

Planning Ahead:
Evaluating trends in modern contraceptive prevalence
and contraception's effect on fertility rates
between 1990 and 2010

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Abstract

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Background: As contraceptive prevalence is a key indicator of a country's population health and socioeconomic development, we seek to describe national, regional, and global trends in method-specific contraceptive prevalence, and to quantify the effect of changes in contraceptive use on trends in fertility.

Methods and Findings: Using 30,181 estimates of country, age, and method-specific prevalence from individual-level surveys and tabulated reports, we applied an ensemble modeling approach to estimate contraceptive prevalence in 187 countries between 1990 and 2010 for 7 age groups of women and 14 methods of contraception. We used attributable risk calculations to quantify the impact of changes in contraceptive use on changes in fertility rates. We found that a slow yet steady increase in global modern contraceptive prevalence, from 40.9% (40.2% - 41.5%) in 1990 to 47.9% (47.2% - 48.4%) in 2010, masked substantial differences in trends and levels between

countries and ages groups. For example, remarkable increases in contraceptive prevalence occurred in many Latin American and South Asian countries, while the prevalence of modern methods—including condoms—remained low in most of Sub-Saharan Africa. Moreover, modern contraceptive prevalence in adolescent girls (15-19) remained low, despite the health and economic risks posed by pregnancy. Finally, we found that a 0.52 decline in the total fertility rate (TFR) between 1990 and 2010 was attributable to increases in contraceptive prevalence.

Conclusions: While increased modern contraceptive prevalence has substantially reduced birth rates in certain countries and age groups, there remains considerable room for progress among women in Sub-Saharan Africa and adolescent girls worldwide. Policymakers in settings with low levels of prevalence should evaluate how successful programs from other countries can be appropriately applied in their own communities. Finally, funders, researchers, and policymakers should carefully assess why uptake of contraception has been low among certain groups so that they can devise effective strategies for increasing contraceptive prevalence in all women of reproductive age.

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Introduction

Contraceptive prevalence, or the fraction of women aged 15-49 using a method of contraception to delay or avoid becoming pregnant, is a key measure of a country's population health and level of social and economic development. Contraceptive prevalence has been designated as an indicator of progress on Millennium Development Goal 5 (MDG5.B), or "universal access to reproductive health". [1] Tracking progress towards MDG5.B is critical, as highlighted at the recent London Summit on Family Planning, co-hosted by the Bill & Melinda Gates Foundation and the U.K. Department for International Development, which focused on increasing access to and use of contraception. [2]

Contraceptive use impacts population health through several channels. First, by reducing the probability of becoming pregnant, contraception guards women against adverse pregnancy outcomes, complications due to unsafe abortions, and causes of maternal mortality. [3,4] Second, women who use contraception, and hence have fewer pregnancies, experience wider birth intervals and have more resources to invest in *each* of their children. As a result, their children are at a decreased risk of suffering from debilitating or fatal illnesses. [4-6]

A country's contraceptive prevalence rate also impacts its social and economic development. Women who use effective contraceptive methods are less likely to experience unwanted pregnancies, and thus are able to stay in school for longer periods and/or participate more actively in their country's workforce. [3,7] Moreover, if girls are not expected to give birth to

many children beginning at a young age, parents are more likely to invest in their daughters' education. [8] In these and other ways, increased contraceptive uptake may result in economic gains, as well as higher levels of female empowerment and gender equality.

Given the strong connection between contraception, health, and development, it is critically important to monitor the trends in contraceptive prevalence among different groups of women. In light of this fact, we seek to determine how levels and trends in contraceptive prevalence have changed over the period 1990 to 2010. More specifically, we examine the extent to which trends in use vary by country, age, and contraceptive method. We also investigate how changes in the use of contraception have impacted fertility rates.

Answering these questions is critical, not only so that – as we approach 2015 – we can measure progress toward achieving MDG5.B, but also so that policymakers can ascertain which communities are in greatest need of further attention on matters related to family planning.

Methods

Trends in Contraceptive Prevalence

We generated a complete time series of prevalence by country, age, and method of contraception for the period 1990 to 2010 in three distinct steps.

1) Data Collection

First, we systematically gathered all nationally-representative contraceptive prevalence data for 187 countries between 1990 and 2010 that was publicly available. Our sources individual-level microdata from 196 Demographic and Health Surveys, 29 Reproductive Health Surveys, 67 Multiple Indicator Cluster Surveys, and 5 United States' National Surveys of Family Growth. We also included tabulated data from ministries of health, international agencies, and an array of other sources. Through this process, we gathered 30,181 data points across all countries, ages, years, and methods of contraception. **Table 1** provides an overview of the data included in this study.

2) Data Processing

Second, we adjusted the data for inconsistencies in age reporting. One of our goals in this study was to estimate trends in contraceptive prevalence for women in seven standard age groups: 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45-49. However, many tabulated sources reported prevalence for age groups spanning more than 5 years. To standardize age groups, we applied a technique known as “age-splitting”, which subdivides estimates for wide age intervals into estimates for their constituent five-year age blocks. This technique is rooted in the idea that $prev_{i-n}$, or the method-specific prevalence for broad age group $i - n$, reflects the underlying

prevalence and age structure of smaller age groups, a_i, a_{i+4}, \dots, a_n . In other words, for a given country and year:

$$prev_{i-n} = \sum_{a=i}^n (prev_a * \frac{pop_a}{pop_{a-n}})$$

where i is the youngest age in the broad age interval, n is the oldest age in the broad age interval, $prev$ is the method-specific contraceptive prevalence, and pop is the size of the population. By applying rearrangements of this equation to sources with prevalence estimates for both a broad age category and gold-standard five-year intervals (i.e. estimates from survey microdata and a subset of reports), we uncovered the implied age distribution of prevalence for each unique contraceptive method and super-region combination.¹ Then, we applied the observed relationship between prevalence in the aggregate age group and prevalence in the five-year age groups to sources for which we had only non-standard age reporting. In this way, were able to subdivide estimates for broad age categories into their constituent parts.

We also made adjustments to data from sources that sampled only currently- or ever-married women. In certain regions of the world, including South Asia and the Middle East, questions on the use of contraception are not asked of unwed women. As our goal in this study was to measure contraceptive prevalence among *all* women of reproductive age (15-49), regardless of their marital status, we used a statistical crosswalk to convert estimates of contraceptive prevalence among married women into estimates for all women. We accomplished this by taking advantage of the fact that for nearly all estimates of prevalence in *all* women, we had corresponding estimates among married women. We were able to apply the results of the

¹ We have grouped all countries into one of seven “super-regions”: East Asia/Pacific, Eastern Europe/Central Asia, High Income, Latin America/Caribbean, North Africa/Middle East, South Asia, and Sub-Saharan Africa.

following regression – which we ran separately for each of geographical “super-region”, age group, and contraceptive method – to data from sources for which we only had estimates among married women:

$$\text{logit}(\text{prev.all}_{c,y,a,m}) = \beta_0 + \beta_1 \text{logit}(\text{prev.marr}_{c,y,a,m}) + \beta_2 \text{frac.marr}_{c,y,a}$$

where c is country, y is year, a is age-group, m is method of contraception, prev.all is the contraceptive prevalence in all women, prev.marr is the contraceptive prevalence in married women, and frac.marr is the fraction of women who are married.

3) Modeling

Finally, we generated complete time series by contraceptive method, age group, and country for the period 1990 to 2010. Our goal was to subdivide the entire population of women of reproductive age into one of three mutually exclusive groups and 11 mutually exclusive subgroups, as listed in **Table 2**.

The group “traditional methods” refers to natural, non-technological methods such as withdrawal, breastfeeding, and the rhythm method. The subgroup “uncovered” refers to women who have had sex but are not currently pregnant. The subgroup “other” refers to technological forms of birth control not otherwise listed, such as female condoms, diaphragms, and vaginal rings.

For each of the 3 groups and 11 subgroups, we tested a wide array of mixed effect and spatial temporal models which used different combinations of covariates to predict the logit transformation of prevalence. We modeled each group—i.e. no method, traditional, and modern—as a fraction of the age-specific population of women and each subgroup as a fraction of its corresponding group. We modeled each modern method of contraception as a mutually

exclusive category because the majority of data sources reported a single method per woman.

For sources that reported more than one method per woman, we categorized women on the basis of their most effective form of contraception. [9]

For each of the 14 models, we evaluated the predictive power of the following epidemiologically relevant covariates: log-transformed lag-distributed income, average years of female education, coverage of one antenatal care visit (ANC1), coverage of four antenatal care visits (ANC4), and coverage of in-facility delivery (IFD). [10] We tested all possible combinations of covariates and retained models for which the coefficients were statistically significant ($p < 0.05$) and, for our no method and modern method models, had the expected relationship with prevalence (**Table 3**). This yielded a total of 206 potential models across the 14 methods.

We tested spatial temporal Gaussian process regressions (GPR) for each combination of covariates identified in the aforementioned process. [11–13] Spatial temporal models help to identify trends in the data not captured by available covariates to the extent that data are correlated in time, space, and—in this study—age. We also tested ensemble models, which are weighted averages of the individual component models. Past studies have found that ensemble models decrease the error and improve the accuracy of the predictions that are generated. [14–16] In all of our models, we down-weighted age-split or marital status adjusted data so that, if we unintentionally introduced bias through either of these processes, these points did not have undue influence on the levels and trends we predicted.

