Control and Prevention (CDC)[37] and state-specific gonorrhea positivity rates estimated by discounting the state-level chlamydia positivity rate by the ratio of the overall gonorrhea rate to the overall chlamydia rate for women. We used 2011 state-level data on chlamydia positivity among female patients in family planning clinics because that was the last year the CDC collected such data under the Infertility Prevention Project. After 2011, the CDC began collecting similar data from a more limited number of family planning sites under the STD Surveillance Network (SSuN) and only reports national positivity data. We compared the national positivity rates for women by age published from SSuN for 2016[38] and they were essentially the same as the 2011 national positivity rates by age.

We then applied these percentages to data on the number of female contraceptive patients who would be expected to forgo care in the absence of publicly supported services (equal to 72% of those served at Title X and non–Title X–funded clinics and to female Medicaid recipients who received contraceptive services from private providers in 2016).
For men, we followed similar steps, beginning with the reported state-level numbers of male patients tested for chlamydia during a family planning visit at a Title X–funded health center in 2016 and the numbers of gonorrhea tests performed on male patients. We multiplied the number of men receiving each test by state-specific positivity rates for chlamydia and gonorrhea reported for men aged 16–24 entering the national job training program[38] to estimate the number of male Title X patients with a positive chlamydia or gonorrhea result. We estimated the numbers of male patients tested in non–Title X clinics by assuming that the same ratio of males tested to female patients found at Title X clinics would apply in non–Title X clinics, and that the

same proportion of positive test results would apply in both types of clinics. We did not estimate any male patients served or tested for STIs by private providers, because we had no data on the numbers of male Medicaid recipients making family planning visits to private providers.

We assumed that 96% of both female and male patients testing positive for chlamydia or gonorrhea would receive treatment.[39] We used published formulas developed by Chesson, Owusu-Edusei and others to estimate the likelihood that STI testing and treatment will prevent certain negative health outcomes.[40–43] Based on these formulas, we assumed that the likelihood of developing pelvic inflammatory disease (PID) among treated women would be reduced from 15% to 0% among symptomatic positive cases and from 15% to 7.5% among asymptomatic positive cases. We assumed that the likelihood of developing epididymitis in men would be reduced from 2% to 0% in all cases. Evidence indicates that treatment is less effective among women with asymptomatic chlamydia or gonorrhea, as their infections may have already progressed to PID prior to treatment.[44] We assumed that 20% of women testing positive for chlamydia or gonorrhea would be symptomatic.[45,46] Per Chesson and colleagues, we adjusted our estimates of the impact of chlamydia treatment to account for possible coinfection with gonorrhea (multiplying by 0.925 for both men and women); estimates of the impact of gonorrhea treatment were adjusted to account for possible coinfection with chlamydia (multiplying by 0.79 for women and 0.90 for men) and for possible reinfection within one year (multiplying by 0.70). Finally, we assumed that among women with PID, 19% would experience pelvic pain, 17% would become infertile, and 9% would experience an ectopic pregnancy.[47]

We also estimated the number of HIV infections prevented by treating individuals infected with chlamydia or gonorrhea prior to contracting an STI-attributable HIV infection. We used published formulas that assume the average number of new HIV cases attributable to a new case of chlamydia or gonorrhea are 0.0011 and 0.0007, respectively; assumed treatment of these infections reduces the time frame in which an STI-attributable HIV transmission is possible by one-fourth (multiplying by 0.25); and adjusted for overlap in sex partners among patients being treated (multiplying by 0.75).[41]

HIV testing. We used 2016 state-level data from Title X–supported family planning clinics[22] on the numbers of HIV tests performed on female and male contraceptive patients and numbers of positive HIV tests among all those tested. Then, we adjusted these state-level rates by sex, using data on HIV testing in health care settings from the CDC: The positivity rate for males in 2015–2017 was 5.6 times that for females.[48–50]

