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ORIGINAL RESEARCH

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A nationwide analysis of hormonal contraception, sterilisation surgeries and reversal practices amongst Australian men and women from 2001 to 2021

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Abstract

Family planning falls within the spectrum of care within our medical society. We sought to illustrate changes in contraceptive methods over time and evaluate tubal ligation and vasectomy reversal practices in Australia. Yearly data from 2000 to 2021 was extracted from 3 databases: Pharmaceutical Benefits Schedule, Medicare Benefit schedule and Australian Institute of Health and Welfare databases. Population adjusted rates of procedures and medical therapies were calculated using data from Australian Bureau of statistics. Use of Long acting reversible contraception (LARC) has increased by 34.1% from 2001 to 2021, with Mirena being the preferred contraception. The peak age group for tubal ligation during caesarean section was those >35-year-old (64.7%) whereas vasectomy more commonly performed in men aged 35–44. There was a 21.6% decrease in the number of vasectomies over time from 2000–2020. Female surgical sterilisation:vasectomy ratio shows tubal ligation was twice more common than vasectomy. Both macro/microsurgical anastomosis of the vas deferences were conducted: vasovasostomy (VV) and vasoepididymostomy (VE). There was a preponderance in the use of microsurgical approach for VV. Reversal mostly common occurred in those aged 40–44 at 29%. Overall, the rate of vasectomy is continuously falling over time whilst there is a steady incline in the use of LARC from 2020–2021. Both vasovasostomy and vasoepididymostomy reconstruction are practised. Although definitive conclusion from the literature lags, "real-world" trend indicate that micro-surgically conducted vasovasostomy might be the better surgical technique for desired patient outcomes.

Keywords

Vasectomy; Contraception; Reversal practices; Sterilisation procedures; Vasovasostomy; Vasoepididymostomy; Tubal ligation

1. Introduction

Traditionally the onus of birth control has fallen onto women, however since decision about pregnancy affect both partners, there has been societal efforts for men to share the contraceptive burden equitably [1, 2]. Despite this, a recent study described a steady decline in the prevalence of vasectomy over the last two decades in the United States of America [3]. Whilst the trend is apparent, access issues given a fee for service payment model in the US may have contributed to this observation. Australia however, has a national health care system with subsidy for vasectomy. As such, it would be interesting to correlate this observation given improved access to healthcare and evolved technique to minimally invasive no-scalpel vasectomy. To further provide insight into the validity of the finding, an understanding of female contraceptive practices is important. Henceforth, national data regarding female contraceptive methods were sought to complement the observed findings.

There are numerous hypotheses regarding the changing practice in semi-permanent or permanent contraceptive interventions. Some of the reasons may be societal, opportunistic at the time of caesarean, acceptance of complications, financial or the ease of reversal. The data to date is not conclusive, and assessing patterns of care in a separate system is important in rationalising the evidence. In this study, we aim to gather and analyse contraceptive procedures in both men and women, and assess rationale behind the change in trend.

2. Material and methods

2.1 Data sources

The Australian Government Department of Health Pharmaceutical Benefit Scheme (PBS) represents a list of government subsidised medications for eligible patients in order to improve

access. Likewise, Medicare Benefit Schedule (MBS) is Australia's publicly funded health insurance scheme which offers repayments for a list of medical procedures. Both PBS and MBS do not incorporate claims for patients treated in public hospitals using hospital funding. Population estimates for each calendar year were obtained from the Australian Bureau Statistics. Cumulative data about national surgical procedures was also captured from the Australian Institute of Health and Welfare (AIHW) database which capture episodes of care for admitted patients in all public and private acute and psychiatric hospitals, free standing day hospital facilities in Australia excluding hospitals operated by the Australian Defence Force and corrections authorities.

2.2 Data collection

PBS item reports were collated from January 2001 to December 2021 for the following codes Implanon (8487Q), Kyleena (11909T) and Mirena (8633), Medroxyprogesterone Depot (3118D).

Additionally, MBS item reports were queried for sterilisation procedures from January 2008 to December 2021:

35691: Sterilisation by interruption of fallopian tubes, when performed in conjunction with Caesarean section.

37623: Vasotomy or vasectomy, unilateral or bilateral.

