



METHOD ARTICLE

What increase in modern contraceptive use is needed in FP2020 countries to reach 75% demand satisfied by 2030? An assessment using the Accelerated Transition Method and Family Planning Estimation Model [version 1; peer review: 2 approved]

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Abstract

Background: Sustainable Development Goal 3.7 aims to ensure universal access to sexual and reproductive health services. One suggested benchmark is to have at least 75% of the demand for contraception satisfied with modern methods (DS) in all countries by 2030. The translation of DS-based targets into targets for the modern contraceptive prevalence rate (mCPR) is needed to make targets actionable.

Methods: We propose the Accelerated Transition (AT) method for determining the mCPR needed to reach demand-satisfied targets by 2030. The starting point for this method is the projection of DS under “business as usual” using the one-country implementation of the Family Planning Estimation Model (FPemcountry). For countries in which the DS target is projected to be later than 2030, the AT method assumes that meeting the DS target by 2030 requires an acceleration of the contraceptive use transition such that the DS target, and its associated mCPR, will be reached in 2030 as opposed to the later year. The DS-target-associated mCPR becomes the mCPR target for the year 2030.

Results: We apply the AT method to assess progress needed for attaining the 75% DS target for married or in-union women in the world’s poorest countries. For 50 out of 68 countries, we estimate that accelerations are needed, with required mCPR increases ranging from 4.3 to 50.8 percentage points.

Open Peer Review

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	Invited Reviewers	
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1. Shawn Malarcher , United States Agency for International Development (USAID), Washington, USA		
2. Amy O. Tsui , Johns Hopkins Bloomberg School of Public Health, Baltimore, USA		
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Conclusions: The AT method quantifies the acceleration needed – as compared to business as usual projections – for a country to meet a family planning target. The method can be used to determine the mCPR needed to reach demand-satisfied targets.

Keywords

Planning Estimation Model (FPEM), demand satisfied, modern contraceptive use, target setting

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Introduction

Family planning success is typically measured with two key family planning indicators: the modern contraceptive prevalence rate (mCPR) and unmet need for contraception. However, the combination of these two indicators into the more complete ‘demand satisfied’ indicator can better capture a country’s family planning performance¹. Demand satisfied has thus been incorporated into the Sustainable development goals (SDGs) with SDG indicator 3.7.1² specifying that the international community should assess the ‘Proportion of women of reproductive age (ages 15–49 years) who have their need for family planning satisfied with modern methods’. One proposed benchmark related to SDG 3.7.1 is to have at least 75% of the demand for family planning satisfied with modern contraceptives in all countries by 2030³. We refer to this global benchmark of 75% demand satisfied as DS75. Other examples of targets for this indicator allow for country variation and past country experiences to inform country-specific target values⁴.

“Business as usual” (BAU) projections, referring to projections of family planning indicators based on historical trends, can be used to assess if countries are on target to meet DS75 by 2030. The one-country implementation of the Family Planning Estimation Model (FPEMcountry)^{5–8} produces model-based projections of family planning based on parametrization of trends in contraceptive use and unmet need. In summary, FPEMcountry models contraceptive prevalence using logistic growth curves. Estimates of unmet need are obtained by capturing the relationship between contraceptive prevalence and unmet need. BAU projections for DS are obtained from projected contraceptive use and unmet need.

Countries that are not currently projected to meet DS75 by 2030 will require a larger-than-BAU increase in the number of users of modern methods of contraception between now and 2030. Estimating the required increase in mCPR and hence required number of additional users for each country can facilitate planning for the appropriate allocation of resources at the country level. A previous study for states in India has estimated the required increases in mCPR and additional users needed to achieve DS targets using 2030 projections of total demand (contraceptive prevalence plus unmet need) for contraception⁸. This method combined accelerated growth in modern use with business-as-usual growth in total demand; the method did not account for faster-than-BAU increases in mCPR to coincide with faster-than-BAU increases in demand that are likely to occur due to, for example, increased efforts in family planning programs⁹. Methods that account for faster-than-BAU increases in demand to coincide with faster-than-BAU increases in mCPR are needed to avoid underestimation of mCPR targets, and thus, failure to meet DS targets.

