National, regional, and global rates and trends in contraceptive prevalence and unmet need for family planning between 1990 and 2015: a systematic and comprehensive analysis

Leontine Alkema, Vladimira Kantorova, Clare Menozzi, Ann Biddlecom

Summary

Background Expansion of access to contraception and reduction of unmet need for family planning are key components to improve reproductive health, but scarce data and variability in data sources create difficulties in monitoring of progress for these outcomes. We estimated and projected indicators of contraceptive prevalence and unmet need for family planning from 1990 to 2015.

Methods We obtained data from nationally representative surveys, for women aged 15–49 years who were married or in a union. Estimates were based on 930 observations of contraceptive prevalence between 1950 and 2011 from 194 countries or areas, and 306 observations of unmet need for family planning from 111 countries or areas. We used a Bayesian hierarchical model combined with country-specific time trends to yield estimates of these indicators and uncertainty assessments. The model accounted for differences by data source, sample population, and contraceptive methods included in the measure.

Findings Worldwide, contraceptive prevalence increased from 54·8% (95% uncertainty interval 52·3–57·1) in 1990, to 63·3% (60·4–66·0) in 2010, and unmet need for family planning decreased from 15·4% (14·1–16·9) in 1990, to 12·3% (10·9–13·9) in 2010. Almost all subregions, except for those where contraceptive prevalence was already high in 1990, had an increase in contraceptive prevalence and a decrease in unmet need for family planning between 1990 and 2010, although the pace of change over time varied between countries and subregions. In 2010, 146 million (130–166 million) women worldwide aged 15–49 years who were married or in a union had an unmet need for family planning. The absolute number of married women who either use contraception or who have an unmet need for family planning is projected to grow from 900 million (876–922 million) in 2010 to 962 million (927–992 million) in 2015, and will increase in most developing countries.

Interpretation Trends in contraceptive prevalence and unmet need for family planning, and the projected growth in the number of potential contraceptive users indicate that increased investment is necessary to meet demand for contraceptive methods and improve reproductive health worldwide.

Funding United Nations Population Division and National University of Singapore.

Introduction

Provision of access to voluntary family planning, especially effective contraceptive methods, for women and men is not only crucial to directly improve reproductive health outcomes, but is also positively associated with improvements in health, schooling, and economic outcomes.[1–3] Monitoring of family planning rates and trends globally, regionally, and nationally draws attention to progress towards achievement of universal access to reproductive health—a target in Millennium Development Goal (MDG) 5 to improve maternal health—and indicates the investments needed and progress expected from programmatic efforts to expand access to effective contraceptive methods.[4,5] Global efforts to improve women's and children's health and increase access to family planning information, services, and supplies[6,7] mean a heightened demand for frequent, comparable,

and timely estimates of family planning indicators to monitor progress.

However, analysis of family planning levels and trends is challenging because the number of observations per country are scarce or not recent. In a new compilation of data for family planning indicators for 194 countries and areas, 43% of countries and areas had no data for unmet need for family planning and 65% of countries had no data for unmet need since 2005.[8] Methodological differences between data sources, both within and across countries, also complicate the derivation of reliable estimates of trends in family planning indicators.

Studies in which investigators have assessed rates and trends in contraceptive prevalence and unmet family planning need across many countries have tended to use straightforward approaches. Such methods include use of the most recent observation as indicative of present rates or application of linear extrapolation based on the

Department of Statistics and Applied Probability and the Saw Swee Hock School of Public Health, National University of Singapore, Singapore (L Alkema PhD)**; and United Nations Population Division, Department of Economic and Social Affairs, New York, NY, USA** (V Kantorova PhD, C Menozzi Laurea, A Biddlecom PhD)

Correspondence to:
Dr Ann Biddlecom, United Nations Population Division, Department of Economic and Social Affairs, DC2-1988, New York, NY 10017, USA
biddlecom@un.org

two most recent observations,[5,9–11] use of a spline-based extrapolation method,[1] or restriction of the data sources or region examined.[5,12] Investigators of some studies derived future trends in contraceptive prevalence from projected fertility rates.[13,14] An annual series of estimates has not been published. In this report, we aimed to estimate and project national, regional, and global trends in contraceptive prevalence and unmet need for family planning from 1990 to 2015, the period during which the MDGs are to be met.

Methods

Data

Contraceptive prevalence is measured as the percentage of women who report themselves or their partners as using at least one contraceptive method of any type (modern or traditional; appendix p 5). Unmet need for family planning is defined as the percentage of women who want to stop or delay childbearing but who are not using any method of contraception to prevent pregnancy. Observations of unmet need for family planning in our database are, whenever possible, based on the revised algorithm of the indicator designed to improve comparability within and across countries.[15] The estimates in this report are for women of reproductive age (15–49 years) who were currently married or in a union (referred to as married/in-union women of reproductive age [MWRA]).

We used the United Nations Population Division database for contraceptive prevalence and unmet need for family planning (appendix pp 5–7).[8] Data were obtained from nationally representative household surveys, especially those from international survey programmes, such as the Demographic and Health Surveys, the Multiple Indicator Cluster Surveys, and the Reproductive Health Surveys. All observations were assessed with respect to the sample population other than MWRA (eg, observations that represent women in different age groups or all sexually active women), and other sample population biases (eg, exclusion of a region of a country or use of a different categorisation of contraceptive method use). The estimates presented in this report are based on 930 observations of contraceptive prevalence between 1950 and 2011 from 194 countries or areas, and 306 observations of unmet need for family planning from 111 countries or areas.

Statistical analysis

We developed a statistical model to estimate trends in contraceptive prevalence and unmet need over time for each country. The modelling approach combined systematic trends in prevalence with a flexible time-series model that captured fluctuations around the main trends within countries. The appendix (pp 9–34) shows details of the model specification, implementation, and validation.

For every country, we modelled the expected transition from low to higher contraceptive prevalence with a logistic growth curve. The logistic function is appropriate to represent social diffusion processes, such as the adoption of contraceptive methods,[16] when uptake is expected to increase initially, up to a maximum rate, after which the rate decreases when prevalence reaches higher values.[17] To allow for deviations from a smooth pathway of growth in prevalence, as indicated by the data, the logistic growth curve was combined with a time-series model. The trend in use of modern contraceptive methods as a proportion of total contraceptive prevalence was modelled in a similar way, with a country-specific logistic growth curve combined with a time-series model.

We used a Bayesian hierarchical model[18,19] to estimate the parameters of the logistic growth curves (its expected final value, the pace of adoption, and the timepoint when the rate of uptake is at its peak) for each country, such that the estimates were based on the observations for the country of interest and the subregional, regional, and global experience. This approach means that the fewer the number of observations for the country of interest, the more its estimates are driven by the experience of other countries, whereas for countries with many observations, the results are driven by those observations.

Total contraceptive prevalence was used to predict the percentage of women with an unmet need for family planning based on an expected (and empirically observed) statistical relation between total contraceptive prevalence and unmet need (appendix p 13). Our model assumed that as total contraceptive prevalence starts to increase from very low values, the percentage of women with unmet need (among women who were not using contraception) increases, as new norms about family planning and family size spread and take hold. After a period of increase, unmet need is assumed to decrease as more women use contraception and family planning information and services expand to meet demand. Country-specific estimates of unmet need were obtained by modelling of the general relation between contraceptive prevalence and unmet need with a hierarchical approach and a time-series model to capture country-specific changes in trends of unmet need. For countries without data for unmet need, estimates for this measure were based on each country's estimates of total contraceptive prevalence, the relation between contraceptive prevalence and unmet need, and the distribution of country-specific amounts of unmet need in the respective subregion.

Estimates of contraceptive prevalence were based on all available data in a country, including data from before 1990. We included additional parameters in the model to account for the misclassification of women in a subset of surveys and to account for potential differences in prevalence outcomes associated with surveys in which the sampled population was not representative of the group of MWRA but instead consisted of women in different age groups, all sexually active women irrespective of marital status, or when the sample was not nationally representative (appendix pp 15–21). We estimated error

variance parameters by type of data source to account for differences in data quality between the surveys.

We used a Markov Chain Monte Carlo (MCMC) algorithm to generate samples of the posterior distributions of the parameters.[20] This approach produced a set of trajectories of contraceptive prevalence and unmet need for family planning for each country. We produced functions of these outcomes to measure other indicators, such as the percentage of demand for family planning that is satisfied (the ratio of contraceptive prevalence to the sum of contraceptive prevalence and the unmet need for family planning).

We computed 95% uncertainty intervals for all indicators of interest with the 2·5th and 97·5th percentiles of the posterior distributions. For reported changes in values, posterior probabilities of an increase (PPI) or decrease (PPD, where PPD=1–PPI) were calculated. These probabilities indicate the amount of certainty for the reported change: a higher posterior probability corresponds to greater certainty about the direction of the change. Significant changes refer to changes for which the PPI or PPD is greater than 0·95. The MCMC sampling algorithm was implemented with JAGS 3.2.0 Open Source software,[21] and the analysis was done in R (version 2.15).[22] Software programs and data are available from the authors.

Role of the funding source

The sponsors of the study had no role in the study design, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all data in the study and had final responsibility for the decision to submit for publication.

Results

Between 1990 and 2010, contraceptive prevalence in MWRA increased worldwide, in developing countries as a group, and in most subregions except for those where contraceptive prevalence was already high (figure 1 and table 1). Globally, contraceptive prevalence rose from 54·8% (95% uncertainty interval 52·3–57·1) in 1990, to 63·3% (60·4–66·0) in 2010, or 8·5 percentage points (4·7–12·1, PPI>0·99). This increase was driven mainly by a rise in contraceptive prevalence in developing countries, from 51·8% (48·8–54·6) in 1990, to 62·0% (58·7–65·0) in 2010; we recorded a larger absolute increase in contraceptive prevalence when China is excluded (table 1). Most of this growth over time occurred in the 1990s. The increase in contraceptive prevalence globally and in developing countries slowed significantly (PPD>0·95) in 2000–10 compared with the 1990s, and the rate of change for 2005–10 was similar to that for 2000–05 (appendix pp 41–44).

