

English version of "Prävalenz von Hysterektomien bei Frauen im Alter von 18 bis 79 Jahren. Ergebnisse der Studie zur Gesundheit Erwachsener in Deutschland (DEGS1)"  
 Bundesgesundheitsbl 2013 · 56:716–722  
 DOI 10.1007/s00103-012-1660-7  
 © Springer-Verlag Berlin Heidelberg 2013

F. Prütz · H. Knopf · E. von der Lippe · C. Scheidt-Nave · A. Starker · J. Fuchs

Department of Epidemiology and Health Monitoring, Robert Koch Institute, Berlin

# Prevalence of hysterectomy in women 18 to 79 years old

## Results of the German Health Interview and Examination Survey for Adults (DEGS1)

### Background and purpose

The first abdominal hysterectomy was probably performed in England in 1843 (unplanned); the first vaginal hysterectomy about 120 AD in Ephesus [1]. Nowadays, hysterectomy is one of the most common gynaecological procedures in many countries [2]. In addition to abdominal and vaginal hysterectomies, a laparoscopic approach is possible [3]. Indications for a hysterectomy are cancer of the uterus and the ovaries and non-malignant diseases such as fibroids, genital prolapse, and dysfunctional uterine bleeding [4]. Although hysterectomy is a therapeutic measure, the women affected may also perceive it as the loss of an important organ and may be concerned about potential adverse outcomes [4, 5], especially in case of a simultaneously performed oophorectomy or when they are still premenopausal. In addition to the usual operation risks, such as post-operative bleeding, infections and anaesthesiological complications, there can be an earlier onset of menopause in premenopausal women after hysterectomy, even if there was no simultaneous oophorectomy performed [6]. International studies show that altogether, quality of life improves after the operation and that, in general, there are no negative effects on psychological health [7, 8,

9, 10]. However, since some women feel that their health is impaired after hysterectomy [9, 10, 11, 12, 13] elective hysterectomies should only be performed after carefully weighing the benefits and risks and offering women additional support if necessary.

In Germany, as in other countries, there are regional variations for hysterectomy rates. These may be a sign of differences in the indications to operate [14, 15]. However, it is stated that the attitude towards hysterectomies has changed, and that physicians' recommendations have become more differentiated and individualised, taking alternative treatments into account [16]. A German guideline on the indications, methods and post-operative care of hysterectomies is scheduled for completion in 2013 [17].

Previous surveys on the frequency of hysterectomy in Germany are based on data from the nationwide DRG statistics [2, 15] and on data from the health insurance funds [14]. Data are also available from external quality assurance in hospitals according to Article 137 SGB V (German Social Security Code) [18]. So far in Germany, survey data, which allow analysis of the factors associated with hysterectomy, are provided—within a tight regional framework—only in the Women's Health Report for Bremen [19]. Thus the objective of this study is to analyse the

prevalence of hysterectomy in Germany in line with sociodemographic factors and possible health influencing factors.

### Methods

The German Health Interview and Examination Survey for Adults ("Studie zur Gesundheit Erwachsener in Deutschland", DEGS) is part of the health monitoring system at the Robert Koch Institute (RKI). The concept and design of DEGS are described in detail elsewhere [20, 21, 22, 23, 24]. The first wave (DEGS1) was conducted from 2008–2011 and comprised interviews, examinations and tests [25, 26]. The target population comprises the residents of Germany aged 18–79 years. DEGS1 has a mixed design which permits both cross-sectional and longitudinal analyses. For this purpose, a random sample from local population registries was drawn to complete the participants of the German National Health Interview and Examination Survey 1998 (GNHIES98), who re-participated. A total of 8,152 persons participated, including 4,193 first-time participants (response rate 42%) and 3,959 revisiting participants of GNHIES98 (response rate 62%). In all 7,238 persons attended one of the 180 examination centres, and 914 were interviewed only. The net sample (n=7,988) permits representative cross-

**Tab. 1** Percentage of 18- to 79-year-old women with hysterectomy by age group, by age group and socioeconomic status, and by age group and place of residence in 1988