We evaluated each model's accuracy using 15 train-test-test splits. We randomly designated 70% of the data for training, 15% for the first round of testing, and 15% for the second round of testing. We re-estimated each of the potential models using the train dataset. As test data are not

included in train models, these predictions help us to assess how well the models will do in cases where group or subgroup data are missing.

We assessed the predictive validity of the individual models using both test datasets and the predictive validity of the ensemble models using the second test dataset. We generated the following three measures of predictive validity: (1) the root mean squared error (RMSE) of the logit of prevalence; (2) the proportion of the time that the model correctly predicted the trend, i.e. whether prevalence was increasing or decreasing between two years; and (3) the fraction of data in the test set included in the 95% prediction interval. We selected the individual or ensemble model with the lowest RMSE and best trend predictions as our final model.

Because we modeled each group and subgroup independently, our predictions did not always sum to the expected value. Therefore, our final step was to proportionally rescale the predictions for the fraction of women in each group so that they summed to 100% and the fraction of women in each subgroup to sum to the value of the corresponding group. We did this using the 1000 draws generated by the GPR models, so as to accurately estimate uncertainty.

Impact of Changes in Contraceptive Prevalence on Related Health Outcomes

To estimate the relationship between changes in contraception and changes in related health outcomes, we calculated the fraction of the change in total fertility rates and age specific fertility rates between 1990 and 2010 that could be attributed to changes in modern contraceptive prevalence, as well as to changes in age at first sex (sexual debut) and the prevalence of traditional methods. The total fertility rate (TFR) is defined as the average number of children that a woman in a given country and year is expected to have in her lifetime. The age specific fertility rate (AFSR) is defined as the number of births per 1,000 women in a five-year age group

that are expected for a particular country-year combination. The estimates of TFR and ASFR that we used in this analysis were from the UN Population Division. [17]

To do this calculation, we first estimated the fertility rate in 1990 that was attributable to factors other than contraception use and age at first sex using the following equation:

$$F = \frac{TFR_{1990}}{\sum_{m=1}^i (prev_{m,1990} * h_m) + prev_{t,1990} * h_t + prev_{n,1990} * h_n + prev_{s,1990} * h_s}$$

where m refers to a particular modern method of contraception, t refers to traditional methods, n refers to no method, s refers to women who have never had sex, F refers to the underlying fertility rate, and h is the hazard of becoming pregnant relative to no method. In other words, h_n is equal to 1 and h_s is equal to 0. The hazard estimates used in these calculations are from an analysis by Straney et al. [9] When estimating the effect of contraception on age-specific fertility, we substituted the $ASFR_{1990}$ in for the TFR_{1990} .

Next, we solved the equation above for TFR or ASFR and combined it with our 2010 estimates of group and method-specific prevalence to calculate (1) the expected change in TFR or ASFR given changes in the proportion of women who have never had sex (i.e. $prev_{s,2010}$), but setting the relative proportions of $prev_m$, $prev_t$, and $prev_n$ equal to their 1990 levels split among the remainder; (2) the additional change in TFR or ASFR that was expected given changes in the proportion of women using modern methods, but setting the relative proportions of $prev_t$ and $prev_n$ equal to their 1990 levels split among the remainder; (3) the additional change expected given the changes in the proportion of women using traditional methods; and (4) the residual, unexplained change in ASFR or TFR that was due to other factors, such as changes in abortion rates, frequency of sexual intercourse, levels of malnutrition, and fertility treatment success rates.

Results

Trends in Contraceptive Prevalence

The global trend in modern contraceptive prevalence, as well as the breakdown by method, was relatively invariant over time (**Figure 1**). On average, overall modern prevalence rose a modest 0.34% per annum on average, from 40.9% (40.2%-41.5%) in 1990 to 47.9% (47.2%-48.4%) in 2010. Throughout the two decades, female sterilization was the most popular method, with 16.7% of women aged 15-49 using it as their main method of contraception in 2010. In large part, the prevalence of the next most popular method, intrauterine devices (IUDs), was driven by China, where more than 27% of women aged 20 and over used IUDs in 2010.

Results for global use mask the fact that countries, regions, and age groups vary both in terms of overall modern contraceptive use and method-specific use. A complete list of prevalence estimates by country, year, age, and method of contraception is available on request.

As seen in **Figure 2** and **Table 4**, national trends in overall prevalence were extremely diverse. For many countries in East Asia and Western Europe, particularly Taiwan and Austria, the prevalence of modern contraception rose from already high levels (50-60%) in 1990 to even higher levels in 2010 (60-80%). In many parts of South and Southeast Asia, Latin America, the Middle East, and Southern Africa, the use of modern methods increased dramatically, starting at relatively low levels in 1990 and increasing steadily over the next two decades. Of the 187 studies included in this study, Paraguay and Namibia were tied for the largest absolute change, a 24 percentage point increase between 1990 and 2010. Trends in prevalence for most countries in the Asia Pacific (High Income), Australasia, North America (High Income), and Southern Latin America regions were relatively flat, although they began the period at high levels of use (50-

60%). With the exception of Mongolia, Romania, Russia, and Belarus, modern contraceptive prevalence in Central Asia and Eastern and Central Europe stagnated at middling levels (15%-40%). In fact, a handful of countries in these regions experienced decreases between 1990 and 2010, with Bulgaria and Montenegro tied for the largest absolute decline in modern contraceptive use (5 percentage points). Finally, the vast majority of countries in Central and West Africa, as well as many in East Africa, remained at low levels, often below 20% prevalence, over the entire two decades.

Within individual countries, the use of modern contraception also varied by age. Previous studies have found that the health risks associated with pregnancy are greatest in the young and the old. [18–21] Moreover, relatively low age-specific fertility rates in 15-19 year old women and in those over 40 suggest that women at these ages are the least likely to want to become pregnant. Despite these similarities, sexually active adolescent girls were far less likely to use a modern method of contraception than were older women. Across all countries and years, the median ratio of modern contraceptive prevalence in sexually active 15-19 year-old relative to 40-44 year old women was 0.67. When developed countries were excluded from this calculation, the ratio dropped to 0.60 and when Sub-Saharan African countries were dropped – where prevalence was low irrespective of age – the ratio dropped still further to 0.53. However, by the time women reached the 20-24 year-old age bracket, modern contraceptive prevalence among women who had had sex was comparable to that of 40-44 year olds.

The method composition of modern contraception was also highly variable within and between countries (**Figure 3**). Overall, as expected, permanent methods—i.e. female and male sterilization—were popular among older women (40+) while reversible methods were popular in younger women. The relative ranking of reversible methods was largely dependent on

geography. In East Asia and North Africa/Middle East, the most common method among women aged 25-29 was the IUD, where the prevalence in 2010 was 34.6% and 19.8%, respectively. In North America (High Income) and most of Latin America, women aged 25-29 were most likely to use the pill, where 2010 values of regional prevalence ranged from 13.9% in Central Latin American to 33.9% in Southern Latin America. Among 25-29 year old women in Asia Pacific, High Income, condoms were the most popular method of contraception (40.6%). Finally, Central European women aged 25-29 were more likely to use traditional methods (20.1%) than any modern method of contraception, which was unusual among regions with comparable levels of economic development.

In particular, the trends for two methods are worth highlighting. First, injection use exhibited an impressive increase in countries across East Africa, South and Southeast Asia, and Latin America between 1990 and 2010. To name just a few, the prevalence of injections among 20-24 year-old women rose from 2.3% to 13.5% in Ethiopia, 1.0% to 25.5% in Malawi, 23.4% to 42.9% in Indonesia, and 4.4% to 22.2% in El Salvador. Second, despite considerable investments by NGOs, bilateral, and multilateral organizations to combat HIV transmission, condom use remained strikingly low among women in all but a handful of Sub-Saharan African countries (**Table 5**). Two exceptions to this trend were Cameroon and Namibia, where condom use among young women increased between 13 and 23 percentage points from 1990 to 2010. In most other African countries, however, condom use grew less than 5% and often remained in the single digits.

Impact of Changes in Contraceptive Prevalence on Related Health Outcomes

Table 6 presents the change in TFR between 1990 and 2010 that could be attributed to changes in modern contraceptive prevalence. At the global level, a 0.52 decline in the average number of

children a woman had in her lifetime could be credited to increases in contraceptive prevalence. To put this number in context, the total observed change in TFR was 0.78, which dropped from 3.25 to 2.47 over the two decades. At the regional level, the effect of changes in prevalence – which increased in all regions – on changes in TFR ranged from 0.06 fewer children per woman in High Income countries to 0.79 fewer children in South Asian countries. As expected, rises in the use of contraception had the greatest impact on fertility in countries with rapid contraceptive scale-up. For instance, in Paraguay and Namibia, the countries with the greatest absolute change in modern contraceptive prevalence, a 1.66 decline in TFR between 1990 and 2010 was attributed to increases in contraception. To see the effect of changes in modern contraception on changes in TFR for all 187 countries, please refer to **Table 7**.