Trends over time in subregions varied greatly, ranging from slight decreases in western Europe and Australia and New Zealand to an increase of 20·6 percentage points (18·0–23·1) in eastern Africa (table 1). Large increases in contraceptive prevalence were estimated
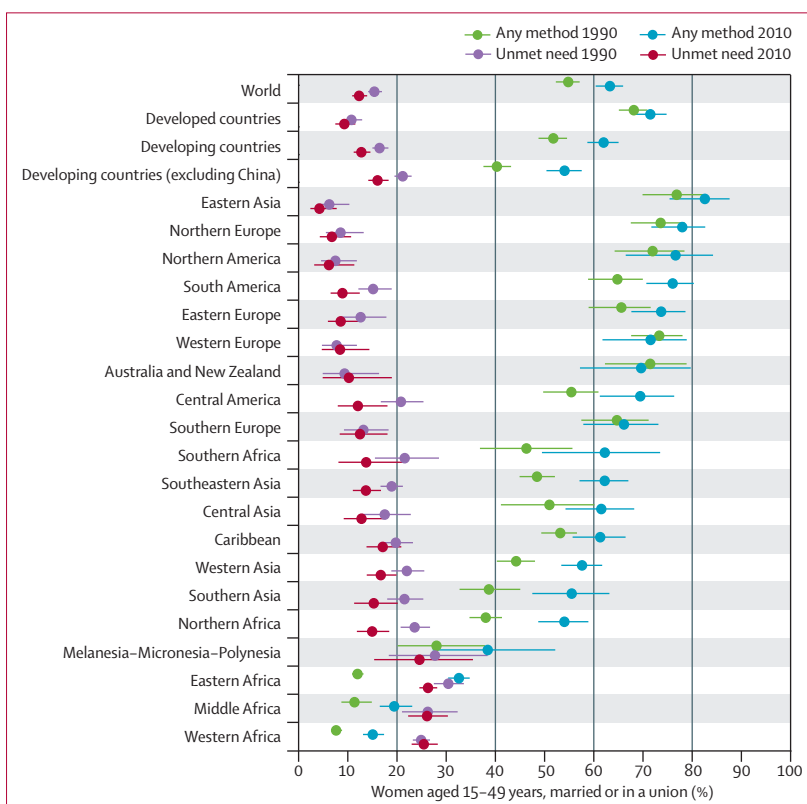

Figure 1: **Percentage of women aged 15–49 years who were married or in a union who used a contraceptive method or who had an unmet need for family planning in 1990 and 2010, by world, development group, and subregion**
Horizontal lines represent the 95% uncertainty intervals.

even for some subregions that had already reached high levels in 1990. In Central America and South America, where more than half of MWRA were using contraception in 1990, contraceptive prevalence by 2010 rose by 14·1 percentage points (4·1–23·0) and 11·2 percentage points (3·8–18·6), respectively. The largest absolute increases in contraceptive prevalence (>15 percentage points, PPI>0·95) were in southern Asia and three subregions of Africa (eastern, northern, and southern Africa; table 1). However, in two subregions of Africa, contraceptive prevalence still remained low: by 2010, fewer than one in five MWRA used any contraceptive method in middle and western Africa (table 1). For comparison, eastern and middle Africa had similar contraceptive prevalences in 1990, yet 20 years later middle Africa's rate had risen by just 8·0 percentage points (3·7–12·4, PPI>0·99) whereas that of eastern Africa had risen by more than twice this amount (table 1).

Nationally, in the 194 countries with any data available, estimates of contraceptive prevalence in 2010 were less than 10% in four African countries (Chad, Mali, Sierra Leone, and South Sudan) and more than 80% in China, Costa Rica, Hong Kong, Malta, Norway, and the UK (table 1). In 81 of the 194 countries, contraceptive prevalence increased significantly from 1990 to 2010 (PPI>0·95) and

	Contraceptive prevalence (% [95% uncertainty interval])			Unmet need (% [95% uncertainty interval])		
	1990	2010	Change 1990–2010	1990	2010	Change 1990–2010
World	54·8 (52·3–57·1)	63·3 (60·4–66·0)	8·5 (4·7 to 12·1)*	15·4 (14·1–16·9)	12·3 (10·9–13·9)	–3·1 (–5·0 to –1·1)†
Developed countries	68·1 (65·1–70·9)	71·5 (67·8–74·8)	3·3 (–0·3 to 6·9)‡	10·7 (8·9–12·9)	9·3 (7·5–11·5)	–1·4 (–3·5 to 0·7)§
Developing countries	51·8 (48·8–54·6)	62·0 (58·7–65·0)	10·3 (5·9 to 14·5)*	16·5 (15·0–18·3)	12·8 (11·2–14·6)	–3·7 (–5·9 to –1·4)†
Developing countries (excluding China)	40·3 (37·6–43·2)	54·1 (50·4–57·5)	13·8 (9·0 to 18·2)*	21·2 (19·5–23·0)	16·0 (14·2–18·3)	–5·1 (–7·7 to –2·4)†
Africa	17·4 (16·5–18·5)	30·9 (29·3–32·5)	13·5 (11·6 to 15·3)*	26·4 (25·0–28·0)	23·2 (21·9–24·6)	–3·2 (–5·1 to –1·3)†
Eastern Africa	12·0 (10·9–13·2)	32·6 (30·4–34·8)	20·6 (18·0 to 23·1)*	30·4 (27·5–33·6)	26·3 (24·5–28·2)	–4·1 (–7·7 to –0·8)†
Burundi	8·4 (4·9–13·8)	21·9 (18·4–26·1)	13·4 (7·2 to 19·1)*	27·3 (21·3–34·3)	29·2 (20·0–39·7)	1·7 (–8·0 to 12·6)
Comoros	14·0 (6·9–24·9)	39·8 (22·7–61·7)	25·2 (4·9 to 50·3)*	35·4 (26·9–44·5)	27·9 (15·4–39·6)	–7·5 (–22·0 to 5·7)
Djibouti	3·3 (0·8–9·9)	23·8 (14·4–37·5)	20·1 (8·2 to 35·3)*	28·7 (16·7–44·3)	29·9 (18·6–43·2)	1·1 (–11·4 to 13·0)
Eritrea	5·4 (2·8–9·8)	15·2 (8·1–27·2)	9·6 (1·3 to 22·3)‡	28·9 (21·8–37·1)	29·7 (21·7–38·8)	0·7 (–10·1 to 11·8)
Ethiopia	2·6 (1·6–4·2)	26·9 (22·8–31·1)	24·2 (19·9 to 28·6)*	32·1 (23·0–42·6)	27·2 (24·3–31·3)	–4·8 (–15·8 to 4·6)
Kenya	28·5 (22·5–35·4)	47·3 (37·7–57·0)	18·7 (7·0 to 30·2)*	36·5 (31·6–41·6)	24·7 (18·4–31·3)	–11·8 (–19·9 to –3·8)†
Madagascar	14·3 (9·3–21·4)	40·4 (31·1–50·9)	25·9 (14·0 to 38·1)*	31 (25·4–37·1)	20·5 (15·4–25·9)	–10·6 (–18·5 to –2·8)†
Malawi	11·6 (8·4–15·9)	45·0 (40·2–50·1)	33·4 (26·9 to 39·5)*	35·2 (29·2–41·6)	26·9 (23·4–30·2)	–8·4 (–15·5 to –1·4)†
Mauritius	75·2 (67·7–81·6)	76·0 (61·9–86·2)	0·8 (–14·3 to 13·1)	6·8 (3·6–11·5)	6·4 (2·4–14·3)	–0·4 (–6·0 to 7·4)
Mozambique	4 (1·9–8·0)	13·2 (10·3–16·9)	9·1 (4·3 to 13·4)*	24·3 (17·4–33·1)	23·8 (17–31·9)	–0·6 (–11·2 to 9·2)
Reunion	71·7 (67·5–75·5)	72·3 (54·4–85·6)	0·6 (–17·0 to 14·3)	9·4 (5·4–14·9)	8·9 (3·0–20·3)	–0·3 (–7·5 to 10·3)
Rwanda	17·9 (12·9–24·4)	49·5 (43·6–54·8)	31·5 (23·1 to 38·9)*	37·2 (31·3–43·4)	20·6 (17·7–24·2)	–16·6 (–23·5 to –9·7)†
Somalia	4·4 (1·2–14·2)	18·8 (8·9–37·3)	13·6 (3·2 to 31·4)*	29·0 (17·2–44·6)	30·2 (18·4–44·2)	1·1 (–11·5 to 13·2)
South Sudan	0·6 (0·1–2·4)	4·9 (1·8–9·2)	4·1 (1·1 to 8·5)*	27·7 (16·1–43·5)	29·1 (17·1–44·8)	1·4 (–10·8 to 13·5)
Uganda	6·9 (4·8–9·8)	28·4 (23·0–34·4)	21·4 (15·3 to 28·0)*	32·2 (24·3–40·8)	35·6 (28·9–42·6)	3·3 (–7·2 to 13·8)
Tanzania	11·1 (8·1–15·2)	34·3 (27·4–42·2)	23·2 (15·1 to 31·8)*	27·2 (22·9–31·8)	25·6 (21·0–30·4)	–1·6 (–8·0 to 4·7)
Zambia	14·5 (9·8–21·3)	43·2 (32·0–55·4)	28·5 (15·0 to 42·1)*	29·3 (24·0–35·1)	25·1 (17·7–32·2)	–4·2 (–13·5 to 4·9)
Zimbabwe	44·3 (36·5–52·4)	58·9 (53·9–63·7)	14·6 (5·0 to 23·7)*	21·6 (16·2–27·9)	15·9 (11·8–20·8)	–5·8 (–13·1 to 1·6)§
Middle Africa	11·4 (8·7–14·9)	19·4 (16·5–23·1)	8·0 (3·7 to 12·4)*	26·3 (21·0–32·3)	26·1 (22·3–30·3)	–0·1 (–6·3 to 5·5)
Angola	4·2 (1·7–9·7)	12·9 (6·2–26·0)	8·4 (0·9 to 21·6)‡	27·4 (15·7–42·9)	28·8 (17·2–43·5)	1·3 (–10·8 to 13·0)
Cameroon	12·1 (8·7–16·7)	25·6 (19·9–32·3)	13·4 (6·3 to 21·1)*	22·9 (19·0–27·3)	22·2 (16·3–29·1)	–0·7 (–7·9 to 7·1)
Central African Republic	11·8 (6·4–19·8)	26·3 (15·6–41·5)	14·3 (1·9 to 30·6)‡	21·3 (15·7–28·1)	22·7 (14·9–32·6)	1·4 (–7·7 to 11·8)
Chad	1·9 (0·8–4·2)	5·5 (3·0–10·2)	3·5 (0·3 to 8·4)‡	19·8 (14·1–27·3)	21·8 (15·7–29·4)	1·9 (–7·1 to 11·1)
Congo (Brazzaville)	24·6 (9·8–45·4)	44·6 (36·2–53·6)	19·8 (–1·8 to 36·8)‡	25·4 (16·8–35·4)	19·8 (14·1–26·5)	–5·5 (–16·1 to 4·6)
Democratic Republic of the Congo	13·9 (9·0–20·6)	19·3 (14·9–25·2)	5·5 (–2·1 to 12·9)¶	28·4 (19·0–39·4)	27·8 (22·0–34·2)	–0·6 (–12·1 to 9·6)
Equatorial Guinea	7·5 (2·6–18·2)	19·4 (9·3–37·3)	11·3 (–0·4 to 29·3)‡	27·8 (16·3–43·4)	28·4 (17·0–42·3)	0·4 (–11·8 to 11·9)
Gabon	21·0 (9·6–37·5)	38·5 (22·3–58·7)	16·9 (–3·8 to 40·6)¶	30·0 (21·4–39·7)	25·5 (14·7–35·9)	–4·5 (–17·9 to 7·6)
São Tomé and Princípe	21·0 (9·9–37·5)	37·8 (29·2–47·6)	16·4 (–1·5 to 32·3)‡	37·9 (26·7–49·4)	36·6 (29·4–43·4)	–1·4 (–14·1 to 11·1)
Northern Africa	38·0 (34·7–41·3)	54·0 (48·7–58·9)	16·0 (9·7 to 21·8)*	23·6 (20·7–26·7)	14·9 (11·8–18·4)	–8·6 (–12·6 to –4·5)†
Algeria	45·7 (37·7–54·1)	62·6 (49·5–74·2)	17·0 (1·3 to 30·8)‡	21·6 (12·9–32·3)	13·2 (6·1–23·6)	–8·2 (–18·5 to 2·0)§
Egypt	43·3 (37·2–49·7)	61·5 (52·1–69·9)	18·2 (7·1 to 28·6)*	23·3 (18·7–28·4)	11·5 (7·5–16·5)	–11·8 (–18·3 to –5·1)†
Libya	38·4 (24·3–54·0)	56·1 (35·4–75·5)	17·4 (–7·0 to 42·0)¶	24·3 (13·9–37·5)	16·3 (6·0–30·5)	–7·7 (–22·2 to 5·7)
Morocco	39·6 (32·5–46·9)	65·4 (50·3–78·3)	25·7 (9·2 to 40·7)*	22·5 (18·3–26·9)	10·9 (5·1–19·4)	–11·5 (–19·0 to –2·4)†
Sudan	8·5 (6·6–10·9)	11·8 (7·9–17·3)	3·3 (–1·3 to 9·1)¶	28·9 (24·2–33·9)	29·0 (20·0–39·2)	0·2 (–9·4 to 10·4)
Tunisia	52·9 (44·8–61·0)	64·1 (50·8–75·8)	11·1 (–4·3 to 25·4)¶	18·0 (10·9–27·1)	12·3 (5·8–22·1)	–5·5 (–15·2 to 4·1)
Southern Africa	46·3 (36·9–55·7)	62·2 (49·5–73·5)	15·9 (0·0 to 30·8)‡	21·6 (15·5–28·5)	13·7 (8·1–21·3)	–7·7 (–16·7 to 1·7)§
Botswana	34·7 (27·0–43·2)	53·1 (38·9–66·6)	18·3 (2·6 to 33·3)‡	26·4 (21·1–32·2)	18·6 (10·2–29·1)	–7·8 (–17·3 to 2·8)§
Lesotho	20·7 (15·0–27·8)	47·9 (40·0–55·9)	27·0 (16·7 to 36·9)*	33·4 (24·3–43·5)	23·4 (18·5–28·6)	–10·0 (–21·2 to 0·3)‖
Namibia	29·8 (23·1–37·4)	55·9 (43·2–67·8)	26·0 (11·1 to 40·1)*	23·9 (19·1–29·2)	19·1 (11·8–27·3)	–4·9 (–13·9 to 4·7)
South Africa	49·5 (38·6–60·3)	63·7 (48·9–76·7)	14·1 (–4·2 to 31·4)¶	20·2 (13·3–28·2)	12·7 (6·1–21·4)	–7·4 (–17·8 to 3·6)§
Swaziland	21·7 (16·1–28·4)	62·6 (56·1–67·7)	40·8 (31·6 to 48·6)*	34·7 (24·6–45·3)	16·6 (12·4–21·9)	–18·0 (–29·0 to –7·0)†
Western Africa	7·6 (6·7–8·8)	15·1 (13·1–17·4)	7·4 (5·2 to 9·9)*	24·9 (23·2–26·7)	25·4 (23·0–28·3)	0·5 (–2·4 to 3·7)
Benin	10·9 (6·7–17·3)	19·4 (12·1–29·8)	8·4 (–1·0 to 19·7)‡	28·1 (20·9–36·6)	28·3 (22·1–35·5)	0·2 (–10·0 to 9·9)
Burkina Faso	6·8 (4·3–10·5)	16·8 (14·1–20·0)	10·0 (5·5 to 14·1)*	26·5 (21·3–32·6)	30·2 (22·6–38·7)	3·7 (–5·7 to 13·4)
Cape Verde	29·4 (22·3–37·3)	62·4 (48·5–75·0)	32·9 (17·1 to 47·2)*	30·1 (21·6–39·7)	15·3 (8·2–24·2)	–14·8 (–26·5 to –2·8)†

