

Original research article

Temporal and regional trends in IUD insertion: a population-based study in Ontario, Canada[☆]

Sheila Dunn^{a,b,*}, Geoffrey M. Anderson^{c,d}, Arlene S. Bierman^{c,e,f}
for the POWER Study

^aWomen's College Research Institute, Women's College Hospital, Toronto, Ontario, Canada, M5G 1N8

^bDepartment of Family and Community Medicine, University of Toronto, Toronto, Ontario, Canada, M5T 1W7

^cInstitute for Clinical Evaluative Sciences, Toronto, Ontario, Canada, M4N 3N5

^dDepartment of Health Policy Management and Evaluation, Faculty of Medicine, University of Toronto, Toronto, Ontario, M5T 3M6

^eKeenan Research Centre, Li Ka Shing Knowledge Institute, St. Michael's Hospital, Toronto, Ontario, Canada, M5S 1W8

^fLawrence S. Bloomberg Faculty of Nursing and Department of Medicine, University of Toronto, Toronto, Ontario, Canada, M5T 3M6

Received 27 February 2009; revised 3 April 2009; accepted 8 April 2009

Abstract

Background: Intrauterine device (IUD) use is low in Canada and declined between 1985 and 1995. This study examines temporal and regional trends in IUD insertion in Ontario, Canada, from 1996 to 2006.

Study Design: We used physician billing data to determine annual age-adjusted IUD insertion rates for women aged 15–55 years and proportions inserted by gynecologists and family physicians (FPs). We used small area variation statistics to analyze variation in rates across the province.

Results: Annual insertion rates followed a U-shaped distribution and were lowest in 2001 and highest in 2006. From 1996 to 2006, the proportion inserted by FPs fell from 38.2% to 31.6% ($p < .001$). In 2006, women in regions with the highest rates were twice as likely to have an IUD inserted as those in the lowest-rate regions.

Conclusions: IUD insertion rates began to increase in 2001, the year of introduction of the levonorgestrel-releasing intrauterine system. Regional variation in rates suggests that access is not equal across the province and that strategies to support FPs to insert IUDs may be important to ensure adequate access.

© 2009 Elsevier Inc. All rights reserved.

Keywords: Intrauterine devices; Contraception; Family physician; Gynecologist; Trends; Area variation

1. Introduction

Access to contraception is essential to women's health. Although a wide variety of contraceptive methods is available in Canada, the majority of sexually active women use one of only three methods — the oral contraceptive pill

(32%), male condom (21%) and sterilization (22%) [1]. Only 1–3% of Canadian and U.S. women of reproductive age use the intrauterine device (IUD) for contraception [1–4], while in Europe, it is used by 10–26% of such women [4]. Although the ideal mix of contraceptives for a population is not known, the very low rates of IUD utilization in North America suggest that they are underutilized.

The IUD is safe, effective and well tolerated with efficacy and continuation rates comparable to or better than oral contraceptives [5,6]. Old fears about associated pelvic infections and infertility have not been borne out with newer IUDs, and current guidelines place few restrictions on their use [7–10]. Two IUD options are available in Canada: the copper IUD, which has two brands with copper content ranging from 200 to 380 mm², and the levonorgestrel-releasing intrauterine system (LNG-IUS), which

[☆] The POWER Study is funded by Echo: Improving Women's Health in Ontario, an agency of the Ontario Ministry of Health and Long-Term Care (MOHLTC); and was supported by the Institute for Clinical Evaluative Sciences (ICES), which is funded by an annual grant from the Ontario MOHLTC. The opinions, results and conclusions reported in this article are those of the authors and are independent from the funding sources. No endorsement by ICES, Echo or the Ontario MOHLTC is intended or should be inferred.