Volume of other relevant surgical procedures was also tabulated as retrieved from the AIHW database: vasectomy unilateral and bilateral, microsurgical Vasovasostomy unilateral and bilateral, Microsurgical vasoepididymostomy unilateral and bilateral, Vasovasostomy unilateral and bilateral, Vasoepididymostomy unilateral and bilateral.

Data were ordered as raw totals for each year and per age group. These were then aggregated in Excel and described per 100,000 women aged 20–50 and men aged 15–85.

2.3 Data analysis

Data analysis and figures were generated with Excel (version 16.65, Microsoft, Redmond, WA, USA). No formal statistical testing of a priori hypotheses were performed. This study was retrospective in nature and aim to demonstrate broad longitudinal observations. To illustrate relationships between procedures, ratios were computed for LARC: combined female sterilisation procedures, combined female surgical sterilisation:vasectomy, female:male reversal.

3. Results

3.1 Trends in the use of long-acting reversible contraception (LARC)

The subsidised long-acting reverse contraceptive methods in Australia compromised of progesterone only implant (Implanon©), progesterone-only injectable contraceptive, and levonorgestrel-releasing intrauterine device (IUD) (Mirena© or Kyleena©) (Fig. 1). No population data is available for Copper IUD. From 2003 to 2021, there was a steady increase in the use of Mirena from 1.2% of total prescriptions in 2003 to 8.7% in 2021. It can be clearly seen that as hormonal IUDs use grew, the use of progesterone-only injectable contraceptive however, show a continual decline over time. Implanon uptake displayed variability in rate of use. From 2003 to 2015, there was a gradual growth from 3.1% in 2003 to a peak of 6.9% of total Implanon prescriptions in 2015. Thereafter, its use slightly dipped in 2016 and levelled off.

3.2 Treatment per age

3.2.1 Age group of women choosing permanent sterilisation

Over the 2000–2021 period, analysis of sterilisation procedure by interruption of fallopian tubes showed that the peak age group for tubal ligation during caesarean section was those >35-year-old (64.7%), followed by 25–34 (35%) and 20–24 (0.2%) (Fig. 2). There was no recorded sterilisation for the under 20 years old group. Over time, there were a declining use of permanent sterilisation among those aged between 20–24.

3.2.2 Vasotomy/Vasectomy stratified by age group and time-periods

Use of vasotomy/vasectomy methods in men of various aged group over 4 different time period is described in Fig. 3. Across years, the overall trend remained relatively stable. Surgical sterilisation is most commonly performed in men aged 35–44. There appears to be a mirror image on either side of the peak age group. The proportion of men choosing sterilisation in those aged 25–34 and 45–54 appears similar. Although of declining proportion, sterilisation uptake is evident across a man lifespan.

3.3 Sterilisation method by population from 2000 to 2021

Of women having surgery, the two most common methods are laparoscopic sterilisation and sterilisation by open abdominal approach (Fig. 4A). Laparoscopic sterilisation peaked use was in 2002–2003 at 296 per 100,000 women and the rate gradually fell over the years to a low point of 38.3 per 100,000 in 2019–2020. By contrast, Fig. 4A, reveals that the rate of open sterilisation, the other preferred method, has on the other hand remained stable over the years. From 2000 to 2021, the rate of sterilisation *via* vaginal approach and electro-destruction of fallopian tubes continue to decrease from a rate of 15.4 per 100,000 in 2001 to 0.9 per 100,000 in 2021 and 10.4 per 100,000 in 2021 to 0.4 per 100,000 in 2021 respectively.

3.4 Comparison of LARC and surgical sterilisation in women

To demonstrate differences between utilisation of LARC and surgical sterilisation (combination of Laparoscopic sterilisation, Sterilisation *via* vaginal approach, Sterilisation by open abdominal approach, electro-destruction of fallopian tubes) ratios between treatments were calculated. These were then graphed against time (Fig. 4B). An increasing LARC:Surgical sterilisation was noted for women aged 20–50 over time.