Hysterectomy		30–39 years	40–49 years	50–59 years	60–69 years	70–79 years	Total	n <sub>unweighted</sub>
Percentage of women with hysterectomy <sup>a</sup> (95% CI)		0.8% (0.2–2.8%)	10.9% (8.3–14.3%)	27.5% (23.4–32.1%)	32.4% (27.8–37.4%)	39.4% (34.1–44.8%)	17.5% (16.0–19.0%)	3487
SES	Low (95% CI)	3.7% (0.5–22.1%)	16.7% (9.2–28.3%)	35.2% (23.9–48.5%)	42.3% (32.1–53.1%)	40.3% (29.9–51.8%)	22.9% (19.0–27.3%)	551
	Medium (95% CI)	0.6% (0.2–1.9%)	10.6% (7.5–14.9%)	26.5% (21.1–32.7%)	30.9% (25.2–37.4%)	39.4% (32.7–46.4%)	17.1% (15.2–19.2%)	2178
	High (95% CI)	<sup>a</sup>	7.7% (3.3–17.0%)	25.4% (18.3–34.1%)	26.6% (18.4–37.0%)	35.4% (22.9–50.3%)	13.0% (10.3–16.3%)	758
Place of residence in 1988	Former GDR (east) (95% CI)	3.4% (0.8–13.7%)	12.2% (7.7–18.9%)	23.6% (18.0–30.5%)	30.4% (23.5–38.4%)	27.0% (18.5–37.7%)	16.2% (13.6–19.0%)	1034
	Former FRG (west) (95% CI)	0.3% (0.1–1.3%)	10.5% (7.3–15.1%)	29.6% (24.5–35.3%)	32.0% (26.4–38.1%)	45.7% (49.3–52.1%)	21.0% (19.0–23.2%)	2028
	Other place (95% CI)	<sup>a</sup>	9.7% (3.6–23.9%)	14.1% (5.7–30.6%)	47.6% (22.2–74.3%)	17.3% (3.9–51.8%)	7.9% (4.8–12.6%)	225

FRG Federal Republic of Germany, GDR German Democratic Republic. <sup>a</sup>No occurrences in the 18–29 year age group and within individual cells.

sectional and time trend analyses for the age range of 18–79 years in comparison with GNHIES98 (n=7,124) [24]. The data of the revisiting participants can be used for longitudinal analyses.

The cross-sectional and trend analyses are conducted with a weighting factor which corrects deviations in the sample from the population structure with regard to age, sex, region and nationality, as well as community type and education [24]. A separate weighting factor was prepared for the examination part. Calculation of the weighting factor also considered re-participation probability of GNHIES98 participants, based on a logistic regression model. A non-response analysis and a comparison of selected indicators with data from census statistics indicate a high level of representativity of the net sample for the residential population aged 18–79 years of Germany [24]. To take into account the weighting as well as the correlation of the participants within a community, the confidence intervals were determined with the SPSS-20 procedures for complex samples. Differences are regarded as statistically significant if the respective 95% confidence intervals do not overlap.

The survey population for this analysis comprises 3,705 women aged 18–79 years who participated in the examination part of DEGS1. After the exclusion of 205 women with incomplete answers, a total of 3,500 remained for the statistical evaluation. As some questions were

not answered by all participants, there are different sample sizes among the individual aspects.

The analyses are based on the answers of the participants to the following questions in the written questionnaire:

- “Which of the following gynaecological disorders and/or surgical procedures have occurred with you?” (“Hysterectomy” was one of five possible answers, followed by a question about the year of the operation.)
- “When did you have your first period?”
- “Roughly how old were you when your menstrual cycle stopped? (We only mean the end of your menstruation without use of the pill or other hormone preparations.)”
- “Please state how many live births, miscarriages, still births and abortions you had.”

In addition to this, a computer-assisted medical interview (CAPI) was used to gather information on medically diagnosed cancers. Overall, the information obtained enables the calculation of the average age at which the uterus was removed along with conclusions concerning a connection with a gynaecological cancer, simultaneous oophorectomy and the menopausal status when the operation was performed. The classes ≤11, 12–14 and ≥15 years were used (as in [27]) for the age of menarche, and the classes 0, 1–2, ≥3 (as in [28]) for the num-

ber of live births. The variables age, social status, place of residence in 1988 and Body Mass Index (BMI) were also used for the analyses. Social status was determined using an index which includes information on school education and vocational training, professional status and net household income (weighted by household needs) which enables a classification into low, middle and high status groups [29]. The place of residence in 1988 was chosen in order to determine regional differences in the frequency of hysterectomies between the former sovereign states of East Germany (GDR) and West Germany (FRG).

Descriptive analyses were stratified by age group, region, social status and indication. Correlation was calculated between hysterectomy (dependent variable) and health variables (independent variables: age at menarche, number of live births and overweight in line with WHO defined as BMI ≥25).