We present a new method for assessing country-specific levels of mCPR needed to achieve DS targets by 2030, referred to as the accelerated transition (AT) method. The starting point for this method is the projection of DS under BAU using FPEMcountry^{5–8}. For countries in which the DS target is projected to be later than 2030, the AT method assumes that meeting the DS target by 2030 requires an acceleration of the contraceptive use transition such that the DS target, and its associated mCPR, will be reached

in 2030 as opposed to the later year. The DS target-associated mCPR is the mCPR target for the year 2030. Based on mCPR targets, we estimate progress needed for attaining DS targets in terms of a mCPR gap. Using the AT method we assess progress for the countries in the FP2020 initiative¹⁰ towards reaching mCPR targets associated with DS75 and quantify the relative acceleration needed to achieve these targets in each country.

Methods

Family planning indicators and data

Contraceptive prevalence is measured as the percentage of women who report themselves or their partners as currently using at least one contraceptive method of any type (modern or traditional). Unmet need for family planning is defined as the percentage of women who want to stop or delay childbearing but who are not currently 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 countries¹¹. The estimates reported in this study 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]).

Family planning data were obtained from nationally representative household surveys, the Demographic and Health Surveys (DHS), Performance Monitoring and Accountability 2020 surveys, the Multiple Indicator Cluster Surveys, the Reproductive Health Surveys, Contraceptive Prevalence Surveys and World Fertility Surveys¹². The estimates presented in this report are based on 558 survey observations of contraceptive prevalence between 1968 and 2019 from 68 countries and 320 survey observations of unmet need for family planning from 66 countries. This survey database was prepared for the FP2020 report¹⁰ and stored in the data set `contraceptive_use_track20` in FPEMcountry⁷.

Model-based projections of Family Planning Indicators using FPEMcountry

The FPEMcountry⁷ R package implements a one-country version of the Family Planning Estimation Model which combines a Bayesian hierarchical model with country specific time trends to yield estimates of contraceptive prevalence and unmet need for family planning for women aged 15–49 who are married or in a union. The model accounts for differences by data source, sample population, and contraceptive methods included in the measure^{5,6}. For every country, the FPEMcountry R package models contraceptive prevalence with an expected trend that assumes contraceptive prevalence will begin with a gradual increase, it will subsequently become more rapid and then it will begin to slow down when high levels of prevalence are reached. The parameters that control the trend are estimated hierarchically, such that estimates are based on the data available in the country of interest, and also the sub-regional, regional, and global experience. Distortions are added to capture how rates of change in the observed data (i.e., faster/slower rates of change in contraceptive prevalence) deviate from the rates of change indicated by the expected trend. Projections are informed by recent changes that have occurred in contraceptive prevalence (i.e., the difference between the two most recent surveys) as

well as past experience⁶. Estimates of unmet need are obtained by capturing the relationship between contraceptive prevalence and unmet need. Similar to the model for contraceptive prevalence, a hierarchical approach is used to estimate parameters. Time dependent distortions are added to capture country-specific changes in the level of the indicator^{5,6}. Estimates and projections of demand satisfied are derived from calculating the ratio of modern contraceptive prevalence to total demand (contraceptive prevalence plus unmet need).

Accelerated Transition (AT) method

We propose the Accelerated Transition (AT) method for assessing the mCPR level needed to reach a specific DS target. The starting point for this method is the projection of DS under “BAU” using projections, in the case of FP, using FPEMcountry. BAU projections are illustrated for Afghanistan in Figure 1 (solid lines). For countries such as Afghanistan in which the DS target is projected to be later than the target year, the AT method assumes that meeting the DS target by 2030 requires an acceleration of the contraceptive use transition such that the DS target, and its associated mCPR, will be reached in 2030 as opposed to the later year. The DS target-associated mCPR becomes the mCPR target for the year 2030. For example, in Afghanistan, DS75 is achieved in the year 2054, when 75% of demand (red line) overlaps with mCPR (green line) and is equal to 54.6%. Under an accelerated transition (dashed lines), the DS75 target is reached in 2030 instead, and the mCPR is equal to 54.6% in 2030.

