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ORIGINAL RESEARCH

Trends in Incidence and Mortality of Gynecological and Breast Cancers in Poland (1980–2018)

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Background: This study aimed to analyze and determine the incidence and mortality trends in gynecological and breast cancers (BCs) in Poland. The gynecological cancers assessed were cervical cancer (CC), corpus uteri cancer (CUC), ovarian cancer (OC), vaginal cancer (VAC), and vulvar cancer (VUC).

Patients and Methods: Data concerning the incidence and mortality for the period of 1980–2018 were obtained from the Polish National Cancer Registry (PNCR). Joinpoint regression analysis was performed to identify trends, which were described using the annual percentage change (APC) and the average annual percent change (AAPC).

Results: Statistically significant increases were observed in BC incidence (AAPC: 2.3; CI: 1.8 to 2.9; $p<0.05$), CUC incidence (AAPC: 2.3; CI: 1.9 to 2.7; $p<0.05$), CUC mortality (AAPC: 0.4; CI: 0.1 to 0.7; $p<0.05$) and VUC mortality (AAPC: 1.16, CI: 0.1 to 2.2; $p<0.05$). VAC mortality decreased (AAPC: −3.5, CI: −5.0 to –2.0; $p<0.05$), as did CC incidence and mortality (AAPC: −2.1, CI: −2.3 to −1.8; $p<0.05$, AAPC: −2.0, CI: −2.2 to –1.8; $p<0.05$, respectively). Between 1980 and 1993, OC incidence initially increased and then stabilized (AAPC: 0.9; CI: 0.7 to 1.1; $p<0.05$). After 2007, OC mortality decreased (AAPC: 0.0; CI: −0.2 to 0.2; $p=0.8$). Trends in VUC and VAC incidence and BC mortality were not statistically significant.

Conclusion: The results of this study showed a significant increase in OC, CUC, and BC incidence, and a decrease in the incidence of CC and VAC. The VUC trends were stable. Mortality trends for BC initially fluctuated and, since 2010, has begun to increase. Throughout the observed period, mortality due to VUC and CUC increased, whereas decreased among patients with CC. OC mortality was stable, but not significant. Furthermore, the study showed a correlation between age group and rate of incidence and mortality of each assessed cancer.

Keywords: gynecological cancers, breast cancer, incidence, mortality, average annual percentage change

Introduction

Gynecological cancers constitute a serious public health problem because gynecological malignancies continue to be an important cause of cancer-related mortality. With an estimated annual incidence of more than 3.6 million and mortality exceeding 1.3 million, these cancers account for nearly 40% of all cancer incidence and for more than 30% of all cancer mortality in women worldwide.[1] Breast cancer (BC) and corpus uteri cancer (CUC) are the top three malignancies involving the female reproductive system worldwide and are strongly related to lifestyle, socioeconomic conditions, and demographic changes.[1] Increasing wealth within Polish society during recent years, combined with successive lifestyle changes, has resulted in an increase in Western diseases, such as diabetes, obesity, and hypertension—all of which may be risk factors for some of these malignancies.[2,3]

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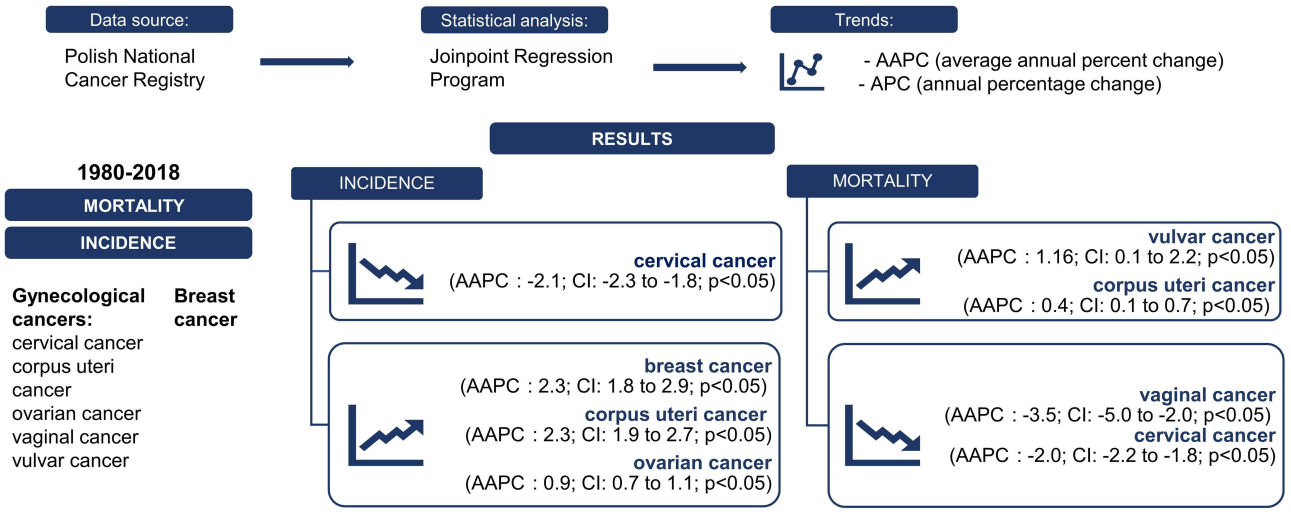
Graphical Abstract