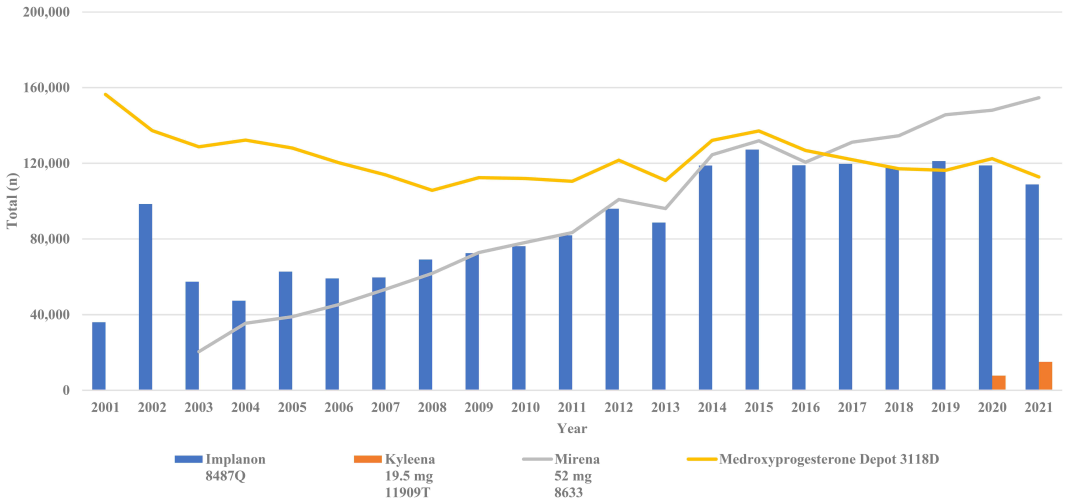

FIGURE 1. Total number of subsidised hormonal contraception prescription by year from 2001 to 2002 according to the class.

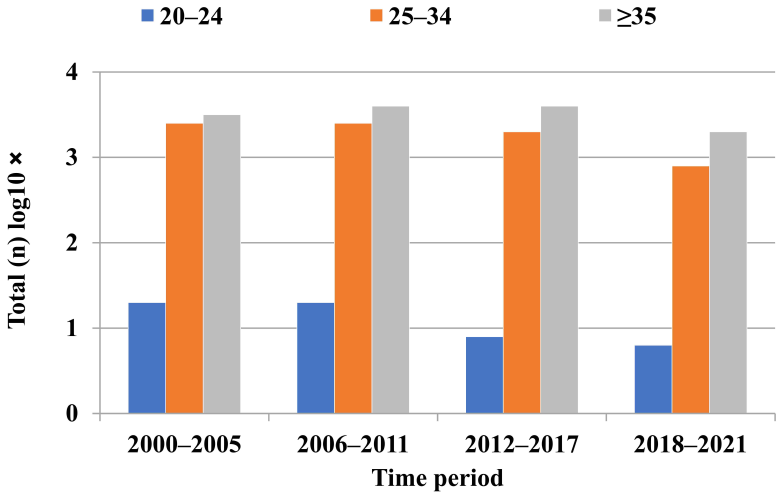

FIGURE 2. Age group by time period & total number of services (for item 35691 sterilisation by interruption of fallopian tubes when performed in conjunction with caesarean section).

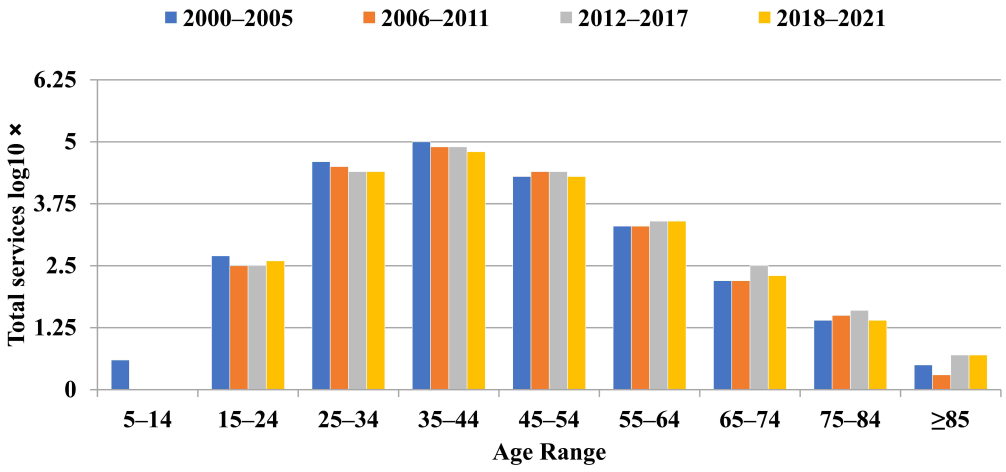

FIGURE 3. Overall vasotomy/vasectomy procedures according to age group and 5-year time periods.