AT measures: relative acceleration, target mCPR, and progress assessments

We let t^* be the earliest year in which a country is expected to achieve DS75 (i.e., 2054 for Afghanistan). We estimate t^* based

on projections of the demand satisfied indicator from FPEM-country, with the maximum set to 2100. For countries with $t^* > 2030$, the goal is to achieve the target in the target number of years ($2030 - t^{(current)}$), as opposed to in the BAU projected number of years ($t^* - t^{(current)}$). We quantify the relative acceleration required to meet the DS75 target, $rel.accel_c$, by comparing the number of years it would take to meet DS75 under the BAU scenario to the number of years until the desired year for target achievement (i.e., 2030):

$$rel.accel_c = (t^* - t^{(current)}) / (2030 - t^{(current)}).$$

The relative acceleration measurement quantifies the speed up that would make this possible. For example, a required relative acceleration of 2 means that a country must achieve the target 2 times faster (or in half the number of years) than it is currently expected to do.

For countries with $t^* > 2030$, the target-associated mCPR $tmod_c$ for 2030 is the mCPR projected for year t^* :

$$tmod_c = mod_{c,t^*},$$

where mod_{c,t^*} denotes mCPR in country c in year t^* and $tmod_c$ is the DS75-associated target mCPR in country c . The difference between the levels of mCPR in $t^{(current)}$ and the target mCPR is the current mCPR target gap, gap_c given by:

$$gap_c = tmod_c - mod_{c,t^{(current)}}$$

Continuing with the Afghanistan illustration, Afghanistan needs to increase mCPR by 30.8% percentage points over an 11-year

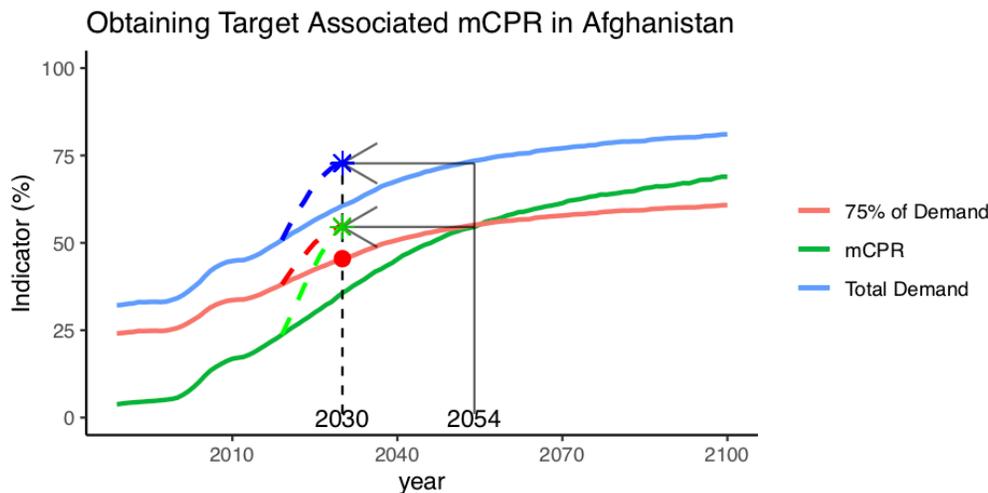


Figure 1. An illustration of the Accelerated Transition and Demand-based methods to obtain modern contraceptive prevalence rate (mCPR) targets for Afghanistan. Business as usual projections (solid lines) and accelerated transition projections (dashed lines) for mCPR, total demand and 75% demand satisfied. Accelerated transition (AT)-based mCPR target and total demand for 2030 are indicated with stars, the demand-based mCPR target (75% of total demand in 2030) is shown in red.

timescale in order to meet DS75 by 2030 rather than over the 35-year timescale that is currently projected for achieving DS75 (see Table 1).

We compare the assessment of the AT-method-based mCPR gap associated with DS75 to the gap obtained by the approach used in New *et al.*, 2016⁸, referred to as the demand-based (DB) method. Under the DB approach, the target-mCPR is estimated as being 75% of the projected total demand in 2030. For Afghanistan, the DB approach gives a target mCPR of 45.3% (see Figure 1 and Table 1). This is lower than the AT

method-based target mCPR of 54.6% because the DB approach is based on accelerated increases in mCPR only, as opposed to accelerated increases in both mCPR as well as total demand.