* Corresponding author. Tel.: +1 416 351 3705; fax: +1 416 351 3727.
E-mail address: sheila.dunn@wchospital.ca (S. Dunn).

was introduced in 2001. All have a lifespan of 5 years and are highly effective in preventing pregnancy. Effectiveness is similar for the LNG-IUS and IUDs containing more than 250 mm² of copper, but the LNG-IUS is more effective than the 200-mm² copper IUD [11]. The LNG-IUS is also used therapeutically to control menorrhagia and dysfunctional uterine bleeding. In Canada, the physician fee for IUD insertion is covered under provincial health insurance plans. However, provincial health insurance does not pay for the IUD itself. This cost is borne by the woman unless she has supplementary insurance that covers it, either through a private plan or social assistance. Nevertheless, even for women who bear the full cost, the IUD is one of the most economical forms of contraception [12].

To consider an IUD, women need knowledge about it as an option and access to a provider who either is able to insert it or will refer for insertion. This is usually a family physician (FP), as they are the main primary care providers in the Canadian system. A 2002 survey of Canadian women of reproductive age found that only 50% were “familiar” with the IUD and only 10% had a very favorable opinion of it; for the oral contraceptive pill, 96% of women were familiar and 63% had a very favorable opinion [1]. Physicians also vary in their knowledge and beliefs about the IUD and in their ability to insert it. Physicians in the United States and Canada have been shown to have an exaggerated perception of risks/contraindications for IUDs [13,14], and U.S. and European studies have shown wide variation among physicians in the characteristics of patients they consider for IUDs [14–16]. Although IUD insertion is a core competency for gynecologists (GYNs), FPs vary in their ability to provide it. In Ontario, only 34% of urban-trained and 19% of rural-trained family medicine residents felt competent with IUD insertion at graduation from their residency program [17].

Between 1985 and 1995, IUD use in Canada declined from 5.7% to 2.6% of all reproductive-aged women [3], and in a 2002 survey, only 1% of Canadian women aged 15–44 years who had ever had intercourse were using an IUD [1]. The objective of this study was to determine trends in the rates of IUD insertion in Ontario, Canada’s most populous province, from 1996 to 2006 and in the proportions inserted by FPs and GYNs. We also wanted to examine geographic variability in insertion rates throughout the province. Evidence about IUD utilization across the province and about the relative importance of FPs and GYNs as IUD providers could allow us to draw inferences about barriers in access to this effective but infrequently used contraceptive.

2. Materials and methods

We conducted a cross-sectional population-based study using Ontario health care databases housed at the Institute for Clinical Evaluative Sciences (ICES). This study was part of the Project for an Ontario Women’s Evidence-Based Report

Card, a multiyear study that reports on a broad range of women’s health indicators with a focus on health determinants and inequities. The study was approved by the Research Ethics Board of Sunnybrook Health Sciences Centre.

We identified women having IUD insertions between January 1, 1996, and December 31, 2006, through a unique procedure code for IUD insertion submitted by physicians to the Ontario Health Insurance Plan (OHIP) to claim for payment and track service provision. All Ontario citizens are eligible for OHIP, and almost all physician services are insured benefits. Only 1% of Ontario FPs work in venues that do not submit billing codes; however, they are not large providers of IUDs [18]. We excluded IUD insertions for non-Ontario residents; for those that were likely the result of miscoding (women outside the 15- to 55-year age range on January 1 of the year of the insertion, males); if the billing physician was not registered in Ontario, not listed in the physician database on the IUD insertion date or not an FP/general practitioner or GYN; if the patient’s address was missing; or if the physician’s address was unknown.

We determined the woman’s age and her area of residence by linking her encrypted health insurance number from the OHIP IUD insertion claim with the Registered Persons Database. This database provides basic demographic information about anyone who has ever received an OHIP number.

Physician specialty (FP, GYN or other) was determined by linking the physician number on the OHIP claim to the 2004 ICES Physician Database, a validated database that contains information on all licensed Ontario physicians. For new physicians not included in the Physician Database, the Corporate Provider Database was checked for certification in gynecology. Finally, for new physicians with no certification in gynecology, the OHIP billing specialty, a classification based on physician billing claims, was used to determine specialty.