(Continues on next page)

	Contraceptive prevalence (% [95% uncertainty interval])			Unmet need (% [95% uncertainty interval])		
	1990	2010	Change 1990–2010	1990	2010	Change 1990–2010
(Continued from previous page)						
Côte d'Ivoire	7·7 (4·9–11·9)	17·6 (10·4–28·8)	9·9 (1·7 to 21·2)*	29·9 (23·0–37·6)	30·4 (21·6–40·1)	0·5 (–10·5 to 11·6)
The Gambia	10·2 (7·8–13·2)	20·8 (11·6–34·5)	10·6 (1·1 to 24·5)‡	31·6 (19·1–46·8)	31·3 (19·5–45·5)	–0·3 (–12·5 to 11·2)
Ghana	15·1 (11·7–19·2)	24·2 (17·6–32·2)	9·0 (1·2 to 17·7)‡	36·0 (31·2–41·1)	35·6 (29·8–41·7)	–0·4 (–8·1 to 7·2)
Guinea	1·8 (1·0–3·0)	10·8 (6·2–18·7)	8·9 (4·2 to 16·9)*	24·6 (19·5–30·4)	24·6 (18·3–32)	0·0 (–8·2 to 8·8)
Guinea–Bissau	5·1 (1·8–12·3)	13·6 (8·6–21·0)	8·3 (0·8 to 16·2)‡	28·7 (16·8–44·2)	30·3 (18·6–44·4)	1·4 (–11·3 to 13·5)
Liberia	7·0 (4·5–11·0)	12·9 (8·6–19·0)	5·8 (0·3 to 12·3)‡	33·1 (25·9–40·8)	35·0 (28·2–42·2)	1·8 (–7·8 to 11·6)
Mali	3·9 (2·4–6·0)	9·3 (5·8–14·9)	5·4 (1·3 to 11·0)*	26·1 (20·9–31·8)	29·2 (22·5–36·8)	3·1 (–5·6 to 12·0)
Mauritania	3·2 (2·1–4·7)	12·4 (7·6–19·8)	9·2 (4·1 to 16·7)*	30·1 (21·0–41·0)	31·9 (23·0–42·0)	1·7 (–10·7 to 14·0)
Niger	3·9 (2·5–6·2)	12·3 (7·5–19·9)	8·3 (2·9 to 16·0)*	19·5 (15·4–24·5)	19·3 (14·3–25·4)	–0·2 (–7·2 to 6·9)
Nigeria	7·2 (5·7–9·4)	14·4 (11·2–18·4)	7·1 (3·3 to 11·4)*	21·2 (18·5–24·1)	21·2 (17·1–26·3)	0·1 (–5·0 to 5·6)
Senegal	7·2 (5·1–10·0)	12·7 (10·6–15·3)	5·5 (2·0 to 8·8)*	33·3 (28·0–38·9)	33·2 (25·5–41·2)	–0·2 (–9·3 to 9·2)
Sierra Leone	2·7 (1·5–4·9)	7·6 (5·2–11·3)	4·8 (1·8 to 8·7)*	28·4 (18·9–40·4)	29·9 (24·2–36·3)	1·5 (–10·7 to 12·1)
Togo	25·0 (17·2–34·7)	16·7 (13·5–20·9)	–8·3 (–18·7 to 0·5)‖	42·4 (35·6–49·1)	36·4 (27·1–45·9)	–6·0 (–17·3 to 5·1)
Asia	56·7 (52·9–60·1)	66·8 (62·5–70·7)	10·1 (4·6 to 15·6)*	14·6 (12·8–16·9)	11·0 (9·0–13·4)	–3·7 (–6·5 to –0·7)†
Central Asia	51 (41·1–60·1)	61·5 (54·2–68·2)	10·6 (–1·5 to 23·0)‡	17·5 (12·9–22·8)	12·8 (9·2–17·3)	–4·7 (–11·0 to 1·6)§
Kazakhstan	55·1 (39·9–68·9)	59·3 (45·2–72·0)	4·1 (–15·5 to 24·1)	17·8 (10·1–26·9)	15·0 (7·9–24·4)	–2·7 (–14·2 to 9·0)
Kyrgyzstan	53·4 (35·4–69·6)	56·4 (41·8–70·4)	2·9 (–19·0 to 26·4)	14·9 (7·6–23·7)	13·9 (7·1–22·9)	–0·9 (–12·2 to 10·5)
Tajikistan	28·0 (10·7–50·9)	41·9 (31·1–53·6)	13·7 (–11·6 to 36·8)	26·1 (14·8–40·1)	22·4 (13·0–34·8)	–3·6 (–16·0 to 8·2)
Turkmenistan	54·2 (31·2–72·9)	65·7 (48·2–79·8)	11·0 (–13·6 to 39·7)	14·3 (6·1–24·7)	9·4 (3·9–18·4)	–4·6 (–17·2 to 7·0)
Uzbekistan	52·0 (34·4–67·5)	67·3 (55·0–78·2)	15·2 (–5·0 to 37·2)¶	15·9 (8·6–25·0)	9·4 (4·5–17·0)	–6·3 (–16·6 to 3·8)
Eastern Asia	76·9 (69·9–82·3)	82·6 (75·4–87·6)	5·7 (–3·1 to 14·4)¶	6·2 (3·7–10·3)	4·2 (2·4–7·7)	–1·9 (–5·9 to 1·7)
China	78·5 (70·6–84·6)	84·4 (76·6–90·0)	5·9 (–3·8 to 15·6)	5·4 (2·8–9·9)	3·4 (1·5–7·2)	–2·0 (–6·4 to 1·9)
Hong Kong	83·9 (79·4–87·6)	80·2 (72·2–86·4)	–3·7 (–12·3 to 3·8)	3·8 (1·8–7·0)	5·1 (2·2–10·3)	1·3 (–1·9 to 5·9)
Japan	58·8 (54·8–62·7)	54·4 (41·1–67·2)	–4·4 (–18·3 to 9·0)	15·2 (8·8–22·9)	17·2 (8·6–28·9)	2·1 (–6·6 to 12·0)
Mongolia	54·7 (39·8–67·7)	58·5 (49·0–67·5)	3·7 (–12·4 to 21·8)	15·0 (7·8–25·2)	13·2 (7·6–20·6)	–1·8 (–12·1 to 7·0)
North Korea	61·5 (53·7–68·8)	69·5 (54·6–81·4)	7·9 (–9·0 to 22·7)	13·7 (7·4–22·3)	9·6 (3·8–20·0)	–3·9 (–12·8 to 6·0)
South Korea	77·2 (70·3–82·7)	79·1 (71·8–84·7)	1·9 (–4·8 to 8·5)	6·3 (3·0–11·6)	5·5 (2·5–10·7)	–0·7 (–4·8 to 3·2)
Southeastern Asia	48·5 (44·9–52·1)	62·2 (57·1–67·0)	13·8 (7·4 to 19·8)*	18·9 (16·6–21·2)	13·7 (11·0–16·7)	–5·2 (–8·7 to –1·5)†
Burma	16·2 (12·1–21·2)	45·5 (36·4–54·8)	29·2 (18·7 to 39·9)*	25·9 (17·1–36·8)	20·0 (12·4–29·5)	–5·7 (–16·2 to 4·1)
Cambodia	8·3 (3·9–16·7)	49·3 (43·7–55·0)	40·8 (30·5 to 48·6)*	32·0 (22·6–42·7)	23·6 (20·2–27·0)	–8·4 (–19·7 to 1·4)‖
Indonesia	48·8 (42·5–55·2)	60·9 (49·9–70·9)	12·1 (–0·5 to 24·0)‡	17·4 (14·0–21·0)	13·3 (8·2–19·7)	–4·1 (–10·3 to 3·2)
Laos	14·0 (8·7–21·6)	46·5 (33·2–60·1)	32·4 (16·6 to 48·1)*	32·1 (20·9–45·4)	23·0 (13·8–34·2)	–8·9 (–22·5 to 3·4)§
Malaysia	52·6 (41·3–64·1)	55·6 (40·0–70·4)	2·9 (–13·5 to 18·9)	18·6 (10·5–29·3)	17·0 (8·2–29·1)	–1·6 (–12·0 to 9·1)
Philippines	41·9 (32–52·9)	49·7 (43·2–56·1)	7·7 (–4·8 to 19·7)	27·9 (21·0–35·0)	22·6 (18·0–27·8)	–5·3 (–13·9 to 3·2)
Singapore	65·7 (54·9–74·9)	65·7 (47·0–80·6)	0·1 (–18·6 to 16·5)	11·9 (5·9–20·6)	11·8 (4·4–24·4)	–0·1 (–9·6 to 11·2)
Thailand	69·2 (60·0–76·9)	79·4 (73·9–83·8)	10·2 (0·8 to 20·4)‡	10·2 (6·6–15·0)	5·3 (3·0–8·9)	–4·8 (–10·3 to 0·0)‖
Timor–Leste	22·0 (16·9–28·1)	23·6 (18·5–29·6)	1·7 (–6·3 to 9·6)	19·2 (15·9–23·1)	29 (24·0–34·0)	9·8 (3·7 to 15·7)*
Vietnam	57·9 (49·9–65·7)	78·0 (74·1–81·7)	20·1 (11·3 to 29·1)*	16·8 (11·2–23·6)	6·2 (4·1–9·0)	–10·6 (–17·6 to –4·5)†
Southern Asia	38·7 (32·7–45·1)	55·5 (47·5–63·2)	16·8 (6·6 to 26·5)*	21·5 (18·0–25·3)	15·3 (11·3–20·1)	–6·2 (–11·7 to –0·2)‖
Afghanistan	5·5 (2·7–11·0)	22·2 (19·0–26·0)	16·6 (10·7 to 21·4)*	28·1 (16·4–44·1)	29·5 (18·2–43·0)	1·2 (–10·6 to 12·6)
Bangladesh	34·1 (26·4–42·2)	60·5 (53·8–66·7)	26·4 (16·3 to 36·0)*	25·5 (20·2–31·4)	12·9 (9·8–16·5)	–12·6 (–19·3 to –6·3)†
Bhutan	14·1 (7·1–25·1)	64·6 (58·3–69·8)	50·3 (37·4 to 59·8)*	29·4 (18·2–43·0)	12·5 (7·7–18·7)	–16·8 (–28·9 to –6·8)†
India	41·5 (33·7–49·8)	57·3 (46·3–67·6)	15·7 (2·0 to 28·7)‡	20·2 (15·6–25·2)	14·2 (8·8–20·8)	–6·0 (–13·3 to 2·0)§
Iran	55·7 (49·2–61·9)	72·6 (58·0–83·8)	17·0 (0·9 to 30·0)‡	17·1 (10·1–25·8)	8·4 (3·3–18·0)	–8·4 (–17·1 to 1·1)‖
Maldives	27·7 (21·5–35·1)	36·2 (29·3–44·2)	8·5 (–1·7 to 18·7)¶	30·1 (20·9–40·0)	28·3 (23·3–33·4)	–1·7 (–12·2 to 7·9)
Nepal	18·6 (14·2–23·9)	48·8 (42·0–55·8)	30·1 (21·5 to 38·5)*	33·6 (25·9–41·7)	26·3 (21·5–31·2)	–7·3 (–16·5 to 1·9)§
Pakistan	12·2 (10·3–14·6)	32·4 (23·2–43·1)	20·1 (10·8 to 31·0)*	30·2 (26·8–33·7)	25·9 (19·6–32·6)	–4·3 (–11·5 to 2·9)
Sri Lanka	65·9 (56·6–74·3)	71·5 (59·0–81·3)	5·4 (–9·5 to 19·0)	10·6 (6·8–15·5)	7·3 (3·7–12·6)	–3·2 (–9·5 to 3·3)
Western Asia	44·2 (40·3–48·1)	57·6 (53·4–61·7)	13·4 (7·7 to 19·0)*	22·0 (18·8–25·5)	16·7 (13·9–19·9)	–5·3 (–9·0 to –1·6)†
Armenia	52·1 (39·3–64·9)	55·2 (48·2–62·4)	3·1 (–11·5 to 17·6)	21·3 (13·1–30·9)	18·9 (13·5–25·0)	–2·4 (–13·4 to 7·4)