## Results

### Prevalence of hysterectomy

Overall, 17.5% (n=689) of the women interviewed stated that they underwent a hysterectomy. As this proportion increases with advancing age, the highest prevalence of 39.4% is to be found in the 70- to 79-year-old age group (■ **Tab. 1**). Most women (48.5%) had a hysterectomy between the ages of 40 and 49 years, with

an average age of 43.9 and a range from 24–74 years of age. As no hysterectomy data were collected within the scope of GNHIES98, a comparison over time is not possible.

### Attendant circumstances

Cancer of the uterus or ovaries was reported by 6.1% of women who underwent a hysterectomy. A different pattern can be observed with them as to the age at which the hysterectomy was performed: there is an even distribution over the medium age groups, with operations being less frequent among the 40- to 49-year-olds but more frequent among women aged under 40 years and those aged 50 years and over (■ Fig. 1).

In all 19.7% of women who underwent a hysterectomy stated that they also had an oophorectomy. Assuming that all women who did not report gynaecological cancer had surgery on a benign indication, 17.7% of all women who had a hysterectomy on benign indications had a simultaneous oophorectomy. Most of these women (46.7%) were aged between 40 and 49 years when they had the operation, and 28.1% were over 50 years of age. Of all hysterectomies, 30.2% can be considered as postmenopausal operations, 87.7% of which were performed on benign indications (data not listed in table).

### Possible influencing factors

With regard to socioeconomic status, significant differences can be seen in the prevalence of hysterectomies between women with a high and low social status. Whereas 22.9% of women with a low social status are hysterectomised, the proportion for women with a high social status is only 13.0% (■ Tab. 1). No significant differences can be recognised after age stratification.

Differences by community size or on the level of the federal states cannot be seen (data not in the table), but a comparison by place of residence in 1988 does show that the prevalence of hysterectomy in 70- to 79-year-old women from the old federal state (West Germany) is significantly higher than in women from

Bundesgesundheitsbl 2013 · DOI 10.1007/s00103-012-1660-7  
© Springer-Verlag Berlin Heidelberg 2013

## F. Prütz · H. Knopf · E. von der Lippe · C. Scheidt-Nave · A. Starker · J. Fuchs Prevalence of hysterectomy in women 18 to 79 years old. Results of the German Health Interview and Examination Survey for Adults (DEGS1)

### Abstract

In many countries, hysterectomy is one of the most frequently performed surgical procedures in gynaecology. The aim of this study is to analyse the prevalence of hysterectomy in Germany by sociodemographic factors and factors of (reproductive) health. Analyses are based on data from the German Health Interview and Examination Survey for Adults (DEGS1), which is part of the health monitoring of the Robert Koch Institute (RKI). The prevalence of hysterectomy among participating women (18–79 years old) was 17.5% (n=689). Most women (49.1%) were 40–49 years old when surgery was performed; 6.1% of hysterectomised women had cancer of the uterus or ovaries, and 19.7% under-

went a simultaneous oophorectomy. There were significant differences in the prevalence of hysterectomy regarding social status, place of residence in 1988, number of live births, and body weight. DEGS1 is the first study showing the prevalence of hysterectomy in a representative sample of the German population. More detailed analyses of the DEGS data, among other data sources, are needed to evaluate the importance of the described associations and to assess trends.

### Keywords

Health survey · Germany · Hysterectomy · Prevalence · Determinants

## Prävalenz von Hysterektomien bei Frauen im Alter von 18 bis 79 Jahren. Ergebnisse der Studie zur Gesundheit Erwachsener in Deutschland (DEGS1)

### Zusammenfassung

Gegenwärtig gehört die Entfernung der Gebärmutter in vielen Ländern zu den häufigsten gynäkologischen Eingriffen. Ziel der vorliegenden Auswertung ist es, die Prävalenz der Hysterektomie in Deutschland nach soziodemografischen Faktoren und möglichen gesundheitlichen Einflussfaktoren zu analysieren. Basis sind die im Rahmen der „Studie zur Gesundheit Erwachsener in Deutschland“ (DEGS1) erhobenen Daten des Gesundheitsmonitorings des Robert Koch-Instituts (RKI). Insgesamt wurde bei 17,5% (n=689) der befragten Frauen (Alter: 18 bis 79 Jahre) eine Gebärmutterentfernung durchgeführt. Bei den meisten Frauen (49,1%) fand diese im Alter von 40 bis 49 Jahren statt. Von 6,1% der hysterektomierten Frauen wurde eine Krebserkrankung der Gebärmutter oder der Eierstöcke angegeben. Bei 19,7% der

Frauen mit Hysterektomie wurde gleichzeitig eine Eierstockentfernung durchgeführt. Signifikante Unterschiede in den Prävalenzen für eine Hysterektomie zeigen sich mit Blick auf den Sozialstatus, den Wohnort im Jahr 1988, die Anzahl der Lebendgeburten und das Körpergewicht. DEGS1 ist die erste Studie, in der deutschlandweit und bevölkerungsrepräsentativ die Prävalenz der Gebärmutterentfernung erhoben wird. Weitere vertiefende Analysen – auch mit den DEGS-Daten – sind notwendig, um die Bedeutung der einzelnen Einflussfaktoren genauer untersuchen und Trendabschätzungen vornehmen zu können.

