

# Decreasing trend and changing indications of hysterectomy in Finland

Jenni Hakkarainen<sup>1,2,3</sup>  | Aapeli Nevala<sup>1</sup>  | Eija Tomás<sup>2,4,5</sup> | Kari Nieminen<sup>2,4,5</sup>  |  
Nea Malila<sup>1</sup>  | Janne Pitkäniemi<sup>1,6,7</sup>  | Annika Auranen<sup>4,5</sup> 

<sup>1</sup>Finnish Cancer Registry, Institute for Statistical and Epidemiological Cancer Research, Helsinki, Finland

<sup>2</sup>Faculty of Medicine and Health Technology (MET), Tampere University, Tampere, Finland

<sup>3</sup>Department of Obstetrics and Gynecology, Central Finland Central Hospital, Jyväskylä, Finland

<sup>4</sup>Department of Obstetrics and Gynecology, Tampere University Hospital, Tampere, Finland

<sup>5</sup>Tays Cancer Centre, Tampere University Hospital, Tampere, Finland

<sup>6</sup>Department of Public Health, School of Medicine, University of Helsinki, Helsinki, Finland

<sup>7</sup>Faculty of Social Sciences, Tampere University, Tampere, Finland

## Correspondence

Jenni Hakkarainen, Finnish Cancer Registry, Unioninkatu 22, 00130 Helsinki, Finland.  
Email: Jenni.hiltunen@tuni.fi

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## Abstract

**Introduction:** Hysterectomy has been one of the most common surgical procedures in women in Finland. We studied the population-based trends of hysterectomy and its indications from 1986 to 2017.

**Material and methods:** A retrospective population-based cohort was created from the Care Register for Health Care by identifying women who had a hysterectomy from 1986 to 2017 and calculating the number of women from the Digital and Population Data Services Agency. We estimated the number and incidence of hysterectomy by period and age as well as by indication. We considered the primary diagnosis at the time of surgery as the indication of hysterectomy.

**Results:** The number of hysterectomies increased from 7492 procedures in 1986 to 12 404 procedures in 1998, and reduced substantially after that to 5971 procedures in 2017, the turning point being in 1999. The incidence rate of hysterectomy has decreased on average by 2.5% annually from 432.6 per 100 000 women in 1998–2001 to 224.5 per 100 000 women in 2014–2017. The median age at the time of hysterectomy has increased from 51 years in 1998–2001 to 55 years in 2014–2017. The cumulative burden of hysterectomy by age of 60 years has nearly halved from the first 4-year period (23%) to the last (12%). After 2010, the most common indication has been genital prolapse and incontinence, whereas earlier it was uterine fibroids.

**Conclusions:** The number and incidence of hysterectomies have fluctuated during the observation period 1986–2017 and decreased considerably during the past 17 years in Finland. This is probably a result of the availability of hormonal and other conservative treatment options for bleeding disorders and uterine fibroids. As hysterectomy practically removes the risk for endometrial cancer, the change in hysterectomy incidence over time emphasizes the importance of correcting endometrial cancer incidence according to hysterectomy incidence.

## KEYWORDS

epidemiology, gynecology, hysterectomy, incidence, indications, surgery

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### Key Message

After a steady increase during the 1990s, the incidence rate of hysterectomy has decreased considerably during the past two decades. This change needs to be noted when calculating the incidence rate and future predictions of endometrial cancer.

## 1 | INTRODUCTION

Hysterectomy, i.e. surgical removal of the uterus, has been one of the most commonly performed surgical procedures in women.<sup>1</sup> The majority of hysterectomies are performed for benign indications. The typical benign indications for hysterectomy include uterine fibroids, menorrhagia, uterine prolapse and endometriosis.<sup>2-4</sup> Malignant indications include endometrial, ovarian and cervical cancers.<sup>3,4</sup> In Finland, hysterectomy rates have been historically high, as approximately one-fifth of women aged 45–64 years were reported to have undergone the procedure by 1989.<sup>5</sup> Hysterectomy incidence was still increasing in Finland in the 1990s.<sup>6</sup> During the last two decades, since 2000, new treatment options especially for benign conditions such as bleeding disorders and uterine fibroids have emerged.<sup>7</sup> These alternative treatment methods include hormonal treatments such as the levonorgestrel-releasing intrauterine system (LNG-IUS), endometrial ablation, uterine artery embolization, operative hysteroscopy and pharmaceutical treatment.<sup>7,8</sup> The current Finnish treatment guidelines recommend alternative options to hysterectomy as the primary treatment in benign diseases and more invasive surgical interventions such as hysterectomy can be used if conservative treatment has failed.<sup>8-11</sup> The incidence of hysterectomy has lately markedly decreased in Finland.<sup>6,12</sup> The reason for this may be development of these alternative options to hysterectomy in the treatment of gynecological conditions.