Next, we applied the HIV testing rates and positivity rates to the 2016 state-level estimates of female patients served at publicly funded clinics and to national estimates of female Medicaid recipients who received contraceptive services from private providers. We also applied them to state-level estimates of men served at publicly funded clinics, by assuming that the same ratio of male to female patients found at Title X clinics would apply in non–Title X clinics; we did not estimate any HIV tests performed by private providers for male Medicaid recipients. We adjusted the estimates to apply only to women and men expected to forgo contraceptive and related STI services in the absence of public funding (72% of current female patients in each provider setting and 100% of male patients). We further adjusted the number of positive test results by multiplying the totals for each state by 0.63 to account for individuals who would have already known that they were HIV-positive or who did not return for their test results.[51]

To estimate the impact of the positive test results, we applied a rate of 7.8 transmissions averted per year per 100 persons newly aware of their serostatus, based on an estimate from Hall and colleagues that accounts for reduction in risky behavior and reduced infectivity from

entry into treatment.[52] However, we further assumed that the preventive effects of learning about one's serostatus would last for an average of three years, at which time patients would receive an HIV test from another source.[53] We applied that assumption to our own estimates and multiplied the annual number of HIV infections averted by three.

Cervical Cancer Testing and Prevention

Pap and HPV testing. Pap tests have long been used to identify abnormal cervical cells, which allows for early and effective treatment of precancer. In 2012, the U.S. Preventive Services Task Force,[54] the American Cancer Society,[55] and the American College of Obstetricians and Gynecologists[56] harmonized their guidelines into one common set of guidelines that emphasized less frequent screening compared with previous recommendations. These guidelines recommend that routine Pap testing only occur as frequently as every three years, and recommend a switch to "co-testing" with an additional HPV test every five years starting at age 30.[57] We determined the direct medical benefits and cost savings that accrue from testing for cervical cancer among publicly supported contraceptive patients using this testing protocol; this assumes that early identification and treatment of HPV-attributable abnormal cells and precancer takes the place of more costly treatment that would be needed to address more serious disease and death.

To calculate the number of cervical cancer cases that were prevented, we determined the number of publicly supported contraceptive patients who received a Pap test by using as a proxy the proportion of unduplicated patients who received a Pap test at a Title X–supported clinic in 2016.[22] Nineteen percent of all publicly supported patients received a Pap test. We calculated the ratio of unduplicated patients receiving Pap tests to all patients by state, and then applied those ratios to the state-specific number of patients served at Title X and non–Title X clinics. We then discounted the number of patients tested at both Title X and non–Title X clinics by applying the ratio of those who would have been expected to forgo services in the absence of publicly supported care (72% of patients, see page 12). We also applied the national ratio of patients screened for HPV to the discounted number of female Medicaid patients served by private providers.[27]

Next, we obtained the number of cervical cancer cases and related deaths that would occur with and without testing and under two different testing scenarios from Kim and colleagues.[57] These scenarios—Pap tests alone every three years from ages 21 to 65 for a maximum of 15 tests and Pap tests alone every three years from ages 21 to 29 with a switch to Pap tests plus HPV co-testing every five years from ages 30 to 65 for a maximum of 11 tests—were chosen because they are in line with the harmonized cervical cancer screening guidelines from the major guideline-making organizations described above.[54–56] By comparing the testing and no-testing scenarios, we determined the number of cases prevented under both scenarios.

We then produced ratios of cancer cases prevented (110 cases per 100,000 women for Pap testing only and 162 for Pap and HPV co-testing) and deaths prevented (51 per 100,000 women for Pap testing only and 73 for Pap and HPV co-testing) for one year of testing. The next step was to apply these ratios to the proportions of all publicly supported patients who would have been subject to the Pap-only testing regimen and the Pap and HPV co-testing regimen (30% and 70%, respectively, based on information from Guttmacher's 2015 survey of publicly supported clinics providing contraceptive services[58]) to get the number of cases and deaths prevented among patients.