In 2020, BC surpassed lung cancer as the most common type of cancer diagnosed in women, with an estimated 2.3 million new cases in 2020 accounted for 6.9% of all cancer-related deaths, making it the leading cause of cancer death in women as well.[1] The most important risk factors for BC are increased estrogen exposure (eg, related to early menarche, late menopause, nulliparity, or hormonal contraception); short duration, or total lack, of breastfeeding; obesity; diabetes; and genetic mutations.[4–6]

Cervical cancer (CC) is currently the second most common gynecological cancer, with 0.6 million new cases in 2020, and it is the fourth leading cause of cancer death in women, with approximately 342,000 deaths worldwide.[1] Human papillomavirus (HPV), with its 12 oncogenic types, is the major risk factor for CC.[1,7–9] CC is considered nearly completely preventable because of the highly effective primary prevention method (the HPV vaccine) as well as secondary prevention measures.[1]

CUC was the third most diagnosed cancer in women, with 417,000 new cases and 97,000 deaths in 2020.[1] Incidence rates vary depending on ethnicity and are higher in developed countries, mainly because of increased risk factors (ie, obesity; increased estrogen exposure; infertility, particularly in the presence of polycystic ovarian syndrome; and long-term hormone replacement therapy).[1,10,11]

Ovarian cancer (OC) is the fourth most common gynecological malignancy, with 313,959 new cases and 207,252 deaths in 2020, making it the most lethal gynecological cancer.[1,12,13] Risk factors are heterogeneous and depend on the histological type of ovarian cancer.[12] Various factors affect the occurrence of OC, of which genetic factors are among the most important.[13]

Currently, vulvar cancer (VUC) and vaginal cancer (VAC) are less prevalent, ranking, respectively, as the fifth (45,240 new cases, 17,427 deaths last year) and the sixth (17,908 new cases, 7995 deaths) most common cancers of the female reproductive system in terms of absolute numbers of cases worldwide.[1] The worldwide distribution of vulvovaginal cancers is associated with less-developed regions as well as with advanced age, smoking, and HPV infection.[14]

The study aims to analyze and determine the incidence and mortality trends in gynecological cancers and BCs in Poland.

Materials and Methods

Data Sources

The study reviewed the entire female population in Poland experiencing gynecological cancers and BCs between 1980 and 2018. Incidence and mortality data for the investigated period were obtained from the Polish National Cancer

Registry (PNCR). Cases of malignant neoplasms are collected in the PNCR according to malignant neoplasm reporting cards, and data on deaths caused by malignant neoplasms come from death certificates collected by the Central Statistical Office.[15] Therefore, PNCR is a reliable source of data on cancer incidence and mortality in Poland. Between 1980 and 1996, diagnoses were classified according to the Ninth Revision of the International Classification of Diseases (ICD-9); after 1996, diagnoses were based on the Tenth Revision of the ICD (ICD-10).[16] Cancers were coded as follows: BC as ICD-9 code 174 and ICD-10 code C50; CC as ICD-9 code 180 and ICD-10 code C53; CUC as ICD-9 code 182 and ICD-10 code C54; OC as ICD-9 code 183 and ICD-10 code C56; VAC as ICD-10 code C52; and VUC as ICD-10 code C51. VAC and VUC did not have separate codes in the ICD-9 but instead were both coded as 184. For this reason, they are included in our study only as of 1999. Regrettably, data for 1981 and 1986–1987 were unavailable for study, and data from 1997–1998 were missing because of medical staff strikes at that time. Institutional review board consent was not applicable, because anonymous registry data were retrospectively analyzed.