(Continues on next page)

	Contraceptive prevalence (% [95% uncertainty interval])			Unmet need (% [95% uncertainty interval])		
	1990	2010	Change 1990–2010	1990	2010	Change 1990–2010
(Continued from previous page)						
Azerbaijan	43·0 (22·5–65·0)	54·4 (40·5–67·9)	11·0 (–13·3 to 35·7)	20 (9·9–30·8)	14·8 (8·6–22·0)	–5·0 (–17·2 to 6·6)
Bahrain	55·2 (46·5–63·6)	66·4 (46·5–82·2)	11·1 (–9·6 to 28·9)	17·9 (10·4–27·5)	11·8 (4·0–25·2)	–5·7 (–16·8 to 6·5)
Georgia	32·5 (15·3–53·5)	52·1 (36·3–67·4)	19·0 (–4·1 to 42·4)¶	26·1 (15·2–38·8)	18·3 (9·4–29·6)	–7·6 (–20·7 to 4·6)
Iraq	17·5 (13·1–23·3)	50·5 (42·3–58·6)	33 (23·2 to 42·1)*	30·6 (18·7–45·0)	20·3 (12·1–30·4)	–10·2 (–22·0 to 0·4)‖
Israel	67·0 (51·9–79·0)	71·8 (49·5–87·2)	4·7 (–15·5 to 21·2)	11·5 (4·9–22·3)	9·1 (2·5–22·8)	–2·2 (–11·7 to 9·1)
Jordan	40·6 (35·3–46·6)	58·9 (51·2–66·4)	18·2 (8·6 to 27·4)*	26·0 (22·4–29·3)	14·0 (10·2–18·1)	–11·9 (–17·0 to –6·6)†
Kuwait	39·2 (30·6–48·4)	55·6 (37·4–72·5)	16·2 (–3·7 to 34·9)¶	25·5 (15·5–36·9)	17·4 (7·6–30·7)	–7·8 (–20·5 to 4·7)
Lebanon	62·8 (51·3–73·4)	62·0 (47·2–74·9)	–0·9 (–18·6 to 16·7)	13·7 (6·8–23·5)	14·1 (6·5–25·2)	0·4 (–10·2 to 11·4)
Occupied Palestinian Territory	39·8 (25·3–55·4)	54·3 (41·8–66·4)	14·2 (–5·5 to 34·3)¶	25·0 (14·2–37·8)	18·2 (9·8–29·3)	–6·6 (–19·0 to 5·3)
Oman	12·3 (8·9–16·9)	47·1 (29·3–66·6)	34·6 (16·3 to 54·7)*	30·4 (18·1–45·2)	21·6 (10·2–35·0)	–8·6 (–23·7 to 4·2)§
Qatar	35·8 (26·8–46·1)	53·3 (34·8–71·0)	17·3 (–3·2 to 37·6)‡	26·8 (16·5–38·8)	18·6 (8·2–32·2)	–7·9 (–21·6 to 4·6)
Saudi Arabia	25·9 (14·9–40·8)	34·9 (21·7–52·6)	9·0 (–10·4 to 30·1)	29·3 (18·1–43·0)	26·7 (15·2–39·8)	–2·6 (–15·3 to 8·8)
Syria	37·3 (27·7–48·3)	58·5 (44·2–71·2)	21·1 (3·6 to 37·2)*	26·1 (16–38·1)	15·9 (8·0–27·3)	–9·8 (–21·8 to 1·5)‖
Turkey	62·2 (54·4–69·5)	72·7 (64·2–79·9)	10·4 (–0·6 to 21·2)‡	14·7 (10·3–20·0)	8·7 (5·0–14·0)	–6 (–12·4 to 0·8)‖
United Arab Emirates	23·9 (13·6–37·8)	45·7 (26·2–67·6)	21·2 (–1·3 to 47·5)‡	29·7 (18·3–43·0)	22·2 (10·0–36·2)	–7·3 (–22·2 to 5·5)
Yemen	8·2 (5·6–11·7)	36·5 (24·4–50·9)	28·3 (15·5 to 42·9)*	37·8 (28·1–48·0)	31·6 (21·7–41·7)	–6·2 (–19·3 to 6·7)
Europe	68·1 (64·5–71·4)	72·0 (68·1–75·5)	3·9 (–0·5 to 8·1)‡	11·2 (8·9–14·0)	9·3 (7·3–11·7)	–1·9 (–4·5 to 0·6)§
Eastern Europe	65·6 (58·9–71·6)	73·7 (67·6–78·6)	8·0 (1·1 to 15·0)‡	12·6 (8·7–17·8)	8·6 (6·0–12·5)	–4·0 (–8·6 to 0·0)‖
Belarus	56·8 (41·2–70·3)	68·9 (55·0–80·2)	11·9 (–6·1 to 31·0)	17·1 (8·4–29·3)	10·7 (4·5–20·9)	–6·1 (–18·4 to 4·7)
Bulgaria	78 (66·2–86·8)	70·8 (52·5–84·5)	–6·8 (–25·4 to 8·5)	8·3 (3·6–16·7)	12·0 (4·4–25·2)	3·4 (–5·7 to 16·0)
Czech Republic	72·2 (61·7–80·6)	71·4 (52·9–84·7)	–0·8 (–18·8 to 14·3)	9·9 (5·2–17·3)	10·0 (3·7–21·8)	0·2 (–8·1 to 11·2)
Hungary	76·5 (66·7–83·8)	75·7 (57·3–88·2)	–0·7 (–18·4 to 12·8)	7·5 (3·7–13·9)	7·7 (2·4–19·1)	0·2 (–6·5 to 10·5)
Moldova	68·3 (52·5–80·5)	67·5 (54·9–78·1)	–0·6 (–17·8 to 17·7)	10·9 (4·8–20·8)	11·6 (6·2–19·2)	0·5 (–10·4 to 10·2)
Poland	70·0 (57·8–80·2)	70·4 (49·4–85·3)	0·3 (–19·4 to 16·4)	10·2 (4·5–19·1)	10 (3·1–23·4)	–0·1 (–9·0 to 11·3)
Romania	60·2 (45·9–72·8)	69·6 (54·8–81·3)	9·1 (–7·4 to 25·9)	13·6 (6·9–23·0)	9·5 (4·1–18·5)	–3·9 (–13·4 to 5·2)
Russia	63·6 (51·6–74·3)	78·6 (68·1–86·3)	14·7 (3·2 to 26·8)*	13·6 (6·7–23·7)	6·2 (2·6–13·1)	–7·1 (–15·9 to –0·4)‖
Slovakia	70·5 (58·1–80·7)	72 (52·9–85·6)	1·5 (–16·5 to 16·7)	10 (4·4–19·3)	9·2 (3·0–21·4)	–0·7 (–9·4 to 9·8)
Ukraine	66·6 (49·8–80·0)	67·0 (56·2–76·2)	0·2 (–16·0 to 19·2)	11·6 (5·0–22·1)	10·7 (6·3–16·6)	–0·9 (–11·9 to 7·7)
Northern Europe	73·6 (67·5–78·5)	78·0 (71·7–82·7)	4·3 (–1·1 to 9·7)¶	8·5 (5·5–13·2)	6·8 (4·3–10·7)	–1·7 (–5·1 to 1·2)
Denmark	73·2 (61·0–82·2)	72·1 (51·7–86·6)	–0·9 (–19·7 to 14·0)	8·6 (3·7–17·2)	9·0 (2·7–21·9)	0·4 (–7·4 to 11·2)
Estonia	63·5 (48·0–76·8)	65·7 (45·3–81·6)	1·9 (–18·2 to 21·2)	13·3 (5·8–25·1)	12·2 (4·2–25·8)	–1 (–12·6 to 10·9)
Finland	75·1 (64·7–83·2)	74·8 (54·8–88·0)	–0·1 (–18·6 to 13·5)	7·7 (3·5–14·9)	7·7 (2·3–19·9)	0 (–6·7 to 10·5)
Ireland	70·5 (53·7–83·0)	67·0 (51·5–79·5)	–3·4 (–20·6 to 14·9)	9·8 (3·7–21·4)	11·5 (4·8–23·1)	1·6 (–9·1 to 11·8)
Latvia	67·2 (52·2–79·3)	68·5 (49·0–83·4)	1·3 (–19·0 to 19·9)	12·4 (5·6–23·2)	11·5 (4·0–24·6)	–0·9 (–12·0 to 11·5)
Lithuania	54·5 (39·4–68·8)	59·6 (39·5–77·0)	4·8 (–16·3 to 25·2)	17·8 (9·1–29·3)	15·2 (6·0–28·7)	–2·4 (–14·4 to 10·3)
Norway	74·5 (63·4–83·0)	80·3 (67·3–89·0)	5·7 (–6·3 to 16·7)	7·9 (3·4–15·6)	5·4 (2·0–13·1)	–2·3 (–8·9 to 3·8)
Sweden	72·0 (57·8–82·5)	71·3 (52·3–85·2)	–0·6 (–19·3 to 15·8)	9·1 (3·8–19·0)	9·4 (3·0–21·8)	0·2 (–8·8 to 11·2)
UK	76·0 (66·9–83·1)	82·3 (73·4–88·6)	6·2 (–1·3 to 13·6)¶	7·2 (3·3–14·1)	4·7 (1·9–10·1)	–2·4 (–7·5 to 1·5)
Southern Europe	64·7 (57·5–71·2)	66·1 (57·9–73·1)	1·4 (–7·9 to 10·4)	13·2 (9·2–18·3)	12·5 (8·4–18·1)	–0·6 (–5·9 to 4·7)
Albania	67·8 (49·5–81·9)	65·2 (53·7–74·9)	–2·6 (–19·3 to 16·9)	11·2 (4·4–22·4)	13·9 (8·7–20·4)	2·7 (–9·1 to 11·7)
Bosnia and Herzegovina	52·0 (33·6–70·1)	49·7 (32·8–67·5)	–2·2 (–23·6 to 19·3)	19·3 (8·7–33·1)	20·5 (9·8–34·1)	1 (–11·9 to 14·1)
Croatia	64·7 (42·2–82·6)	66·8 (43·1–85·4)	2·3 (–17·9 to 21·1)	12·7 (4·0–27·7)	11·6 (3·2–26·8)	–1·1 (–12·4 to 10·6)
Greece	69·4 (54·5–81·3)	69·1 (51·7–82·5)	–0·3 (–18·7 to 16·9)	10·6 (4·4–21·3)	10·8 (4·0–22·8)	0·1 (–10·1 to 11·3)
Italy	62·6 (46·4–76·2)	65·3 (45·5–81·1)	2·8 (–18·2 to 22·3)	13·3 (6·1–24·0)	12·1 (4·4–24·7)	–1·2 (–12·5 to 10·8)
Macedonia	59·6 (36·2–79·7)	63·9 (39·4–83·5)	4·1 (–16·8 to 24·3)	15·4 (5·1–30·6)	13·3 (3·8–28·8)	–2·0 (–14·1 to 10·1)
Malta	84·2 (75·1–90·5)	82·3 (66·1–91·8)	–1·8 (–16·8 to 9·2)	3·9 (1·6–8·9)	4·7 (1·4–13·3)	0·6 (–3·8 to 8·2)
Montenegro	56·3 (38·6–72·8)	52·0 (35·3–68·8)	–4·0 (–24·5 to 16·5)	17·3 (7·5–30·5)	19·4 (9·1–32·6)	2·1 (–10·6 to 14·7)
Portugal	74·6 (61·8–84·0)	78·7 (65·0–87·2)	3·8 (–10·6 to 17·7)	7·9 (3·3–16·5)	6·1 (2·4–14·4)	–1·6 (–9·4 to 6·0)
Serbia	60·5 (42·9–76·2)	59·5 (51·1–67·5)	–1·0 (–17·7 to 17·3)	13·6 (5·6–25·5)	13·3 (7·6–20·7)	–0·3 (–11·4 to 8·8)
Slovenia	76·2 (64·0–85·3)	75·7 (57·3–87·9)	–0·4 (–18·6 to 14·4)	7·8 (3·4–15·6)	7·8 (2·5–19·1)	0·0 (–7·8 to 10·6)

(Continues on next page)