Hysterectomy, either total or supracervical, practically removes the risk of future endometrial cancer and total hysterectomy removes the risk of future cervical cancer also. Therefore, the number of hysterectomies performed in the population affects the incidence and absolute number of these cancers in the population. This is particularly significant in the case of endometrial cancer, which is one of the most common cancers in women and is usually detected after the typical hysterectomy age. Sixteen years ago, in 2004, a study by Luoto et al. showed that the hysterectomy-corrected incidence of endometrial cancer in Finland was actually 29% higher than the uncorrected rate.<sup>6</sup> The previous study was performed 20 years ago with data ending at the year 1999, considering total and supracervical hysterectomy separately; the purpose of the present study was to estimate the number and incidence trends of total and supracervical hysterectomy in Finland in the years 1986–2017 because the incidence of hysterectomy has fluctuated over time. In order to understand the causes for the possible changes in the hysterectomy incidence, we explored the hysterectomy trends by treatment indication.

## 2 | MATERIAL AND METHODS

The data on hysterectomy were provided by the Care Register for Health Care (HILMO) from January 1, 1986, when the recording of surgical procedures began, to December 31, 2017. The Care Register for Health Care register is maintained by the Finnish Institute of Health and Welfare and it contains procedures performed in public hospitals; information from the primary health care and private clinics are not covered in our study. The Care Register for Health Care is a continuation of the former Hospital Discharge Register. The Care Register for Health Care procedure codes are organized until 1995 according to the procedure classification of the Finnish Hospital League and from 1996 onward according to the Nordic Classification of Surgical Procedures (Table S1). Procedures were further divided into total hysterectomy and supracervical hysterectomy. If duplicate procedures were recorded, we considered only the first hysterectomy of a woman.

We included all hospital care episodes with a hysterectomy procedure, irrespective of the indication (malignant or benign). The main diagnoses of hospital episodes were coded according to the Finnish version of the International Classification of Diseases (ICD), the eighth version until 1986, the Finnish version of the ninth revision from 1987 to 1995 and the current version of the 10<sup>th</sup> revision (ICD-10) starting from 1996 onwards. Additional information of the division of diagnosis codes is given in the Supplementary material (Table S2). Number of women at the time of the study by age and calendar year was obtained from the Digital and Population Data Services Agency in Finland. For further analysis, procedures were divided into subgroups according to main diagnosis and age documented at the procedure and by age at the time of procedure.

The incidence rate of hysterectomy was estimated using age-period-specific population data. Age-specific weights of the Finnish population in 2014 were used for age-adjusted hysterectomy incidence rates. The annual percentage change with time in hysterectomy incidence trends over time was estimated using Poisson regression with two points, and so with three intervals.<sup>13</sup> The age-specific incidence rate by period was fitted using smoothed splines and tested for heterogeneity of the period-effect with the likelihood ratio test. We estimated the time trends in different diagnosis groups during time with a two-point regression model. Additionally, we calculated the cumulative sum of age-specific incidence rates during different periods in order to analyze the cumulative burden on the healthcare system, i.e. the proportion of women affected by hysterectomy during the study period. The analysis was conducted using R and packages `Epi` 2.4.0, `segmented` 0.5.4.0, `stats` 3.6.1 and `POPepi` 0.4.8 (all available in CRAN).

## 2.1 | ETHICAL APPROVAL

The study was approved by The Finnish Institute for Health and Welfare on March 5, 2019 (Permit no. THL/367/6.02.00/2019). As this study was a registry-based study, ethical approval was not required according to the Act on the Secondary Use of Health and Social Data.<sup>27</sup>