Results

We constructed BAU projections for 68 countries of the FP2020 initiative and assessed the accelerations needed in each country to meet DS75 by 2030. In total, 50 out of 68 countries are projected to reach 75% demand satisfied in some year after 2030 and require acceleration in their FP transition between 2019 and

Table 1. 75% demand satisfied (DS75) assessment. Countries are ordered by the target year in which they are projected to achieve DS75 under 'business as usual' (BAU) projections. *Modern contraceptive prevalence rate (mCPR) target gap* refers to the levels of mCPR required for DS75 to be achieved and *Users target gap* refers to the numbers of users that are required if DS75 is to be achieved by 2030.

Country	Target year	Target mCPR	mCPR target Gap (% point)	Users Target Gap (million)	Acceleration	DB mCPR gap
Sri Lanka	2031	58.7	4.3	0.02	1.1	58.9
Ethiopia	2032	53	15.3	6.35	1.2	52.1
Madagascar	2032	54.4	12.7	1.27	1.2	54
India	2036	57.2	7.3	27.74	1.5	56.7
Nepal	2040	59.3	12.9	1.44	1.9	58.8
United Republic of Tanzania	2040	55.5	18.1	3	1.9	52.9
Uganda	2041	58.2	20.8	2.6	2	55.8
Mozambique	2041	51.4	24.1	1.9	2	46.4
Djibouti	2047	53.5	28.6	0.05	2.5	46.9
Kyrgyzstan	2047	51.1	12.9	0.18	2.5	47.8
Burkina Faso	2047	51.4	21.6	1.42	2.5	46.2
Burundi	2048	55.3	28.5	0.72	2.6	50.8
Cambodia	2048	59.9	15.6	0.71	2.6	57.8
Senegal	2049	51.4	24.1	1.08	2.7	44.4
Sao Tome and Principe	2051	57.1	15.8	0.01	2.9	55.7
Liberia	2052	53.7	26.2	0.27	3	47.3
Timor-Leste	2053	55.8	29.1	0.08	3.1	50.6
Sierra Leone	2053	51.6	29.7	0.5	3.1	42.3
Bolivia (Plurinational State of)	2053	63.5	17.6	0.45	3.1	62.8
Afghanistan	2054	54.6	30.8	3.38	3.2	45.5
Niger	2054	48.1	29.1	2.12	3.2	37
Ghana	2055	55.4	26.7	1.45	3.3	49.5
Guinea-Bissau	2056	48.2	30.1	0.09	3.4	36.9
Côte d'Ivoire	2058	52.7	32.5	1.74	3.5	43.4
Congo	2060	55.3	29.8	0.33	3.7	50.7

Country	Target year	Target mCPR	mCPR target Gap (% point)	Users Target Gap (million)	Acceleration	DB mCPR gap
Mali	2061	50.1	33.2	1.8	3.8	37.3
Comoros	2063	56.4	36.1	0.07	4	47.4
Pakistan	2064	56.5	29.7	15	4.1	47.5
Cameroon	2065	53.5	33	1.71	4.2	44.3
Philippines	2066	59.8	18.5	4.42	4.3	58
State of Palestine	2067	59.3	13	0.24	4.4	56.7
Mauritania	2067	52.5	37.7	0.35	4.4	40.1
Nigeria	2068	49.9	36.8	15.88	4.5	33.3
Guinea	2068	50.1	39.1	1.09	4.5	31.6
Eritrea	2069	53.5	41.2	0.27	4.5	38.3
Haiti	2070	59.6	26.3	0.51	4.6	57.1
Togo	2070	55	33.9	0.58	4.6	45.6
Tajikistan	2071	53.6	25.2	0.57	4.7	47.3
Benin	2074	52.8	39.6	1.08	5	40.1
Central African Republic	2076	51.2	36.1	0.41	5.2	38.6
Iraq	2076	59.3	20.4	2.46	5.2	54.7
Yemen	2076	60.6	26.4	1.97	5.2	55.1
Sudan	2077	52.5	38.6	3.42	5.3	37.1
Gambia	2086	51.6	41.3	0.21	6.1	31.9
South Sudan	2089	54.4	49.4	1.1	6.4	30.7
Democratic Republic of the Congo	2091	54.7	44.1	7.7	6.5	42.1
Somalia	2092	54.3	50.8	1.37	6.6	29.9
Solomon Islands	2100	48.4	22.3	0.03	7.4	43.7
Papua New Guinea	2100	50.4	21.8	0.45	7.4	46.1
Chad	2100	41	36.1	1.3	7.4	24.7