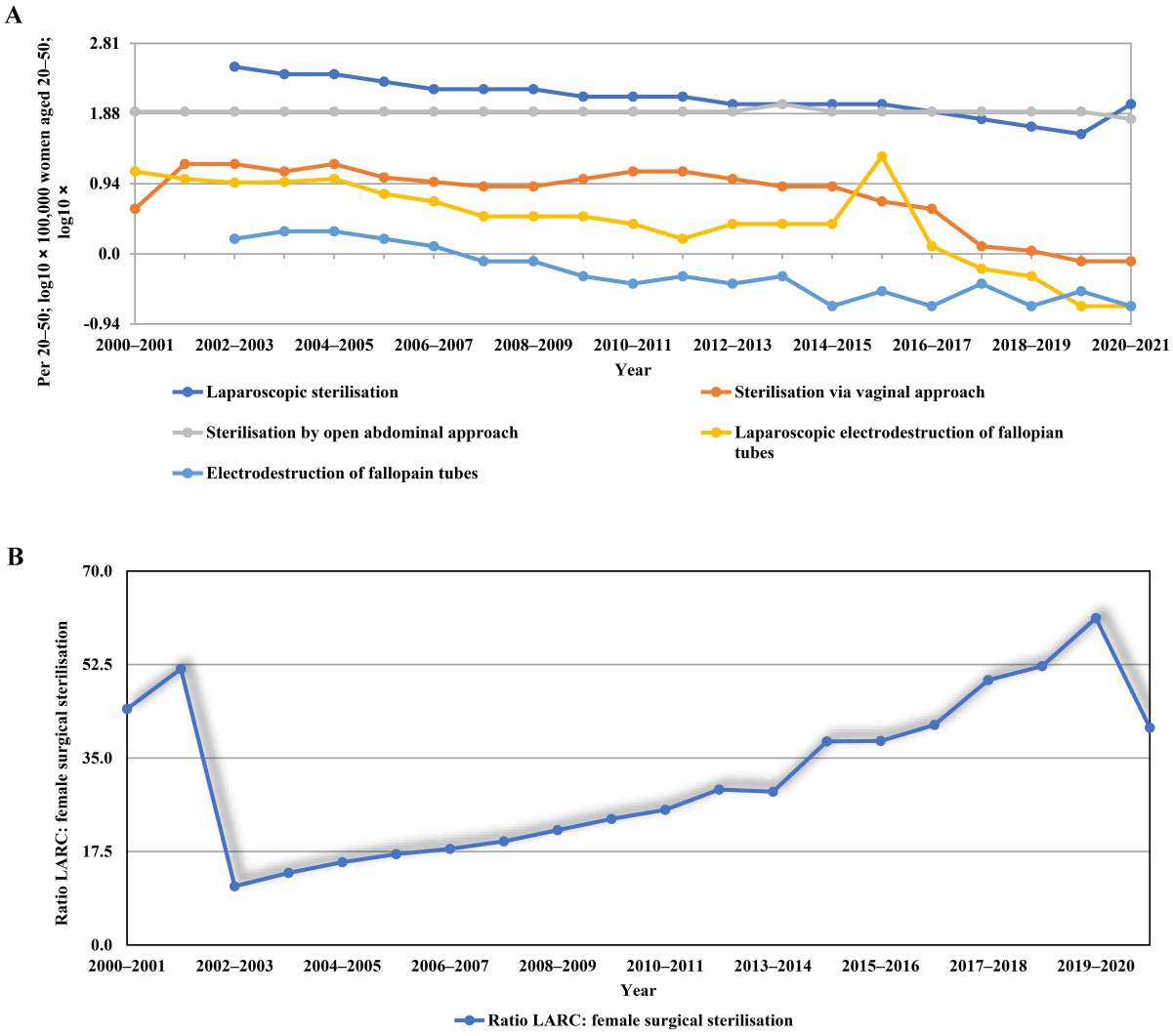

FIGURE 4. Comparison of LARC and surgical sterilisation in women. (A) Female—specific sterilisation trends from 2000 to 2021—number of each procedure per 100,000 women. (B) Comparison of combined female sterilisation procedures and hormonal methods, presented as hormonal:sterilisation ratio. LARC: long-acting reversible contraception.