Using the same method, we determined the change in age-specific fertility that could be attributed to changes in modern contraceptive prevalence. By comparing the results for women aged 30-34 in developed and developing countries, we can begin to understand some of the dynamics affecting birth rates (**Figure 4**).

In 1990, the ASFR for women aged 30-34 was 70.4 per 1,000 in developed countries and 126.3 in developing countries. By 2010, the ASFR for this same age group of women had risen to 94.0 and dropped to 92.8 in developed and developing, respectively. Our analysis suggests that rises in modern contraceptive prevalence among women aged 30-34 in developed countries were responsible for 2.7 fewer births per 1,000 women. However, the effects of the slight decline in the fraction of women who had never had sex, as well as of considerable changes in residual, unobserved factors, more than counteracted the decline attributed to increases in use of modern contraception. For this reason, we observe a net increase in ASFR among 30-34 year olds in developed countries. Conversely, we found that for 30-34 year old women in developing

countries, the combined effect of increases in modern prevalence, traditional prevalence, and changes in unobserved factors—i.e. 23.3, 4.7, and 18.2 fewer births per 1,000 women, respectively—more than outweighed the 12.7 birth per 1,000 woman increase caused by the decline in the proportion of women who had never had sex.

The results of the age-specific analysis also highlight inequalities in the impact of modern contraceptive scale-up on declines in ASFR. Among adolescent girls in developing countries, increased use of modern contraception was responsible for 41.8% of the observed decline in ASFR between 1990 and 2010. Conversely, in women aged 20-24, 25-29, and 30-34, rises in modern contraceptive prevalence were responsible for 71.1%, 68.0%, and 69.5% of the drop in ASFR (**Figure 4**). Therefore, young women—for whom the health and socioeconomic risks of pregnancy are high—did not benefit as much from changes in the use of contraception as did other high-fertility age groups.

Discussion

We found that a slow but steady increase in modern contraceptive prevalence masked varied trends between different countries and age groups. While modern contraceptive prevalence grew at a robust rate in many Latin American and South Asian countries, prevalence – even of condoms – remained distressingly low in most of Sub-Saharan Africa. Moreover, we found that increases in modern contraception contributed to the decline in birth rates that occurred between 1990 and 2010, but had a less substantial impact on high risk adolescents in developing countries than on other high-fertility women.

Between 1990 and 2010, the change in modern prevalence ranged from a 5% decline in Bulgaria and Montenegro to a 20% increase in Mongolia and a 24% increase in Paraguay and Namibia. Policymakers may gain insight into ways to encourage more women to use modern methods of contraception by examining cases of rapid scale-up. After Stroessner's reign ended in 1989, the Paraguayan government began to foster a legal and institutional climate that facilitated family planning. [22] In 1992, it added an article to its Constitution to promote "Family Planning and Maternal and Infant Health"; in 1994, it created the National Reproductive Health Council, which coordinates governmental and non-governmental agencies that provide family planning services; and in 1997, it decided that National Sexual and Reproductive Health programs would be updated every four years. In the late 1980s, the Mongolian government ended its longstanding pronatalist population policies. It lifted its restrictions on the use and distribution of contraceptives and developed its own set of family planning services. [23] Together, these examples suggest that through centralized governmental action, policymakers can effectively change individual behaviors. By creating laws and organizations that directly support family planning efforts, they may succeed in promoting increased use of contraception.

We found that in a handful of countries throughout the developing world, injection use escalated rapidly between 1990 and 2010. For instance, in Indonesia, which is the fourth most populous country in the world, injection use in women 20-24 rose from 23.4% to 42.9% in just two decades. In part, this increase may have occurred because of concerted efforts to develop alternative, non-facility-based channels for contraception distribution. [24] A highly publicized social marketing scheme, the “Blue Circle” campaign, was initiated in the late 1980s and subsidized the private sale of contraception in well-marked, non-medical establishments. Moreover, the National Family Planning Coordinating Board of Indonesia (BKKBN) trained midwives in private practice (*bidans*) on topics related to family planning. Similarly, countries in Latin America which experienced large gains in the prevalence of injections made use of social marketing campaigns involving mobile sales, community outlets, and community promoters to distribute contraceptives. [25] It has been hypothesized that women selected injections from the available methods because they were perceived to be safe, discreet, and easy to use. These initiatives suggest that the provision of untraditional, community-based distribution channels may facilitate increased use of contraception; however, low-cost alternatives like these should be pursued with caution due to their highly variable quality. [24]

As noted above, modern contraceptive prevalence in adolescents worldwide remained low between 1990 and 2010. Moreover, despite huge influxes of money and services to combat HIV transmission [26], condom use stagnated at disturbingly low levels among young women in most parts of Sub-Saharan Africa. Two striking exceptions to this pattern were Namibia and Cameroon, where condom use in women aged 15-24 grew by an order of magnitude over the study period. In part, peer-facilitated HIV prevention programs in both countries may have fueled the remarkable growth in condom use. In 1997, the Namibian government partnered with

UNICEF to develop “My Future is My Choice”, a peer education life skills program that educated in- and out-of-school youth on matters relating to sexuality, reproductive health, and HIV prevention. [27] Similarly, Population Services International (PSI) joined forces with the Social Marketing Program of Cameroon (PMSC) in 1999 to implement “100% Jeune”, a youth-oriented peer education program which encouraged open communication about sensitive issues like abstinence and condom use, and which promoted consistent condom use, even with regular partners. [28] Given the rapid scale-up of condom use in Namibia and Cameroon, peer education programs warrant further investigation as a means of promoting the use of contraception among young women in and out of Africa.

Although increases in contraceptive prevalence appeared to have a large effect on changes in birth rates for many groups of women, a sizable portion of the change in fertility could not be attributed to any of the determinants our study measured. Other factors that may have contributed to declines in birth rates include, but are not limited to, increases in abortion and decreases in the frequency of sex. Conversely, other factors that may have contributed to increases in fertility rates include improvements in nutritional status and—particularly in affluent countries—advances in fertility treatment. Further research will be required in order to disaggregate the residual “other” category into its constituent parts.

At the global level, we found that increases in the use of modern contraception between 1990 and 2010 led women to have 0.52 fewer children, on average, over the course of their lifetime. Given that contraception impacts fertility, and that fertility—or, more specifically, pregnancy—is a required risk factor for maternal mortality, neonatal mortality, infant mortality, and child mortality [29], we believe that further research should be done to investigate the effect of actual and counterfactual changes in contraceptive prevalence on maternal and child health.

Our results should be interpreted with caution in light of the study's limitations. First, the data for adolescent girls (15-19) were sparse and sample sizes were small. We tried to mitigate the effect of scant data by using prevalence estimates from adjacent age groups to inform levels and trends in the group of interest. Second, a portion of the data came from sources that presented results for broader age groups than were used in this study or for just married women and, as such, had to be modified using age-splitting and marital status adjustments. To prevent these data from having undue influence, we assigned them lower weights in our spatial temporal models compared to other estimates of prevalence. Third, most data sources only reported a single method of contraception per woman. Therefore, our model would not have captured situations in which a woman used one method to prevent pregnancy and another to prevent STI/HIV transmission. Finally, our assessment of the impact of changes in sexual debut, modern prevalence, and traditional prevalence assumed that one variable would change at a time, while in reality these changes occur simultaneously. Therefore, the dynamics of the relationship between the various explanatory factors and the outcomes of interest, TFR or ASFR, may have been more complicated than our method could capture.

From this study, we can see that the scale-up of modern contraception has the potential to positively impact maternal and child health by reducing fertility rates and the risks associated with pregnancy. However, while increased contraceptive prevalence has substantially impacted birth rates in certain countries and age groups, there remains considerable room for progress among women in Sub-Saharan Africa and adolescent girls worldwide. Policymakers in settings with low levels of prevalence should evaluate how successful programs from other countries can be appropriately applied in their own communities. Finally, as the end year for the MDG target approaches (2015), funders, researchers, and policymakers should carefully assess why uptake of

contraception has been low in certain groups of women. In so doing, perhaps they will be able – in the next round of goal-setting – to devise an effective set of strategies for increasing the use of contraception among all women of reproductive age.