	Contraceptive prevalence (% [95% uncertainty interval])			Unmet need (% [95% uncertainty interval])		
	1990	2010	Change 1990–2010	1990	2010	Change 1990–2010
(Continued from previous page)						
Spain	66·5 (54·9–76·5)	66·6 (55·0–76·4)	0·1 (–15·2 to 15·6)	13·5 (7·0–22·9)	13·1 (6·7–22·6)	–0·4 (–10·4 to 9·6)
Western Europe	73·3 (67·6–78·0)	71·5 (61·8–78·9)	–1·7 (–11·6 to 6·4)	7·7 (4·7–11·9)	8·4 (4·7–14·4)	0·7 (–3·3 to 5·9)
Austria	55·2 (39·2–70·2)	59·5 (39·4–76·7)	4·2 (–17·8 to 25·4)	16·5 (7·5–28·7)	14·4 (5·4–28·0)	–2·0 (–14·3 to 10·5)
Belgium	72·2 (61·3–80·8)	71·2 (57·6–81·8)	–0·9 (–16·5 to 13·5)	7·2 (3·4–13·5)	8 (3·3–16·6)	0·7 (–5·9 to 8·9)
France	77·5 (69·4–84·0)	75·3 (62·9–84·4)	–2·2 (–15·8 to 9·7)	5·2 (2·5–9·8)	5·7 (2·4–12·1)	0·4 (–4·5 to 6·6)
Germany	71·9 (60·8–80·8)	71·3 (50·7–85·4)	–0·5 (–20·8 to 14·7)	8·5 (3·7–16·6)	8·8 (2·6–21·3)	0·2 (–7·6 to 11·3)
Netherlands	75·2 (66·1–82·4)	67·6 (56·4–77·1)	–7·5 (–17·8 to 2·3)§	7·0 (3·1–13·6)	10·5 (4·7–19·6)	3·3 (–2·2 to 10·5)
Switzerland	76·6 (66·0–84·8)	76·4 (58·7–88·5)	–0·2 (–17·9 to 13·8)	6·5 (2·6–13·4)	6·5 (1·9–16·8)	0·0 (–6·5 to 9·2)
Latin America and the Caribbean	61·6 (57·3–65·3)	73·2 (69·1–76·8)	11·7 (6·0 to 17·3)*	16·9 (14·6–19·7)	10·4 (8·3–13·2)	–6·5 (–10·0 to –3·0)†
Caribbean	53·2 (49·3–56·6)	61·3 (55·7–66·5)	8·2 (1·8 to 14·4)*	19·8 (16·9–23·2)	17·1 (13·8–20·9)	–2·7 (–6·8 to 1·6)
Anguilla	40·7 (19·1–63·8)	51·1 (33·5–68·7)	10·2 (–14·3 to 35·3)	24·9 (12·0–39·8)	20·2 (9·5–33·6)	–4·5 (–18·8 to 9·3)
Antigua and Barbuda	53·4 (40·1–66·4)	62·6 (40·6–81·1)	9·2 (–12·4 to 27·8)	19·2 (10·1–30·9)	14·2 (4·6–29·1)	–4·9 (–16·7 to 8·1)
Bahamas	60·9 (47·6–72·8)	67 (44·8–84·0)	6·1 (–14·4 to 23·7)	15·2 (7·4–26·2)	11·8 (3·7–26·5)	–3·2 (–13·9 to 9·2)
Barbados	55·3 (42·6–67·2)	63·5 (41·4–81·8)	8·3 (–13·0 to 26·2)	18·2 (9·8–29·5)	13·7 (4·4–28·2)	–4·4 (–15·8 to 8·3)
Cuba	69·7 (60·5–77·6)	71·7 (58·5–82·3)	2·0 (–12·7 to 15·5)	10·5 (5·4–18·5)	9·5 (4·0–18·8)	–1·0 (–9·2 to 8·0)
Dominica	53·3 (39·0–66·8)	62·2 (40·4–80·5)	8·9 (–11·8 to 27·6)	19·4 (9·9–31·3)	14·3 (4·8–28·9)	–4·7 (–16·6 to 7·9)
Dominican Republic	55·2 (48·5–61·7)	69·4 (59·4–78·0)	14·1 (2·1 to 25·3)‡	19·2 (15·2–23·6)	12·4 (7·4–18·9)	–6·8 (–13·6 to 0·9)‖
Grenada	52·2 (42·0–62·4)	63·2 (40·7–82·6)	10·9 (–10·9 to 30·7)	20·0 (11·4–30·6)	13·8 (4·2–28·7)	–5·8 (–18·2 to 7·3)
Guadeloupe	45·4 (25·6–67·3)	58·0 (33·0–80·4)	12·1 (–9·2 to 32·8)	22·9 (10·3–37·2)	16·5 (5·0–32·5)	–5·9 (–19·3 to 7·0)
Haiti	11·2 (8·6–14·4)	34·8 (23·6–48·1)	23·5 (12·1 to 37·2)*	42·8 (34·7–50·8)	35·5 (26·5–43·9)	–7·4 (–18·8 to 3·9)
Jamaica	56·1 (48·8–63·3)	69·3 (54·5–81·3)	13·1 (–2·7 to 27·3)¶	18·1 (12·0–25·4)	10·8 (4·7–20·7)	–7·1 (–16·1 to 3·1)§
Martinique	49·1 (29·2–69·5)	60·2 (35·8–81·2)	10·6 (–10·5 to 31·0)	21·2 (9·3–35·4)	15·4 (4·7–31·3)	–5·3 (–18·1 to 7·1)
Montserrat	55·7 (38·5–71·3)	63·8 (41·1–82·8)	8·1 (–13·3 to 27·4)	17·8 (8·3–31·1)	13·6 (4·1–29·1)	–4·1 (–16·2 to 8·9)
Puerto Rico	74·8 (64·8–82·6)	79·1 (65·6–88·3)	4·2 (–10·4 to 17·3)	7·3 (3·5–13·8)	5·6 (2·1–13·4)	–1·6 (–8·3 to 5·7)
Saint Kitts and Nevis	46·9 (31·3–63·6)	59·2 (36·0–79·8)	11·8 (–9·7 to 31·8)	22·3 (11·6–35·2)	16·1 (5·2–31·3)	–6·0 (–18·7 to 6·9)
Saint Lucia	48·9 (35·9–62·0)	59·8 (37·8–78·9)	10·7 (–10·2 to 30·1)	21·5 (12·0–33·5)	15·6 (5·4–30·7)	–5·7 (–18·1 to 7·2)
Saint Vincent and the Grenadines	58·5 (45·4–70·8)	65·6 (43·6–83·1)	6·9 (–13·5 to 25·0)	16·5 (8·2–27·7)	12·7 (4·0–27·3)	–3·6 (–14·9 to 8·9)
Trinidad and Tobago	49·8 (39·7–60·3)	48·1 (34·7–61·8)	–1·8 (–18·4 to 14·8)	18·3 (12·6–24·6)	20·0 (11·6–30·2)	1·7 (–7·9 to 12·5)
Virgin Islands	65·3 (42·7–81·7)	73·4 (56·9–85·3)	7·8 (–11·7 to 30·9)	12·7 (4·4–27·5)	8·7 (3·1–19·6)	–3·8 (–17·8 to 6·7)
Central America	55·4 (49·7–61·0)	69·4 (61·2–76·3)	14·1 (4·1 to 23·0)*	20·8 (16·7–25·4)	12·0 (8·0–18·1)	–8·6 (–14·7 to –1·6)†
Belize	43·4 (32·7–54·6)	47·8 (33·3–62·8)	4·5 (–13·0 to 22·1)	25·3 (16·6–35·5)	22·8 (12·7–35·1)	–2·5 (–14·3 to 9·5)
Costa Rica	73·1 (65·9–79·3)	81·7 (78·9–84·1)	8·6 (1·7 to 16·2)*	8·1 (4·4–13·8)	4·7 (2·6–7·8)	–3·4 (–8·4 to 0·4)‖
El Salvador	50·1 (38·3–61·6)	71·9 (60·2–81·2)	21·6 (10·0 to 33)*	19·0 (11·8–27·6)	8·6 (4·1–16·1)	–10·1 (–18·3 to –2·6)†
Guatemala	27·4 (19·9–36·3)	49·2 (33·2–65·3)	21·7 (3·5 to 39·4)*	28·8 (23·4–34·5)	21·6 (12·1–32·0)	–7·1 (–18·3 to 4·4)
Honduras	44·0 (34·8–53·7)	66·1 (52·9–77·3)	21·9 (6·3 to 36·6)*	25·1 (17·5–33·4)	14·8 (8·0–23·9)	–10·1 (–21·0 to 1·3)‖
Mexico	59·2 (51·6–66·3)	72·1 (61·2–81·0)	13·0 (–0·1 to 24·6)‡	20·0 (14·7–26·0)	10·9 (5·6–18·8)	–9·0 (–16·9 to 0·2)‖
Nicaragua	45·5 (36·4–54·9)	72·9 (61·7–82·0)	27·3 (12·5 to 40·3)*	26·2 (19·0–33·9)	10·4 (5·4–18·0)	–15·6 (–25·0 to –5·5)†