Statistical Analysis

The direct standardization method using the world standard population as reference one was used to calculate the age-standardized rates (ASRs) for cancer incidence and mortality. The direct standardization method was used because age-specific incidence and mortality rates were known. The denominator used in crude ratios and ASRs was 100,000.[15] To determine trends, Joinpoint regression analysis was performed with the use of the Joinpoint Regression Program, version 4.8.0.1 (Statistical Methodology and Applications Branch, Surveillance Research Program, National Cancer Institute, Bethesda, MD).[17] The analysis involved regression of the logarithmic time of the ASRs and then a transformation of the slope, resulting in the annual percentage change (APC).[18] To consider various trends among different time partitions, the number of Joinpoints was set between 0 and 2, which allowed for the selection of a best-fitting model with the estimated APC for each segment. The average APC (AAPC) was used to illustrate the trend during the entire period under consideration. Trends were considered statistically significant when p values were <0.05. The term "stable" was used in the event that the APC was between -0.5 and 0.5. Below this interval, trends were deemed "decreasing"; above this interval, they were deemed "increasing." The above criteria for describing trends were applied in accordance with the guidelines of the National Cancer Institute.[19] The trend data are presented as the APC or AAPC values with 95% confidence intervals (CIs). All calculations were performed using Joinpoint Regression Program, Version 4.8.0.1 (Statistical Research and Applications Branch, National Cancer Institute).

Results

BC

Since 1980, 392,682 cases of BC have been diagnosed in Poland, and our analysis revealed a statistically significant increase in the incidence (AAPC: 2.3; CI: 1.8 to 2.9; $p<0.05$). Overall, 163,202 Polish women have died from BC since 1980. However, despite the increased incidence, no statistically significant trend in mortality was noted during the study period (AAPC: 0.0; CI: −0.1 to 0.2; $p=0.6$). Mortality increased during 1980–1994 and then decreased until 2010, at which time it began to increase again until the end of the observation period (Figure 1A, Table 1A).

Apart from women aged 20–24 years, each of the investigated 5-year age groups was characterized by a significant increase in the incidence of BC. The highest observed significant APC value was in women aged 70–74 years during 1988–1993 (APC: 7.63; CI: 3.4 to 12.1; $p<0.05$; Table 2A).

Mortality from BC has significantly decreased in recent years among women ages 25–34, 40–49, and 55–59 years, with APCs ranging from −2.46 to −1.26. By contrast, mortality increased, as evidenced by statistically significant APCs occurring in older age groups (ie, those who were ages 50–54, 65–79, and ≥85 years), with APC values ranging from 0.86 to 10.75. Mortality from BC in the 60–64 years age group did not show any significant trend during the entire timeframe under consideration. APC values for the 35–39 and 80–84 year age groups were also not significant (Table 1A).

CUC

During 1980–2018, there were 128,112 cases of CUC, and 57,397 cases resulted in patient death. We observed an increase in CUC incidence (AAPC: 2.3; CI: 1.9 to 2.7; $p<0.05$) during the study years, but mortality was stable (AAPC: 0.4; CI: 0.1 to 0.7; $p<0.05$); both trends were statistically significant. In the years 1980–2006, the CUC mortality rate had been decreasing. However, since 2006, mortality has been rapidly increasing, leading to an AAPC greater than zero (Figure 1A, Table 1A).