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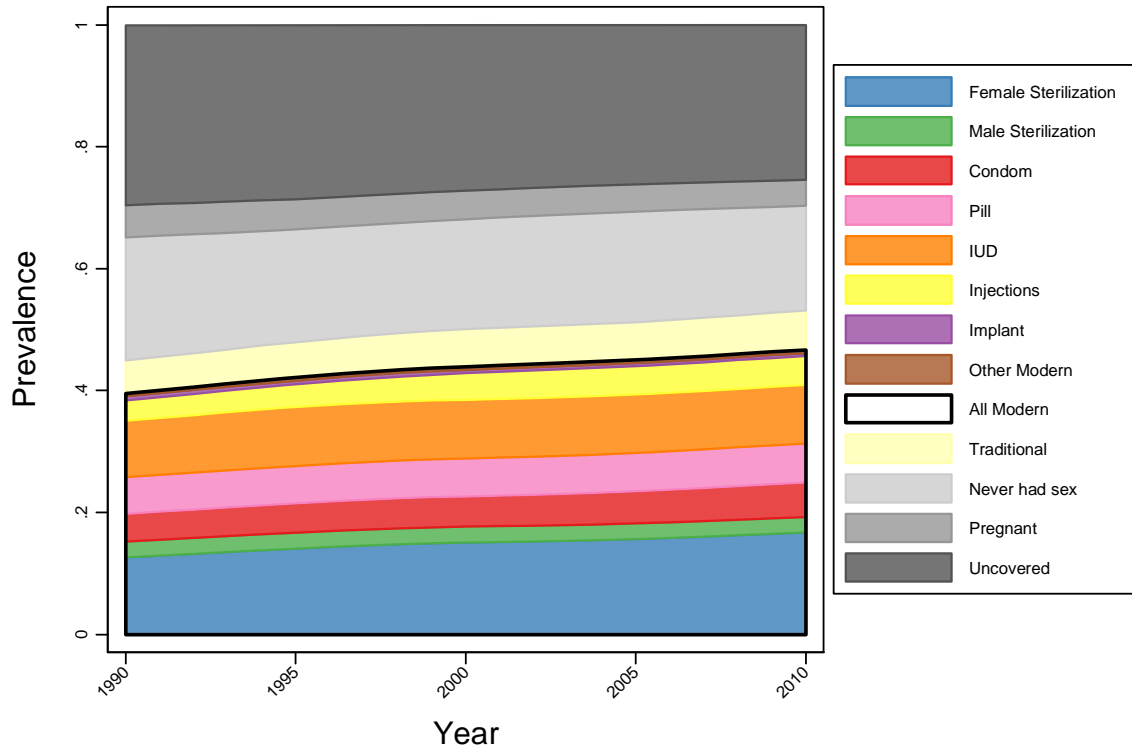
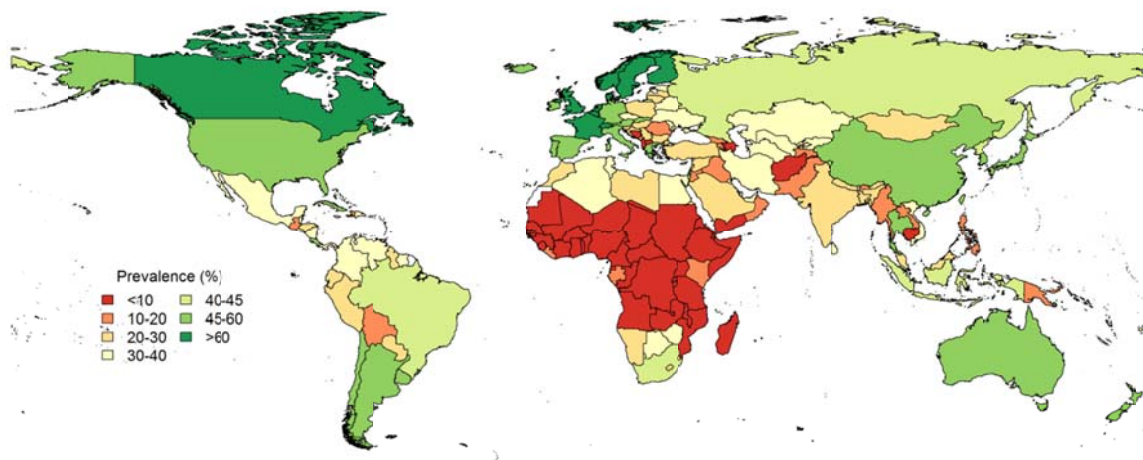


Figure 1: Global trends in prevalence among women of reproductive age (15-49)

Modern Contraceptive Prevalence (%), 1990



Modern Contraceptive Prevalence (%), 2010

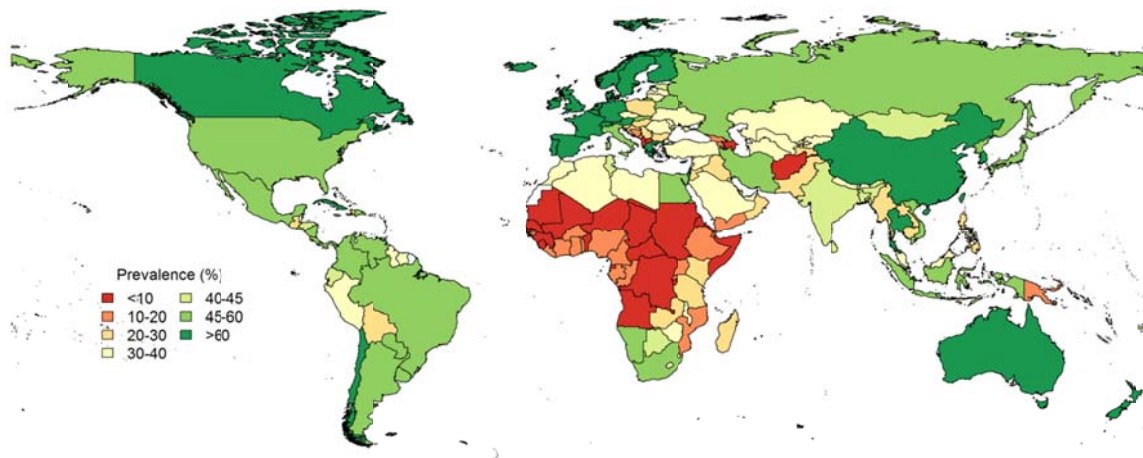


Figure 2: Modern contraceptive prevalence (%) among women of reproductive age in 1990 and 2010

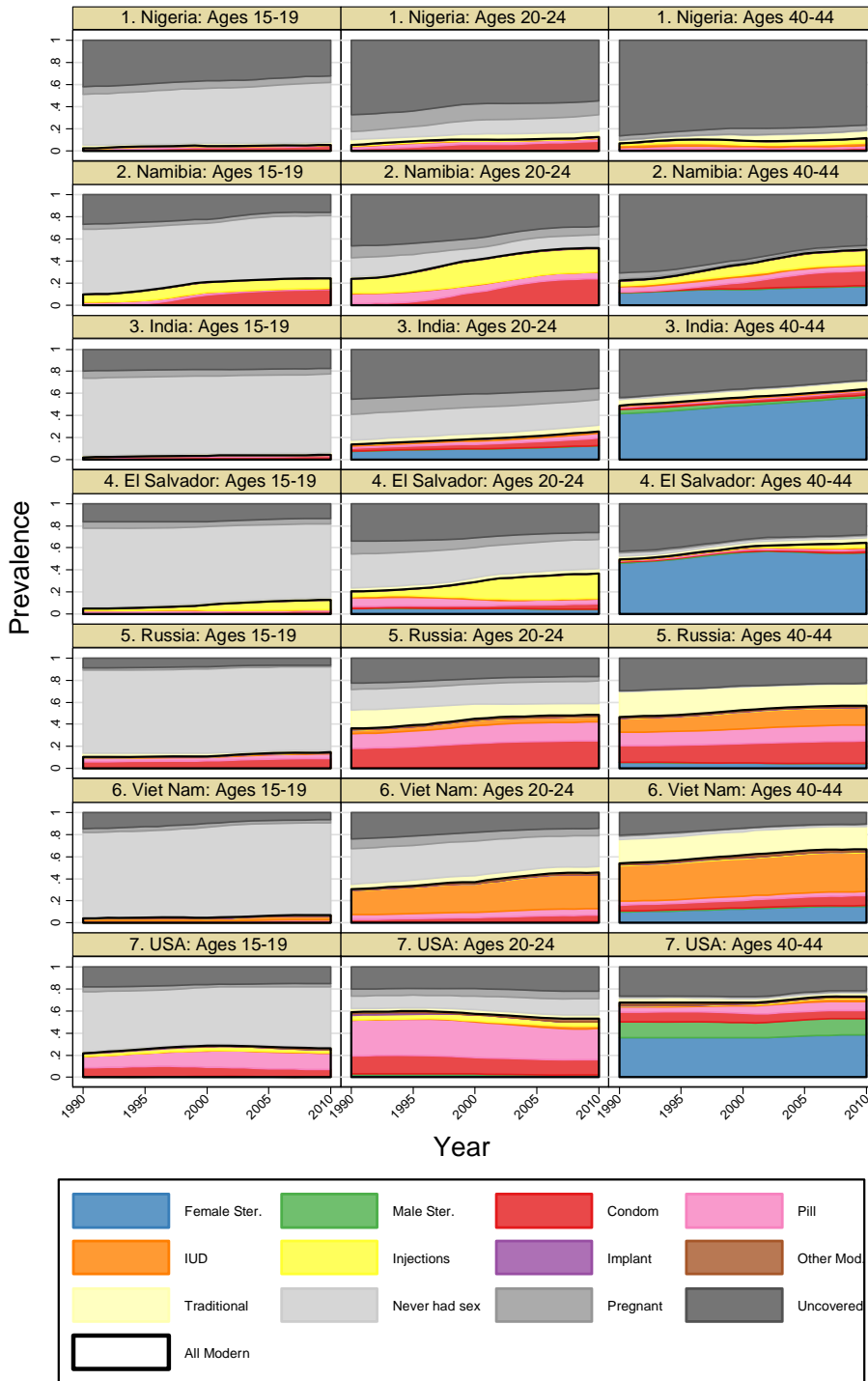


Figure 3: National age- and method-specific trends in (1) Nigeria; (2) Namibia; (3) India; (4) El Salvador; (5) Russia; (6) Viet Nam; and (7) the United States