2030 to meet DS75 by 2030. Required relative accelerations range from 1.1 to greater than 7 (Figure 2), with 35 countries needing to accelerate by at least a factor of 3 (Table 1). Associated mCPRs among countries projected to meet DS75 before 2100 range from 48.1% in Niger to 63.5% in Bolivia (Plurinational State of). It is projected that DS75 will not be met by 2100 in three countries (Chad, Papua New Guinea and Solomon Islands). In these countries, the target mCPR was set to the projected mCPR for 2100, resulting in a relatively low target for Chad (41.0%).

For countries needing acceleration, we estimate that the mCPR target gaps between 2019 and 2030 range from 4.3 percentage points in Sri Lanka to 50.8 percentage points in Somalia (Figure 2 and Table 1). mCPR gaps translate directly into the absolute numbers of required additional users of modern

contraceptive methods. Nigeria and Pakistan face some of the biggest challenges needing to accelerate their modern contraceptive use transition by a factor of 4 in order to add 15.9 and 15.0 million additional users respectively by 2030 (Table 1).

Figure 3 compares the estimated target gaps using the AT method to those obtained using the DB method. As expected, due to keeping demand in 2030 constant in the DB method, we observe that estimated target gaps are larger based on the AT method as compared to the DB method. The differences tend to be larger for countries with larger gaps that need more acceleration.

Discussion

We have presented the accelerated transition (AT) method as a new method to calculate mCPR targets associated with DS

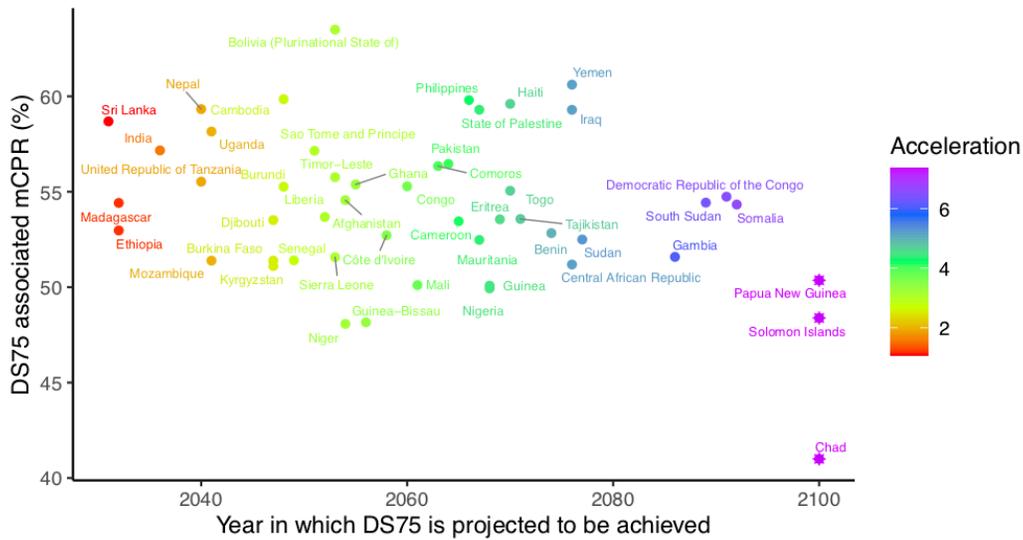


Figure 2. Target modern contraceptive prevalence rate (mCPR) plotted against 75% demand satisfied (DS75) target year. Colors indicate the relative acceleration required. Stars indicate countries where the target year is capped at 2100.

targets. As the name suggests, the AT method quantifies the acceleration needed – as compared to business as usual projections – for a country to meet a target. We find that substantial accelerations are needed in countries that are not on track to achieve 75% demand satisfied for married or in-union women by 2030, with required mCPR increases ranging from 4.3 to 50.8 percentage points.