In nearly all 5-year age groups, CUC incidence increased during the study years. A nonsignificant decrease in the incidence of CUC was noted only in women aged 60–64 years since year 2008 (APC: −0.61; Cl: −1.6 to 0.3; $p>0.05$). Almost all the increases in the incidence of CUC were statistically significant, except for a few time periods in the 55–59

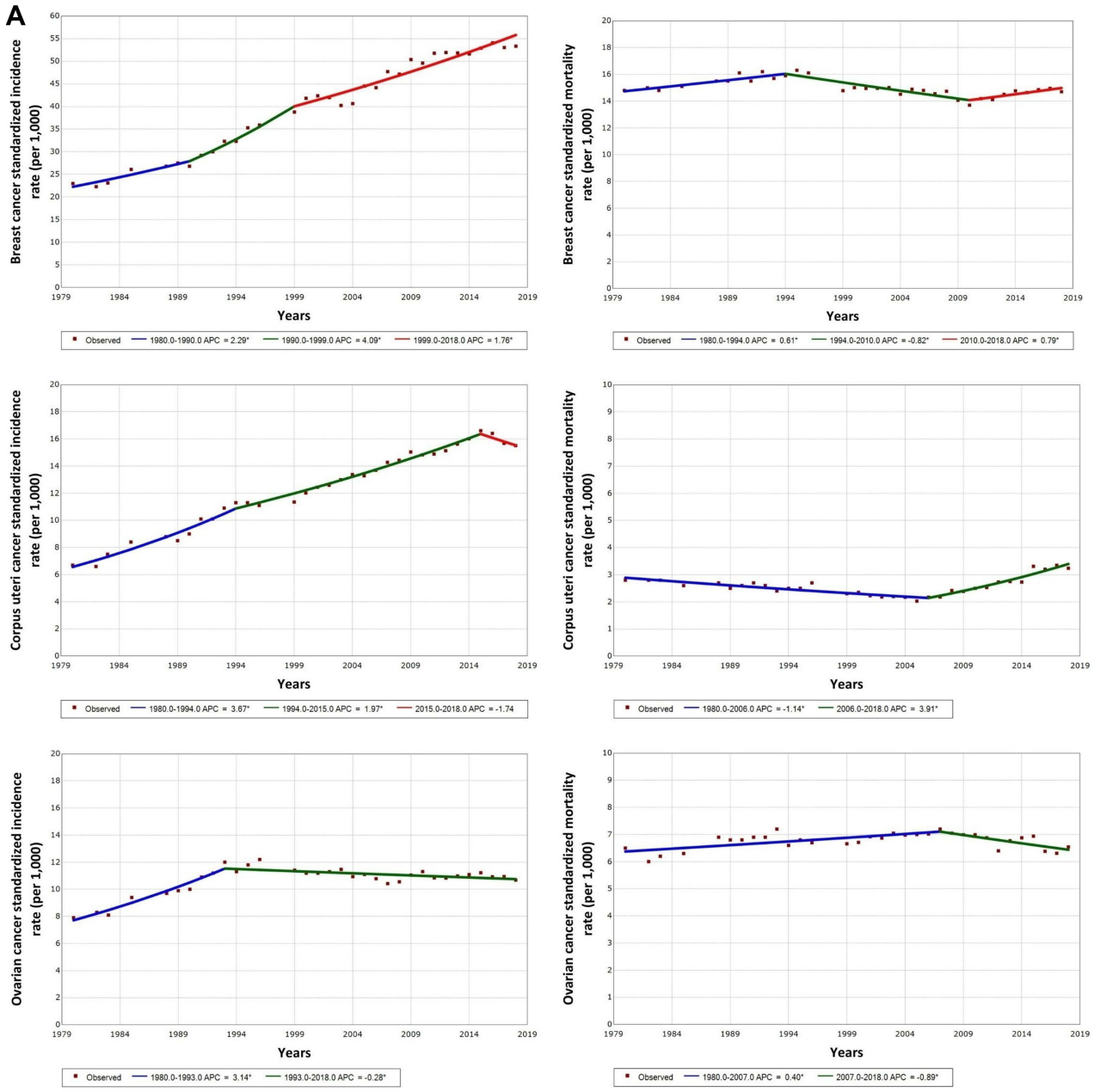


Figure 1 Continued.