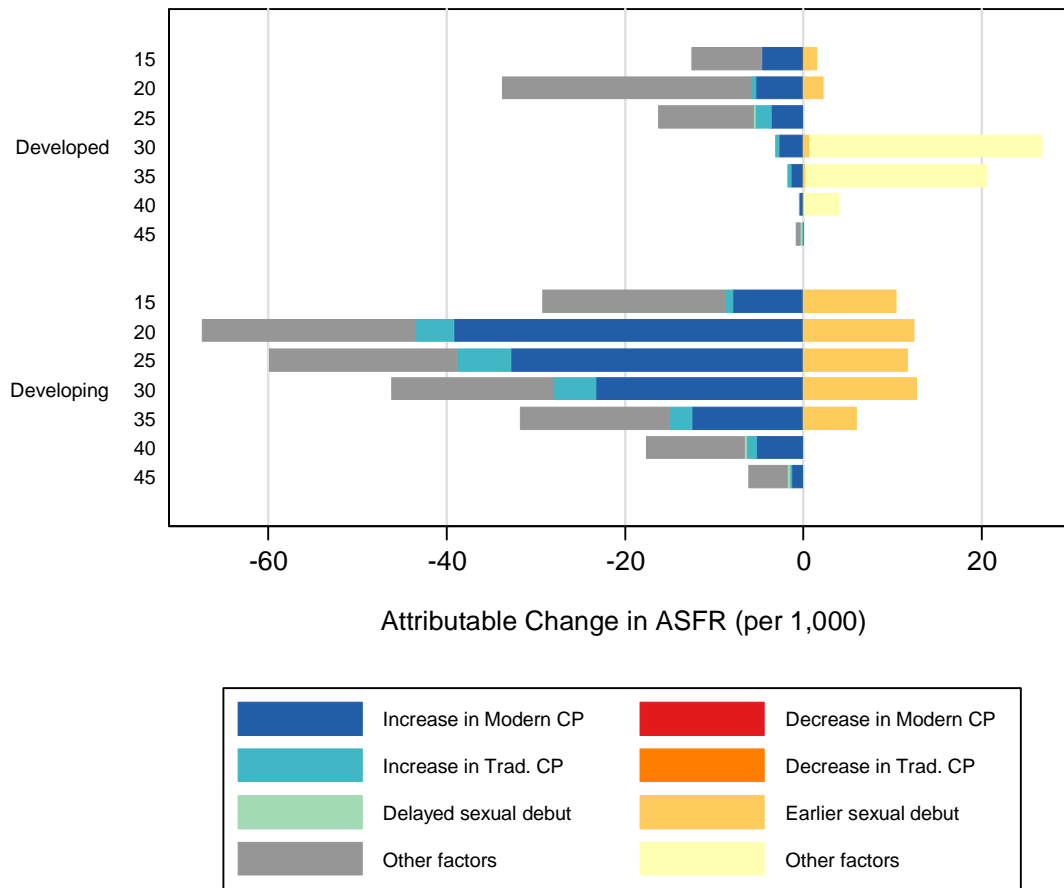


Figure 4: Change in ASFR attributable to modern prevalence, traditional prevalence, sexual debut, and other factors

Table 1: Number of data points, by super-region and method

Region	All Modern	Condom	Pill	IUD	Injections
East Asia/Pacific	484	227	229	222	222
Eastern Europe/Central Asia	383	330	330	309	257
High Income	244	256	256	253	158
Latin America/Caribbean	552	457	464	464	457
North Africa/Middle East	318	196	207	201	189
South Asia	206	145	145	146	145
Sub-Saharan Africa	1,074	833	826	833	833
	Implant	Male Sterilization	Fem. Sterilization	Other Modern	All Traditional
East Asia/Pacific	179	219	228	160	168
Eastern Europe/Central Asia	195	195	295	293	306
High Income	62	198	226	194	79
Latin America/Caribbean	376	444	457	444	444
North Africa/Middle East	139	148	203	199	169
South Asia	118	128	144	126	151
Sub-Saharan Africa	805	798	826	833	902
	No Method	Never had sex	Pregnant	Uncovered	
East Asia/Pacific	222	84	125	84	
Eastern Europe/Central Asia	288	100	240	100	
High Income	239	37	20	20	
Latin America/Caribbean	438	319	436	311	
North Africa/Middle East	202	-	133	-	
South Asia	125	14	118	14	
Sub-Saharan Africa	787	602	819	602	

Table 2: Modeling groups and subgroups

	Group	Subgroup
All women of reproductive age (15-49)	No method	Never had sex
		Pregnant
		Uncovered
	Traditional	<i>[Traditional]</i>
	Modern	Male condom (“condom”)
		Oral contraceptives (“the pill”)
		Intrauterine Device (IUD)
		Implant
		Injection
		Female Sterilization
Male Sterilization		
Other		

Table 3: Expected direction of relationship between covariate and group-specific prevalence

Covariate	Direction for "No Method"	Direction for "Modern"
Female Education by Age	negative	positive
LDI (I\$ per capita)	negative	positive
ANC1	negative	positive
ANC4	negative	positive
IFD	negative	positive

Table 4: National prevalence of modern methods, change and levels

Region	Country	Population, 2010	Change in Modern Prevalence, 1990-2010	1990 Modern Prevalence	2010 Modern Prevalence
Asia Pacific, High Income	South Korea	12,730,134	6%	56% (54%-57%)	62% (59%-64%)
	Brunei Darussalam	119,813	4%	56% (54%-58%)	60% (57%-63%)
	Singapore	1,039,107	3%	54% (53%-56%)	57% (54%-60%)
	Japan	26,403,321	2%	53% (52%-54%)	55% (52%-58%)
Asia, Central	Mongolia	824,077	20%	24% (22%-25%)	44% (42%-46%)
	Tajikistan	1,844,543	6%	16% (14%-18%)	22% (20%-23%)
	Turkmenistan	1,445,180	5%	31% (29%-34%)	36% (34%-38%)
	Uzbekistan	7,793,362	3%	36% (34%-37%)	39% (38%-41%)
	Kazakhstan	4,441,922	3%	35% (33%-36%)	38% (36%-40%)
	Georgia	1,149,316	2%	13% (11%-14%)	15% (14%-17%)
	Azerbaijan	2,745,684	2%	7% (6%-9%)	9% (8%-10%)
	Kyrgyzstan	1,505,777	0%	33% (31%-35%)	33% (31%-35%)
Armenia	858,031	-1%	15% (14%-16%)	14% (13%-15%)	
Asia, East	Taiwan	6,257,211	14%	56% (54%-57%)	70% (64%-74%)
	China	363,763,915	11%	59% (58%-61%)	70% (68%-71%)
	North Korea	6,441,524	8%	45% (43%-46%)	53% (48%-57%)
Asia, South	Bhutan	188,336	16%	16% (15%-17%)	32% (23%-36%)
	Nepal	7,795,973	14%	24% (22%-26%)	38% (35%-40%)
	India	314,542,473	14%	30% (28%-31%)	44% (42%-46%)
	Bangladesh	41,060,441	13%	29% (27%-30%)	42% (40%-43%)
	Pakistan	44,584,396	11%	10% (9%-11%)	21% (19%-22%)
Asia, Southeast	Viet Nam	25,779,599	16%	36% (34%-39%)	52% (51%-53%)
	Laos	1,663,443	16%	11% (10%-12%)	27% (25%-28%)
	Mauritius	363,069	13%	44% (41%-45%)	57% (51%-62%)

	Cambodia	3,914,617	12%	9% (8%-10%)	21% (20%-22%)
	Sri Lanka	5,461,646	11%	33% (30%-36%)	44% (41%-46%)
	Indonesia	67,437,401	10%	42% (40%-43%)	52% (50%-54%)
	Thailand	18,930,194	10%	57% (55%-59%)	67% (65%-68%)
	Malaysia	7,419,739	10%	23% (19%-26%)	33% (29%-37%)
	Myanmar	13,807,132	10%	15% (14%-17%)	25% (23%-26%)
	Philippines	23,873,297	8%	16% (15%-18%)	24% (23%-25%)
	Seychelles	20,074	4%	40% (37%-43%)	44% (40%-47%)
	Timor-Leste	239,139	1%	11% (10%-12%)	12% (11%-13%)
	Maldives	95,530	-2%	21% (19%-22%)	19% (18%-20%)
Australasia					
	New Zealand	1,083,635	4%	59% (57%-61%)	63% (60%-65%)
	Australia	5,177,744	3%	60% (58%-61%)	63% (61%-64%)
Caribbean					
	Dominican Republic	2,587,328	16%	36% (34%-36%)	52% (51%-53%)
	Haiti	2,588,198	10%	11% (10%-11%)	21% (19%-23%)
	Trinidad and Tobago	392,495	8%	20% (17%-22%)	28% (26%-30%)
	Saint Vincent and the Grenadines	29,284	8%	35% (30%-39%)	43% (41%-45%)
	Dominica	18,779	7%	37% (32%-40%)	44% (41%-46%)
	Guyana	196,158	7%	25% (22%-28%)	32% (30%-33%)
	Grenada	28,378	6%	35% (33%-37%)	41% (38%-45%)
	Barbados	69,469	6%	40% (37%-43%)	46% (43%-48%)
	Cuba	2,983,531	6%	55% (51%-59%)	61% (59%-62%)
	Saint Lucia	50,212	6%	38% (35%-40%)	44% (42%-46%)
	Belize	83,853	6%	32% (31%-34%)	38% (36%-40%)
	Bahamas	97,114	5%	42% (39%-45%)	47% (43%-52%)
	Antigua and Barbuda	22,374	5%	44% (40%-48%)	49% (44%-55%)
	Jamaica	721,358	5%	40% (38%-41%)	45% (43%-47%)