HPV vaccination. The HPV vaccine has become an integral part of reproductive health care in the United States because of the vaccine's ability to prevent both cervical dysplasia and various cancers, such as cervical, anal/rectal, oropharyngeal, vaginal and vulvar.[59,60] Since late 2016, the only vaccine that has been available for administration is the nonavalent HPV vaccine (GARDASIL 9), which protects against nine strains of HPV: HPV 6, 11, 16, 18, 31, 33, 45, 52 and 58.[61,62] The CDC's Advisory Committee on Immunization Practices (ACIP) recommended that the vaccine be administered to females aged 13–26 and males aged 13–21.[61]

In this analysis, we estimated the medical events prevented and related cost savings by administering the vaccine to publicly funded patients. First, we calculated the ratio of HPV vaccinations administered to contraceptive patients using data published in Planned Parenthood Federation of America's annual report.[63,64] This ratio (0.010) is used as a proxy for the ratio of vaccinations provided to patients at all publicly supported family planning facilities who would have been expected to forgo services in the absence of publicly supported care (72% of patients, see page 12).

The current definition of a complete vaccination sequence is two or three injections, based on the age of the individual receiving the vaccine. As of December 2016, ACIP has recommended that individuals who receive their first HPV vaccination before their 15th birthday only require two doses of the vaccine; the three-dose schedule is recommended for all other individuals.[62] Using the 2016 National Immunization Survey, we determined the proportion of female adolescents that received each number of doses for the 13–14 and 15–17 age-groups. At public facilities, 56% of 13–14-year-olds received at least three doses, 18% received two and 25% received one.[65] For 15–17-year-olds, 63% received at least three doses, 22% received two and 15% received one. Next, we applied this distribution of vaccine doses to the total number of vaccines provided at publicly supported family planning clinics to calculate the total number of women visiting these clinics who are protected by the vaccine.

All HPV vaccines distributed in the United States are designed to prevent nine types of HPV, including types 16 and 18, which cause 70% of cervical cancers.[62] Because the nonavalent vaccine has 97% efficacy[66] in preventing cervical precancers in women not previously exposed to HPV, we applied that efficacy rate to those aged 15 or older who received three doses and adolescents younger than 15 who received at least two doses, as this is considered to be full coverage at this age. We then discounted the efficacy by a conservative 10% to account for a missed dose in the schedule, resulting in an estimated 87% efficacy for two doses, considered to be incomplete coverage, for those aged 15–17 and older. One dose of the vaccine at any age was estimated to be 78% effective. Importantly, studies have supported the relatively high efficacy of less than a full-dose schedule of the vaccine.[67–69]

In order to ensure that the efficacy rates reflect current practice, as some adolescents will be vaccinated after they are sexually active, we used an age-specific vaccine efficacy adjustment factor calculated by Chesson et al.[70] multiplied by the percentage of vaccines administered to each age from 13 to 26; for girls younger than 13 who were vaccinated, we assumed full coverage.

To obtain lifetime estimates of abnormal Pap smears, precancerous lesions and cervical cancer cases that would have been prevented with administration of the full-dose schedule of the HPV vaccine, we subtracted the number of cases that would have occurred in vaccinated women from the number of cases that would have occurred in non-vaccinated women from published estimates. The final counts were 50,000 abnormal Pap tests, 10,000 precancerous lesions and 500 cases of cervical cancer prevented per 100,000 women vaccinated.[71] We also calculated

the number of women who would have died from cervical cancer within five year of diagnosis using the rate of 200 deaths per 100,000 women vaccinated. These rates were applied to the number of women vaccinated.

