

Original Research Article

The role of female permanent contraception in meeting the demand for family planning in low- and middle-income countries^{☆☆☆}

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ARTICLE INFO

Article history:

Received 29 November 2021

Received in revised form 2 May 2022

Accepted 4 May 2022

Keywords:

Disparities

Ecological study

Equity

Family planning

Global health

Permanent contraception

ABSTRACT

Objective: Our aim was to describe the reliance on female permanent contraception among women with demand for family planning satisfied with modern methods (mDFPS) in low- and middle-income countries (LMICs) and to describe socio-economic and demographic patterns of permanent contraception in countries with high use.

Study Design: Using data from the latest national health survey carried out in LMICs, we estimated mDFPS and the share of each contraceptive method used. Countries with a share of more than 25% of female permanent contraception were further explored for differences by wealth, number of living children, woman's age, and by the intersection of woman's age and number of living children.

Results: In the 20 countries studied, between 6% and 94% of the contracepting population used modern methods. Female permanent contraception accounted for more than half of women using modern contraceptives in India, Dominican Republic, El Salvador, Mexico, and Colombia. In India and Tonga, more than 20% of women using contraceptives with fewer than 2 living children were using female permanent contraception. Among women with 2 living children, countries with the highest reliance on permanent contraception were India (79%), El Salvador (61%), Cuba (55%), Colombia (52%), and Thailand (51%). Dominican Republic, El Salvador, India, and Mexico presented high levels of permanent contraception among younger women, with reliance higher than 30% among women aged 25 to 29 and 50% or more among women aged 30 to 34.

Conclusions: Reliance on permanent contraception was high in several countries and among women aged less than 35 years.

Implications: Our results may help policymakers and health managers improve family planning services in low- and middle-income settings. We identified high use of female permanent contraception among modern contraceptive users in several countries, even among young women with fewer children.

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1. Introduction

Satisfied demand for family planning has increased in most low- and middle-income countries (LMICs) in the past decades [1–4], with several countries reaching above 70% of coverage [5]. However, despite the development and improvement of reversible modern contraceptives and the concomitant decrease in the use

of female permanent contraception [6], the proportion of female contraceptive users relying on it is still large in several countries [7,8]. Permanent contraception is the predominant method in India, Dominican Republic and Mexico, where it accounts for 70%, 66%, and 58%, respectively, of modern contraceptive use among women [7,8].

Permanent contraception is highly effective and does not require any further action to prevent pregnancy [9]. However, the main concerns of permanent contraception are its invasive nature and irreversibility, which might lead to regret in the future [8,10–12]. In places where permanent contraception use is predominant, lack of availability of other methods, coercion or pressure to adopt it is a concern [8]. Evidences of coercion to accept permanent contraception have been documented among marginalized women, such as those who are poor or live with disabilities [13,14].

[☆] Conflict of interest: The authors have no conflict of interest.

^{☆☆} Funding: This work was supported by Associação Brasileira de Saúde Coletiva (ABRASCO) and by the Bill and Melinda Gates Foundation [grant number OPP 1199234]. Under the grant conditions of the Foundation, a Creative Commons Attribution 4.0 Generic License has already been assigned to the author accepted manuscript version that might arise from this submission.

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Despite the abundant literature on family planning, limited evidence describes social disparities on reliance on female permanent contraception. We present estimates of demand for family planning satisfied with modern contraceptive methods (mDFPS) in LMICs and the share of female permanent contraception among women using modern methods. We evaluate within country disparities in terms of wealth, woman's age, and number of living children in the countries with the highest reliance on permanent methods. Also, considering the intersectionality between woman's age and number of living children we identify situations of high reliance on permanent contraception in women who are young and have few children.

2. Methods

We estimated demand for family planning satisfied by modern methods (mDFPS) using nationally representative Demographic and Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS) carried out since 2010 in 105 LMICs. For Brazil and Ecuador we used data from the 2013 *Pesquisa Nacional de Saúde* (PNS) and from the 2012 *Encuesta Nacional de Salud y Nutrición*, respectively. Both surveys have similar characteristics to DHS and MICS. Since several surveys only collect reproductive information for women who are married or in a union, we restricted the analyses to this group. Recent data from DHS and MICS covers 75% of the LMICs in Eastern & Southern Africa, 92% of those in West & Central Africa, 62% of those in Middle East & North Africa, 88% of South Asia countries, 52% of those in East Asia & the Pacific, 84% in Europe and Central Asia and in Latin America and the Caribbean.

Demand for family planning satisfied by modern methods is a highly used measure. It is estimated as the proportion of women of reproductive age (15–49 years) in need of contraception that are currently using a modern contraceptive method. Women in need of contraception are those who are fecund and do not want to become pregnant within the next 2 years, or are unsure [15]. Modern contraceptive methods are technological products or medical procedures that prevent natural reproduction [16].

We classified modern contraceptive methods in: (1) short-acting reversible methods (pill, male and female condom, injectables, patches, diaphragms, spermicidal agents, and emergency contraception); (2) long-acting reversible contraceptive methods (intrauterine device and implants); (3) permanent female contraception; and (4) permanent male contraception. The share of permanent methods was calculated for countries and population subgroups as the proportion of women relying on female permanent contraception among users of modern methods.

Surveys from Brazil, Ecuador, Argentina, Georgia, and South Sudan do not allow for the estimation of need for contraception. Considering the high correlation between mDFPS and modern contraceptive use prevalence, for these surveys, we estimated satisfied demand for family planning from contraceptive prevalence using the following predictive equation [17]:

$$(mDFPS) = 0.61 + 0.68 \log(CPR) + 3.57 CPR^2$$

where CPR is contraceptive prevalence. This equation was developed and validated in a multicountry analysis. More details are presented elsewhere [17].

All the analyses considered the survey design, including sampling weights and clustering.