We suggest that the AT method provides more appropriate expectations for the levels of mCPR required to meet DS targets than the DB method⁸. In countries where DS targets are projected to be later than 2030, we argue that the DB method fails to capture the dynamics of how FP indicators evolve. Specifically, the assumption of a fixed level of demand in 2030 accompanying the accelerated mCPR growth required to reach the target in this year is not realistic. That is, we cannot justify the assumption that accelerating mCPR will result in an equivalent deceleration of unmet need plus traditional contraceptive use combined. In fact, evidence suggests that increases in mCPR are likely to coincide with increased demand⁹. To combat this, the AT method uses the FPEMcountry R package to estimate the mCPR in the year in which the DS targets in question is projected to be met, which implicitly accounts for the changes in demand that coincide with reaching this relevant level of demand satisfied. The comparison of the AT and DB methods for assessing DS75 illustrates that for countries with demand satisfied projected to be less than 75% in 2030 mCPR targets from the DB method are lower than AT-based estimates.

Recently, Li *et al.* also obtained mCPR targets for DS75¹³. They used a regression model to estimate mCPR as a quadratic function of DS, with country fixed effects. mCPR target values at DS75 were obtained by plugging in a DS of 75% in the fitted regression equation. Hence, the Li *et al.* mCPR targets are based

on the assumption that differences in mCPR between countries stay constant with time and DS. While the model provides a good in-sample fit, its predictive performance is not verified¹³. The approach also does not provide any measure of acceleration needed to accomplish DS75. In contrast, the AT method is based on the FPEM, which does not assume that differences in mCPR between countries stay constant with time and DS and has been shown to work well for short-term projection^{5,6}. In addition, the AT method provides a measure of relative acceleration needed for the DS75 target.

While we suggest that the AT method improves upon existing methods, it is not without limitations. The AT method relies on projections of demand and mCPR by FPEMcountry. While this model has been shown to work well for short-term projections^{5,6}, its accuracy for long-term projections cannot be verified. In addition, by definition, the method assumes that accelerated mCPR growth would promote the same changes in demand and unmet need as compared to seeing the same mCPR growth over a longer time period.

We demonstrated the use of the AT method here for evaluating the DS75 target. More general, the approach can be used for any DS-based target. Indeed, given the rapid acceleration needed for a large number of countries to achieve DS75 (35 countries need to accelerate their transition by at least a factor of 3), other country-specific approaches to target setting, i.e. based on attainment probabilities⁴, may result in more realistic targets.

The main contribution of the AT method is to make DS-based targets actionable, that is, to provide the mCPR-associated target that in turn, provides direct information on the number of women needing modern contraceptives under the target. Given that accelerated progress towards demand-satisfied targets is desirable for many countries, we hope that the concrete

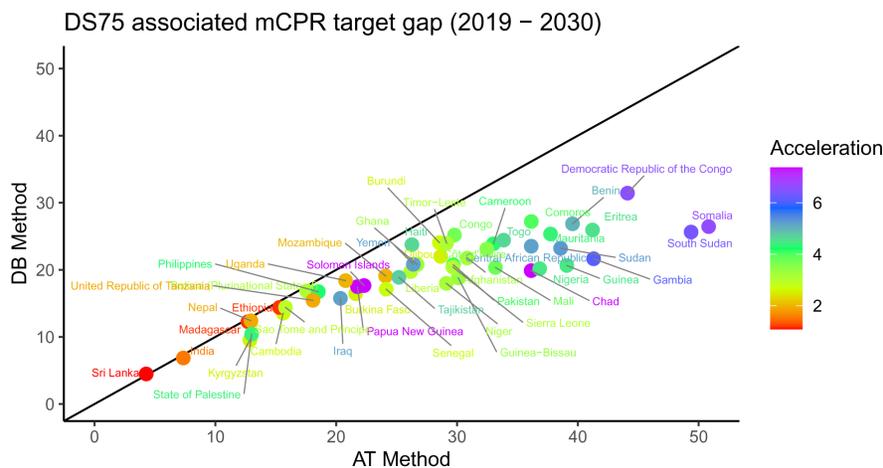


Figure 3. A comparison of the modern contraceptive prevalence rate (mCPR) target gaps according to the accelerated transition (AT) method and the demand based (DB) method. Each point represents a single country. Color indicates the relative acceleration needed according to the AT method. DS75 - 75% demand satisfied.

information on the remaining gap in mCPR and associated users aids the implementation of successful FP programs.