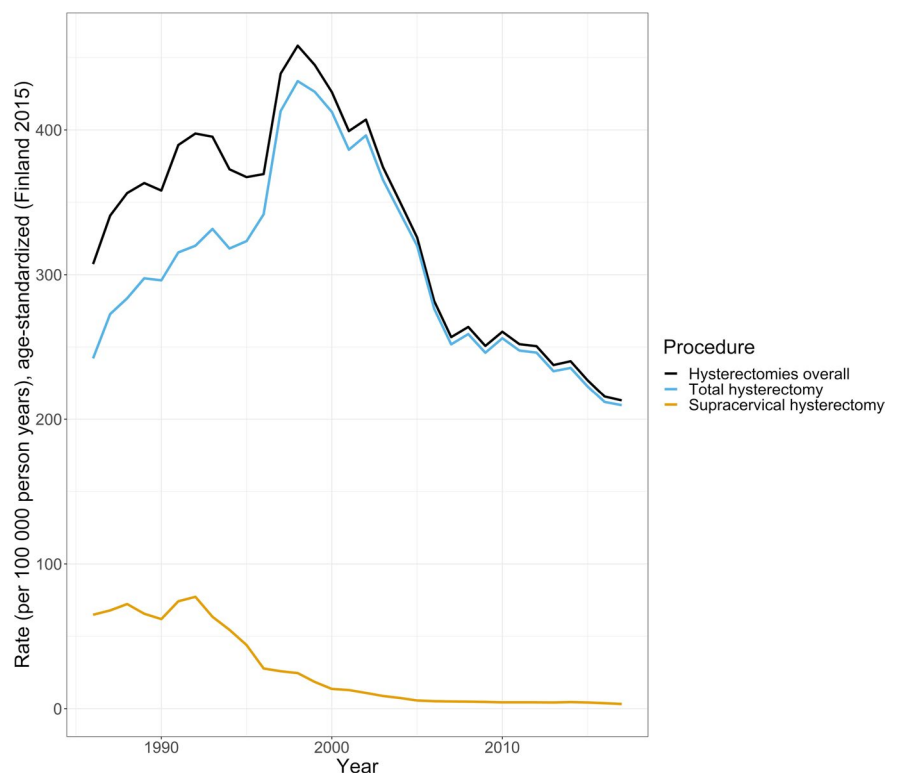
## 3 | RESULTS

From 1986 to 2017 the annual number and incidence rate of hysterectomies in Finland underwent considerable changes

(Table 1, Figure 1). In the first 4-year period (1986–1989), the average annual age-standardized rate of any hysterectomy was 341/100 000 woman-years, with an average of 8554 hysterectomies annually. The incidence rate of any hysterectomy peaked in the period 1998–2001 to 431/100 000 woman-years and on average 11 771 annual hysterectomies. After 2001, the incidence has declined and was 224/100 000 woman-years in 2014–2017 with on average 6270 annual hysterectomies. In the period 1986–1989, 20% of the hysterectomies were supracervical hysterectomies, whereas in the last period of 2014–2017, this procedure type was practically non-existent, constituting only 1.7% of all hysterectomies.

**TABLE 1** Annual average number and incidence rates per 100 000 woman-years of supracervical, total and all hysterectomies by calendar time period, annual average numbers and rates are age-standardized, duplicates not included

Period	Supracervical hysterectomy		Total hysterectomy		All hysterectomies	
	Annual average number	Annual incidence	Average annual number	Annual incidence	Average annual number	Annual incidence
		per 100 000 woman-years		per 100 000 woman-years		per 100 000 woman-years
1986–1989	1801	68	6745	274	8554	342
1990–1993	1964	70	8201	315	10 170	385
1994–1997	1093	38	9391	349	10 487	387
1998–2001	487	17	11 284	414	11 771	431
2002–2005	229	8	9812	355	10 040	363
2006–2009	136	5	7156	258	7292	263
2010–2013	122	4	6846	245	6968	250
2014–2017	111	4	6159	220	6270	224



**FIGURE 1** Annual age-standardized rates of hysterectomy by type of procedure, rate per 100 000 woman-years [Color figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

The early period increase and later decrease in the age-specific hysterectomy incidence rate has mainly happened in the perimenopausal age group (ages 41–60 years) (Table 2, Figure 2). In the most recent period, an increase in incidence can be observed in the age group of 70- to 75-year-old women (Figure 2). The age-specific hysterectomy incidence curve has transformed into a more biphasic form during recent periods, with a pronounced peak at the age of 41–60 years and a second peak at the age of 70–75 years. The median age of all hysterectomies during the peak-years period in 1998–2001 was 51 years whereas during the most recent study period of 2014–2017 the median age was 55 years.

The annual age-adjusted hysterectomy incidence by indication is plotted in Figure 3. Before 2000, the most common indication for hysterectomy was uterine fibroids. The lifetime risk of having a hysterectomy because of uterine fibroids has decreased from 12.8% between 1994 and 2001 to 4.8% in 2010 and 2017 (Table 3). After 2000, hysterectomies decreased rapidly as the result of a decrease of procedures based on this indication. For indications such as genital prolapse or incontinence and malignant neoplasms of genitourinary organs, the risk of having a hysterectomy has remained intact (Table 3). For bleeding disorders and endometriosis, the number of hysterectomies has decreased from study periods 1994–2001 to 2010–2017, the lifetime risk decreasing from 3.6% to 2.2% for bleeding disorders and from 1.6% to 0.7% for endometriosis (Table 3). For the other indication group, the lifetime risk of hysterectomy has decreased from 6.1% to 3.7%.