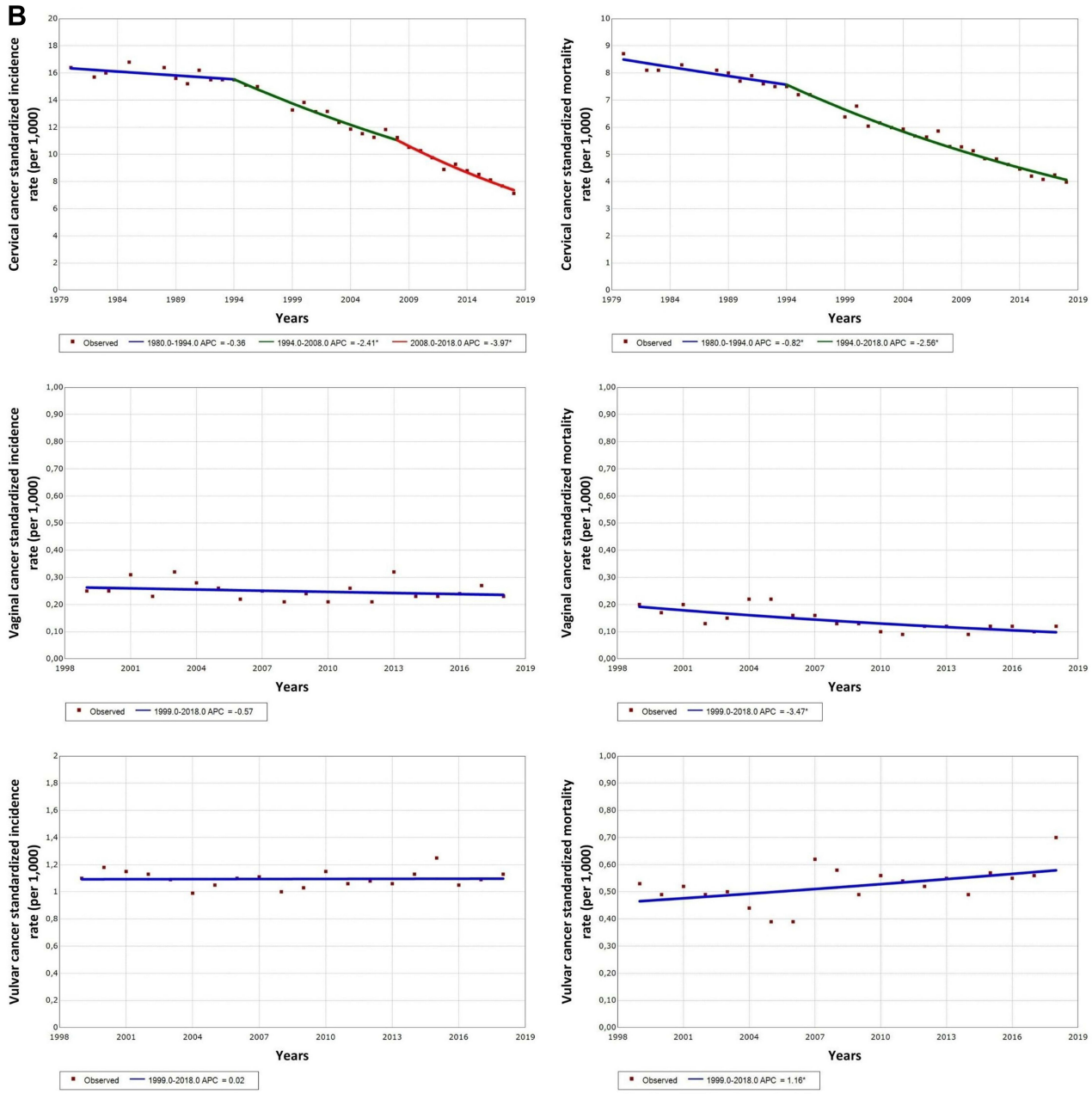


Figure 1 (**A**) Standardized incidence and mortality trends in breast, corpus uteri, and ovarian cancers, 1980–2018. (**B**) Standardized incidence and mortality trends in cervical, vaginal, and vulvar cancers, 1980–2018. *Statistically significant.
Abbreviations: APC, annual percentage change.

years and ≥85 years age groups. The increase in the 55–59 years age group was no longer statistically significant after 2002 (APC: 0.46; Cl: −0.1 to 1.0), and the increase in the ≥85 years age group was not statistically significant during 1995–2004 (APC: 0.64; Cl: −3.4 to 4.9; Table 2A).