	Suriname	137,509	0%	36% (34%-37%)	36% (34%-37%)
Europe, Central	Romania	5,394,434	20%	10% (10%-11%)	30% (28%-32%)
	Albania	856,016	4%	5% (5%-6%)	9% (8%-10%)
	Slovakia	1,407,420	4%	52% (49%-54%)	56% (54%-59%)
	Czech Republic	2,528,232	3%	34% (32%-36%)	37% (34%-40%)
	Macedonia	528,023	1%	6% (4%-8%)	7% (7%-8%)
	Serbia	2,375,565	0%	23% (21%-26%)	23% (22%-25%)
	Slovenia	478,262	0%	26% (24%-30%)	26% (23%-32%)
	Bosnia and Herzegovina	985,940	0%	10% (7%-12%)	10% (9%-11%)
	Croatia	1,026,773	-1%	22% (19%-26%)	21% (18%-24%)
	Hungary	2,376,278	-1%	28% (25%-34%)	27% (23%-32%)
	Poland	9,507,662	-2%	23% (22%-25%)	21% (18%-25%)
	Bulgaria	1,782,256	-5%	26% (24%-28%)	21% (18%-26%)
Montenegro	156,669	-5%	18% (16%-20%)	13% (12%-14%)	
Europe, Eastern	Russia	37,088,525	10%	43% (41%-47%)	53% (50%-55%)
	Belarus	2,515,685	9%	37% (35%-40%)	46% (44%-47%)
	Ukraine	11,698,770	5%	35% (32%-38%)	40% (38%-41%)
	Estonia	327,559	3%	37% (35%-39%)	40% (38%-43%)
	Latvia	562,277	3%	29% (26%-31%)	32% (30%-35%)
	Lithuania	853,377	2%	29% (27%-31%)	31% (29%-35%)
	Moldova	961,687	-2%	36% (34%-39%)	34% (33%-36%)
Europe, Western	Austria	2,016,782	16%	55% (53%-56%)	71% (69%-72%)
	Ireland	1,154,874	9%	57% (54%-59%)	66% (64%-68%)
	Cyprus	202,549	9%	57% (55%-59%)	66% (63%-69%)
	Portugal	2,545,186	9%	51% (43%-58%)	60% (57%-65%)
	Greece	2,661,698	8%	53% (50%-56%)	61% (58%-63%)
	Israel	1,812,290	7%	58% (56%-59%)	65% (62%-67%)

	Andorra	19,447	7%	59% (57%-61%)	66% (64%-68%)
	Italy	13,688,129	7%	53% (51%-55%)	60% (57%-62%)
	Iceland	77,669	7%	58% (56%-60%)	65% (63%-67%)
	Spain	10,801,004	7%	53% (49%-55%)	60% (57%-63%)
	Norway	1,121,917	5%	65% (64%-67%)	70% (67%-73%)
	Denmark	1,242,065	5%	60% (59%-62%)	65% (63%-67%)
	Luxembourg	123,439	5%	59% (56%-63%)	64% (62%-67%)
	France	14,253,980	5%	60% (58%-63%)	65% (63%-68%)
	Germany	18,786,219	5%	59% (57%-61%)	64% (62%-66%)
	United Kingdom	14,732,565	4%	66% (64%-68%)	70% (68%-71%)
	Belgium	2,482,316	3%	61% (60%-62%)	64% (61%-67%)
	Finland	1,164,593	3%	62% (60%-64%)	65% (62%-68%)
	Malta	99,421	3%	61% (60%-63%)	64% (61%-68%)
	Switzerland	1,797,678	3%	63% (61%-65%)	66% (64%-68%)
	Sweden	2,075,592	2%	65% (63%-67%)	67% (65%-70%)
	Netherlands	3,818,888	2%	77% (76%-79%)	79% (77%-81%)
Latin America, Andean	Ecuador	3,798,293	15%	27% (26%-28%)	42% (41%-43%)
	Peru	7,718,376	14%	20% (19%-21%)	34% (33%-35%)
	Bolivia	2,496,766	14%	11% (10%-12%)	25% (23%-26%)
Latin America, Central	Nicaragua	1,554,929	18%	31% (29%-33%)	49% (47%-50%)
	Honduras	1,964,231	18%	23% (22%-24%)	41% (38%-42%)
	Colombia	12,603,659	14%	35% (34%-36%)	49% (48%-50%)
	Mexico	30,891,293	14%	37% (36%-38%)	51% (49%-53%)
	Guatemala	3,546,960	13%	17% (16%-18%)	30% (29%-31%)
	Panama	918,265	13%	38% (31%-43%)	51% (47%-55%)

	El Salvador	1,711,516	13%	32% (30%-33%)	45% (44%-46%)
	Venezuela	7,689,282	8%	38% (36%-40%)	46% (43%-49%)
	Costa Rica	1,274,052	3%	46% (44%-47%)	49% (45%-54%)
Latin America, Southern	Uruguay	815,205	6%	51% (46%-55%)	57% (55%-59%)
	Argentina	10,193,659	6%	51% (46%-55%)	57% (55%-60%)
	Chile	4,376,373	5%	55% (50%-58%)	60% (58%-62%)
Latin America, Tropical	Paraguay	1,649,538	24%	26% (25%-26%)	50% (49%-51%)
	Brazil	53,783,225	16%	42% (40%-46%)	58% (55%-61%)
North Africa / Middle East	Iran	22,558,442	17%	33% (31%-34%)	50% (46%-54%)
	Libya	1,785,344	14%	20% (18%-22%)	34% (29%-37%)
	Turkey	20,133,545	13%	22% (21%-24%)	35% (33%-38%)
	Egypt	21,088,770	13%	32% (31%-33%)	45% (44%-46%)
	Syria	5,105,950	12%	21% (19%-23%)	33% (32%-35%)
	Morocco	9,086,347	12%	21% (20%-22%)	33% (31%-35%)
	Tunisia	2,999,330	11%	32% (30%-35%)	43% (41%-45%)
	Jordan	1,552,363	10%	19% (18%-20%)	29% (28%-31%)
	Algeria	10,258,812	9%	30% (29%-32%)	39% (37%-41%)
	Bahrain	296,954	9%	22% (20%-24%)	31% (27%-37%)
	Occupied Palestinian Territory	969,175	7%	25% (22%-29%)	32% (30%-34%)
	Lebanon	1,196,315	7%	27% (24%-29%)	34% (31%-36%)
	Kuwait	650,652	7%	37% (34%-39%)	44% (41%-47%)
	Iraq	7,445,836	7%	15% (13%-16%)	22% (19%-23%)
	Yemen	5,658,320	6%	6% (5%-6%)	12% (11%-13%)
	Saudi Arabia	6,819,768	6%	30% (27%-32%)	36% (34%-39%)
	Oman	668,274	6%	18% (16%-20%)	24% (21%-27%)
	Qatar	276,460	6%	38% (34%-42%)	44% (41%-48%)

	United Arab Emirates	1,562,593	4%	36% (34%-38%)	40% (37%-44%)
	Afghanistan	6,829,016	0%	5% (4%-5%)	5% (4%-6%)
North America, High Income	Canada	8,006,030	3%	64% (63%-66%)	67% (65%-69%)
	United States	72,410,046	0%	59% (58%-61%)	59% (57%-60%)
Oceania	Kiribati	24,130	11%	24% (22%-27%)	35% (31%-39%)
	Micronesia	27,150	9%	24% (18%-29%)	33% (30%-35%)
	Tonga	25,047	9%	32% (28%-34%)	41% (37%-46%)
	Solomon Islands	129,132	8%	15% (13%-18%)	23% (21%-24%)
	Marshall Islands	15,974	8%	29% (26%-32%)	37% (35%-38%)
	Fiji	225,656	7%	33% (29%-35%)	40% (37%-43%)
	Vanuatu	59,528	7%	23% (20%-26%)	30% (28%-31%)
	Papua New Guinea	1,687,739	7%	12% (10%-13%)	19% (17%-21%)
	Samoa	41,814	6%	18% (16%-19%)	24% (22%-27%)
Sub-Saharan Africa, Central	Congo	977,841	5%	9% (8%-11%)	14% (13%-16%)
	Equatorial Guinea	166,291	5%	3% (2%-5%)	8% (6%-9%)
	Gabon	386,408	4%	12% (10%-13%)	16% (14%-18%)
	Congo, the Democratic Republic of the	14,880,938	3%	4% (3%-5%)	7% (6%-8%)
	Angola	4,335,814	3%	4% (3%-5%)	7% (6%-8%)
	Central African Republic	1,066,120	1%	4% (3%-4%)	5% (4%-6%)
Sub-Saharan Africa, East	Malawi	3,310,476	22%	9% (8%-9%)	31% (29%-32%)
	Madagascar	4,875,281	15%	5% (5%-6%)	20% (19%-21%)
	Tanzania	10,200,278	14%	8% (7%-9%)	22% (21%-23%)
	Zambia	2,892,558	13%	9% (8%-9%)	22% (20%-24%)
	Rwanda	2,622,084	12%	7% (7%-8%)	19% (18%-20%)
	Ethiopia	20,027,353	10%	5% (5%-5%)	15% (14%-16%)