2.1. Statistical analysis

We determined annual crude and age-standardized insertion rates for Ontario from January 1, 1996, through December 31, 2006. The numerator was the number of women identified as having an IUD insertion. If more than one insertion was recorded for an individual woman in a year, only the first was counted. The denominator used census data to determine the number of female Ontarians 15–55 years of age. Direct age standardization by 5-year age groupings used 2001 as the standard population year. We determined annual provincial age-standardized insertion rates for GYNs and FPs, and the proportion of IUDs inserted by FPs was compared for 1996 and 2006 using chi-square statistics. Analyses were repeated for women aged 15–39 years, theorizing that the LNG-IUS might be used more often therapeutically by GYNs for menorrhagia in the 40+ age group and, therefore, affect provider rates in this age group. Annual age-specific rates for ages 15–24, 25–39 and 40–55 years were also calculated. We

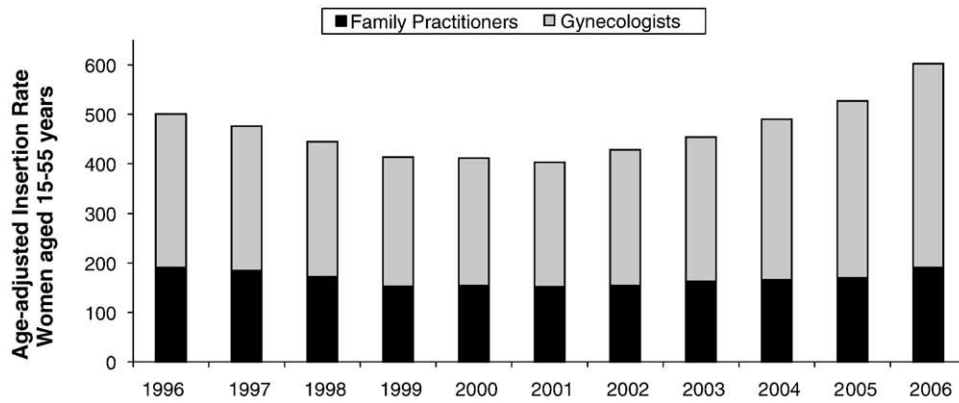


Fig. 1. Age-adjusted IUD insertion rates by FP or GYN 1996–2006 for women aged 15 to 55 years.

obtained counts of GYNs and FPs who submitted at least one billing code for IUD insertion for each year and for those who billed three or more procedures.

To examine IUD insertion rates in various regions of Ontario, we grouped IUD insertions by the woman’s area of residence, using the Local Health Integration Network (LHIN) as the geographic unit. Since 2006, health services in Ontario have been organized administratively under the 14 Ontario LHINs. Most LHINs are located in the more populous southern area of the province. All cover large geographic areas that range in size from a large metropolitan area to the size of California. Age-standardized rates were determined for each LHIN for 2006. Regional variation among LHINs for IUD insertion rates in women aged 15–55 years was quantified using the extremal quotient, the unweighted coefficient of variation (variation across all LHINs expressed as a percentage of the mean rate) and the systematic component of variation, which quantifies variation after eliminating the effect of population size and overall procedure rate. Chi-square tests with adjustment for multiple comparisons were used to test for significance in overall regional variation. Area variation analysis was repeated after excluding three LHINs with large Community Health Centers and Health Service Organizations that do not submit claim codes for physician services.

3. Results

The total number of eligible IUD insertions for the study period was 186,696. There were 3410 (1.8%) exclusions, mostly due to patients’ age falling outside the 15- to 55-year range. Almost all insertions were done by FPs or GYNs.

Between 1996 and 2006, crude and age-adjusted insertion rates for women aged 15–55 years followed a U-shaped distribution (Fig. 1). Age-adjusted rates varied from 403 to 602/100,000 women with the lowest and highest insertion rates occurring in 2001 and 2006, respectively. When data were analyzed for insertions performed in younger women aged 15–39 years, rates showed the same U-shaped curve.