Then, to predict the number of non-cervical HPV-attributable cancer cases prevented, we used published data to calculate ratios of the annual incidence of vulvar, vaginal, anal/rectal and oropharyngeal cancer cases to annual incidence of cervical cancer cases.[72] The ratios calculated were 2,707 vulvar, 635 vaginal, 4,008 anal/rectal, and 2,160 oropharyngeal cancer cases per 10,751 cervical cancer cases. Then, these ratios were multiplied by the number of cervical cancer cases prevented among women receiving services at publicly funded clinics.

Cost Savings from Publicly Supported Contraceptive and Related Services

We calculated public-sector savings by comparing the public-sector costs of providing contraceptive and related services with the public-sector medical costs for all of the events that would have occurred had publicly supported care been unavailable.

Family planning program costs. To estimate the average annual cost per family planning client served at Title X clinics, we used 2016 Title X program data on patients served and program revenues (including revenues from all sources, as well as revenues from only public sources). At the national level: $1.3 billion in total revenues ÷ 3.5 million female patients = $369/patient in total costs; and $1.1 billion in public revenues ÷ 3.5 million patients = $316/patient in public costs. Average family planning program costs were also estimated for each state (Table A4). For both Title X–funded clinics and non–Title X–funded clinics, we assumed that the same per-client public cost would be applicable for all family planning patients.

For each state, we multiplied the average per-patient public cost by the total number of women estimated to have received family planning care from publicly funding clinics in 2016 to estimate the total cost of clinic-based public-sector family planning services. However, to estimate the cost of Medicaid revenues paid for patients served at private providers, we used the full average cost per client ($369) and multiplied that by the number of Medicaid family planning patients served by private providers. This was done because private providers rarely have other revenues that support care for Medicaid patients and because Medicaid law prohibits patient cost-sharing for contraceptive care.

The overall estimate of the public cost for the national family planning program in 2016 using this methodology, including both the costs for services for patients served by clinics ($1.9 billion) and by private providers ($1.2 billion), is $3.1 billion.

Public cost savings from averted births and miscarriages. To calculate savings from the averted births and miscarriages, we first estimated the percentage of those outcomes that would have occurred among women eligible for Medicaid (and among women eligible for related programs, including the Children's Health Insurance Program). Based on methodology developed by Sonfield et al.,[73] we compared state-level contraceptive patient income data with Medicaid maternity care eligibility levels (which vary by state) and made necessary adjustments because a pregnant woman is counted as two people when determining Medicaid eligibility. National and state estimates of the percentage of Title X patients who would be eligible for Medicaid maternity care if they became pregnant were

calculated using 2016 Family Planning Annual Report[22] data on the distribution of patients by income level (excluding women with unknown income). We assumed that these estimates applied to all women receiving contraceptive services from publicly funded clinics. Nationally, 95% of births and miscarriages prevented among family planning clinic patients were estimated to be eligible for coverage under Medicaid (Table A4). For births and miscarriages prevented among Medicaid patients of private providers, we assumed that all such patients would be eligible for Medicaid-funded maternity care.

Second, we tabulated the public-sector cost of each Medicaid-eligible birth. This cost included Medicaid expenditures for prenatal care, delivery, postpartum care and five years of medical care for the child. We used a number of sources to make state-level estimates of the cost of a Medicaid-funded birth. The national cost of a Medicaid-funded birth (including prenatal care, delivery and postpartum care) was estimated to be $6,673 in 2010,[74] based on a rigorous, national study of such costs. We adjusted this estimate for inflation to 2016 dollars using the consumer price index for medical care ($7,966).[75] Then we made estimates of state-level variation in the cost of a Medicaid-funded birth based on a 2016 Medicaid fee index for obstetric care.[76]