Panama	57·1 (42·4–70·7)	53·6 (45·9–61·1)	–3·4 (–18·9 to 12·7)	17·4 (8·5–29·2)	19·5 (11·5–28·9)	1·9 (–9·1 to 12·2)
South America	64·8 (58·8–70·0)	76·0 (70·7–80·3)	11·2 (3·8 to 18·6)*	15·1 (12·1–18·9)	8·9 (6·5–12·4)	–6·2 (–10·7 to –1·7)†
Argentina	53·4 (28·2–73·1)	70·4 (55·5–82·0)	16·4 (–6·9 to 45·6)¶	19·9 (8·2–36·0)	10·6 (4·4–21·2)	–8·8 (–25·3 to 4·7)
Bolivia	34·3 (27·5–41·7)	60·3 (50·0–69·7)	25·9 (13·3 to 37·8)*	34·0 (29·2–38·8)	20·0 (13·7–27·3)	–13·9 (–22·0 to –5·3)†
Brazil	71·6 (61·9–79·8)	79·5 (70·3–86·5)	7·8 (–4·6 to 20·0)	11·6 (7·0–17·7)	7·4 (3·7–13·5)	–4·1 (–11·4 to 3·4)
Chile	53·4 (29·8–73·4)	64·3 (47·8–78·1)	10·6 (–12·3 to 37·5)	19·9 (8·1–35·8)	13·9 (5·8–26·3)	–5·7 (–21·8 to 8·3)
Colombia	66·8 (62·5–71·0)	78·6 (72·8–83·3)	11·8 (4·7 to 18·3)*	13·5 (11·4–15·9)	8·3 (5·8–11·6)	–5·2 (–8·7 to –1·3)†
Ecuador	53·2 (46·6–59·5)	72·4 (59·0–82·8)	19·1 (4·7 to 31·7)*	19·6 (14·9–25·0)	9 (4·0–17·3)	–10·4 (–17·7 to –1·4)‖
Guyana	36·1 (27·0–46·6)	40·8 (33·5–48·6)	4·7 (–7·6 to 16·6)	29·8 (20·6–39·9)	29·4 (24·1–34·7)	–0·4 (–11·2 to 9·8)
Paraguay	48·2 (43·0–53·8)	77·4 (68·0–84·5)	29·1 (18·8 to 37·9)*	18·5 (15·8–21·8)	6·1 (3·1–11·2)	–12·3 (–16·7 to –6·9)†
Peru	55·4 (48·1–62·4)	75·0 (71·2–78·6)	19·6 (11·5 to 27·9)*	23·1 (18·3–28·3)	7·1 (5·8–8·8)	–15·9 (–21·3 to –10·9)†
Suriname	42·3 (28·3–56·3)	50·3 (37·3–63·6)	8·0 (–11·2 to 27·7)	25·7 (14·9–38·7)	21·7 (11·8–33·8)	–3·9 (–16·7 to 8·5)
Uruguay	81·3 (73·2–87·3)	77·3 (64·2–86·7)	–4·0 (–17·6 to 7·6)	5·4 (2·5–10·7)	7·2 (2·8–15·9)	1·7 (–4·0 to 9·7)

(Continues on next page)

	Contraceptive prevalence (% [95% uncertainty interval])			Unmet need (% [95% uncertainty interval])		
	1990	2010	Change 1990–2010	1990	2010	Change 1990–2010
(Continued from previous page)						
Venezuela	59 (48·7–68·6)	70·3 (53·0–83·3)	11·2 (–8·6 to 28·3)	19 (11·0–28·7)	11·8 (4·6–24·1)	–6·8 (–18·4 to 6·3)
Northern America	72·0 (64·2–78·4)	76·6 (66·5–84·2)	4·7 (–3·7 to 12·1)	7·5 (4·6–11·8)	6·2 (3·2–11·3)	–1·3 (–5·2 to 3·2)
Canada	74·0 (64·2–82·0)	73·4 (58·5–84·6)	–0·6 (–16·3 to 13·1)	7·8 (3·6–15·1)	8·0 (2·9–17·7)	0·2 (–6·9 to 9·1)
USA	71·8 (63·1–78·9)	77·1 (66·0–85·4)	5·3 (–3·9 to 13·5)	7·4 (4·2–12·2)	5·9 (2·7–11·5)	–1·5 (–5·8 to 3·4)
Oceania	59·8 (52·8–65·8)	59·3 (49·9–67·6)	–0·5 (–10·4 to 9·0)	14·4 (10·0–20·1)	15·2 (10·1–21·8)	0·8 (–4·7 to 6·4)
Australia and New Zealand	71·5 (62·3–78·9)	69·6 (57·2–79·7)	–1·8 (–14·3 to 9·6)	9·3 (4·9–16·4)	10·2 (4·9–19·0)	0·9 (–5·7 to 8·4)
Australia	71·6 (60·9–80·4)	69·1 (54·3–80·9)	–2·5 (–17·3 to 11·1)	9·2 (4·2–17·6)	10·3 (4·3–21·0)	1·2 (–6·5 to 10·2)
New Zealand	71·0 (57·1–81·9)	72·4 (53·6–85·7)	1·4 (–17·7 to 18·1)	9·5 (3·9–19·4)	8·8 (2·8–20·6)	–0·6 (–9·8 to 10·0)
Melanesia, Micronesia, and Polynesia	28·0 (20·1–37·9)	38·4 (27·2–52·2)	10·2 (–4·1 to 26·1)¶	27·7 (18·3–38·4)	24·6 (15·4–35·4)	–3·0 (–12·4 to 5·7)
Melanesia	27·7 (19·3–38·2)	38·2 (26·5–52·6)	10·3 (–4·8 to 27·0)¶	27·6 (17·6–38·9)	24·4 (14·7–35·8)	–3·0 (–13·0 to 6·1)
Fiji	44·8 (25·9–67·4)	51·7 (27·3–77·2)	6·7 (–14·6 to 27·5)	21·8 (9·4–36·5)	18·5 (5·7–34·3)	–3·1 (–15·8 to 9·0)
Papua New Guinea	24·5 (14·4–37·3)	36·5 (22·8–53·5)	11·8 (–6·5 to 32·2)	28·6 (16·8–42·4)	25·2 (13·9–38·8)	–3·2 (–15·5 to 8·0)
Solomon Islands	27·4 (11·8–47·3)	36·3 (25·7–48·7)	8·7 (–12·8 to 28·8)	25·0 (14·3–38·2)	22·4 (13·2–34·1)	–2·5 (–13·5 to 7·9)
Vanuatu	31·1 (22·3–41·2)	41·7 (29·9–54·9)	10·5 (–4·6 to 26·3)¶	27·8 (16·3–41·0)	23·7 (13·4–36·6)	–3·9 (–15·4 to 6·9)
Micronesia	38·1 (26·5–50·5)	49·5 (37·8–60·3)	11·1 (–2·9 to 25·5)¶	23·9 (15·4–33·1)	19·1 (12·0–27·7)	–4·6 (–13·0 to 3·1)
Guam	43·9 (24·5–64·7)	56·1 (36·4–73·7)	11·6 (–11·9 to 35·3)	21·9 (10·1–36·4)	16·4 (6·6–30·5)	–5·2 (–18·8 to 7·8)
Kiribati	31·5 (16·8–49·7)	42·0 (25·5–61·0)	10·1 (–11·5 to 33·2)	26·6 (14·9–40·5)	22·8 (11·6–36·6)	–3·5 (–17·0 to 8·3)
Marshall Islands	31·4 (20·8–44·3)	45·1 (34·1–56·2)	13·6 (–2·6 to 28·5)‡	23·5 (13·7–35·4)	18·1 (10·2–28·1)	–5·2 (–15·7 to 4·2)
Nauru	27·6 (11·9–48·3)	36·2 (26·3–47·7)	8·5 (–13·0 to 27·6)	27·4 (15·3–41·7)	25·6 (14·8–38·4)	–1·8 (–13·2 to 9·5)
Northern Mariana Islands	31·1 (15·8–53·7)	42·0 (20·4–69·6)	10·6 (–9·3 to 31·9)	26·5 (13·8–40·8)	22·5 (8·5–37·6)	–3·9 (–17·1 to 8·0)
Palau	28·7 (13·0–49·1)	38·5 (23·3–56·7)	9·4 (–11·9 to 31·5)	27 (15·0–41·4)	24·3 (12·9–38·2)	–2·6 (–15·2 to 9·1)
Polynesia	24·3 (14·3–38·0)	31·3 (25·7–37·5)	6·9 (–7·4 to 19·0)	40·2 (29·9–50·6)	43·3 (38·1–48·3)	2·9 (–7·6 to 13·8)
Cook Islands	53·8 (39·0–67·7)	56·0 (36·8–73·7)	2·0 (–20·9 to 25·1)	19·9 (10·0–32·9)	18·5 (7·7–33·4)	–1·2 (–15·7 to 13·2)
Samoa	21·8 (10·6–37·5)	29·0 (23·0–35·9)	7·1 (–9·2 to 20·4)	42·7 (30·9–54·4)	46·4 (40·6–51·8)	3·6 (–8·5 to 15·9)
Tuvalu	23·7 (8·4–43·5)	31·5 (22·4–42·2)	7·5 (–13·2 to 26·2)	31·0 (18·6–45·4)	29·4 (18·9–42·0)	–1·6 (–13·2 to 10·1)