### Schlüsselwörter

Gesundheitsurvey · Deutschland · Hysterektomie · Prävalenz · Einflussfaktoren

the former states of East Germany (45.7% versus 27.0%).

A comparison of the number of live births among women with and without a hysterectomy shows significant differences: 6.4% of childless women, 19.9% of women with one to two children and 27.4% of women with three or more children underwent a hysterectomy

(■ Tab. 2). The differences by age are not statistically significant.

Focusing on the age of menarche, a slightly higher prevalence of hysterectomy can be seen with women who were younger as well as women who were older at menarche (17.2 and 19.5% respectively in contrast to 16.1%), but these differences are not statistically significant.

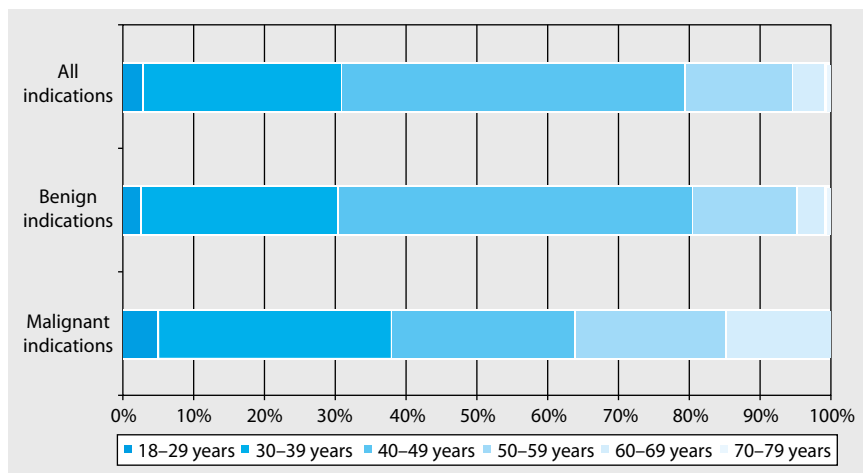


Fig. 1 ▲ Age at hysterectomy by age group and indications.  $n_{\text{unweighted}}=631$

It also becomes clear that hysterectomy was performed significantly more often on women with a currently high Body Mass Index (BMI): 24.2% of women who are overweight (BMI  $\geq 25$ ) are hysterectomised, whereas this only applies to 10.0% of women who are not overweight.

## Discussion

### Prevalence

DEGS1 is the first survey in which the prevalence of hysterectomy has been recorded throughout Germany representative of the population. The collection of data on hysterectomy in surveys is generally regarded as very reliable [30]. The data can be compared with those of the Women's Health Report for Bremen, even though it only shows the prevalences among 40- to 70-year-old women in a region of western Germany. The available routine data (administrative and accounting data) reveal hysterectomy rates for certain years, i.e. incidences. The Bremen study shows a prevalence of hysterectomy of 25%, which is higher than in DEGS1 (17.5%), but this difference is reduced when the comparison is restricted to women who had their place of residence in West Germany in 1988 (21.0%). The average age of hysterectomy in the Bremen study was 43 years [19], which correlates with the value in DEGS1 (43.9 years). The average age for hysterectomies on benign indication lies

at 52 years in the analysis based on routine data for 2005/2006 [2] and 51.2 years for 2010 [18]; the difference to DEGS1 (43.8 years) could be explained among other things by the fact that DEGS1 does not show incidences, but lifetime prevalences. In an international comparison of the prevalence of hysterectomy, Germany ranks mid-table: more than a third of women in the USA undergo a hysterectomy by the time they are 60 [5], roughly 20% in the UK by the age of 55 years [28], while only around 10% of women in Denmark are hysterectomised [31].