	Djibouti	233,208	9%	6% (5%-7%)	15% (14%-16%)
	Uganda	7,297,556	9%	8% (7%-9%)	17% (15%-19%)
	Kenya	9,809,178	9%	19% (18%-21%)	28% (27%-30%)
	Mozambique	5,558,714	9%	6% (5%-6%)	15% (13%-17%)
	Comoros	174,712	5%	8% (7%-9%)	13% (9%-17%)
	Eritrea	1,329,816	2%	3% (2%-3%)	5% (4%-6%)
	Sudan	10,505,795	1%	6% (6%-7%)	7% (6%-8%)
	Somalia	2,142,452	1%	1% (1%-2%)	2% (2%-2%)
	Burundi	2,201,864	0%	6% (5%-6%)	6% (5%-6%)
Sub-Saharan Africa, Southern	Namibia	589,820	24%	23% (21%-23%)	47% (45%-48%)
	Lesotho	553,690	12%	23% (21%-24%)	35% (33%-37%)
	Swaziland	307,407	12%	27% (25%-30%)	39% (37%-41%)
	Botswana	528,346	9%	33% (30%-36%)	42% (39%-45%)
	Zimbabwe	3,159,630	8%	31% (29%-33%)	39% (38%-40%)
	South Africa	13,425,033	8%	45% (42%-47%)	53% (50%-56%)
Sub-Saharan Africa, West	Cape Verde	132,926	17%	26% (22%-30%)	43% (41%-46%)
	Cameroon	4,763,850	12%	5% (5%-6%)	17% (15%-19%)
	Guinea-Bissau	361,733	10%	3% (3%-4%)	13% (11%-15%)
	Gambia	431,346	7%	7% (6%-8%)	14% (12%-15%)
	Côte d'Ivoire	4,589,678	6%	6% (6%-7%)	12% (10%-14%)
	Burkina Faso	3,874,943	6%	5% (4%-5%)	11% (10%-12%)
	Ghana	5,970,927	6%	9% (8%-10%)	15% (13%-16%)
	Sao Tome and Principe	41,071	6%	21% (18%-24%)	27% (25%-28%)
	Togo	1,513,513	6%	7% (6%-8%)	13% (10%-15%)
	Nigeria	36,409,701	6%	5% (5%-6%)	11% (9%-11%)
	Guinea	2,292,470	4%	2% (2%-2%)	6% (5%-7%)
	Senegal	3,035,399	3%	5% (4%-5%)	8% (8%-9%)

Benin	2,094,168	3%	4% (3%-4%)	7% (7%-8%)
Mauritania	858,553	3%	2% (2%-3%)	5% (4%-5%)
Sierra Leone	1,453,898	2%	6% (4%-7%)	8% (7%-9%)
Niger	3,358,780	2%	3% (2%-3%)	5% (4%-5%)
Mali	3,481,552	1%	5% (4%-5%)	6% (6%-7%)
Chad	2,537,875	1%	1% (1%-1%)	2% (2%-2%)
Liberia	935,284	0%	12% (9%-14%)	12% (11%-13%)

Table 5: National prevalence of condoms in 15-19 and 20-24 year old women, Sub-Saharan Africa

Country	Change in condom prev. 15-19	Condom prev., 1990	Condom prev., 2010	Change in condom prev., 20-24	Condom prev., 1990	Condom prev., 2010
Cameroon	14%	1% (1%-1%)	15% (15%-16%)	17%	2% (1%-2%)	19% (19%-20%)
Namibia	13%	1% (0%-1%)	14% (12%-16%)	23%	1% (1%-2%)	24% (21%-27%)
Cape Verde	9%	3% (2%-4%)	12% (10%-14%)	13%	4% (3%-6%)	17% (13%-20%)
Mozambique	6%	1% (0%-1%)	7% (6%-8%)	5%	1% (1%-1%)	6% (5%-7%)
Guinea-Bissau	6%	1% (1%-1%)	7% (6%-8%)	7%	1% (1%-1%)	8% (7%-9%)
Botswana	6%	5% (3%-7%)	11% (8%-13%)	9%	7% (4%-10%)	16% (11%-21%)
Togo	6%	4% (4%-4%)	10% (10%-11%)	7%	5% (5%-6%)	12% (11%-12%)
Burkina Faso	5%	1% (1%-2%)	6% (6%-6%)	7%	2% (2%-2%)	9% (8%-10%)
Swaziland	4%	5% (3%-6%)	9% (8%-11%)	10%	10% (7%-13%)	20% (16%-23%)
Sao Tome and Principe	4%	4% (3%-5%)	8% (7%-9%)	4%	8% (6%-10%)	12% (10%-14%)
Guinea	4%	0% (0%-0%)	4% (4%-5%)	4%	1% (1%-1%)	5% (4%-5%)
Tanzania	4%	1% (1%-1%)	5% (5%-6%)	4%	2% (2%-2%)	6% (5%-8%)
Côte d'Ivoire	3%	4% (3%-4%)	7% (7%-8%)	4%	4% (3%-4%)	8% (7%-9%)
Nigeria	3%	1% (1%-1%)	4% (4%-4%)	7%	2% (1%-2%)	9% (8%-9%)
Zambia	3%	1% (1%-1%)	4% (4%-5%)	5%	3% (3%-4%)	8% (7%-9%)
Congo	3%	6% (6%-6%)	9% (8%-9%)	5%	11% (10%-12%)	16% (15%-16%)
Benin	3%	1% (1%-1%)	4% (4%-4%)	4%	2% (2%-2%)	6% (6%-6%)
Djibouti	3%	1% (1%-2%)	4% (4%-5%)	5%	3% (2%-3%)	8% (7%-10%)
Gabon	3%	7% (6%-7%)	10% (9%-10%)	5%	10% (9%-11%)	15% (14%-16%)
Gambia	2%	2% (1%-2%)	4% (3%-5%)	4%	2% (2%-3%)	6% (5%-8%)
Lesotho	2%	4% (3%-5%)	6% (5%-7%)	7%	6% (4%-7%)	13% (11%-15%)
Uganda	2%	2% (2%-2%)	4% (4%-5%)	4%	3% (2%-3%)	7% (6%-8%)
Ghana	2%	2% (2%-3%)	4% (4%-4%)	3%	4% (3%-4%)	7% (6%-7%)
Congo (DRC)	2%	2% (2%-2%)	4% (4%-4%)	3%	5% (4%-5%)	8% (8%-8%)
Equatorial Guinea	2%	0% (0%-0%)	2% (1%-2%)	3%	1% (0%-1%)	4% (3%-5%)
Malawi	2%	1% (1%-2%)	3% (2%-3%)	0%	4% (3%-4%)	4% (3%-4%)
South Africa	1%	2% (1%-3%)	3% (1%-4%)	1%	3% (2%-4%)	4% (3%-6%)
Kenya	1%	1% (0%-1%)	2% (2%-3%)	3%	1% (1%-2%)	4% (4%-5%)
Madagascar	1%	0% (0%-0%)	1% (1%-1%)	0%	1% (1%-1%)	1% (1%-2%)
Angola	1%	1% (1%-1%)	2% (2%-2%)	3%	2% (1%-2%)	5% (4%-6%)
Comoros	1%	1% (1%-2%)	2% (2%-3%)	2%	2% (2%-3%)	4% (3%-5%)
Burundi	0%	0% (0%-0%)	0% (0%-0%)	1%	0% (0%-1%)	1% (0%-1%)
Zimbabwe	0%	1% (1%-2%)	1% (1%-2%)	0%	3% (2%-4%)	3% (2%-3%)

Mauritania	0%	0% (0%-0%)	0% (0%-0%)	1%	0% (0%-0%)	1% (1%-1%)
Senegal	0%	1% (1%-1%)	1% (1%-1%)	1%	1% (1%-1%)	2% (2%-3%)
Eritrea	0%	0% (0%-0%)	0% (0%-1%)	1%	0% (0%-1%)	1% (1%-1%)
Mali	0%	1% (1%-1%)	1% (1%-1%)	0%	1% (1%-1%)	1% (1%-1%)
Sierra Leone	0%	1% (0%-1%)	1% (1%-2%)	1%	1% (1%-2%)	2% (2%-3%)
Central African Republic	0%	2% (1%-2%)	2% (2%-2%)	2%	2% (2%-2%)	4% (3%-4%)
Liberia	0%	5% (4%-5%)	5% (4%-5%)	1%	5% (4%-7%)	6% (5%-7%)
Niger	0%	0% (0%-0%)	0% (0%-0%)	0%	0% (0%-0%)	0% (0%-0%)
Somalia	0%	0% (0%-0%)	0% (0%-0%)	0%	0% (0%-0%)	0% (0%-0%)
Rwanda	0%	0% (0%-0%)	0% (0%-0%)	1%	0% (0%-0%)	1% (1%-2%)
Chad	0%	0% (0%-0%)	0% (0%-1%)	0%	1% (0%-1%)	1% (1%-1%)
Ethiopia	0%	0% (0%-0%)	0% (0%-0%)	-1%	1% (0%-1%)	0% (0%-1%)
Sudan	0%	1% (0%-1%)	1% (0%-1%)	0%	1% (1%-2%)	1% (1%-2%)