We focused our analysis of inequalities in the 20 countries where the share of female permanent contraception was higher than 25%. We investigated inequalities in terms of wealth quintiles, women's age (15–19, 20–24, 25–29, 30–34, 35–39, and 40–49), number of living children (0–1, 2, 3+), and according to the intersectionality of age and number of living children. Wealth was estimated based on an asset index obtained from information on

household assets, presence of electricity, water supply, sanitary facilities, and building materials of the dwelling, among other variables [18,19].

The wealth score was obtained through principal component analyses, estimated separately for urban and rural areas and later combined into a single score using a regression-based scaling procedure [20]. The households were then classified into 5 equally sized groups based on the value of the score and weighted by the number of residents.

We also measured wealth inequalities using the Slope Index of Inequality (SII). The SII is a complex measure of absolute inequality which represents the difference between the coverage for the top and the bottom of the wealth scale. It ranges between -100 and 100, being the outcome coverage more equal when it is closer to zero [21].

3. Results

Country-level coverage of demand for family planning satisfied by modern methods, share of female and male permanent contraception, and unweighted sample sizes for the 105 countries screened are presented in Supplementary Table 1. Among these countries, mDFPS ranged from 6.0% in Albania to 93.7% in Brazil. India was the country with the largest share of female permanent contraception, with 75.5% (95% CI: 75.1%–75.8%). Latin America & the Caribbean was the region where more countries presented higher reliance on female permanent contraception. Its share was higher than 25% in 12 of the 21 countries studied. The leading countries in the region were Dominican Republic (59.8%; 95% CI: 58.3%–61.1%), El Salvador (54.5%; 95% CI: 52.7%–56.4%), and Mexico (50.5%; 95% CI: 47.4%; 53.6%). West & Central Africa was the region with lower reliance on female permanent contraception, where the share was above 5% only in Chad (5.7%; 95% CI: 2.7%–11.6%) and Congo Democratic Republic (5.2%; 95% CI: 3.3%–8.0%). The region also presented the lowest level of mDFPS, with most countries presenting mDFPS below 50%, except for Sao Tome and Principe (50.2%; 95% CI: 47.1%–53.4%) and Senegal (52.6%; 95% CI: 50.3%–54.8%).

Figure 1 shows the levels of mDFPS and share of female permanent methods for each study country, revealing no clear correlation between the 2 ($r = 0.26$, $p = 0.008$). Highlighted countries, with share of female permanent contraception above 25%, were selected for an in-depth equity analysis.

Gaps in the share of female permanent contraception in term of wealth, age and number of children are presented in Figures 2–5. Estimates for each subgroup and 95% CIs are presented in the supplementary material. Large gaps between rich and poor were found in several countries but there was no single pattern in terms of direction. Twelve of the 20 countries presented positive values of SII, indicating higher share of female permanent contraception among the richest women in comparison to the poorest. The largest gaps were found in Guatemala (SII = 24.5), Papua New Guinea (SII = 20.7), El Salvador (SII = 18.3), Honduras (SII = 17.0), Thailand (SII = 13.3), Nepal (SII = 12.7), and Tonga (SII = 11.3). The share of female permanent contraception was higher among the poorest compared to the richest in Albania (SII = -25.4), Brazil (SII = -24.6), India (SII = -16.2), Pakistan (SII = -14.7), Mexico (SII = -7.2), and Costa Rica (SII = -5.1). India presented a peculiar pattern, with similar shares of female permanent contraception for the 80% poorer women, while the richest 20% were well below, with a share of 65%.

India stands out again in permanent contraception by woman's age (Fig. 3), where younger women present much higher levels of permanent contraception compared to the other countries. 39.2% (95% CI: 38.0%–40.4%) of women 20 to 24 years and 61.7% (95% CI: 60.9%–62.5%) or women 25 to 29 had already been sterilized.