For malignancies, the median age at the time of hysterectomy was 64 years during 1994–2001 and 67 years during 2010–2017, clearly higher than for the other indications even if the lifetime risk was at the same level (3.5%–3.4%) in both periods. The median age at the time of hysterectomy performed for all benign indications was 49 years in 1994–2001 and 52 years in 2010–2017. The cumulative burden of hysterectomy by the age of 60 was 23.2% in 1994–2001 and 11.9% in 2010–2017, so it has almost halved (Figure 2).

The age-specific hysterectomy rates in periods 1994–2001 and 2010–2017 by indications are plotted in Figure 4. For hysterectomies performed before menopause, the rates have declined for uterine fibroids considerably, and for bleeding disorders, other reasons and endometriosis the decrease has been minor. For genital prolapse or incontinence and malignancies the trend seems to be more stable.

## 4 | DISCUSSION

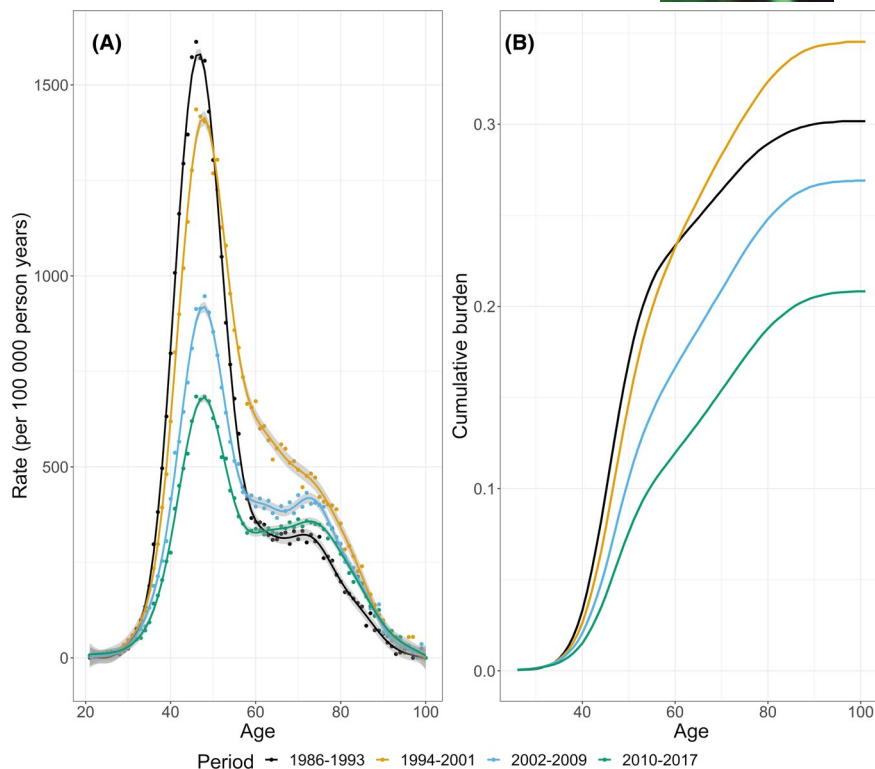
Hysterectomies are performed today more rarely than before the 21st century, as during the peak years in 1998–1999 the incidence rate was almost twice that recorded in the most recent years. Uterine fibroids are no longer the main diagnosis underlying hysterectomies. Indications such as uterine prolapse and incontinence have become proportionally more common reasons for the procedure.

Compared with other Nordic countries, Finland's hysterectomy rates have changed more radically because of their higher incidence at the beginning of the 21st century. The incidence in Sweden was