Mortality from CUC among women in their forties decreased significantly throughout the entire study period. Among women aged 50–79 years, mortality decreased in some 5-year age groups until the early 2000s. The declining trend was statistically significant for the 50–54 years age group (APC: −2.70; Cl: −3.5 to −1.9), the 55–59 years age group (APC: −2.18; Cl: −2.7 to −1.7), and the 60–64 years age group (APC −1.09; Cl: −1.8 to −0.4). In contrast, from the beginning of the 2000s, a statistically significant increase in mortality was observed among women aged 50–79 years. The largest increase was detected in the 75–79 years age group (APC: 6.85; Cl: 4.7 to 9.1). Finally, during the entirety of the study

period, mortality from CUC increased among women age ≥80 years; this change was statistically significant as of the year 2007 both for the 80–84 years age group (APC: 8.40; Cl: 5.9 to 10.9) and the ≥85 years age group (APC: 11.34; Cl: 7.5 to 15.3; Table 2A).

Ovarian Cancer

During the analyzed years, OC was diagnosed in 101,190 women, and 70,948 diagnosed cases ended in death. Between 1980 and 1993, OC incidence significantly increased and then stabilized, resulting in an overall AAPC greater than zero (AAPC: 0.9; CI: 0.7 to 1.1; p<0.05). Mortality was stable until 2007; then, it started to decrease and finally stabilized again, resulting in a non-statistically significant AAPC (AAPC: 0.0; CI: −0.2 to 0.2; p=0.8; Figure 1A, Table 1B).

A statistically significant decrease in the incidence of OC was observed in the youngest group (ages 10–14 years). A Joinpoint analysis identified an increase, followed by a decrease or stabilization, of OC incidence in women aged 40–59 years during the 1990s. However, women aged 65–79 years experienced a large initial increase and, thereafter, a lesser increase in OC incidence. The upward tendency became a nonsignificant, stable trend in the 60–65 years and ≥80 years age groups. There were no significant trends in OC incidence among women aged 15–39 years (Table 2A).

Mortality from OC in the 5-year age groups showed a decrease among women age 20–54 years (statistically significant APC: −8.75 to −1.63), remaining stable for those age 60–64 years and increasing among older women. The statistically significant APCs for women ≥65 years ranged from 0.91 to 3.30. There was no significant trend in OC mortality for the 55–59 years age group (Table 2A).

Cervical Cancer

From 1980 to 2018, 111,644 new cases of cervical cancer were diagnosed, and 57,397 women died. Both incidence and mortality decreased during those years (incidence AAPC: −2.1; CI: −2.3 to −1.8; p<0.05; mortality AAPC: −2.0; CI: −2.2 to −1.8; p<0.05; Figure 1B, Table 1B).

In the analysis of 5-year age groups, statistically significant, decreasing trends were observed in women aged 25–85 years during specific time frames. The decreasing trend was greatest among women ages 50–54 and 50–59 years (APC: −6.85 and−6.65, respectively; p<0.05 for both), whereas a statically significant, stable incidence trend was found only in the 50–54 years age group (APC: −0.46; p<0.05). The 40–44 years (1980–1992) and 45–49 years (1980–2000) age groups experienced a significant trend of increasing incidence (p<0.05; Table 2B).

Mortality from CC revealed a significant decrease among women aged 25–79 years in specific periods (APC: −6.95 and −0.58). There was no statistically significant, stable mortality trend. Only in 1980–1996, among women age 40–44 years, was there a statistically significant, increasing mortality trend (APC: 1.40; p<0.05; Table 2B).

Vulvar Cancer

During the 19-year study period, 9154 new cases of VUC were diagnosed, and 4698 deaths from VUC were confirmed. The incidence of VUC was stable during the analysis period (AAPC: 0.0; CI: −0.4 to 0.5; p>0.05). However, a significant increasing mortality trend was observed (AAPC: 1.16; CI: 0.1 to 2.2; p<0.05; Figure 1B, Table 1C).