To estimate the public cost of medical care for infants (aged 0 to 12 months) and for children aged 13 to 60 months, we analyzed 2010 state-level data from the Medicaid Statistical Information System,[77] and adjusted the results for inflation to 2016 using the consumer price index for medical care. We found that the annual amount paid by Medicaid per eligible child in 2016 was about $4,038 for infant care and $2,338 for children aged 13 to 60 months, nationally. We then applied three adjustments to the state-level public cost per child and summed the results. First, we reduced the number of eligible children each year to account for changes in family income; this was based on an analysis of the ACS that estimated the proportionate drop in Medicaid coverage among children by single years of age.[78] Using the proportion of infants covered by Medicaid as the base, 97% were covered at age 1, 96% at age 2, 94% at age 3 and 94% at age 4. Second, we discounted costs 3% annually. Third, we made an adjustment to account for multiple births by drawing on U.S. vital statistics data: Some 3.95 million children were born in 2016 via 3.88 million deliveries, for a ratio of 1.0177 children per birth.[79] With these adjustments, our final estimate for the average national cost per birth—including prenatal care, delivery and postpartum care, and the medical costs for infant and child care through age five—was $22,122 (Table A4). Note that this methodology for estimating birth costs varies slightly from our analysis of 2010 data. In that prior study, we had data on birth costs in a large number of states from our own surveys and from studies done by others to evaluate Medicaid family planning waivers. Similar updated data were not available, and those earlier surveys were too outdated to continue to use. This shift in methodology resulted in new cost estimates that are not exactly comparable to our prior cost estimates; the total inflation-adjusted cost for 2016 was just 7% higher than for 2010 ($22,122, compared with $20,720 for 2010).

Table A4. National and state data on the per-client public costs for family planning care, percentage of contraceptive clients who would be eligible for Medicaid maternity care and the average cost of a birth covered by Medicaid,* 2016

State	Annual public family planning program cost per patient	% of patients eligible for Medicaid-covered maternity care	Average cost of a Medicaid-covered birth*
Total	**$316**	**95%**	**$22,122**
Alabama	514	88%	20,113
Alaska	439	89%	45,083
Arizona	262	86%	31,821
Arkansas	215	99%	27,636
California	354	100%	15,366
Colorado	374	100%	17,170
Connecticut	235	100%	25,935
Delaware	296	98%	29,668
District of Columbia	366	100%	29,661
Florida	356	76%	23,378
Georgia	112	98%	19,945
Hawaii	297	94%	20,423
Idaho	401	77%	15,761
Illinois	357	94%	20,220
Indiana	347	97%	19,130
Iowa	219	100%	20,568
Kansas	124	87%	20,606
Kentucky	278	94%	25,077
Louisiana	556	98%	20,975
Maine	261	89%	17,274
Maryland	168	100%	25,237
Massachusetts	321	94%	29,303
Michigan	320	91%	24,190
Minnesota	401	100%	25,540
Mississippi	246	97%	21,764
Missouri	207	90%	22,470
Montana	230	78%	24,108
Nebraska	243	91%	24,276
Nevada	363	86%	20,373
New Hampshire	193	88%	16,602
New Jersey	261	96%	16,001
New Mexico	430	100%	28,938
New York	467	95%	24,336
North Carolina	487	92%	19,462
North Dakota	299	59%	24,346
Ohio	213	88%	20,819
Oklahoma	269	96%	21,193
Oregon	430	94%	24,740
Pennsylvania	201	95%	31,830
Rhode Island	90	100%	24,216
South Carolina	220	98%	25,840
South Dakota	329	76%	23,604
Tennessee	158	100%	25,254
Texas	234	98%	23,928
Utah	106	83%	19,974
Vermont	277	90%	22,560
Virginia	437	97%	22,859
Washington	344	90%	21,438
West Virginia	45	90%	22,261
Wisconsin	382	100%	17,455
Wyoming	310	78%	26,651

*Cost of a Medicaid-funded birth includes prenatal care, delivery, postpartum care, and infant and child medical care for five years.