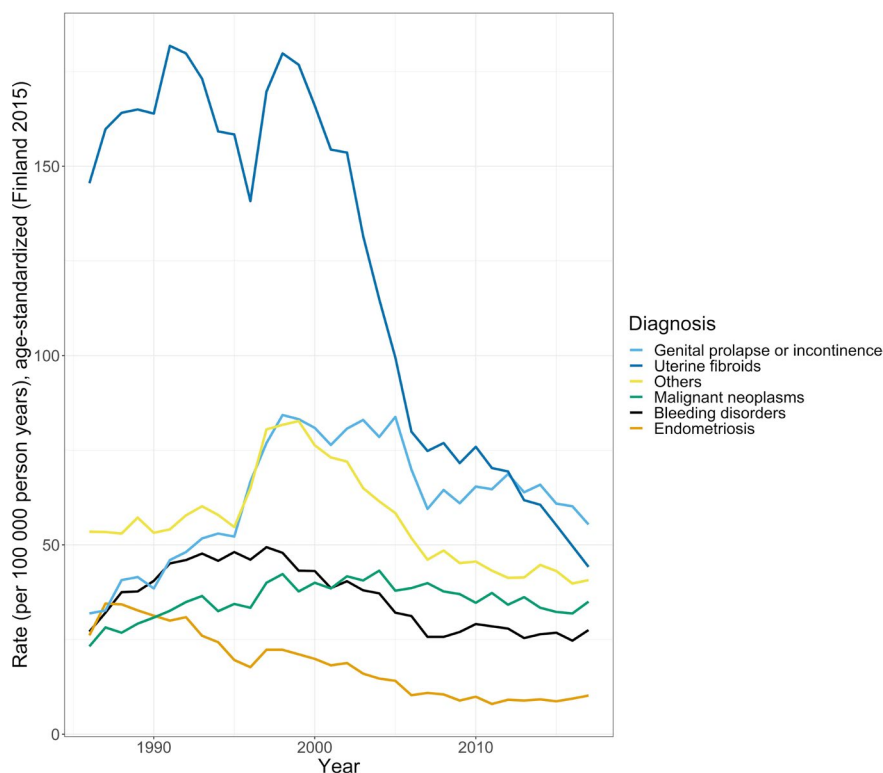
TABLE 2 Number and incidence rates per 100 000 woman-years of overall numbers of hysterectomies by period and age groups

Age (years)	1986–1993		1994–2001		2002–2009		2010–2017	
	Annual average number	Annual incidence per 100 000 woman-years	Annual average number	Annual incidence per 100 000 woman-years	Annual average number	Annual incidence per 100 000 woman-years	Annual average number	Annual incidence per 100 000 woman-years
0–20	18	0.5	36	0.9	24	0.6	6	0.2
21–40	7692	162.3	5926	134.8	3744	95.5	2983	75.1
41–60	41 943	1016.9	47 524	1042.2	30 309	658.3	21 271	501.3
61–80	8530	308.6	14 145	503.2	12 178	389.3	12 704	337.5
81+	769	111.5	1469	188.9	1587	166.1	1747	163.6

**FIGURE 2** Age-specific hysterectomy rates (per 100 000 woman-years) by age (A) and cumulative burden (B) by periods [Color figure can be viewed at wileyonlinelibrary.com]



**FIGURE 3** Annual age-standardized rates of hysterectomies by indication. Rate per 100 000 woman-years [Color figure can be viewed at wileyonlinelibrary.com]



approximately 232 per 100 000 woman-years during the peak year of 1999.<sup>14</sup> According to NOMESCO (Nordic Medico-Statistical Committee. Health Statistics for the Nordic Countries 1995-2017. Available at: <http://www.nowbase.org>) the rate in Sweden in 2015 was 175 per 100 000 woman-years, indicating more stable rates and lower incidence than in Finland.<sup>1</sup> Similar to Sweden, the trend

has been stable in Norway. In Iceland and in Denmark the incidence rates are also decreasing; however, the reduction has not been as extreme as in Finland.<sup>1</sup> In our study, we have considered all the procedures in which a uterus was removed as a hysterectomy, as seen in the Table S1, whereas in the NOMESCO analysis procedure codes LCD and LCC, which stand for partial hysterectomy and total

Diagnosis	1994–2001		2010–2017	
	Cumulative burden (%)	Median age at operation (years)	Cumulative burden (%)	Median age at operation (years)
Bleeding disorders	3.6	46	2.2	46
Endometriosis	1.6	45	0.7	43
Genital prolapse or incontinence	6.7	61	5.7	63
Malignant neoplasms of genitourinary organs	3.5	64	3.4	67
Uterine fibroids	12.8	48	4.8	48
Others	6.1	51	3.7	55

TABLE 3 The cumulative burden and median age at the time of hysterectomy in 1990–1999 and 2008–2017 by indication