### Attendant circumstances

It is estimated that approx. 90% of all hysterectomies are performed for benign diseases of the female genital organs [19]. With values of 9% for malignant and 86% for benign indications, this figure is reflected in the results of the Women's Health Report for Bremen. The values in DEGS1 (6.1% with cancer) are lower, which could be due to the lower sample size or to the fact that the reason for the hysterectomy was not asked directly but reconstructed on the basis of the age information. Regarding the incidences of the years 2005/2006 [2], the proportion of hysterectomies assigned to a cancer of the female genital organs is 12.1%, and thus higher than in DEGS1. The proportion of hysterectomies with simultaneous oophorectomy is also higher at 22.9%; the proportion of this operation on benign indication (12.2%) is low-

er than in DEGS1 (17.7%) [2]. Since routine data do not permit classification of menopausal status at the time of the operation, a comparison is not possible in this regard. One of the restrictions of the DEGS1 data is, however, that the menopausal status was also determined on the basis of age information. This may be difficult especially in the context of hysterectomies, because most uterus removals are performed around the age of the last menstruation. Overall, joint review of the DEGS1 data and the routine data raises the question as to whether there is a trend towards fewer hysterectomies (with simultaneous oophorectomies) for benign diseases, particularly with younger women. This question can only be answered reliably after further research.

### Influencing factors

A relationship between hysterectomy and indicators of socioeconomic status can also be found in several international studies [19, 32, 33, 34]. Among the indicators, education [19, 32] and the women's own occupational status [33] are given special emphasis. Better biological health of women with higher social status, less stress, better healthcare, higher utilisation of screening for early detection (and thereby the possibility of earlier, less invasive interventions) and a greater willingness among physicians to discuss different therapeutic options or consider alternative therapy methods have been mentioned as possible explanations [32, 34].

A comparison of the east-west differences of hysterectomies with other relevant data on regional differences [14, 15] is not possible because the latter are on a much smaller scale and do not reflect prevalences. One reason for the east-west differences (as well as other regional differences) may be that there are (traditionally) different evaluations of operation indications or "operation schools". A Danish study shows that gynaecologists' recommendation of hysterectomy partly depends on the urban-rural localisation of the physicians [35]. A study from the USA emphasises the influence of the period of time which has elapsed since completion of medical training: the

**Tab. 2** Hysterectomy in 18- to 79-year-old women by age group and by the influencing factors number of births, age at menarche and overweight<sup>a</sup>

Hysterectomy		30–39 years	40–49 years	50–59 years	60–69 years	70–79 years	Total	n <sub>unweighted</sub>
Number of live births	None (95% CI)	<sup>a</sup>	<sup>a</sup>	24.7% (7.9–55.7%)	9.7% (1.1–51.2%)	<sup>a</sup>	6.4% (2.3–16.6%)	69
	1–2 (95% CI)	0.6% (0.2–1.9%)	10.5% (7.0–15.4%)	28.0% (23.0–33.6%)	31.7% (26.5–37.4%)	38.4% (30.9–46.4%)	19.9% (17.9–22.1%)	1944
	≥3 (95% CI)	2.7% (0.4–17.1%)	15.7% (9.1–25.9%)	28.1% (18.9–39.6%)	32.5% (23.3–43.4%)	43.3% (34.4–52.7%)	27.4% (23.4–31.9%)	592
Age at menarche	≤11 years (95% CI)	<sup>a</sup>	17.7% (9.2–31.2%)	39.3% (24.0–57.0%)	38.7% (23.4–56.5%)	48.0% (26.8–70.0%)	17.2% (13.1–22.2%)	356
	12–14 years (95% CI)	0.5% (0.1–1.6%)	9.7% (6.6–14.0%)	26.9% (22.6–31.8%)	32.8% (27.6–38.4%)	39.1% (32.5–46.2%)	16.1% (14.4–17.9%)	2335
	≥15 years (95% CI)	2.0% (0.3–13.1%)	6.2% (3.0–12.5%)	21.6% (14.1–31.6%)	29.9% (20.8–40.9%)	39.1% (29.8–49.2%)	19.5% (16.2–23.3%)	696
Overweight as defined by WHO (BMI ≥25)	Yes (95% CI)	1.7% (0.4–7.3%)	14.8% (10.3–20.9%)	30.0% (24.6–35.9%)	34.3% (28.5–40.5%)	41.7% (35.5–48.2%)	24.2% (21.9–26.7%)	1897
	No (95% CI)	0.3% (0.1–1.2%)	8.8% (5.6–13.5%)	23.6% (17.7–30.7%)	28.9% (22.0–37.0%)	28.7% (19.6–39.8%)	10.0% (8.4–11.9%)	1573

<sup>a</sup>No occurrences in the 18–29 year age group and within individual cells

shorter this period, the lower the hysterectomy rate [36]. Therefore when discussing the regional differences, the pivotal role of the indication, which also reflects the different opinions of gynaecologists, becomes obvious [35, 37]. Contrary to this, the density of providers does not currently appear to have any influence on the hysterectomy rates in Germany [14].