The final step to estimate overall cost savings from averted births is to multiply the state-level costs per birth by the number of averted births that would have had a public cost. In this step, we applied a discount to the total number of births averted to account for the fact that some averted births would not generate public cost savings. We based this adjustment on the work of Frost et al. in 2014.[30] They analyzed all births that occurred to women who would have rather postponed or avoided the birth, according to whether the birth was reported to be unwanted or mistimed. Among mistimed births, they analyzed whether or not the birth would have been "extra," that is, would have contributed to the woman having a higher parity than she would have had without the mistimed birth. In addition, they looked at whether or not the woman would likely have still been eligible for publicly funded medical care for the birth if she had waited until later to have the birth. Their analysis concluded that 27% of all averted births would have been mistimed births that would not have resulted in women having a higher overall parity, and they were to women whose likelihood of needing public support for the birth would have been the same even if the birth had occurred later. These births would not have resulted in any public medical costs. We therefore discounted all births averted by 73% prior to estimating the cost savings. We then multiplied the discounted number of births averted that would have been to women eligible for Medicaid coverage by the state-level cost of medical care—including prenatal care, delivery, postpartum care and care for the child through 60 months—and summed the result across states to arrive at our estimates of the total medical cost savings from unplanned births that were averted.

To estimate the public cost of medical care for prevented miscarriages, we used information from an analysis conducted in 2014.[30] In that analysis, it was found that Medicaid costs associated with miscarriage and ectopic pregnancies were equal to 9.8% of the per-birth Medicaid costs for prenatal care, delivery and infant care through 12 months. Thus, we took the state-level adjusted 2016 estimated cost per Medicaid birth (including prenatal care, delivery, postpartum care and care for the child through 12 months) and multiplied that by 9.8% to estimate state-level Medicaid costs per averted miscarriage. Then we multiplied those per-miscarriage estimated Medicaid costs by the numbers of miscarriages averted in each state due to contraceptive use by women served at publicly supported clinics and summed the state-level cost savings to obtain national estimates. We made similar national estimates of the cost savings from miscarriages averted through contraceptive use among Medicaid recipients served by private providers. We did not measure the public costs for prevented abortions in this report. Because few abortions are covered by Medicaid and their costs are relatively low compared with the costs of a birth, the savings from prevented abortions are negligible relative to the savings from prevented births (in our prior analysis, savings from averted abortions represented .2% of gross public cost savings[30]).

Public cost savings from averted STIs and HIV. We used updated estimates of the lifetime direct medical costs per case of untreated PID (2014 published estimate of $4,516 was updated to $4,926 for 2016, using the consumer price index for medical care) and epididymitis ($1,337 in 2014 updated to $1,458 in 2016)[80] and multiplied these by the numbers of cases of PID and epididymitis averted among patients due to testing for chlamydia and gonorrhea.

In addition, we also estimated the indirect benefits from reduced transmission of chlamydia and gonorrhea, using published formulas that assume each infection treated (among both women and men) will result in 0.5 fewer cases in the population.[41] For this component, we relied on published estimates of the average cost per STI case for women and for men in 2010[30,40] and used the medical care consumer price index to adjust estimates forward to 2016. In 2016, the average cost per case for chlamydia was estimated to be $235; for gonorrhea, it was $259.

These cost estimates were then applied to the estimated number of prevented infections.

We estimated the percentage of averted costs that would have been paid for by public sources (primarily Medicaid) for both chlamydia and gonorrhea cases by estimating the percentage of women receiving publicly funded family planning services who have public health coverage. Data from the 2016 ACS were used to estimate the percentage of women aged 15–44 enrolled in Medicaid or other public programs according to two poverty-level groups: less than 100% and 100–249% of the federal poverty level. We distributed the averted costs according to the proportion of Title X patients in each poverty-level group. Nationally, public costs averted were an estimated 43% of the total averted costs for chlamydia and gonorrhea sequelae.