Age-specific rates for the 15- to 24-year, 25- to 39-year and 40- to 55-year age groups also showed a U-shaped curve with the biggest increase occurring in 2006 in the 25- to 39-year age group (Fig. 2).

The rise in insertion rates from 2001 was largely the result of an increase in the number of IUDs inserted by GYNs. Although FPs’ insertion rates were relatively stable over the time period, the proportion of all IUDs inserted by FPs fell significantly from 38.2% in 1996 to 31.6% in 2006 ($p < .001$). For IUD insertions in women aged 15–39 years, the fall in proportion inserted by FPs was smaller (from 39.5% to 34.5%) but remained significant ($p < .001$).

Almost all GYNs who billed an IUD insertion each year inserted three or more IUDs and the number of billing insertions remained fairly constant, rising slightly from 458 in 1996 to 484 in 2005. We excluded 2006 because of a change in the reporting of GYNs’ services in one LHIN in 2006. In contrast, many FPs billed only one insertion and the number of FPs who inserted three or more IUDs fell from a high of 815 in 1996 to a low of 539 in 2001 and then rose slightly to 638 in 2006. In 2006, 14% of the 10,706 Ontario FPs inserted at least one IUD.

In 2006, women residing in LHINs with the highest rates were twice as likely to have an IUD insertion as those living

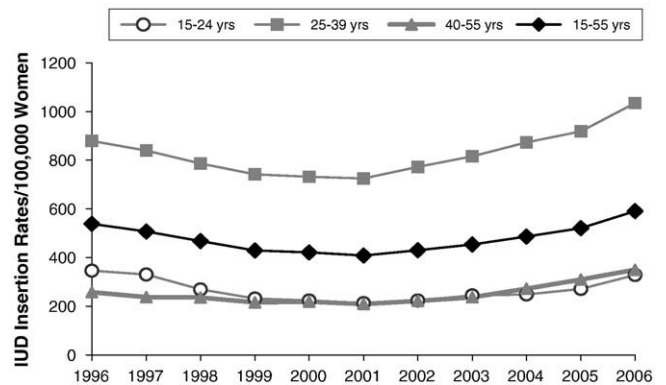


Fig. 2. Overall and age-specific IUD insertion rates/100,000 female Ontarians.

in the lowest-rate LHINs (extremal quotient, 2.1). The overall adjusted chi-square confirmed significant area variation throughout the province (785.6, $p < .001$). When three LHINs with possible data limitations due to large nonreporting Health Service Organizations and Community Health Centers were excluded, variation decreased but remained significant. There was no association seen between LHIN rate and proportion of IUDs inserted by FPs.

4. Discussion

The U-shaped curve in age-adjusted IUD insertion rates from 1996 to 2006 suggests that the downward trend in IUD use noted from 1985 to 1995 is reversing. The increase in insertion rates began in 2001, the year that the LNG-IUS was introduced and was due to increasing insertions by GYNs, not FPs. We noted significant regional variation in IUD insertion rates across Ontario. In 2006, women in some areas of the province were twice as likely to receive an IUD as those living in other areas.

Although we cannot show causality, the clear association of the increase in IUD insertions rates with the introduction of the LNG-IUS in 2001 suggests that enthusiasm for this new IUD is responsible for the increase. Sales figures obtained from the manufacturer of the LNG-IUS support this; between 2005 and 2006, sales of the IUS increased by 3500 (Bayer Pharmaceuticals, personal communication, May 27, 2007). Our OHIP billing data showed a similar increase of 2830 insertions in 2006 over 2005.