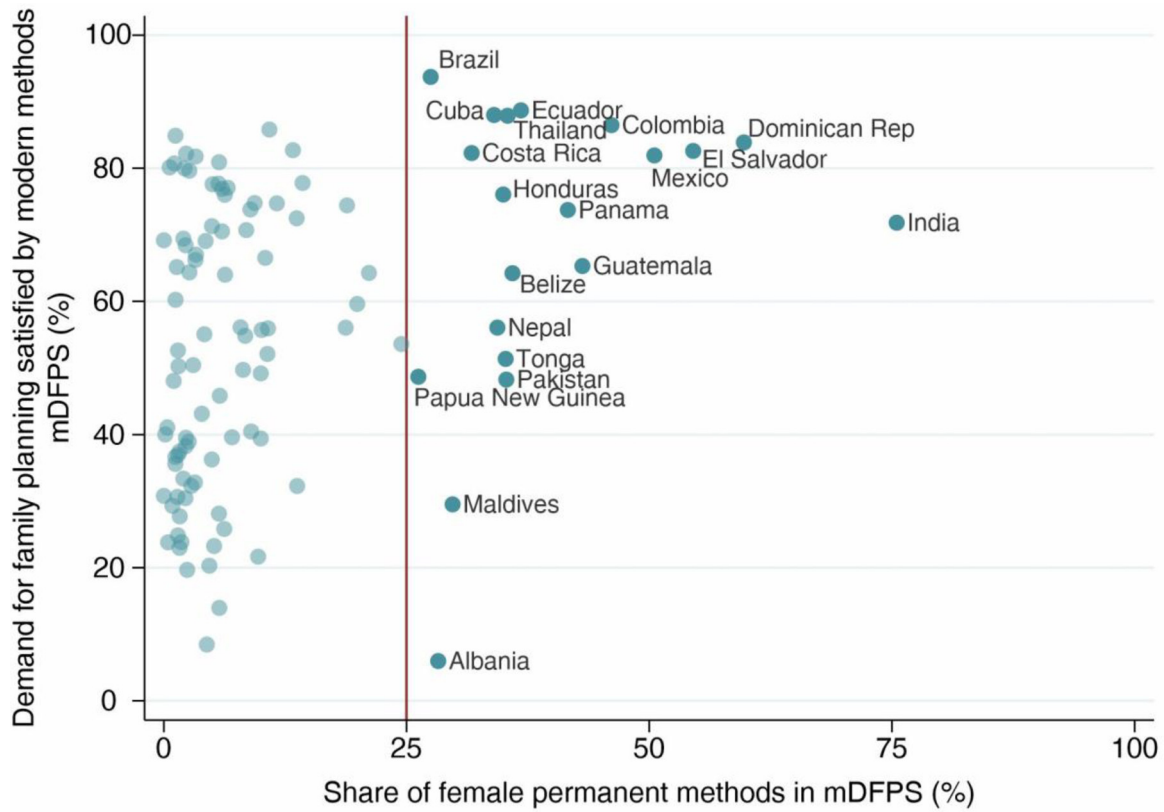


Fig. 1. Demand for family planning satisfied by modern methods (mDFPS) according to the most recent survey from low- and middle-income countries and share of female permanent contraception. Data source: Demographic and Health Surveys, Multiple Indicator Cluster Surveys, and National Health Survey (Brazil). *Countries in the right from the vertical line were those selected to the inequality analysis.

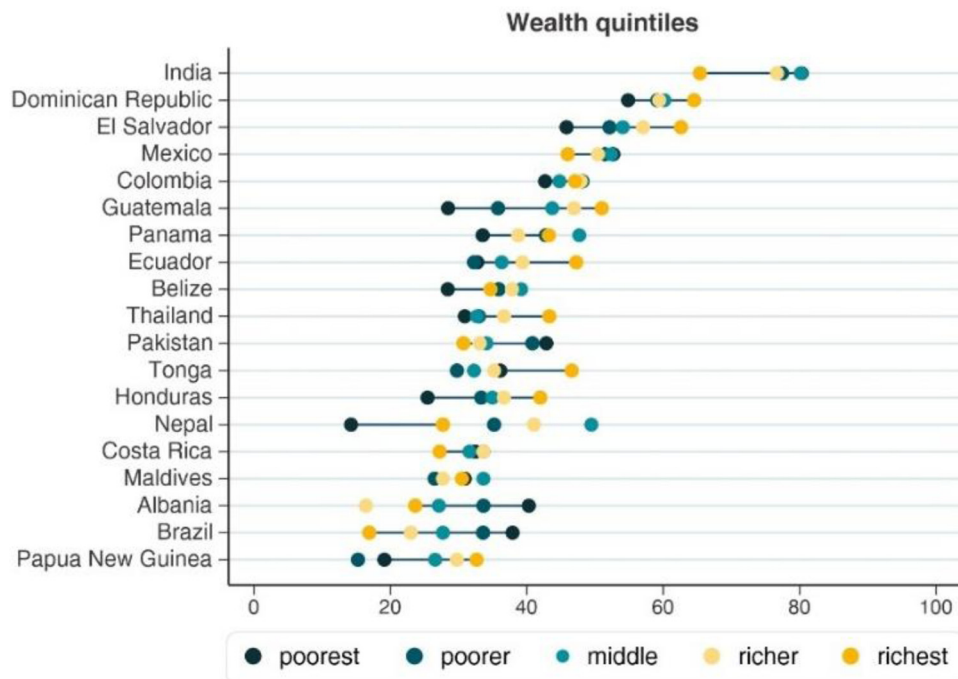


Fig. 2. Inequalities in the share of female permanent contraception in terms of wealth according to the most recent survey, ordered according to overall share of female permanent contraception for countries with a share of 25% or more. Data source: Demographic and Health Surveys, Multiple Indicator Cluster Surveys, and National Health Survey (Brazil).

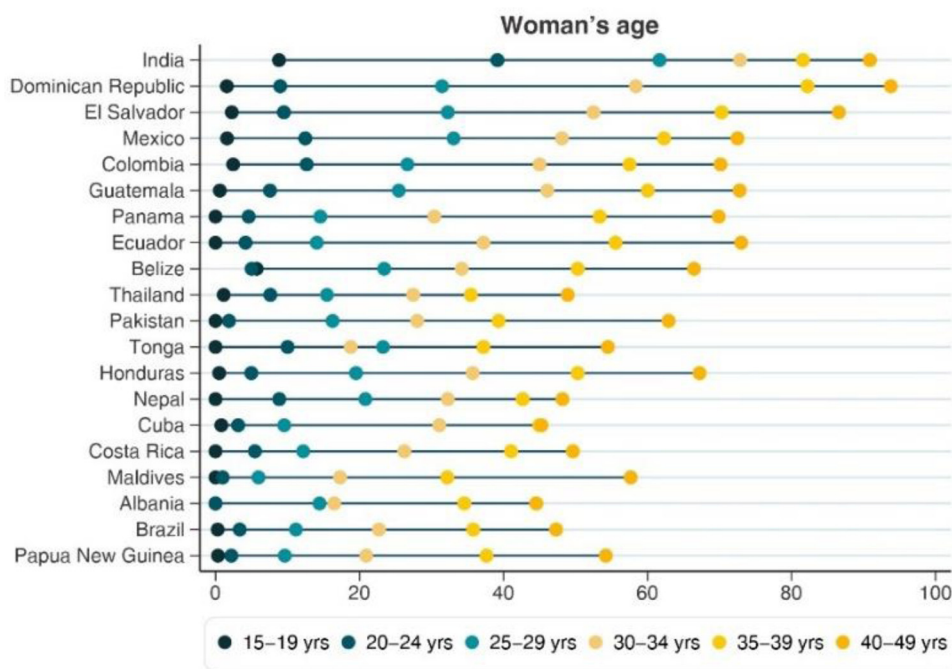


Fig. 3. Inequalities in the share of female permanent contraception in terms of woman's age according to the most recent survey, ordered according to overall share of female permanent contraception for countries with a share of 25% or more. Data source: Demographic and Health Surveys, Multiple Indicator Cluster Surveys, and National Health Survey (Brazil).