A relationship between hysterectomy and the number of live births is also described in international literature [27, 28, 38]. Possible explanations are the damage of gynaecological organs with birth, a reduced need to maintain fertility and a connection with low social status [38]. Another possible explanation is a connection between higher body weight in multiparous women and hysterectomy [27]. A British study differentiates by indications for hysterectomy, whereby the percentage of hysterectomies due to myomas decreases with the number of births and the percentage of hysterectomies due to menstrual disorders increases with the number of births [28].

The influence of body weight on the probability of uterus removal is shown in cohort studies from the UK and Denmark [39, 40]. This can be explained by social status, for example, although associations with the age of menarche and the number of births are also possible. According to the British study, the associ-

ation between overweight and the hysterectomy rate exists irrespective of the number of births, age at menarche and socioeconomic status, thus suggesting other—perhaps genetic—influences [39]. Thought is also being given to an association between hypertension and hypermenorrhoea (heavy or prolonged menstruation), perhaps as part of a metabolic syndrome [41].

An influence of the age at menarche on the hysterectomy risk, as found in two international studies [27, 38], cannot be substantiated on the basis of the DEGS1 data. This could be due to the small number of cases for the lower age classes or to the fact that for older women an “early menarche” took place at a more advanced age than is the case today. Theoretically, the association between an early age at menarche and hysterectomy can be explained by longer estrogen exposure and a resultant higher risk of developing fibroids, which are a common reason for hysterectomies. Genetic factors which have an influence on the age at menarche as well as on hysterectomy-relevant illnesses are another potential explanation [38].

Overall, there is great need for research on the factors that influence hysterectomy. In addition to the aspects mentioned above, hormone therapy, the intake of oral contraceptives, miscarriages, abortions or the type of health insur-

ance could all play a role. The question as to whether the risk of other diseases increases after a hysterectomy—cardiovascular diseases, osteoarthritis and Parkinson’s disease are mentioned in this regard [42, 43, 44]—should also be examined further.

## Conclusions and outlook

The first survey on the prevalence of hysterectomy representative of Germany shows that roughly 18% of all women in Germany underwent hysterectomy. In accordance with international studies, it can be found that the influencing factors lie in the (reproductive) health of women as well as in their social status and healthcare circumstances. It may be possible to explain many different interdependencies with further analysis of the DEGS data; longitudinal analyses may also be useful. A joint review of survey and routine data could give an even more comprehensive picture and would also be of interest from the point of view of health monitoring. Different scenarios are conceivable where the development of prevalence is concerned: the increasing utilisation of alternative techniques (e.g. uterine artery embolisation, hysteroscopic methods) and the critical questioning of the indication could lead to a decrease in prevalence, whereas eco-



conomic incentives for an increase of the caseload in hospitals would tend to produce an increase, and changing health factors (increase in obesity, earlier menarche, fewer pregnancies) could have effects in different directions. Due to the pivotal role of the indication for a hysterectomy, the implementation of guidelines and quality indicators (e.g.: as few patients as possible <35 years old with hysterectomy and benign histology [16]) would constitute an important step towards quality assurance in operative gynaecology. A further aspect is the information of patients and inclusion of their preferences and values when deciding on an operation. A survey from Switzerland [45], which is often quoted in this regard, shows that information campaigns on the benefits and risks of hysterectomy, aimed at patients and doctors, can lower hysterectomy rates.

## Corresponding address

### Dr. F. Prütz

Department of Epidemiology and Health Monitoring, Robert Koch Institute  
General-Pape-Str. 62–66, 12101 Berlin  
Germany  
PruetzF@rki.de

**Funding of the study.** The study was financed by the Robert Koch Institute and the Federal Ministry of Health.

**Conflict of interest.** On behalf of all authors, the corresponding author states that there are no conflicts of interest.