It is not surprising that GYNs were responsible for the increase in insertions. Studies of attitudes to IUDs have shown that GYNs, as compared with FPs, are more likely to counsel their patients about IUDs [16]. As well, diffusion of new therapies such as the LNG-IUS generally flows from specialists to generalists [19]. Specialists have early exposure to innovations in their field through conferences, continuing education and pharmaceutical detailing. GYNs were therefore likely to incorporate the new LNG-IUS into practice soon after its introduction. FPs are likely to be slower to adopt this new device, particularly since the insertion technique differs from that for the copper IUDs. Over time, with broader diffusion of this innovation, we may see an increase in insertion rates by FPs similar to those of GYNs. The decline in the number of FPs inserting IUDs may also have contributed to the trend toward increased insertions by GYNs and may reflect the general trend of FPs to perform fewer procedures in their practices [20]. However, over the study period, insertion rates for FPs remained stable despite the decreasing number of providers. Therefore, the FPs who inserted IUDs were doing more of them.

While there are no “correct” rates for IUD insertion, the twofold regional variation in per capita insertion rates in 2006 may reflect inequitable access to IUDs across the province. A number of factors influence regional variation in

procedure rates, including the ability of the patient to access care, physician practice, patient preference and variable need [21,22]. Although we did not investigate this, physician supply may be an important determinant of IUD insertion rates. In LHINs where access to FPs and GYNs is limited, women may adopt alternative methods of contraception such as condoms that do not require a physician visit or may go without adequate contraception.

Physician enthusiasm has also been shown to be a major determinant of geographic variation in procedure rates particularly for therapies where there are a range of clinical beliefs and practice styles [23]. Physicians’ opinions on the desirability of the IUD vary, and because there are alternative effective contraceptives, those with negative opinions have little need to present the IUD as a contraceptive option. A recent U.S. study of contraceptive providers found that 40% did not offer IUDs to women seeking contraception [16]. Patient preference, which may be closely linked with physicians’ attitudes and knowledge [23], could also be a factor in IUD use and affect rates in areas of Ontario with larger populations of women, such as immigrants, who have stronger preferences for the IUD. However, our analysis used a large geographic area to measure variation, and it is unlikely that differences in patient preference or contraceptive need can account for the twofold variation.

This population-based study has limitations. Our use of health insurance procedure claims misses procedures done in the small number of settings that do not submit these claims as well as insertions done for women such as new immigrants who do not have Ontario Health Insurance. However, although these factors may lead us to underestimate rates, the effect is unlikely to vary from year to year and should not influence temporal trends significantly. We could not determine whether IUD insertion was for contraception, control of menstrual bleeding or a combination of factors. Therefore, firm inferences about changes in IUD use for contraception cannot be drawn from our data. However, the same U-shaped curve for insertion rates was noted for women aged 15–39 years, who are more likely to use the IUD for contraception, suggesting that IUD use for contraception is increasing. The Registered Persons Database used to determine the patient’s LHIN of residence is known to have inaccuracies, and these could have led to imprecise LHIN rates, but this is unlikely to influence geographic variation in any specific direction. Finally, we analyzed area variation according to the patient’s LHIN and therefore could not determine whether women receiving IUDs traveled outside their LHIN to have them inserted. In this case, our area variation would likely underestimate the true variation.

After years of falling utilization, rates of IUD insertion are increasing in Ontario. Our study strongly suggests that the introduction of the LNG-IUS is responsible for this increase. There is significant variation in insertion rates across the province, most likely due to uneven access to a provider and variability in physician enthusiasm for the IUD. Strategies to train physicians about current guidelines for use and

specifically to train FPs, who are the main providers of contraception to insert IUDs, may be necessary to ensure that women have equitable access to this contraceptive method across the province. Continued analysis of IUD insertion trends over the next 5 years would confirm whether the increase is a sustained change in how the IUD is used and determine whether insertion rates for FPs increase with greater diffusion of the LNG-IUS into practice.