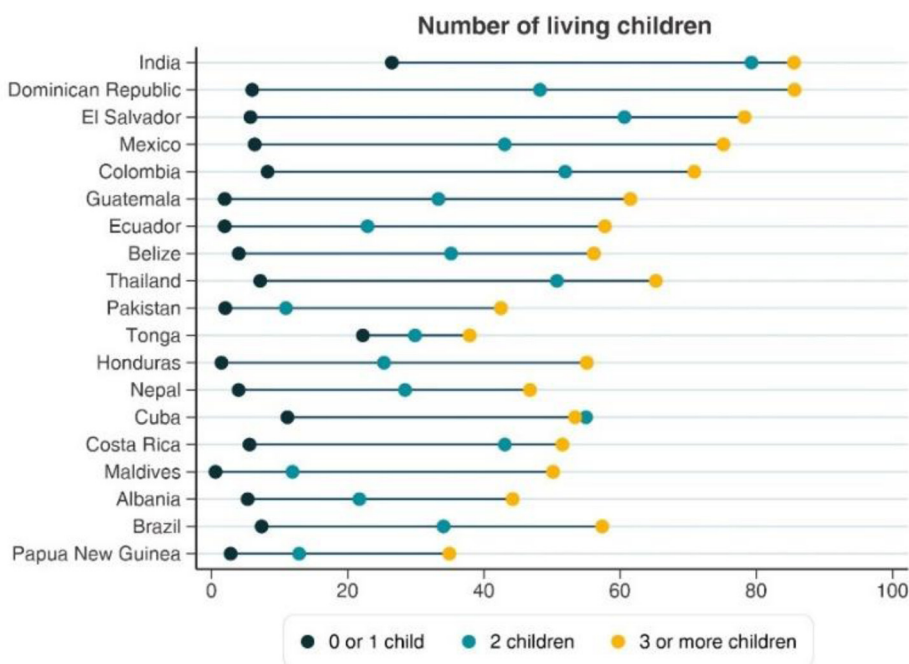


Fig. 4. Inequalities in the share of female permanent contraception in terms of number of living children according to the most recent survey, ordered according to overall share of female permanent contraception for countries with a share of 25% or more. Data source: Demographic and Health Surveys, Multiple Indicator Cluster Surveys, and National Health Survey (Brazil).

Other countries with a high share of permanent contraception in women 25 to 29 years were, in decreasing order, Mexico (33.1%; 95% CI: 27.8%–38.9%), El Salvador (32.3%; 95% CI: 28.5%–36.3%), and Dominican Republic (31.5%; 95% CI: 28.5%–34.6%).

We also observed a monotonic increase of permanent contraception by number of living children (Fig. 4), with 2 countries

standing out in permanent contraception among women with 0 to 1 child: India (26.5%; 95% CI: 25.5%–27.5%) and Tonga (22.2%; 95% CI: 7.5%–50.1%). Considering women with 2 living children, the countries with the highest shares of female permanent contraception were India (79.3%; 95% CI: 78.8%–79.7%), El Salvador (60.6%; 95% CI: 57.4%–63.8%), Cuba (54.5%; 95% CI: 50.3%–59.6%),