Finally, we estimated the public-sector cost savings from HIV infections averted, either among patients who were treated for chlamydia or gonorrhea prior to contracting an STI-attributable case of HIV or among the partners of patients who received a positive HIV test. To do so, we started with an estimate of the total lifetime medical costs associated with HIV. Schackman and colleagues reported a base lifetime cost of $326,500 in 2012 dollars,[81] which we adjusted to $364,875 in 2016 dollars. We applied that figure to the state-level numbers of HIV cases averted to arrive at the total societal costs. Finally, we estimated that 75% of HIV treatment costs nationally would be paid for with public dollars.[82]

Public cost savings from averted cancers, precancer and abnormal cell cases. To calculate the cost savings from Pap and HPV testing, we multiplied the number of cancer cases prevented by the cost to treat one case of cervical cancer in 2016 ($44,501).[83] Costs were discounted 3% per year to account for the average number of years (27) between testing[84] and cervical cancer diagnosis,[85] yielding a final cost per case of $19,948 in 2016. Finally, we determined the proportion of cervical cancer case costs that would have been public costs for each state by multiplying the proportion of U.S. women with public insurance coverage (Medicaid, Medicare or other public program) by age-group for each state by the national incidence of cervical cancer by age-group.[78,86] We then summed the results to yield state-level and national totals of public costs prevented. Nationally, public costs were an estimated 34% of total cervical cancer costs. For each state, we applied the proportion of costs that would be paid from public sources to total costs prevented to yield the total public-sector cost savings.

We also estimated the cost savings from HPV vaccinations, which include the costs for treating abnormal Pap tests, precancerous lesions and cancers. We utilized the per-case cost of treating dysplasia identified by abnormal Pap tests from Brisson et al.[87] and precancerous lesions from Chesson et al. 2016,[83] both inflated to 2016 dollars and discounted 3% annually based on the average number of years between vaccination and diagnosis of each condition (12 years for dysplasia and seven years for precancer). We obtained the median age at vaccination from data from a large national network of family planning clinics; the median age of diagnoSsis for dysplasia was determined from a Cuzick et al. 2014 study of the New Mexico HPV Pap Registry; [88] and for precancerous lesions, we used an estimate from Bekos et. al.[89] The final discounted costs for treatment were $469 per abnormal Pap and $1,471 per precancerous lesion.

To calculate the cost to treat cervical cancer, we utilized the same 2016 cost we used in the Pap and HPV testing section above ($44,501) and discounted it 3% annually based on the average number of years between vaccination and diagnosis (29).[83,85] The median age at diagnosis came from the National Cancer Institute's Surveillance, Epidemiology and End Results Program. The discounted cost per case for cervical cancer was $18,882. Using the same methodology just described, we also calculated the discounted cost per case for other HPV-

attributable cancers. The resulting cancer treatment costs were $7,360 for vulvar cancer (discounted by 44 years),[90] $8,282 for vaginal (discounted by 45 years),[86] $12,563 for anal/rectal (discounted by 40 years),[91] and $14,557 for oropharyngeal (discounted by 41 years).[92]

Finally, we determined the proportion of costs that would have been public costs. For precancer, we did this by multiplying the proportion of U.S. women below 250% of the federal poverty level covered by public insurance for each state by the national incidence of precancer by age-group.[78,86] For the cancers, we used the proportion of U.S. women covered by public insurance for each state[78] and the national incidence of each cancer separately, stratified by age-group.[86] Estimates of the proportion of costs that would have been public costs were calculated at the state level and then summed to produce national estimates. Nationally, an estimated 53.2% of precancer costs were public costs, and 33.6% of cervical, 65.3% of vulvar, 64.6% of vaginal, 52.6% of anal/rectal and 55.3% of oropharyngeal cancer costs were public costs.

Net Savings

We then summed the gross public cost savings derived from prevention of all of the above outcomes to obtain total gross savings. Finally, net savings were estimated by subtracting the family planning program costs from the total gross savings. The average public savings per public dollar spent was calculated by dividing the total gross savings by the total family planning program costs.

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