References

- [1] Fisher W, Boroditsky R, Morris B. The 2002 Canadian Contraception Study: part 1. *JOGC* 2004;26:580–90.
- [2] Edouard L. On the determination of contraceptive prevalence using health care utilization data. *J Clin Epidemiol* 1997;50:481–4.
- [3] Martin K, Wu Z. Contraceptive use in Canada: 1984–1995. *Fam Plann Perspect* 2000;32:65–73.
- [4] United Nations. Department of Economic and Social Affairs Population Division. *World Contraceptive Use 2005*. New York: United Nations Publication; 2006. ST/ESA/SER.A253/2006.
- [5] Hatcher RA, Trussell J, Nelson AL, Cates W, Stewart FH, Kowal D. *Contraceptive technology*. 19th rev. ed. New York: Ardent Media; 2007.
- [6] Rosenberg MJ, Waugh MS. Oral contraceptive discontinuation: a prospective evaluation of frequency and reasons. *Am J Obstet Gynecol* 1998;179:577–82.
- [7] Grimes DA. Intrauterine device and upper-genital-tract infection. *Lancet* 2000;356:1013–9.
- [8] Hubacher D, Lara-Ricalde R, Taylor DJ, et al. Use of copper intrauterine devices and the risk of tubal infertility among nulligravid women. *N Engl J Med* 2001;345:561–7.
- [9] World Health Organization. *Medical eligibility criteria for contraceptive use*. 3rd ed. Geneva (Switzerland): World Health Organization; 2004.
- [10] Black A, Francoeur D, Rowe T, et al. Canadian contraception consensus — part 2. *JOGC* 2004;26:219–54.
- [11] French R, Van Vliet H, Cowan F, Mansour D, Morris, Hughes D, et al. Hormonally impregnated intrauterine systems (IUSs) versus other forms of reversible contraceptives as effective methods of preventing pregnancy. *Cochrane Database Syst Rev* 2004:CD001776.
- [12] Trussell J, Lalla AM, Doan QV, Reyes E, Pinto L, Gricar J. Cost effectiveness of contraceptives in the United States. *Contraception* 2009;79:5–14.
- [13] Stubbs E, Schamp A. The evidence is in. Why are IUDs still out? *Can Fam Physician* 2008;54:560–6.
- [14] Stanwood NL, Garret JM, Konrad TR. Obstetrician-gynecologists and the intrauterine device: a survey of attitudes and practice. *Obstet Gynecol* 2002;99:275–80.
- [15] Vos AAG, Veldhuis HM, Lagro-Janssen TL. Intrauterine contraception: the role of general practitioners in four Dutch general practices. *Contraception* 2004;69:283–7.
- [16] Harper CC, Blum M, de Bocanegra HT, et al. Challenges in translating evidence to practice. The provision of intrauterine contraception. *Obstet Gynecol* 2008;111:1359–69.
- [17] Goertzen J. Learning procedural skills in family medicine: comparison of rural and urban programs. *Can Fam Physician* 2006;52:622–3.
- [18] Schultz SE, Tepper JT, Guttmann A, Jaakkimainen L. Characteristics of primary care practice. In: Jaakkimainen L, Upshur R, Klein-Geltink JE, et al, editors. *Primary care in Ontario: ICES atlas*. Toronto: Institute for Clinical Evaluative Sciences; 2006. p. 178–206.
- [19] Pugh MJ, Anderson J, Pogach LM, Berlowitz DR. Differential adoption of pharmacotherapy recommendation for Type 2 diabetes by generalists and specialist. *Med Care Res Rev* 2003;60:178–200.
- [20] Chan BT. The declining comprehensiveness of primary care. *CMAJ* 2002;166:429–34.
- [21] Health Services Research Group. Small area variations: what are they and what do they mean? *CMAJ* 1992;146:467–70.
- [22] McPherson K. International differences in medical care practices. *Health Care Financ Rev* 1989(Spec No):9–20.
- [23] Wright JG, Hawker GA, Bombardier C, et al. Physician enthusiasm as an explanation for area variation in the utilization of knee replacement surgery. *Med Care* 1999;37:946–56.