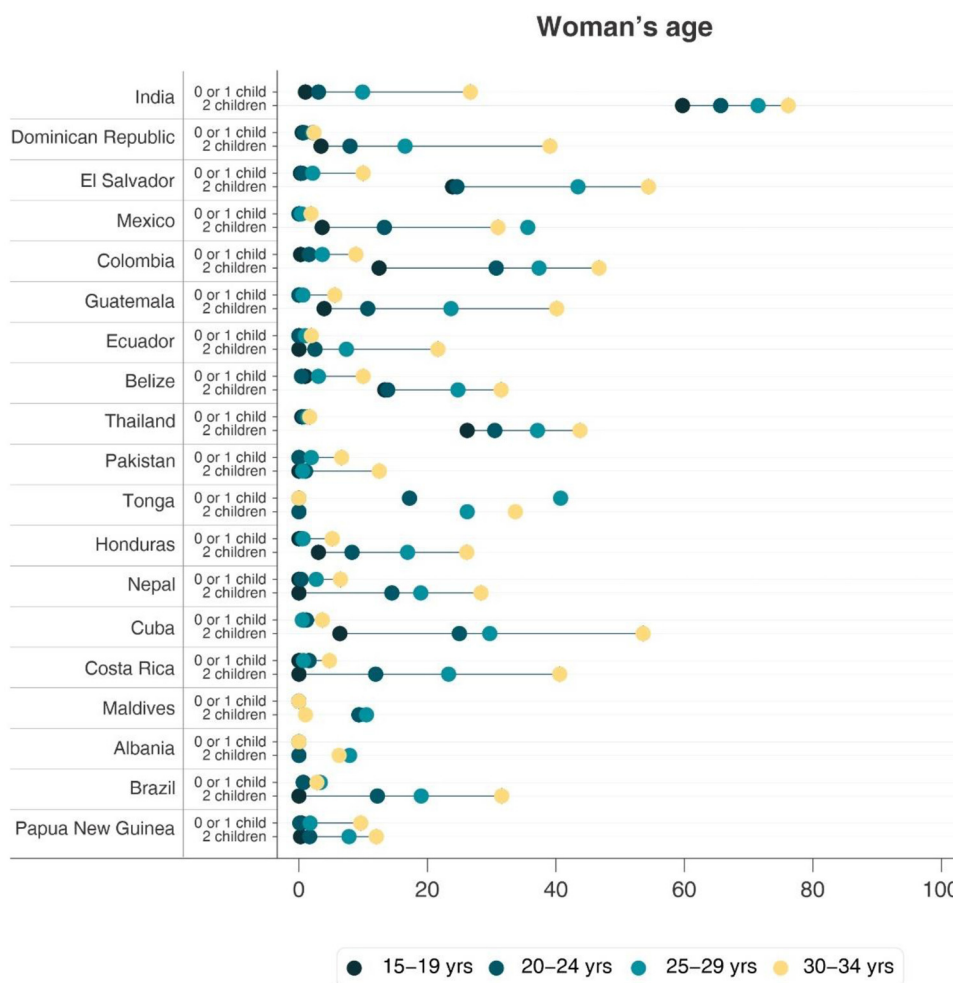


Fig. 5. Intersectional inequalities in the share of female permanent contraception in terms of woman's age and number of living children in the most recent survey, ordered according to overall share of female permanent contraception for countries with a share of 25% or more. Data source: Demographic and Health Surveys, Multiple Indicator Cluster Surveys, and National Health Survey (Brazil).

Colombia (51.9%; 95% CI: 49.1%–54.8%), and Thailand (50.7%; 95% CI: 47.7%–53.7%). Cuba was the only country with similar shares among women with 2 and those with 3 or more children.

Considering the intersectionality between women's age and number of living children, Figure 5 presents the share of female permanent contraception among women younger than 35 and with less than 3 children. Results considering all groups of age and number of living children are presented in the supplementary material. India again stands out with the highest shares of permanent contraception for women with 2 children in all age groups. El Salvador and Thailand were the 2 other countries with higher reliance on permanent contraception for young women with 2 children.

4. Discussion

Using data from national health surveys carried out in LMICs, we presented the proportion of women relying on female permanent contraception among modern contraceptive users. In the countries with higher reliance on permanent methods, we assessed differences between and within countries in term of wealth, number of living children, woman's age, and considering the intersectionality between number of living children and woman's age. Our findings show that in several countries with high levels of mDFPS coverage, this is largely achieved by female permanent contracep-

tion. The countries where this was most marked were India, Dominican Republic, El Salvador, Mexico, and Colombia, with large gaps in terms of wealth. We also found relatively high reliance on permanent contraception among women who are young and have less than 3 children in some countries. Being irreversible, permanent methods are more indicated for women who are sure that they will not want more children, a situation more common in older women with more living children [22].

Permanent contraception can be utilized by any woman [23,24], except in countries with specific legal restrictions, such as Guatemala, Kyrgyzstan, Myanmar, Rwanda, and Sudan [25]. Permanent contraception is highly effective, it does not affect hormonal levels, neither requires user intervention nor involve any additional cost [9]. It is a relatively simple medical intervention [26], however, given the fact it is irreversible (or rather difficult to revert), ethical issues are a primary concern. We found a high reliance on female permanent contraception among women younger than 30 years and among those with less than 3 living children in several countries. Permanent contraception regret is not uncommon and it is higher among those who are unmarried, non-white, with less than 4 children, who were sterilized at young ages, who have been sterilized during a postabortion procedure, and among those who had felt pressure to adopt permanent contraception [22]. The World Health Organization reinforces the importance of making it an informed choice based on detailed counseling by the provider who

Table 1

Demand for family planning satisfied by any modern method (mDFPS), share of permanent methods, and Slope Index of Inequality (SII) in female permanent contraception in 20 low- and middle-income countries with representative data since 2010 and higher use of female permanent contraception

	Source	mDFPS		Share of permanent methods			SII in female permanent contraception
		% (95% CI)	N	female % (95% CI)	male % (95% CI)	N	
South Asia							
India (2015)	DHS	71.8 (71.5; 72.1)	323291	75.5 (75.1; 75.8)	0.6 (0.5; 0.6)	220811	-16.2
Pakistan (2017)	DHS	48.2 (46.4; 50.1)	5996	35.3 (32.6; 38.1)	0.2 (0.1; 0.6)	2770	-14.7
Nepal (2016)	DHS	56.0 (54.3; 57.8)	7605	34.4 (31.8; 37.1)	12.8 (11.1; 14.8)	4258	0.13
Maldives (2016)	DHS	29.5 (27.2; 32.0)	2915	29.7 (25.0; 35.0)	1.0 (0.3; 2.9)	4258	0.7
East Asia & the Pacific							
Thailand (2015)	MICS	87.9 (86.5; 89.1)	14861	35.4 (33.4; 37.4)	0.5 (0.3; 0.8)	12971	13.3
Tonga (2019)	MICS	51.3 (46.9; 55.8)	791	35.2 (30.1; 40.7)	0.4 (0.1; 1.3)	354	11.3
Papua New Guinea (2016)	DHS	48.6 (46.3; 51.0)	6565	26.2 (23.3; 29.3)	2.7 (1.7; 4.2)	3285	20.7
Europe & Central Asia							
Albania (2017)	DHS	6.0 (5.1; 7.0)	4334	28.3 (22.6; 34.7)	0	300	-25.3
Latin America & Caribbean							
Dominican Republic (2014)	MICS	83.9 (83.0; 84.8)	14356	59.8 (58.3; 61.2)	0.2 (0.1; 0.5)	11932	9.4
El Salvador (2014)	MICS	82.6 (81.3; 83.8)	6502	54.5 (52.7; 56.4)	0.4 (0.2; 0.7)	5306	18.3
Mexico (2015)	MICS	81.9 (80.1; 83.7)	6584	50.5 (47.4; 53.6)	1.9 (1.0; 3.4)	5235	-7.2
Colombia (2015)	DHS	86.5 (85.6; 87.3)	17268	46.1 (44.7; 47.6)	4.7 (4.1; 5.4)	14639	4.5
Guatemala (2014)	DHS	65.3 (63.9; 66.6)	11116	43.1 (41.6; 44.7)	1.3 (1.0; 1.6)	7151	24.5
Panama (2013)	MICS	73.7 (71.0; 76.3)	4951	41.6 (38.4; 44.9)	0.8 (0.4; 1.6)	3280	4.8
Ecuador (2012)	NSS	88.7	11094	36.8 (35.0; 38.6)	0.4 (0.3; 0.4)	8636	8.7
Belize (2015)	MICS	64.2 (61.5; 66.9)	2398	35.9 (32.7; 39.3)	0.3 (0.1; 0.8)	1540	4.2
Honduras (2011)	DHS	76.0 (75.0; 77.0)	10925	35.0 (33.7; 36.3)	0.4 (0.3; 0.6)	8128	17.0
Cuba (2014)	MICS	88.0 (85.8; 89.9)	5198	34.0 (31.0; 37.1)	0.0 (0.0; 0.1)	4636	NA
Costa Rica (2011)	MICS	82.3 (79.9; 84.4)	3572	31.7 (28.6; 35.0)	7.8 (6.3; 9.6)	2953	-5.1
Brazil (2013)	NSS	93.7	11657	27.5 (26.0; 29.1)	32.9 (31.2; 34.6)	9801	-24.6