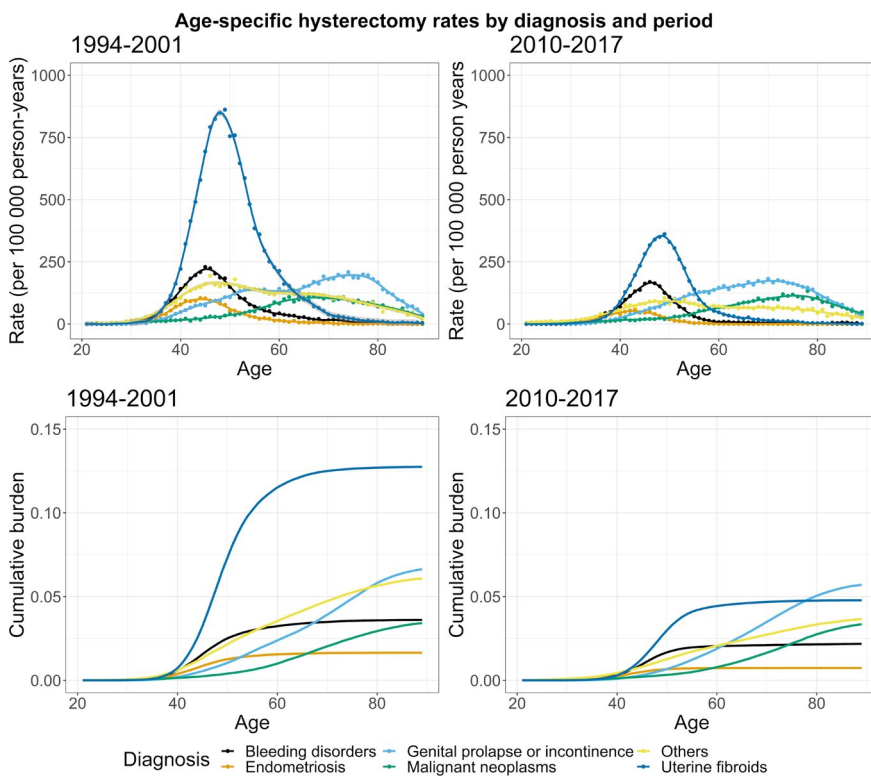


FIGURE 4 Age-specific hysterectomy rates (per 100 000 woman-years) and cumulative burden by main diagnosis and period [Color figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

hysterectomy, were considered as a hysterectomy and codes such as LEF13/14, which represents hysterectomy in a prolapse of the uterus, were left out.

In Finland, the age-specific incidence rate of hysterectomy decreased, especially among women of fertile age. There are many factors that may have had an impact on the decreasing rates of hysterectomies. For example, there are alternative treatment options for benign gynecological conditions such as menorrhagia and uterine fibroids, which can be treated with endometrial ablation, LNG-IUS and other hormonal therapies, uterine artery embolization or operative hysteroscopy. The use of an LNG-IUS has been estimated to be a more cost-effective treatment than hysterectomy, even if the patient should end up undergoing a hysterectomy later.<sup>15</sup> Since the launch of the Finnish study of the LNG-IUS, in the 1990s, this option

has become popular and has affected especially hysterectomies for menorrhagia among other hormonal conditions.<sup>16,17</sup> According to the Finnish retail statistics of Fimea (The Finnish Medicines Agency), which is the authority that regulates pharmaceuticals, the number of LNG-IUS sold in 1990 was 7507 and this has been increasing yearly up to 51 672 in 2018.<sup>18</sup>

The decline in hysterectomy rates can be explained by national guidelines on how to treat uterine fibroids. In 2005, the Finnish Ministry of Social Affairs and Health published the national criteria for conditions, for which the alternative treatment had to be given for 6 months before hysterectomy.<sup>11</sup> The reason for this was to secure the resourcing of healthcare services so that the timely treatment for medically indicated conditions was guaranteed. Although this scoring system is no longer used, the practice changed the mindset of



gynecologists very rapidly on how to treat uterine fibroids. Current practice also reflects a cultural change, which emphasizes treatment with more conservative methods and major surgical procedures are used more strictly.

The Finnish population is becoming older and more obese, which may increase the incidence of genital prolapse and malignant tumors. In this study, we found that the age at the time of procedure was shifting towards higher ages and operations on genital prolapses and malignant tumors have become the main indications for hysterectomy (Figures 2 and 4).

The strengths of this study are the representative nationwide data on hysterectomies, which cover the information of the entire population for over 30 years. The private sector covers less than 5% of the total number of operations in Finland.<sup>19</sup> The use of personal identity numbers in Finland provides reliable recording and linkage of information. The diagnoses are recorded in the patient records at the hospital in connection with the surgery and registered at the Care Register for Health Care comprehensively from the hospital records. The validity of the Care Register for Health Care has been estimated to be from very good to satisfactory.<sup>20</sup> According to the report, the quality of recording of the main procedures and diagnoses to the care register database is very good, but the so-called side procedures and diagnoses may lack information.<sup>20-22</sup> Limitations of this study are in the process of recording and interpretation of coding in the Care Register for Health Care. Since the coding system of procedures and diagnoses has changed during the study period, there may be missing cases and information during the study period, especially during the first year of recording.<sup>23</sup> Also, the comparison of the procedure and diagnosis codes may be difficult because of differences in the codes over time, the latest codes being more precise than the earlier ones. Very often there are two or even more reasons for hysterectomy. As we classified the procedures into categories based on the main diagnosis code, it is possible that operations classified as being performed for bleeding disorders were actually performed because of fibroids, if this was given as the secondary diagnosis code.