The analysis of the incidence of VUC showed decreasing trends in women aged 35–54 years, but only within the subgroups of ages 35–39 and 40–44 years was this trend statistically significant (APC: −5.30 and −5.01, respectively; p<0.05 for both). In the 55–59, 65–69, and 80–84 years age groups, incidence trends were stable (p>0.05). Among women ages 60–64, 70–74, 75–79, and ≥85 years, increasing incidence trends were observed, although these changes were only statistically significant in the 70–74 and ≥85 years age groups (APC: 0.73 and 1.71, respectively; p<0.05 for both). The greatest increase was observed in the ≥85 years age group, whereas the greatest decrease was observed in the 35–39 years age group (p<0.05; Table 2B).

In 2015–2018, a major decrease in mortality was observed in women aged 50–54 years, but it was not statistically significant (APC: −32.25; p>0.05). A slightly decreasing mortality trend was also observed in women aged 65–69 years (APC: −0.29; p<0.05). The mortality trend was stable among women aged 65–79 years (p>0.05). In 1999–2015, the mortality trend increased in the 50–54 years age group and increased during 1999–2018 in the 55–59, 60–64, 80–84, and

≥85 age groups. The ≥85 age group experienced the highest increase, and only this age group had statistically significant differences (APC: 2.64; p<0.05; Table 2B).

Vaginal Cancer

Between 1999 and 2018, VAC was diagnosed in 1953 women, following a nonsignificant, decreasing incidence trend (AAPC: −0.6; CI: −1.6 to 0.5; p>0.05). During that time, 1247 women died of VAC, revealing a statistically significant, decreasing mortality trend (AAPC: −3.5; CI: −5.0 to −2.0; p<0.05; Figure 1B, Table 1C).

The analysis of the incidence of VAC by 5-year age groups showed decreasing incidence trends in women ages 50–54, 65–69 (1999–2014), 75–79, and 80–84 years; statistically significant decreasing incidence trends were detected in the 50–54, 65–69, and 80–84 years age groups (APC: −3.91, −3.18, and −2.70, respectively; p<0.05). Among women ages 55–59, 60–64, 65–69 (2014–2018), 70–74, and ≥85 years, increasing incidence trends were observed (Table 2B).

In all groups, age-specific findings for mortality showed declining trends except the ≥85 years age group. These declines were significant in the 50–54, 70–74, and 80–84 age groups (APC: −4.85, −4.14, and −3.41, respectively; p<0.05 for all). Among women in the ≥85 years age group, the mortality trend was stable (p>0.05; Table 2B).

Discussion

BC consistently remains the most common malignancy of female genital organs in Poland, with an increasing incidence in nearly all age groups. Similar results have been reported about the incidence of CUC, although this trend has slowed in women aged 55–74 years.

According to the Main Statistical Office, the overall fertility rate in Poland has decreased from 2.2 in 1970 to 1.419 in 2019, whereas the mean age at first birth increased from age 22.8 years to 28.3 years in the same timeframe.[20] Furthermore, the average age at menarche has decreased among cohorts of Polish women born between 1959–1970 and 1991–2001.[21] Increasing age at first full-term pregnancy is a risk factor for BC, whereas a decreased birth rate, an earlier age at menarche, a history of late menopause, and use of menopausal hormonal therapy (depending on type of therapy) are risk factors for CUC, OC, and BC development.[4,21–23] Furthermore, postponing pregnancy to an older reproductive age, which has become more common, may result in an increasing number of women diagnosed with the above-mentioned malignancies during pregnancy, as standard prenatal care allows for a concomitant incidental diagnosis of gynecological cancer or BC.[24] All these factors combined may explain to some extent the incidence trends reported in our study. Changes in lifestyle, resulting in a higher prevalence of obesity, may also account for increasing trends in the incidence and mortality of CUC, BC, and OC.[4,22,23,25]