should offer advice and access on alternative suitable reversible methods [23]. In order to respect the woman's and couples' autonomy, the provider also needs to be aware of possible bias in recommendation of female permanent contraception [24]. A careful discussion on alternative methods is important to ensure informed consent [24], especially given the current availability of long-acting reversible methods (Table 1).

Previous studies have identified that women who were more educated and those who were well informed on long-acting reversible methods are more likely to choose them rather than permanent contraceptives [27,28]. Furthermore, there are also strong gender inequalities in the use of female permanent contraception, knowledge about vasectomy is poorly in some countries, where it is associated with negative effects on sexual performance and saw as a threat to virility [29,30].

India, the leading country in female permanent contraception, has a long history of pro-sterilization policies [31]. Currently, family planning programs are focused on voluntary contraception [31], however, the adoption of contraception in high fertility districts, either with reversible methods or permanent contraception, is stimulated with financial incentives to women and to health facilities [32]. The country has cultural norms that encourage women to marry at young ages, to have 2 or 3 children, and to be sterilized once they achieve it [31]. We found that more than 80% of Indian women had been sterilized before 30 years of age. Considering the amount of evidence already available on family planning and contraception in India, indicating the high resistance on female permanent contraception despite the several reversible methods already developed, the country could strongly benefit from evidence-based policies aiming to reduce the current reliance on female permanent contraception through a stronger promotion of reversible contraceptives, especially the long-acting methods.

Permanent contraception is a major component in sexual and reproductive health programs in Dominican Republic, El Salvador,

Colombia, and Mexico [8,33]. Our findings show high reliance on permanent contraception even among women younger than 30 and among those with less than 3 living children in all these countries. The use of long-acting reversible methods is virtually null in almost all of them, except for Mexico [8,33–36]. Despite the availability of contraceptive methods in health services, the choice for female permanent contraception is strongly influenced by the belief that it is much more effective than reversible methods and by the understanding that it has fewer side effects [34].

In agreement with our findings, wealth inequalities have been identified within countries, with pro-poor and pro-rich inequalities, depending highly on characteristics of public and private health services, as stock and price of contraceptive methods [37,38]. We found a higher share among the poorest in India and in Mexico, countries where permanent contraception is offered free of charge and where forced sterilization has been documented among more vulnerable women [39–42]. In Guatemala, Dominican Republic, El Salvador, and Colombia, where it was higher among the wealthiest, family planning services are mostly paid out-of-pocket and tubal ligation is either unavailable in public services or involve long waiting lists [43–45].

Our study has some limitations. First, to include a larger number of countries, we had to exclude never married women from our analysis. These women are usually younger and less likelihood to be sterilized. Despite having included Brazil and Ecuador, for which no recent DHS or MICS surveys were available, we may have missed other countries with available non-standard surveys. Also, we have neither information on method availability in the health services, nor on quality of the information received by the women. The collection of this information by national health surveys could allow us to better differ if the predominance of female permanent contraception is due to cultural preferences or limitations in family planning services provision.

We showed that female permanent contraception accounts for a high proportion of mDFPS in several LMICs, being it highly variable according to the socioeconomic and demographic characteristics included. The high reliance on female permanent contraception in some subgroups found in our study raises a concern on how well informed those women are regarding the permanent nature of the method, and on the availability of other modern contraceptive methods. High quality of sexual and reproductive health education is fundamental to high-quality family planning coverage, especially in settings with higher levels of gender-based inequalities and lower levels of human development. It is fundamental that family planning services provide both reversible and permanent contraceptive methods, information on all available options, and empowerment assistance to the more vulnerable women. A high level of mDFPS coverage in a country must be achieved preserving women's and couples' autonomy on reproductive health, what requires high-quality family planning services.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.contraception.2022.04.003](https://doi.org/10.1016/j.contraception.2022.04.003).