Data availability

Source data

The processed survey data that support the findings of this study are openly available at <https://www.un.org/en/development/desa/population/publications/dataset/contraception/wcu2019.asp> and contained in the R package `FPEMcountry`^{7,14}.

Software availability

Source code is available from Github: <https://github.com/FPRgroup/FPEMcountry/tree/v1.0.1>

Archived source code at time of publication: <http://doi.org/10.5281/zenodo.3899454>¹⁴

License: MIT

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 **Amy O. Tsui** 

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This review is not written independently of the comments of the first Reviewer, many of which I agree with.

Evaluating and appreciating the article requires some background on global family planning, in particular the FP2020 initiative, the composite definition of demand satisfied (DS) and sources of data, as well as a working knowledge of Bayesian modeling. The article's main contribution, besides its application of advanced statistical modeling, is, as it claims, to provide "actionable" DS targets.

The subsample of countries for this analysis is the 50 of the 68 poorest countries in the world (as identified in 2012) which were the intended beneficiaries of the FP2020 initiative.

Comments (bold-face indicates edits/modification requested):

The authors should clarify if the denominator of the contraceptive demand/need and use indicators is all women of reproductive age or women in union only, or both. If both, clarify how including only married women will bias the estimates, particularly in sub-Saharan African countries. Are the denominators for these rates consistently defined for each country?

Demand Satisfied (DS) for women of reproductive age is not defined in equation form and is:

$$DS = mCPR / (CPR + UN)$$

where mCPR is the Modern Contraceptive Prevalence Rate and CPR is the Contraceptive Prevalence Rate, irrespective of method type. Unmet Need is the percent of women of reproductive age who desire to postpone or end childbearing but are not currently using a contraceptive method; it is also a "prevalence rate" (which enables summing it with CPR to

represent Total Demand).

The Accelerated Transition (AT) method described in this article involves setting the value of mCPR for each country for 2030 (when the Sustainable Goal Target 3.7 is to be achieved) to be the same value in whatever year the Family Planning Estimation Model projects 75% of DS will be reached. Its limitation is that although mCPR is artificially accelerated, what happens to the denominator components of CPR and UN under acceleration is not known. Presumably CPR will increase proportionally (without, for example, a large increase in traditional method use) and UN will decline linearly. However, research has shown that UN can increase at first with a CPR increase before it decreases (e.g., Westoff, 2001). This could offset the 75% satisfied level. **Please comment on whether you expect the DS75 level in 2030 should match what is suggested by FPEM should the mCPR indeed be significantly accelerated, or if it is not important.**

The target mCPRs (see Table 1) for DS75 are nearly all around 50% and the average number of years of acceleration is 31.7 (target years minus 2030). Thus many of these countries are unlikely to reach their target mCPR in 2030. **Please comment on how realistic these projections are given their intended actionability. How are these quantified targets likely to be a more effective call to action than FP2020 was?** Note that the additional users in 2019 per the FP2020 Data Dashboard for FP2020 countries is 53.4 million, or a gap of 66.6 million against the 120 million goal. Five countries in Table 1 appear to account for a user gap of 62.1 million (Ethiopia, India, Philippines, Nigeria, and the DR Congo). **Please comment on whether a call to action should focus on accelerating satisfying demand in primarily populous or all 50 countries despite the low likelihood of achieving the target in many.**

The influence of contraceptive method mix is not discussed. India's mix profile is heavily dominated by contraceptive sterilization which would indicate a larger demand for limiting than spacing childbearing. Contrast this with SSA countries with more traditional method use (e.g., Central African Republic) or a high percentage of injectable method use, where demand to space births is greater. **Please comment on how shifts in contraceptive method mix either due to new supply developments or age-related use will affect the target mCPRs and "users target gaps".**

Minor comments:

- Ensure the use of the acronym BAU (Business as Usual) is consistent throughout the paper; sometimes it is BUA and sometimes BAU. As Reviewer 1 requests, clarification of the BAU description is warranted. As I understand it, BAU is simply assuming current trend for a given country follows the projection from the Family Planning Estimation Model. (It's not clear to me why relabeling this method as BAU is needed.)
- The FPEM is used on a country-specific basis for the 50 FP2020 countries. This is referred to as the one-country implementation of FPEM. Why not just say it's a country-specific application of FPEM? One-country is an awkward term.
- Since both the AT method and the regression method in Li *et al.* (2019) (referenced in the article) have a similar aim to provide target mCPRs for 75% demand satisfied levels but their predictive performances are not yet verified, it will be interesting to compare actual mCPRs in 2030 with those estimated by these two methods. **It is worth briefly commenting in the**

Discussion section what the role of behavioral factors is in driving contraceptive use, as this seems to be an absent consideration for statistical modeling/assessments.

Is the rationale for developing the new method (or application) clearly explained?

Yes

Is the description of the method technically sound?

Yes

Are sufficient details provided to allow replication of the method development and its use by others?

Yes

If any results are presented, are all the source data underlying the results available to ensure full reproducibility?

Partly

Are the conclusions about the method and its performance adequately supported by the findings presented in the article?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: contraceptive behavior, reproductive health, demography

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 21 September 2020

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The article describes a new method for estimating how much additional effort will be needed to achieve goals in demand satisfied for family planning by 2030. These estimates will provide country leaders and decision-makers much needed information to assess if their goals are achievable and how much additional effort may be required to meet those goals. The authors provide comparison with previously used methods which does not adjust unmet need for changes over time. The authors provide sufficient justification that the revised method is an improvement

over the current standard.

As my focus was mainly related to use and interpretation of the analysis and results, I highly recommend ensuring review by someone with expertise in modeling to review methods used. I hope the authors will consider the following to further strengthen this important piece of work:

- This statement is circular, please clarify/correct. "Estimates of unmet need are obtained by capturing the relationship between contraceptive prevalence and unmet need."
- In general, I found the description of BAU unclear. Consider reworking with more focus on plain language and contrasting the difference between BAU and the accelerator.
- The article would benefit from a stronger framing of the analysis in expanding access and choice. For example, the following statement "Countries that are not currently projected to meet DS75 by 2030 will require a larger-than-BAU increase in the number of users of modern methods of contraception between now and 2030." could be restated as, "Countries that are not currently projected to meet DS75 by 2030 will require an examination of factors contributing to low contraceptive use and restricted access to family planning services, in these context the "BUA" approach is not addressing the values and preferences of large proportions of the population with an unmet need."
- The point of this scenario is unclear, "A previous study for states in India has estimated the required increases in mCPR and additional users needed to achieve DS targets using 2030 projections of total demand (contraceptive prevalence plus unmet need) for contraception⁸. This method combined accelerated growth in modern use with business-as-usual growth in total demand; the method did not account for faster-than-BAU increases in mCPR to coincide with faster-than-BAU increases in demand that are likely to occur due to, for example, increased efforts in family planning programs⁹. Methods that account for faster-than-BAU increases in demand to coincide with faster-than-BAU increases in mCPR are needed to avoid underestimation of mCPR targets, and thus, failure to meet DS targets." What did the estimation show? How did it influence India's investments?
- Please clarify: "Afghanistan needs to increase mCPR by 30.8% percentage points over an 11-year". Is this 30.8 percent of the percentage point increase or an increase of 30.8 percentage points?
- Please clarify: "Associated mCPRs among countries projected to meet DS75 before 2100 range from 48.1% in Niger to 63.5% in Bolivia (Plurinational State of)."
- Please clarify if the model uses mCPR vs CPR in the estimation of unmet need. Both measures are referenced in the article.
- Please include a discussion of the age of data in the limitation section. How many of these countries have data that is more than 5 or even 10 years old? How accurate is that data?
- Please expand your description of the "acceleration factor". How should this be understood? What does it mean for a country to have an acceleration factor of 4 versus 2?

- Please provide some discussion of how COVID 19 effects this analysis.

Is the rationale for developing the new method (or application) clearly explained?

Yes

Is the description of the method technically sound?

Partly

Are sufficient details provided to allow replication of the method development and its use by others?

Partly

If any results are presented, are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions about the method and its performance adequately supported by the findings presented in the article?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Research Utilization. Population and Reproductive Health

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.