3.5 Surgical sterilisation and reversal practices in male

The number of conducted vasectomies decreased continuously by year as shown in Fig. 5A. In 2000/2001, 200 vasectomies per 100,000 men were performed, while in 2019/2020, the number of conducted vasectomies totalled 129 per 100,000 men. This accounts for a 21.6% decrease in the number of vasectomies.

Both macro-surgical and microsurgical anastomosis of the vas deferent were performed: vasovasostomy (VV) and vasoepididymostomy (VE) (Fig. 5B). From 2000 through to 2021, descriptive analysis showed clear predominance in the use of microsurgical VV over macro-surgical VV and vasoepididymostomy. Reversal of vasectomy peaked in 2004/2005 at 13.9 procedures per 100,000 (all techniques combined) and the rate subsequently fell to an all-time low in 2012/203 at 2.2 cases per 100,000. Thereafter, reversal procedures rose up again to 5.7 in 2013/2014 and the rate levelled off from thereon. Fig. 5C provides an overview of surgical sterilisation in both gender.

3.6 Comparison of female sterilisation procedures and male vasectomy

When stratified according to gender, female surgical sterilisation procedures from 2000 to 2021 dominates that of males' during that time period (Fig. 6). Additionally, overall Female sterilisation:Male vasectomy reductions were observed between 2000 and 2021.

3.7 Comparison of reversal between genders

Throughout the last 21 years, there was a monotonic decrease in fallopian tube anastomosis which occurred between 2000 to 2021, from 6.7 to 1.5 procedures per 100,000 women. Male reversal practices show variability. Its use peak in 2004/2005 13.9 per 100,000 with a marked drop of 72.2, to reach 2.2 procedures per 100,000 in 2012/2013 prior rising again to a rate of 6.4 per 100,000 in 2020/2021.