*Posterior probability of increase (PPI)>0·99. †Posterior probability of decrease (PPD)>0·99. ‡PPI>0·95. §PPD>0·9. ¶PPI>0·9. ||PPD>0·95.

Table 1: Estimates (%) and uncertainty intervals of contraceptive prevalence and unmet need for family planning for 1990 and 2010, and the median absolute percentage points change (1990–2010)
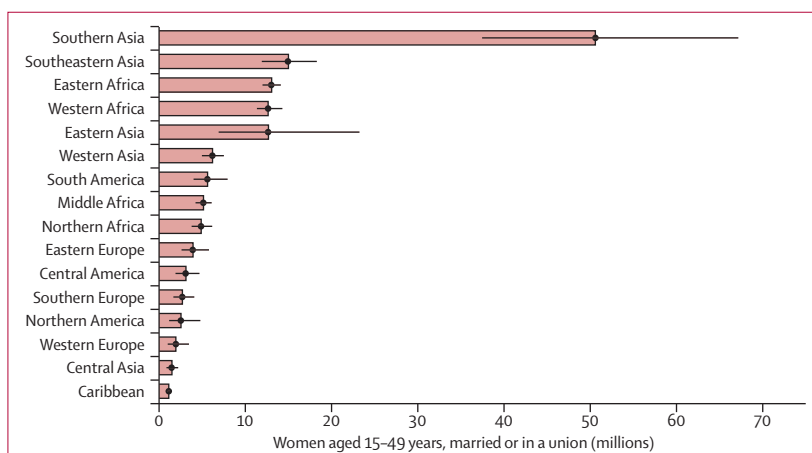

Figure 2: Number of women aged 15–49 years who were married or in a union with an unmet need for family planning in 2010, by subregion
Subregions with fewer than 1 million women with an unmet need for family planning are not presented.
Horizontal lines represent the 95% uncertainty intervals.

only 29 countries had a negative median change, most of which already had high contraceptive prevalence in 1990 (>60%). However, starting at a low contraceptive prevalence in 1990 did not consistently translate into substantial increases over time. Of the 26 countries with contraceptive prevalence lower than 10% in 1990, the absolute increase by 2010 was less than 10 percentage points for 16 countries, all of which were in Africa (table 1).

Most increases in contraceptive prevalence that occurred between 1990 and 2010 were attributable to a rise in the use of modern methods (appendix pp 45–47). Worldwide, 57·0% (54·1–59·7) of MWRA were using a modern method in 2010, representing nine of every ten women using contraception. The prevalence of modern method use in 2010 ranged from 8·3% in middle Africa to more than 70% in eastern Asia, northern America, and northern Europe (appendix pp 45–47). The largest absolute increases from 1990 to 2010 in the use of modern methods (>15 percentage points) were in Central America, eastern Europe, and three subregions of Africa (eastern, northern, and southern Africa). The rise in modern method use worldwide and in developing countries slowed significantly in 2000–10 compared with the 1990s, and the increase in modern method use was significantly slower in eastern Asia and northern Africa and faster in eastern Africa in 2000–10 than in the 1990s (appendix

pp 41–44). No significant global or subregional differences occurred in the degree of change for 2005–10 compared with that for 2000–05 (appendix pp 41–44).

During the same period (1990–2010), unmet need for family planning decreased worldwide and in many subregions (figure 1 and table 1). Worldwide, unmet need fell from 15·4% (14·1–16·9) in 1990, to 12·3% (10·9–13·9) in 2010—a decrease of 3·1 percentage points (1·1–5·0, PPD>0·99), which was driven by decreases in developing countries. In subregions, unmet need fell concurrently with substantial gains in contraceptive prevalence (table 1). The reduction in unmet need was greatest in Central America and northern Africa, where it fell by 8·6 percentage points (PPD>0·99). For most subregions, the pace of change in unmet need in 2000–10 was similar to that in the 1990s (appendix pp 41–44). Eastern Africa is the only subregion where the rate of decrease in unmet need for family planning accelerated recently (2005–10 vs 2000–05; appendix pp 41–44).

In 2010, the unmet need for family planning was lowest in eastern Asia (4·2%, 2·4–7·7), followed by northern America (6·2%, 3·2–11·3) and northern Europe (6·8%, 4·3–10·7). Unmet need was 20% or higher in eastern Africa (26·3%, 24·5–28·2), middle Africa (26·1%, 22·3–30·3), and western Africa (25·4%, 23·0–28·3). In middle and western Africa, the values estimated for 2010 were nearly identical to those in 1990 (table 1). Unmet need in 2010 was also high in Melanesia, Micronesia, and Polynesia (24·6%, 15·4–35·4), although uncertainty was high because of the paucity of reported data. Estimated amounts of unmet need exceeded contraceptive prevalence in 2010 in middle and western Africa. Nationally, estimates of unmet need in 2010 were higher than 25% in 42 countries, 29 of which were in Africa (table 1). In 31 of the 194 countries, unmet need for family planning decreased significantly from 1990 to 2010 (PPD>0·95). For the remaining countries (except for Timor-Leste, which had a significant increase), the change in unmet need was more uncertain.

Figure 2 shows the number of MWRA with an unmet need for any method of family planning in 2010, by subregion; southern Asia had the highest number (51 million, 38–67 million). Four other subregions each had more than 10 million MWRA with an unmet need for family planning in 2010: eastern Africa, western Africa, southeastern Asia, and eastern Asia (figure 2).

Worldwide, 146 million (130–166 million) MWRA had an unmet need for any method of family planning in 2010 (table 2). If women using traditional contraceptive methods are included, the total number of MWRA with unmet need for modern methods increases to 221 million (202–243 million) MWRA in 2010. Total demand for contraception (ie, women who use contraceptives or who have an unmet need for family planning) is projected to grow worldwide from 900 million (876–922 million) MWRA in 2010, to 962 million (927–992 million) in 2015, in view of projected trends in demand and the number of

	Total contraceptive use (million women [95% uncertainty interval])	Unmet need (million women [95% uncertainty interval])	Total demand (million women [95% uncertainty interval])	Unmet need for modern methods (million women [95% uncertainty interval])
World				
2010	753 (719–785)	146 (130–166)	900 (876–922)	221 (202–243)
2015	808 (754–855)	153 (130–182)	962 (927–992)	233 (205–267)
Developed countries				
2010	116 (110–121)	15 (12–19)	131 (127–134)	30 (26–36)
2015	113 (105–119)	15 (12–19)	128 (123–132)	29 (23–35)
Developing countries				
2010	638 (604–669)	131 (115–150)	769 (746–790)	191 (172–212)
2015	695 (642–742)	138 (116–166)	834 (800–864)	204 (178–237)
Developing countries (excluding China)				
2010	410 (382–436)	122 (107–139)	532 (513–548)	179 (162–198)
2015	466 (421–506)	127 (107–153)	594 (566–618)	191 (167–221)

Total contraceptive use refers to any method. Total demand refers to total contraceptive use (any method) and unmet need combined. Unmet need for modern methods refers to unmet need and use of traditional methods combined. MWRA=married/in-union women of reproductive age.

Table 2: **Estimates and uncertainty intervals of the number of MWRA (millions) aged 15–49 years, for total contraceptive use, unmet need, total demand, and unmet need for modern methods, for 2010 and 2015**

MWRA. The absolute number of MWRA with a demand for contraception is projected to increase significantly in 98 of 152 developing countries (appendix pp 51–55).

Discussion

In a comprehensive and systematic manner, we generated the annual values of contraceptive prevalence, unmet need for family planning, and associated indicators, such as unmet need for modern methods, for 194 countries or areas for 1990–2015. Key advantages of our estimation approach compared with previous studies are that our annual estimates are available for a long period for all countries with at least one datapoint for contraceptive prevalence (eg, we generated estimates of unmet need for family planning for 83 countries or areas that had no data for this indicator). We used data from many sources to construct the estimates, systematically accounting for variability in errors across data sources and potential biases in observations that differed from standard measures or reference groups for contraceptive prevalence. We used a probabilistic approach to generate uncertainty intervals for all estimates and enabled assessments of whether an increase or decrease over time was a sign of significant progress or highly uncertain change (panel). We also used a Bayesian hierarchical model to help estimation and short-term projections of trends in countries with little information, based on information from subregional, regional, and global trends.