References

- Hellwig F, Coll CV, Ewerling F, Barros AJ. Time trends in demand for family planning satisfied: analysis of 73 countries using national health surveys over a 24-year period. *J Glob Health* 2019;9:020423. doi:[10.7189/jogh.09.020423](https://doi.org/10.7189/jogh.09.020423).
- United Nations. Trends in contraceptive use worldwide. New York 2015. https://www.un.org/development/desa/pd/sites/www.un.org/development/desa/pd/files/undesa_pd_report_2015_trends_contraceptive_use.pdf (accessed April 28, 2021).
- Cahill N, Sonneveldt E, Stover J, Weinberger M, Williamson J, Wei C, et al. Modern contraceptive use, unmet need, and demand satisfied among women of reproductive age who are married or in a union in the focus countries of the Family Planning 2020 initiative: a systematic analysis using the Family Planning Estimation Tool. *Lancet* 2018;391:870–82. doi:[10.1016/S0140-6736\(17\)33104-5](https://doi.org/10.1016/S0140-6736(17)33104-5).
- Slaymaker E, Scott RH, Palmer MJ, Palla L, Marston M, Gonsalves L, et al. Trends in sexual activity and demand for and use of modern contraceptive methods in 74 countries: a retrospective analysis of nationally representative surveys. *Lancet Glob Health* 2020;8:e567–ee79. doi:[10.1016/S2214-109X\(20\)30060-7](https://doi.org/10.1016/S2214-109X(20)30060-7).
- Ewerling F, Victora CG, Raj A, Coll CVN, Hellwig F, Barros AJD. Demand for family planning satisfied with modern methods among sexually active women in low- and middle-income countries: who is lagging behind? *Reprod Health* 2018;15:42. doi:[10.1186/s12978-018-0483-x](https://doi.org/10.1186/s12978-018-0483-x).
- Fang NZ, Advaney SP, Castaño PM, Davis A, Westhoff CL. Female permanent contraception trends and updates. *Am J Obstet Gynecol* 2021;21:S0002–9378. doi:[10.1016/j.ajog.2021.12.261](https://doi.org/10.1016/j.ajog.2021.12.261).
- Pradhan MR, Dwivedi LK. Changes in contraceptive use and method mix in India: 1992–92 to 2015–16. *Sex Reprod Healthc* 2019;19:56–63. doi:[10.1016/j.srhc.2018.12.006](https://doi.org/10.1016/j.srhc.2018.12.006).
- Bertrand JT, Sullivan TM, Knowles EA, Zeeshan MF, Shelton JD. Contraceptive method skew and shifts in method mix in low- and middle-income countries. *Int Perspect Sex Reprod Health* 2014;40:144–53. doi:[10.1363/4014414](https://doi.org/10.1363/4014414).
- American College of Obstetricians and Gynecologists' Committee on Practice Bulletins—Gynecology/ACOG Practice Bulletin No. 208: benefits and risks of sterilization. *Obstet Gynecol* 2019;133:e194–207. doi:[10.1097/aog.0000000000003111](https://doi.org/10.1097/aog.0000000000003111).
- Levine R, Langer A, Birdsall N, Matheny G, Wright M, Bayer A. Contraception. Disease control priorities in developing countries. Jamison DT, Breman JG, Measham AR, editors. 2nd ed. et al, editors. Washington (DC): The International Bank for Reconstruction and Development /The World Bank; 2006 <https://www.ncbi.nlm.nih.gov/books/NBK11771/>.
- Curtis KM, Mohllajee AP, Peterson HB. Regret following female sterilization at a young age: a systematic review. *Contraception* 2006;73:205–10. doi:[10.1016/j.contraception.2005.08.006](https://doi.org/10.1016/j.contraception.2005.08.006).
- Pal G, Chaurasia H. Revisiting post-sterilization regret in India. *J Obstet Gynaecol India* 2020;70:295–303. doi:[10.1007/s13224-020-01309-5](https://doi.org/10.1007/s13224-020-01309-5).
- Kendall T, Albert C. Experiences of coercion to sterilize and forced sterilization among women living with HIV in Latin America. *J Int AIDS Soc* 2015;18:19462. doi:[10.7448/ias.18.1.19462](https://doi.org/10.7448/ias.18.1.19462).
- Patel P. Forced sterilization of women as discrimination. *Public Health Rev* 2017;38:15. doi:[10.1186/s40985-017-0060-9](https://doi.org/10.1186/s40985-017-0060-9).
- Bradley SE, Casterline JB. Understanding unmet need: history, theory, and measurement. *Stud Fam Plann* 2014;45:123–50. doi:[10.1111/j.1728-4465.2014.00381.x](https://doi.org/10.1111/j.1728-4465.2014.00381.x).
- Hubacher D, Trussell J. A definition of modern contraceptive methods. *Contraception* 2015;92:420–1. doi:[10.1016/j.contraception.2015.08.008](https://doi.org/10.1016/j.contraception.2015.08.008).
- Barros AJ, Boerma T, Hosseinpoor AR, Restrepo-Méndez MC, Wong KL, Victora CG. Estimating family planning coverage from contraceptive prevalence using national household surveys. *Glob Health Action* 2015;8:29735. doi:[10.3402/gha.v8.29735](https://doi.org/10.3402/gha.v8.29735).
- Rutstein SO, Johnson K. The DHS wealth index, Calverton, Maryland, USA: ORC Macro; 2004. <http://dhsprogram.com/pubs/pdf/CR6/CR6.pdf>.
- Filmer D, Pritchett LH. Estimating wealth effects without expenditure data—or tears: an application to educational enrollments in states of India. *Demography* 2001;38:115–32. doi:[10.1353/dem.2001.0003](https://doi.org/10.1353/dem.2001.0003).
- Rutstein SO. The DHS wealth index: approaches for rural and urban areas, Calverton, Maryland, USA: Macro International; 2008. <http://dhsprogram.com/pubs/pdf/WP60/WP60.pdf>.
- Restrepo-Méndez MC, Barros AJ, Black RE, Victora CG. Time trends in socio-economic inequalities in stunting prevalence: analyses of repeated national surveys. *Public Health Nutr* 2015;18:2097–104. doi:[10.1017/S1368980014002924](https://doi.org/10.1017/S1368980014002924).
- Loaiza E. Sterilization regret in the Dominican Republic: looking for quality-of-care issues. *Stud Fam Plann* 1995;26:39–48. doi:[10.2307/2138050](https://doi.org/10.2307/2138050).
- World Health Organization Female sterilization: a guide to provision of services. World Health Organization; 1992. <https://apps.who.int/iris/handle/10665/40133>.
- Committee Opinion No. 695: Sterilization of Women: ethical issues and considerations. *Obstet Gynecol* 2017;129:e109–ee16. doi:[10.1097/aog.0000000000002023](https://doi.org/10.1097/aog.0000000000002023).
- EngenderHealth. Law and policy. Contraceptive sterilization: global issues and trends 2002. https://www.rhsupplies.org/uploads/tx_rhscpublications/EngenderHealth_Contraceptive%20Sterilization-Chapter%204_2002.pdf (accessed May 2, 2021).
- Patil E, Jensen JT. Permanent contraception for women. *Semin Reprod Med* 2016;34:139–44. doi:[10.1055/s-0036-1571434](https://doi.org/10.1055/s-0036-1571434).
- Folch BM, Betstadt S, Li D, Whaley N. The rise of female sterilization: a closer look at Colombia. *Matern Child Health J* 2017;21:1772–7. doi:[10.1007/s10995-017-2296-x](https://doi.org/10.1007/s10995-017-2296-x).
- Jadhav A, Vala-Haynes E. Informed choice and female sterilization in South Asia and Latin America. *J Biosoc Sci* 2018;50:823–39. doi:[10.1017/S0021932017000621](https://doi.org/10.1017/S0021932017000621).
- Mahapatra S, Narula C, Thakur CP, Kalita TJ, Mehra R. Assessment of knowledge and perception regarding male sterilization (Non-Scalpel Vasectomy) among community health workers in Jharkhand, India. *Indian Journal of Community Health* 2014;26(4):431–6. <https://www.iapsmupuk.org/journal/index.php/IJCH/article/view/452>.
- Hall MAK, Stephenson RB, Juvekar S. Social and logistical barriers to the use of reversible contraception among women in a rural Indian village. *J Health Popul Nutr* 2008;26:241–50 <https://doi.org/10.2307/23499496>.
- Singh A, Ogollah R, Ram F, Pallikadavath S. Sterilization regret among married women in India: implications for the Indian national family planning program. *Int Perspect Sex Reprod Health* 2012;38:187–95. <https://www.doi.org/10.1363/3818712>.
- Government of India, Ministry of Health & Family Welfare. Guidelines 'Mission Parivar Vikas'. 2020. http://nhm.gov.in/images/pdf/programmes/family-planning/guidelines/MPV/MPV_guidelines.pdf (accessed May 3, 2021).
- Rudzik AE, Leonard SH, Sievert LL. Determinants of tubal ligation in Puebla, Mexico. *Women Health* 2011;51:365–82. <https://www.doi.org/10.1080/03630242.2011.574793>.
- Cremer ML, Holland E, Monterroza M, Duran S, Singh R, Terbell H, et al. Exploring factors in the decision to choose sterilization vs alternatives in rural El Salvador. *Medscape J Med* 2008;10(8):183. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2562046/>.
- Ponce de Leon RG, Ewerling F, Serruya SJ, Silveira MF, Sanhueza A, Moazzam A, et al. Contraceptive use in Latin America and the Caribbean with a focus on long-acting reversible contraceptives: prevalence and inequalities in 23 countries. *Lancet Glob Health* 2019;7:e227–ee35. doi:[10.1016/S2214-109X\(18\)30481-9](https://doi.org/10.1016/S2214-109X(18)30481-9).
- Sullivan TM, Bertrand JT, Rice J, Shelton JD. Skewed contraceptive method mix: why it happens, why it matters. *J Biosoc Sci* 2006;38:501–21. <https://www.doi.org/10.1017/S0021932005026647>.
- Ewerling F, McDougal L, Raj A, Ferreira LZ, Blumenberg C, Parmar D, et al. Modern contraceptive use among women in need of family planning in India: an analysis of the inequalities related to the mix of methods used. *Reprod Health* 2021;18:173. <https://www.doi.org/10.1186/s12978-021-01220-w>.
- de Oliveira IT, Dias JG, Padmadas SS. Dominance of sterilization and alternative choices of contraception in India: an appraisal of the socioeconomic impact. *PLoS One* 2014;9:e86654. <https://www.doi.org/10.1371/journal.pone.0086654>.
- Zepeda HR, Marín BAO. Vulnerabilidad impuesta y violación sistemática a los derechos de las mujeres indígenas en México. *Rev Med Elec-*