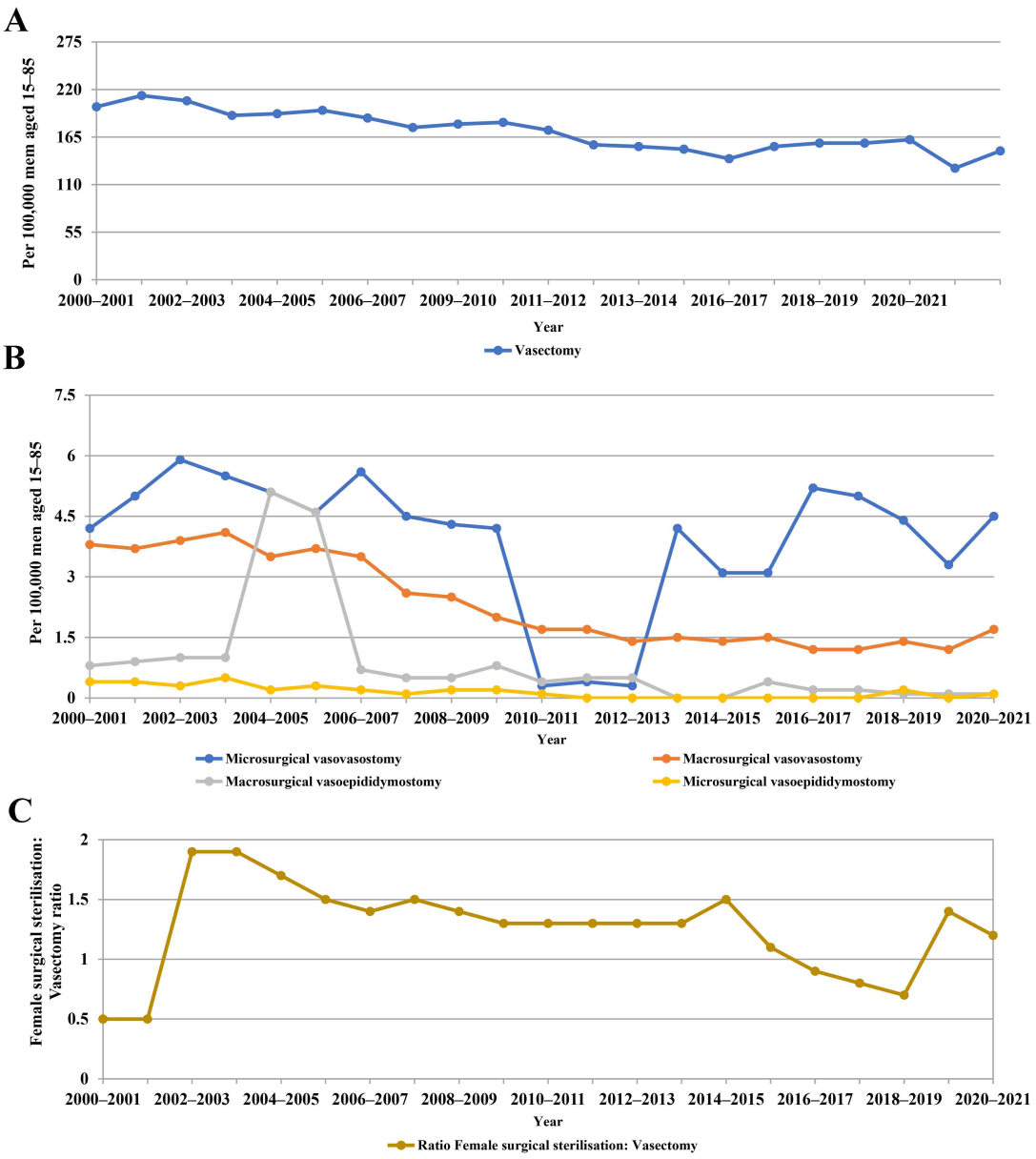

FIGURE 5. Surgical sterilisation and reversal practices in male. (A) Vasectomy per 100,000 population from 2000–2021; (B) Reversal practices per 100,000 men; (C) Comparison of surgical sterilisation in both gender presented as female surgical sterilisation:vasectomy by time period.

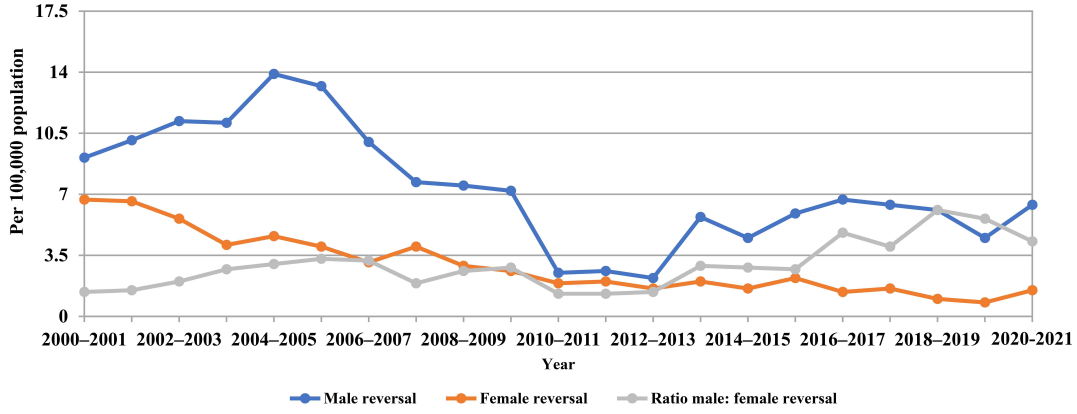

FIGURE 6. Reversal practices rate per 100,000 population for Male (Vasovasotomy & Vasoepidydimostomy combined), Female and ratio of Male:Female reversal practices.

3.8 Age of reversal in male

Age of reversal using vasovasostomy and vasoepididymostomy combined varied amongst age group with the predominant group being 40–44 at 29.03%, see Table 1.

TABLE 1. percentage of vasovasotomy & vasoepidydimostomy performed according to age-group over the period 2005/2021.