We tested the models with validation exercises to assess model calibration and predictive performance (by excluding 20% of observations at random, and all observations from 2005 onwards, respectively). Results from the cross-validation tests showed that the models used performed well (appendix pp 33–34). Additionally,

Systematic review

Country-specific data for family planning indicators have been assessed and compiled regularly by the United Nations Population Division into a publicly available database.[10] We updated the database and systematically recorded differences by data source, sample population, and measurement of family planning indicators.

We reviewed articles and reports about global and regional estimates of contraceptive prevalence and unmet need for family planning that used global compilations of family planning data or that were identified by contact with experts. We also searched PubMed and Popline for publications between 1990 and 2012 with the keywords "contraceptive prevalence", "contraceptive use", or "unmet need for family planning". None of the previous studies that published global and regional estimates of family planning indicators produced a series of annual country, regional, and global estimates of family planning indicators with uncertainty intervals.[1,5,9–14]

Interpretation

This study advances the modelling methods for family planning indicators and expands on previous work by providing a systematic and comprehensive set of estimates and projections for 194 countries and for regional and global values of contraceptive prevalence and unmet need for family planning (for any method or for modern methods of contraception) in married or in-union women of reproductive age. The uncertainty intervals for all estimates and projections enable assessment of whether changes over time are significant or highly uncertain.

Our results show that contraceptive prevalence worldwide in married or in-union women of reproductive age increased and unmet need for family planning decreased, and that both trends were driven by changes in developing countries. The rate of increase in contraceptive prevalence worldwide and in developing countries slowed significantly in 2000–10 compared with the 1990s. For most subregions, the pace of change in unmet need in 2000–10 was similar to that in the 1990s. The absolute number of married women of reproductive age with a demand for contraception is projected to increase substantially by 2015, both worldwide and in most developing countries.
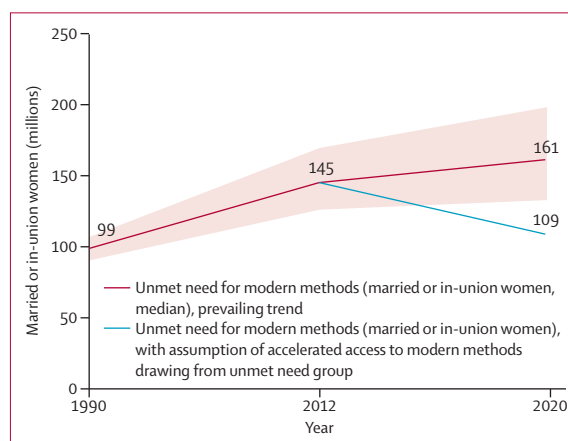

Figure 3: **Estimates and projections of unmet need for modern contraceptive methods (1990–2020) and potential effect of London Summit on Family Planning objective of 120 million new modern method users in the world's 69 poorest countries (≤US$2500 gross national income per head in 2010)** Shaded area represents uncertainty intervals.

when we excluded all data for unmet need for family planning in a random subset of 22 countries that had observations for unmet need, the validation test suggested that the model was well calibrated. Comparisons of our model estimates with those from a recent study[5] showed that the estimates in 2012 of modern method use and unmet need for modern methods (percentage and absolute number of married women) were similar—within the 95% uncertainty intervals of the model-based estimates—for developing regions and almost all subregions (appendix pp 36–37).

The results of this study apply to family planning levels and trends for women of reproductive age who are married or in a union, which is a standard reference group for measurement of reproductive health outcomes. However, women who are sexually active but not married or in a union also need access to pregnancy prevention information and services. Sexually active unmarried women tend to have higher contraceptive prevalence and unmet need than do married women,[15] and account for a notable proportion of overall unmet need for family planning[5] (eg, 28% of unmet need in Latin America).[23] The model developed in this study can be expanded to generate

systematic and comprehensive annual estimates and projections of family planning indicators for all women.

An important challenge for those people measuring trends in contraceptive prevalence and unmet need for family planning is the low number of observations available over time, especially for unmet need for family planning. Although the models that we used provide reasonable estimates of unmet need for countries without such data, substantial uncertainty surrounds the estimates. In view of the importance of this indicator to monitor progress made in achievement of universal access to reproductive health, increased efforts are necessary to close the gaps in the availability of information about unmet need for family planning.

Our findings support calls to increase investments in family planning,[7] especially in regions where contraceptive prevalence is still low, unmet need is high, and the growth in the number of women of reproductive age is rapid. Although the amount of funding for family planning as a percentage of overall donor assistance for health has generally stagnated over the past decade,[4] funding for family planning on a per-head basis has fared even worse.

Recent commitments to expand access to effective contraceptive methods, such as those made at the 2012 London Summit on Family Planning to provide modern contraceptive methods to an additional 120 million women in 69 of the world's poorest countries by 2020, make it even more imperative to have frequent and timely estimates about family planning levels and trends to assess the effect of such commitments. As an example, we show the 1990–2020 estimated trends in unmet need for modern methods for MWRA in the 69 countries of focus in the London Summit (figure 3). Although the London Summit objective applies to all women of reproductive age, and not only those who are married or in union, the baseline estimated number of modern method users in 2012 in the

69 countries is remarkably similar (258 million women[11]) to our model estimation of 257 million (95% uncertainty interval 224–289 million) MWRA. In view of historical trends and population growth, we project 161 million (133–198 million) MWRA in 2020 with an unmet need for modern contraceptive methods. Should the London Summit objective of 120 million new modern method users be met, and with the assumption that the accelerated investment in family planning shifts women from unmet need to modern method use, unmet need for modern methods in 2020 would change from stagnant values to a substantially lower number of 109 million MWRA. The difference represents additional modern method users beyond our projected increase of 68 million MWRA. The country-specific estimates and projections from this study can be used in a similar manner to assess the demand for, and the effect of commitments to, national family planning.

Our estimates of global, regional, and national values and trends of contraceptive prevalence and unmet need for family planning are important for expansion of programmatic efforts. Since the annual estimates and projections presented here are comparable across countries and over time, they can form the basis of comparative analyses of how changes in family planning rates relate to family planning programme effort,[24] maternal and child health outcomes,[1,2,25,26] and the cost-savings of satisfying present amounts of unmet need.[5,27] The annual time series is also useful for in-depth analyses of the roles of family planning policies, programmes, and other contextual factors in shaping national family planning trends. Our model-based annual estimates and projections of family planning indicators and the degree of uncertainty around them provide the global health and development community with a better understanding of the progress made, the likely path ahead, and the payoffs that can be accrued by investment in family planning now.

References
1 Ahmed S, Li Q, Liu L, Tsui AO. Maternal deaths averted by contraceptive use: an analysis of 172 countries. *Lancet* 2012; **380:** 111–25.
2 Cleland J, Conde-Agudelo A, Peterson H, et al. Contraception and health. *Lancet* 2012; **380:** 149–56.
3 Canning D, Schultz TP. The economic consequences of reproductive health and family planning. *Lancet* 2012; **380:** 165–71.
4 United Nations. The millennium development goals report 2012. New York: United Nations, 2012.
5 Singh S, Darroch JE. Adding it up: costs and benefits of contraceptive services—estimates for 2012. New York: Guttmacher Institute and United Nations Population Fund, 2012.
6 Commission on Information and Accountability for Women's and Children's Health. Keeping promises, measuring results. Geneva: World Health Organization, 2011. http://www.everywomaneverychild.org/images/content/files/accountability_commission/final_report/Final_EN_Web.pdf (accessed May 8, 2012).
7 Carr B, Gates MF, Mitchell A, Shah R. Giving women the power to plan their families. *Lancet* 2012; **380:** 80–82.
8 United Nations, Department of Economic and Social Affairs, Population Division. World contraceptive use 2012. New York: United Nations, 2012.
9 Mauldin WP, Segal SJ. Prevalence of contraceptive use: trends and issues. *Stud Fam Plann* 1988; **19:** 335–53.
10 United Nations, Department of Economic and Social Affairs, Population Division. World contraceptive use 2010. New York: United Nations, 2011.
11 London Summit on Family Planning, Technical Note: Data sources and methodology for developing the 2012 baseline, 2020 objective, impacts and costings. London: Family Planning Summit Metrics Group, 2012.
12 Khan S, Mishra V, Arnold F, Abderrahim N. Contraceptive trends in developing countries. DHS Comparative Reports No. 16. Calverton: Macro International Inc, 2007.
13 Bongaarts J, Johansson E. Future trends in contraceptive prevalence and method mix in the developing world. *Stud Fam Plann* 2002; **33:** 24–36.
14 Stover J, McKinnon R, Winfrey B. Spectrum: a model platform for linking maternal and child survival interventions with AIDS, family planning and demographic projections. *Int J Epidemiol* 2010; **39:** i7–i10.
15 Bradley SEK, Croft TN, Fishel JD, Westoff CF. Revising unmet need for family planning. DHS Analytical Studies No. 25. Calverton: ICF International, 2012.
16 Committee on Population, National Research Council. Diffusion processes and fertility transition: selected perspectives. Casterline JB, ed. Washington: National Academy Press, 2001.
17 Marchetti C, Meyer PS, Ausubel JH. Human population dynamics revisited with the logistic model: how much can be modeled and predicted? *Technol Forecast Soc* 1996; **52:** 1–30.
18 Gelman A, Carlin JB, Stern HS, Rubin DB. Bayesian data analysis, 2nd edn. Boca Raton: Chapman & Hall/CRC, 2004.
19 Lindley DV, Smith AFM. Bayes estimates for the linear model. *J R Stat Soc* 1972; **34:** 1–41.
20 Gelfand A, Smith AFM. Sampling-based approaches to calculating marginal densities. *J Am Stat Assoc* 1990; **85:** 398–409.
21 Plummer M. JAGS: a program for analysis of Bayesian graphical models using Gibbs sampling. In: Proceedings of the 3rd International Workshop on Distributed Statistical Computing (DSC 2003), March 20–22, 2003, Vienna, Austria.
22 R Development Core Team. R: A language and environment for statistical computing. Vienna: R Foundation for Statistical Computing, 2011.
23 Cleland J, Bernstein S, Ezeh A, Faundes A, et al. Family planning: the unfinished agenda. *Lancet* 2006; **368:** 1810–27.
24 Ross J, Smith E. Trends in national family planning programs, 1999, 2004 and 2009. *Int Perspect Sex Reprod Health* 2011; **37:** 125–33.
25 WHO. Trends in maternal mortality: 1990 to 2010. Geneva: World Health Organization, 2012.
26 Sedgh G, Singh S, Shah IH, Åhman E, et al. Induced abortion: incidence and trends worldwide from 1995 to 2008. *Lancet* 2012; **379:** 625–32.
27 Moreland RS, Talbird S. Achieving the Millennium Development Goals: the contribution of fulfilling the unmet need for family planning. Washington: USAID, 2006.