Table 6: Change in TFR (1990-2010) attributable to modern prevalence, globally and by super-region

Region	TFR, 1990	Attributable Change
Global	3.25	-0.52
South Asia	4.23	-0.79
North Africa/Middle East	4.75	-0.70
Latin America/Caribbean	3.32	-0.68
Sub-Saharan Africa	6.27	-0.53
East Asia/Pacific	2.62	-0.51
Eastern Europe/Central Asia	2.18	-0.22
High Income	1.76	-0.06

Table 7: Change in TFR (1990-2010) attributable to modern prevalence, by country

Region	Country	TFR, 1990	Attributable Change
Asia Pacific, High Income	Brunei Darussalam	3.53	-0.18
	Japan	1.60	0.00
	Korea, Republic of	1.63	-0.10
	Singapore	1.76	-0.04
Asia, Central	Armenia	2.58	-0.02
	Azerbaijan	2.93	-0.09
	Georgia	2.18	-0.10
	Kazakhstan	2.95	-0.18
	Kyrgyzstan	3.85	-0.07
	Mongolia	4.16	-1.21
	Tajikistan	5.19	-0.54
	Turkmenistan	4.33	-0.49
Uzbekistan	4.18	-0.25	
Asia, East	China	2.35	-0.47
	Korea, Democratic People's Republic of	2.43	-0.21
	Taiwan	1.81	-0.46
Asia, South	Bangladesh	4.62	-0.78
	Bhutan	5.76	-1.11
	India	3.95	-0.78
	Nepal	5.21	-0.99
	Pakistan	6.04	-0.80
Asia, Southeast	Cambodia	5.77	-1.15
	Indonesia	3.19	-0.61
	Lao People's Democratic Republic	6.11	-1.44
	Malaysia	3.52	-0.57
	Maldives	6.13	0.39
	Mauritius	2.28	-0.45
	Myanmar	3.50	-0.49
	Philippines	4.36	-0.49
	Seychelles	2.17	-0.13
	Sri Lanka	2.53	-0.37
	Thailand	2.17	-0.40
	Timor-Leste	5.39	-0.20
	Viet Nam	3.63	-0.85
Australasia	Australia	1.86	-0.05
	New Zealand	2.04	-0.09
Caribbean	Antigua and Barbuda	3.09	-0.10
	Bahamas	2.64	-0.10
	Barbados	1.75	-0.11

	Belize	4.56	-0.29
	Cuba	1.77	-0.02
	Dominica	3.09	-0.24
	Dominican Republic	3.51	-0.81
	Grenada	3.85	-0.23
	Guyana	2.65	-0.26
	Haiti	5.47	-0.74
	Jamaica	2.99	-0.03
	Saint Lucia	3.44	-0.14
	Saint Vincent and the Grenadines	3.00	-0.24
	Suriname	2.95	0.17
	Trinidad and Tobago	2.50	-0.25
Europe, Central	Albania	3.27	-0.17
	Bosnia and Herzegovina	1.74	-0.04
	Bulgaria	1.77	0.02
	Croatia	1.70	0.00
	Czech Republic	1.81	-0.02
	Hungary	1.78	-0.05
	Macedonia, the Former Yugoslav Republic of	2.18	-0.06
	Montenegro	1.90	0.06
	Poland	2.04	-0.03
	Romania	1.92	-0.38
	Serbia	2.12	-0.15
	Slovakia	2.03	-0.26
	Slovenia	1.53	-0.06
Europe, Eastern	Belarus	1.89	-0.41
	Estonia	1.95	-0.11
	Latvia	1.89	-0.15
	Lithuania	1.97	-0.13
	Moldova	2.41	0.06
	Russian Federation	1.86	-0.30
	Ukraine	1.86	-0.12
Europe, Western	Andorra	1.54	-0.16
	Austria	1.47	-0.38
	Belgium	1.58	-0.08
	Cyprus	2.38	-0.28
	Denmark	1.62	-0.12
	Finland	1.72	-0.11
	France	1.76	-0.16
	Germany	1.38	-0.11
	Greece	1.46	-0.14
	Iceland	2.15	-0.24

	Ireland	2.06	-0.22
	Israel	3.01	-0.30
	Italy	1.32	-0.10
	Luxembourg	1.54	-0.16
	Malta	2.05	-0.14
	Netherlands	1.56	-0.07
	Norway	1.83	-0.13
	Portugal	1.57	-0.19
	Spain	1.38	-0.10
	Sweden	1.95	-0.09
	Switzerland	1.54	-0.07
	United Kingdom	1.84	-0.06
Latin America, Andean	Bolivia	4.92	-0.91
	Ecuador	3.75	-0.82
	Peru	3.88	-0.71
Latin America, Central	Colombia	3.14	-0.54
	Costa Rica	3.19	-0.13
	El Salvador	4.00	-0.93
	Guatemala	5.60	-1.12
	Honduras	5.18	-1.39
	Mexico	3.45	-0.64
	Nicaragua	4.79	-1.43
	Panama	3.06	-0.54
	Venezuela	3.48	-0.34
Latin America, Southern	Argentina	2.99	-0.31
	Chile	2.61	-0.30
	Uruguay	2.51	-0.26
Latin America, Tropical	Brazil	2.88	-0.70
	Paraguay	4.58	-1.67
North Africa / Middle East	Afghanistan	7.94	-0.05
	Algeria	4.79	-0.61
	Bahrain	3.77	-0.27
	Egypt	4.41	-0.93
	Iran, Islamic Republic of	4.88	-1.16
	Iraq	6.01	-0.47
	Jordan	5.88	-0.66
	Kuwait	2.83	-0.16
	Lebanon	3.18	-0.26
	Libyan Arab Jamahiriya	4.97	-0.78
	Morocco	4.11	-0.61
	Occupied Palestinian Territory	6.49	-0.74
	Oman	7.17	-0.53

	Qatar	4.29	-0.21
	Saudi Arabia	5.89	-0.50
	Syrian Arab Republic	5.42	-0.93
	Tunisia	3.70	-0.54
	Turkey	3.28	-0.47
	United Arab Emirates	4.41	-0.19
	Yemen	8.64	-0.71
North America, High Income	Canada	1.65	-0.08
	United States	1.93	0.06
Oceania	Fiji	3.46	-0.43
	Kiribati	4.79	-0.76
	Marshall Islands	4.79	-0.54
	Micronesia, Federated States of	5.02	-0.89
	Papua New Guinea	4.79	-0.46
	Samoa	4.77	-0.47
	Solomon Islands	5.88	-0.59
	Tonga	4.68	-0.67
	Vanuatu	4.95	-0.63
Sub-Saharan Africa, Central	Angola	7.16	-0.23
	Central African Republic	5.80	-0.08
	Congo	5.41	-0.23
	Congo, the Democratic Republic of the	7.04	-0.19
	Equatorial Guinea	5.89	-0.35
	Gabon	5.13	-0.20
Sub-Saharan Africa, East	Burundi	6.48	-0.04
	Comoros	5.71	-0.38
	Djibouti	6.17	-0.64
	Eritrea	6.21	-0.16
	Ethiopia	7.03	-0.97
	Kenya	6.12	-0.75
	Madagascar	6.23	-1.08
	Malawi	6.79	-1.86
	Mozambique	6.24	-0.55
	Rwanda	7.16	-1.18
	Somalia	6.61	-0.03
	Sudan	5.97	-0.05
	Tanzania, United Republic of	6.23	-0.98
	Uganda	7.08	-0.75
	Zambia	6.50	-0.95
Sub-Saharan Africa, Southern	Botswana	4.76	-0.57
	Lesotho	4.95	-0.84

	Namibia	5.28	-1.67
	South Africa	3.72	-0.58
	Swaziland	5.78	-0.99
	Zimbabwe	5.28	-0.73
Sub-Saharan Africa, West	Benin	6.75	-0.25
	Burkina Faso	6.85	-0.46
	Cameroon	5.94	-0.65
	Cape Verde	5.34	-1.36
	Chad	6.68	-0.04
	Côte d'Ivoire	6.32	-0.34
	Gambia	6.09	-0.43
	Ghana	5.66	-0.39
	Guinea	6.75	-0.26
	Guinea-Bissau	6.62	-0.67
	Liberia	6.55	-0.03
	Mali	7.06	-0.15
	Mauritania	5.95	-0.20
	Niger	7.80	-0.15
	Nigeria	6.42	-0.34
	Sao Tome and Principe	5.46	-0.41
	Senegal	6.68	-0.29
	Sierra Leone	5.68	-0.13
	Togo	6.34	-0.35