## References

- Sutton C (1997) Hysterectomy: a historical perspective. *Baillieres Clin Obstet and Gynaecol* 11:1–22
- Stang A, Merrill RM, Kuss O (2011) Hysterectomy in Germany: a DRG-based nationwide analysis, 2005–2006. *Dtsch Arztebl Int* 108:508–514
- Johnson N, Barlow D, Lethaby A et al (2005) Methods of hysterectomy: systematic review and meta-analysis of randomised controlled trials. *BMJ* 330:1478
- Ehret-Wagener B, Buse G (2004) Die Hysterektomie, eine folgenreiche Operation. In: Beckermann MJ, Perl FM (eds) *Frauen-Heilkunde und Geburtshilfe. Integration von Evidence-Based Medicine in eine frauenzentrierte Gynäkologie*. Schwabe, Basel, pp 1525–1549
- Whiteman MK, Hillis SD, Jamieson DJ et al (2008) Inpatient hysterectomy surveillance in the United States, 2000–2004. *Am J Obstet Gynecol* 198:34.e31–e37
- Farquhar CM, Sadler L, Harvey SA, Stewart AW (2005) The association of hysterectomy and menopause: a prospective cohort study. *BJOG* 112:956–962
- Kjerulff KH, Langenberg PW, Rhodes JC et al (2000) Effectiveness of hysterectomy. *Obstet Gynecol* 95:319–326
- Rannestad T (2005) Hysterectomy: effects on quality of life and psychological aspects. *Best Pract Res Clin Obstet Gynaecol* 19:419–430
- Khastgir G, Studd JW, Catalan J (2000) The psychological outcome of hysterectomy. *Gynecol Endocrinol* 14:132–141
- Flory N, Bissonnette F, Binik YM (2005) Psychosocial effects of hysterectomy: literature review. *J Psychosom Res* 59:117–129
- Pelka M (2005) Zur Bewältigungsfähigkeit nach Hysterektomie. Eine Interviewstudie mit 100 Frauen nach Hysterektomie wegen gutartiger Uteruserkrankungen. Dissertation. Medizinische Hochschule Hannover, Hannover
- Cooper R, Mishra G, Hardy R, Kuh D (2009) Hysterectomy and subsequent psychological health: findings from a British birth cohort study. *J Affect Disord* 115:122–130
- McPherson K, Herbert A, Judge A et al (2005) Psychosexual health 5 years after hysterectomy: population-based comparison with endometrial ablation for dysfunctional uterine bleeding. *Health Expect* 8:234–243
- Geraedts M, Malik M (2012) Regionale Unterschiede bei Hysterektomien und Ovariektomien. In: Klauber JGM, Friedrich J, Wasem J (eds) *Krankenhaus-Report 2012. Schwerpunkt: Regionalität*. Schattauer, Stuttgart
- Bertelsmann Stiftung (eds) (2011) *Faktencheck Gesundheit. Regionale Unterschiede in der Gesundheitsversorgung*. Bertelsmann Stiftung, Gütersloh
- AQUA-Institut (2011) *Beschreibung der Qualitätsindikatoren für das Verfahrensjahr 2010. Gynäkologische Operationen*. [http://www.sgg.de/downloads/QIDB/2011/AQUA\\_15n1\\_Indikatoren\\_2011.pdf](http://www.sgg.de/downloads/QIDB/2011/AQUA_15n1_Indikatoren_2011.pdf). Accessed 25 Mar 2013
- AWMF (2010) *Angemeldetes Leitlinienvorhaben: Indikation und Methodik der Hysterektomie*, Registriernummer 015-070. <http://www.awmf.org/leitlinien/detail/anmeldung/1/II/015-070.html>. Accessed 25 Mar 2013
- AQUA-Institut (2011) *Bundesauswertung zum Verfahrensjahr 2010. 15/1 Gynäkologische Operationen*. [http://www.sgg.de/downloads/Bundesauswertungen/2010/bu\\_Gesamt\\_15N1-GYN-OP\\_2010.pdf](http://www.sgg.de/downloads/Bundesauswertungen/2010/bu_Gesamt_15N1-GYN-OP_2010.pdf)
- Senator für Arbeit, Frauen, Gesundheit, Jugend und Soziales Bremen (eds) (2001) *Frauengesundheitsbericht Bremen 2001*. Bremen
- Kurth BM, Lange C, Kamtsiuris P, Hölling H (2009) Health monitoring at the Robert Koch-Institute. Status and perspectives. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 52:557–570
- Kurth BM (2012) Das RKI-Gesundheitsmonitoring—was es enthält und wie es genutzt werden kann. *Public Health Forum* 20(7):4.e1–4.e3
- Gößwald A, Lange M, Kamtsiuris P, Kurth BM (2012) DEGS: German Health Interview and Examination Survey for Adults. A nationwide cross-sectional and longitudinal study within the framework of health monitoring conducted by the Robert Koch-Institute. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 55:775–780
- Scheidt-Nave C, Kamtsiuris P, Gößwald A et al (2012) German Health Interview and Examination Survey for Adults (DEGS)—design, objectives and implementation of the first data collection wave. *BMC Public Health* 12:730
- Kamtsiuris P, Lange M, Hoffmann R et al (2013) The first wave of the German Health Interview and Examination Survey for Adults (DEGS1). Sampling design, response, sample weights, and representativeness. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 56:620–630
- Robert Koch-Institut (RKI) (2009) *DEGS: Studie zur Gesundheit Erwachsener in Deutschland—Projektbeschreibung. Beiträge zur Gesundheitsberichterstattung des Bundes*. RKI, Berlin
- Gößwald A, Lange M, Dölle R, Hölling H (2013) The first wave of the German Health Interview and Examination Survey for Adults (DEGS1). Participant recruitment, fieldwork, and quality management. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 56:611–619
- Settnes A, Lange AP, Jorgensen T (1997) Gynaecological correlates of hysterectomy in Danish women. *Int J Epidemiol* 26:364–370
- Vessey MP, Villard-Mackintosh L et al (1992) The epidemiology of hysterectomy: findings in a large cohort study. *Br J Obstet Gynaecol* 99:402–407
- Lampert T, Kroll L, Müters S, Stolzenberg H (2013) Measurement of socioeconomic status in the German Health Interview and Examination Survey for Adults (DEGS1). *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 56:631–636
- Brett KM, Madans JH (1994) Hysterectomy use: the correspondence between self-reports and hospital records. *Am J Public Health* 84:1653–1655
- Settnes A, Jorgensen T (1996) Hysterectomy in a Danish cohort. Prevalence, incidence and socio-demographic characteristics. *Acta Obstet Gynecol Scand* 75:274–280
- Cooper R, Lucke J, Lawlor DA et al (2008) Socio-economic position and hysterectomy: a cross-cohort comparison of women in Australia and Great Britain. *J Epidemiol Community Health* 62:1057–1063
- Marks NF, Shinberg DS (1997) Socioeconomic differences in hysterectomy: the Wisconsin Longitudinal Study. *Am J Public Health* 87:1507–1514
- Brett KM, Marsh JV, Madans JH (1997) Epidemiology of hysterectomy in the United States: demographic and reproductive factors in a nationally representative sample. *J Womens Health* 6:309–316
- Gimbel H, Ottesen B, Tabor A (2002) Danish gynecologists' opinion about hysterectomy on benign indication: results of a survey. *Acta Obstet Gynecol Scand* 81:1123–1131
- Bickell NA, Earp JA, Garrett JM, Evans AT (1994) Gynecologists' sex, clinical beliefs, and hysterectomy rates. *Am J Public Health* 84:1649–1652