The impact of the decreasing trend in incidence rate of hysterectomies will become apparent later. A study from the USA suggested that uterine/endometrial cancer rates are increasing as the result of the practice of retaining the uterus.<sup>24</sup> In addition, it is proposed that uterine cancer incidence and mortality rates will be higher when hysterectomies are taken into account in the population numbers at risk than the current observed rates without considering this.<sup>24,25</sup> The fact that bleeding disorders and fibroids are treated with hormonal treatments, can also have protective effects on endometrial cancer risk. A recent study from the USA reported, that the proportion of high-risk endometrial cancers among endometrial cancer patients is increasing and the authors suggested that this might be due to the protective effect of LNG-IUS on the low-risk endometrial cancers.<sup>26</sup>

This study showed that clinicians in Finland currently perform fewer hysterectomies for benign indications such as uterine fibroids or bleeding disorders, suggesting the use of other treatment modalities or a decrease in incidence of benign uterine disease. The

decrease in the incidence rate of hysterectomy has two significant implications. First, it affects the demand for healthcare resources. Second, and more importantly, it inevitably affects the incidence of other uterine diseases, most essentially, the incidence of endometrial cancer. Among postmenopausal women in Finland, the population of women who have undergone a hysterectomy is currently proportionally smaller than 20 years ago and at the same time, the population of women who have had a conservative treatment with a hormone-releasing intrauterine system has increased. A failure to correct uterine cancer incidence rates to the actual population at risk (women with intact uterus) leads to incorrect estimates of endometrial cancer incidence, as reported earlier.<sup>6</sup>

The results of our study show that, in Finland, the hysterectomy rates have varied markedly during the last three decades, and there is valid reason to adjust endometrial cancer incidence rates, as well as future predictions on endometrial cancer incidence in line with these changes. These changes might have an effect not only on endometrial cancer incidence, but also on the histological distribution of endometrial cancer in the future and mortality due to gynecological cancers, which may require new measures in the treatment of the patients.

## 5 | CONCLUSION

The availability of hormonal and other conservative treatment methods for uterine fibroids and bleeding disorders has led to a significant decrease in hysterectomy incidence in Finland during the last two decades. The impact of this on future incidence and mortality of endometrial cancer needs to be evaluated.

## CONFLICTS OF INTEREST

None.

## AUTHOR CONTRIBUTIONS

JH contributed to data summary review, abstract composition and manuscript construction; JH, AA and JP contributed to concept development and manuscript organization; and AN contributed to statistical programming and performed statistical analysis. All authors contributed to manuscript preparation.

## ORCID

Jenni Hakkarainen  <https://orcid.org/0000-0002-0792-3532>

Aapeli Nevala  <https://orcid.org/0000-0002-9253-4493>

Kari Nieminen  <https://orcid.org/0000-0003-4498-9300>

Nea Malila  <https://orcid.org/0000-0001-8127-8087>

Janne Pitkaniemi  <https://orcid.org/0000-0001-9879-6673>

Annika Auranen  <https://orcid.org/0000-0002-9678-4684>

## REFERENCES

1. Nordic Medico-Statistical Committee. Health Statistics for the Nordic Countries 1995-2017. Available at: <http://www.nowba.se.org>