Age group	Percentage of reversal; %
25–29	1.29
30–34	6.77
35–39	26.77
40–44	29.03
45–49	16.13
50–54	7.90
55–59	10.65
60–64	0.81
65–69	0.32
70–74	0.32

4. Discussion

Despite the often partially funded access to contraceptive intervention and the advent of minimally invasive vasectomy, our data show that there was a continuous decline in the overall population-adjusted rates in the number of vasectomies from 2000 to 2021. This reinforce findings from other high income countries like the USA, and the United Kingdom which also has a freely publicly funded healthcare system like Australia [4, 5].

Rates of female sterilisation are exponentially declining over time with observed trend likely due to growth in the use of LARC. Arguably, men's reproductive autonomy is thought to be inhibited by the dearth of male contraceptives compared to their female counterparts with vasectomies viewed as hardly a choice given its permanency. Despite the reduction in the rates of surgical sterilisation in women, our data demonstrate that tubal ligation is twice more common than vasectomy. With the dominant rhetoric of permanency on par, the differing rate in definitive sterilisation amongst gender might be due to men's perception and attitudes towards their responsibility in family planning [6]. Additionally, although non-permanent hormonal contraception options are plentiful, we cannot conclusively tell from our data whether this factor is associated with a declining trend in vasectomies.

The literature revealed an inverse correlation between economic conditions and vasectomies [7]. Two economic downturn in Australia was the due to the global financial crisis (GFC) which occurred from mid-2007 to early 2009 as well as COVID-19 pandemic in 2020 [8, 9]. Whilst no marked change in vasectomy frequencies was observed during GFC, there was an 11% drop in rate during the pandemic in 2020/2021. It is however unknown whether this observed difference is due to economic strain and couple dynamics or a lack of access as a consequence of social distancing rules and lockdowns.

Despite the inconclusive evidence regarding the best method for vasectomy reversal [10], the most commonly performed method for reversal in Australia appears to be microscopic vasovasostomy. Australian urologists also offer microscopic vasoepididymostomy however the low rate might be due to its technical demand on the surgeon. Overall, there appears to be a decrease of reversals over time. Hypothetically, this might either be due to better family planning practices, lack of affordability given that it is not funded by medicare or the variable reported success rates. Given the propensity to microsurgery, this study highlights the need to increase exposure of urological trainees to microsurgical procedures in their practice. However, with declining rates of vasectomy, volume of exposure to ensure adequate training might be an issue.

Limitations of the present study include the PBS datasets for LARC. The national claims do not differentiate between new and continued users of LARC and lack individual patient data to investigate whether users switched between methods. Whilst an attempt was made to explain observed trends, there are a few variables which were not explored that could have accounted for these changes: ethnicity, marital status, education, religion, adoption and change in abortion laws. These presumed explanatory variables were unfortunately not available with the currently existing dataset for us to analyse. Next, our study lacks data on copper intra-uterine device. This non-hormonal IUD is not subsided by the PBS herein uptake is not accessible.

5. Conclusions

In summary, this study reinforces the dominant gender norms for contraception responsibility which still largely falls onto women. There is also a trend away from vasectomy in Australia and reasons for it are likely multifactorial. Our study also highlights the increase in uptake of LARC. The significance of this finding with respect to birth rate in Australia is yet to be ascertained. As a matter of social justice, men ought to be progressive and move towards shared contraception responsibility. Research to allow practical improvement in this social phenomena is warranted. However, to truly shift societal gender dynamics, males need to also be afforded more contraception options that are currently available to exert greater control on their reproduction.

AVAILABILITY OF DATA AND MATERIALS

The data presented in this study are available on reasonable request from the corresponding author.

AUTHOR CONTRIBUTIONS

BNHS, HR and EC—conceptualised and designed the research study. BNHS—was responsible for data collection, analysing and interpretation of the data as well as drawing the manuscript. HR and EC—revised the paper and given final approval of the version to be published.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval is exempt at Metro South Human Research Ethics Committee for this type of study. Given that no individual patient was involved, there was no need to seek patient specific consent.

ACKNOWLEDGMENT

Not applicable.

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This research received no external funding.

CONFLICT OF INTEREST

The authors declare no conflict of interest. Eric Chung is serving as one of the Editorial Board members of this journal. We declare that Eric Chung had no involvement in the peer review of this article and has no access to information regarding its peer review. Full responsibility for the editorial process for this article was delegated to AVM.

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