- 
37. Bickell NA, Earp J, Evans AT, Bernstein SJ (1995) A matter of opinion about hysterectomies: experts' and practicing community gynecologists' ratings of appropriateness. *Am J Public Health* 85:1125–1128
  38. Cooper R, Hardy R, Kuh D (2008) Timing of menarche, childbearing and hysterectomy risk. *Maturitas* 61:317–322
  39. Cooper R, Hardy R, Kuh D (2008) Is adiposity across life associated with subsequent hysterectomy risk? Findings from the 1946 British birth cohort study. *BJOG* 115:184–192
  40. Settnes A, Jorgensen T (1998) Hypertension and hysterectomy in Danish women. *Obstet Gynecol* 92:274–280
  41. Settnes A, Andreassen AH, Jorgensen T (2005) Hypertension is associated with an increased risk for hysterectomy: a Danish cohort study. *Eur J Obstet Gynecol Reprod Biol* 122:218–224
  42. Howard BV, Kuller L, Langer R et al (2005) Risk of cardiovascular disease by hysterectomy status, with and without oophorectomy: the Women's Health Initiative Observational Study. *Circulation* 111:1462–1470
  43. Stove J, Sturmer T, Kessler S et al (2001) Hysterectomy and patterns of osteoarthritis. The Ulm Osteoarthritis Study. *Scand J Rheumatol* 30:340–345
  44. Benedetti MD, Maraganore DM, Bower JH et al (2001) Hysterectomy, menopause, and estrogen use preceding Parkinson's disease: an exploratory case-control study. *Mov Disord* 16:830–837
  45. Domenighetti G, Luraschi P, Casabianca A et al (1988) Effect of information campaign by the mass media on hysterectomy rates. *Lancet* 2:1470–1473