2. Brummer TH, Jalkanen J, Fraser J, et al. FINHYST 2006 – National prospective 1-year survey of 5 279 hysterectomies. *Hum Reprod.* 2009;24:2515-2522.
3. Hammer A, Rositch AF, Kahlert J, Gravitt PE, Blaakaer J, Sogaard M. Global epidemiology of hysterectomy: possible impact on gynecological cancer rates. *Am J Obstet Gynecol.* 2015;213:23-29.
4. Whiteman MK, Hillis SD, Jamieson DJ, et al. Inpatient hysterectomy surveillance in the United States, 2000–2004. *Am J Obstet Gynecol.* 2008;198:34.e1-34.e7.
5. Luoto R, Hemminki E, Topo P, Uutela A, Kangas I. Hysterectomy among Finnish Women: prevalence and Women's own opinions. *Scand J Public Health.* 1992;20:209-212.
6. Luoto R, Raitanen J, Pukkala E, Anttila A. Effect of hysterectomy on incidence trends of endometrial and cervical cancer in Finland 1953–2010. *Br J Cancer.* 2004;90:1756-1759.
7. Garry R. The future of hysterectomy. *BJOG An Int J Obstet Gynaecol.* 2005;112:133-139.
8. American College of Obstetricians and Gynecologists. ACOG practice bulletin. Alternatives to hysterectomy in the management of leiomyomas. *Obstet Gynecol.* 2008;112:387-400.
9. Hurskainen R, Teperi J, Rissanen P, et al. Quality of life and cost-effectiveness of levonorgestrel-releasing intrauterine system versus hysterectomy for treatment of menorrhagia: a randomised trial. *Lancet.* 2001;357:273-277.
10. Taipale K, Leminen A, Räsänen P, et al. Costs and health-related quality of life effects of hysterectomy in patients with benign uterine disorders. *Acta Obstet Gynecol Scand.* 2009;88:1402-1410.
11. Ministry of Social Affairs and Health, Finland. Heinonen S, Kauko M, Saarikoski S, Penttinen J. (2005) STM kiireettömän hoidon kriteerit 2010. Sosiaali- ja terveysministeriön selvityksiä - sarja, Yhtenäiset kiireettömän hoidon perusteet. [STM Emergency Care Criteria 2010. Reports of the Ministry of Social Affairs and Health - Series, Uniform Criteria for Urgent Care.] In Finnish. Available from: <https://stm.fi/>
12. Jokinen E, Brummer T, Jalkanen J, et al. Hysterectomies in Finland in 1990–2012: Comparison of outcomes between trainees and specialists. *Acta Obstet Gynecol Scand.* 2015;94:701-707.
13. Muggeo VMR. Estimating regression models with unknown breakpoints. *Stat Med.* 2003;22:3055-3071.
14. Lundholm C, Forsgren C, Johansson ALV, Cnattingius S, Altman D. Hysterectomy on benign indications in Sweden 1987–2003: a nationwide trend analysis. *Acta Obstet Gynecol Scand.* 2009;88:52-58.
15. Heliövaara-Peippo S, Hurskainen R, Teperi J, et al. Quality of life and costs of levonorgestrel-releasing intrauterine system or hysterectomy in the treatment of menorrhagia: a 10-year randomized controlled trial. *Am J Obstet Gynecol.* 2013;209:535.e1-535.e14.
16. Nilsson CG, Luukkainen T, Diaz J, Allonen H. Intrauterine contraception with levonorgestrel: a comparative randomised clinical performance study. *Lancet.* 1981;1:577-580.
17. Lahtenmaki P, Haukkamaa M, Puolakka J, et al. Open randomised study of use of levonorgestrel releasing intrauterine system as alternative to hysterectomy. *Br Med J.* 1998;316:1122-1126.
18. Finnish Medicines Agency Fimea. Finnish statistics on medicines. Lääkkeiden tukkumyyntirekisteri [Wholesale pharmaceutical register], 30th Sep edn. 2019.
19. Finnish Institute for Health and Welfare. Toimenpiteiden lukumäärä palveluntuottajittain. [Number of measures by service provider]. 2020;1(1).
20. Sund R. Quality of the Finnish Hospital Discharge Register: a systematic review. *Scand J Public Health.* 2012;40:505-515.
21. Gissler M, Haukka J. Finnish health and social welfare registers in epidemiological research. *Nor Epidemiol.* 2004;14:113-120.
22. Finnish Institute for Health and Welfare (THL). Erikoissairaanhoido - Laatuseloste. [Specialist care - Quality statement.] 2019;11-4. Available in Finnish: <https://thl.fi/fi/tilastot-ja-data/tilastot-aiheet/sairastavuus-ja-tapaturmat/tapaturmat/laatuseloste>
23. Keskimäki J, Aro S. Accuracy of data on diagnosis, procedures and accidents in the Finnish hospital discharge register. *Int J Health Sci.* 1991;2:15-21.
24. Temkin SM, Minasian L, Noone A-M. The end of the hysterectomy epidemic and endometrial cancer incidence: what are the unintended consequences of declining hysterectomy rates? *Front Oncol.* 2016;6:1-6.
25. Miller AB, Visentin T, Howe GR. The effect of hysterectomies and screening on mortality from cancer of the uterus in Canada. *Int J Cancer.* 1981;27:651-657.
26. Doll KM, Winn AN. Assessing endometrial cancer risk among US women: long-term trends using hysterectomy-adjusted analysis. *Am J Obstet Gynecol.* 2019;221:318.e1-318.e9.
27. The Ministry of Social Affairs and Health. The Act on the Secondary Use of Health and Social Data. 2019.

## SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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