- trón 2017;39(4):933–46. http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1684-18242017000400008&nrm=iso.
- [40] Bansal A, Dwivedi LK. Sterilization regret in India: Is quality of care a matter of concern? *Contracept Reprod Med* 2020;5:13. <https://www.doi.org/10.1186/s40834-020-00115-8>.
- [41] Brown CH. The forced sterilization program under the Indian emergency: results in one settlement. *Hum Organ* 1984;43:49–54. <https://www.doi.org/10.17730/humo.43.1.xk724j7682r88686>.
- [42] Center for Reproductive Rights Derechos Reproductivos de la Mujer en Mexico, New York, NY: Un Reporte Sombra; 1997. <https://reproductiverights.org/sites/default/files/documents/Mexico%20CEDAW%201997%20Spa.pdf>.
- [43] USAID, Health Policy Plus. Financing family planning: Colombia. 2016. http://www.healthpolicyplus.com/ns/pubs/2068-2105_HPSFIBriefColombiaEnglish.pdf (accessed May 3, 2021).
- [44] USAID, Health Policy Plus. Financing family planning: Dominican Republic. 2016. https://pdf.usaid.gov/pdf_docs/PA00MDR2.pdf (accessed May 3, 2021).
- [45] USAID, Health Policy Plus. Financing family planning: Guatemala. 2016. http://www.healthpolicyplus.com/ns/pubs/2068-2111_HPSFIBriefGuatemalaEnglish.pdf (accessed May 3, 2021).