Nationwide, a BC screening program was launched in 2006. According to assembled data, no significant changes have been observed since its launch. Nevertheless, the reported coverage of approximately 40% is low, which may also explain the persistently increasing mortality rates in older age groups, when diagnosis occurs at more advanced cancer stages.[26] Declining mortality rates of BC, CUC, and OC have been observed generally among women younger than age 50 years. These observations may be related to regular gynecological care as a result of pregnancy or contraceptive use as well as to increasing awareness. Furthermore, new therapeutic options for BC, such as adjuvant radiotherapy, post-surgical hormonal treatment, and immunotherapy, have led to improvements in disease management. Nonetheless, some pharmaceutical agents have just been registered in Poland, so the definite effect of these novel options on trends in BC mortality remains to be determined. Recently HER2-targeted therapies have become accessible as part of the oncology drug program. Similarly, since 2021, olaparib has been refunded as first-line maintenance therapy in certain groups of women with the *BRCA1*/2 mutation and OC.[27] Oral contraceptive use, which is a proven protective factor against epithelial OC—a type that comprises approximately 90% of all OC (the other 10% is represented by nonepithelial OC and amounts to a minor contributor to overall incidence and mortality)—likely has played a role in the incremental changes in OC incidence that, since the 1990s, has shown decreasing trends among women younger than age 60 years.[23,28] This use also has resulted in either a slowing of the increase or stabilization of trends among older women. Similar changes in incidence trends have been reported in the United States.[29] Generally, trends in OC incidence and mortality are comparable to those previously reported; however, a distinctively more decreasing trend in OC mortality has been recently observed in women aged 45–54 years. Similarly, the continuation of formerly reported tendencies

Table 1 Incidence and Mortality of Breast, Corpus Uteri (A), Ovarian, Cervical (B), and Vulvar and Vaginal (C) Cancers in Poland, 1980–2018

A. Breast, Corpus Uteri												
Years	**Breast Cancer**						**Corpus Uteri Cancer**					
	Incidence			**Mortality**			**Incidence**			**Mortality**		
	n	**CR**	**ASR**	**n**	**CR**	**ASR**	**n**	**CR**	**ASR**	**n**	**CR**	**ASR**
1980	5154	28.3	23.0	3446	18.9	14.8	1524	8.4	6.7	702	3.9	2.8
1981	–	–	–	–	–	–	–	–	–	–	–	–
1982	5120	27.6	22.3	3641	19.6	15.0	1547	8.3	6.6	716	3.9	2.8
1983	5386	28.7	23.1	3664	19.5	14.8	1796	9.6	7.5	726	3.9	2.8
1984	–	–	–	–	–	–	–	–	–	–	–	–
1985	6147	32.3	26.1	3795	19.9	15.1	2029	10.6	8.4	714	3.7	2.6
1986	–	–	–	–	–	–	–	–	–	–	–	–
1987	–	–	–	–	–	–	–	–	–	–	–	–
1988	6513	33.6	26.8	4045	20.9	15.5	2200	11.3	8.8	758	2.9	2.7
1989	6706	34.5	27.5	4097	21.1	15.5	2166	11.1	8.5	702	3.6	2.5
1990	6649	34.0	26.8	4323	22.1	16.1	2301	11.8	9.0	763	3.9	2.6
1991	7343	37.4	29.2	4198	21.4	15.5	2626	13.4	10.1	776	4.0	2.7
1992	7671	29.0	30.0	4429	22.5	16.2	2611	13.3	10.1	781	4.0	2.6
1993	8416	42.6	32.3	4381	22.2	15.7	2858	14.5	10.9	724	3.7	2.4
1994	8458	42.8	32.3	4449	22.5	15.9	3001	15.2	11.3	762	3.9	2.5
1995	9173	46.3	35.3	4665	23.6	16.3	2980	15.0	11.3	763	3.9	2.5
1996	9681	48.8	35.9	4738	23.9	16.1	3043	15.3	11.1	845	4.2	2.7
1997	–	–	–	–	–	–	–	–	–	–	–	–
1998	–	–	–	–	–	–	–	–	–	–	–	–
1999	10,903	54.9	38.8	4553	22.9	14.8	3260	16.4	11.4	761	3.8	2.3
2000	11,853	59.7	41.8	4712	23.7	15.0	3496	17.6	12.0	808	4.1	2.4
2001	12,118	61.0	42.4	4825	24.3	15.0	3675	18.5	12.4	776	3.9	2.2
2002	12,132	61.5	42.0	4825	24.5	15.0	3796	19.3	12.6	757	3.8	2.2
2003	11,733	59.6	40.2	4942	25.1	15.0	3953	20.1	13.0	783	4.0	2.2
2004	12,049	61.2	40.7	4887	24.8	14.5	4193	21.3	13.4	794	4.0	2.2
2005	13,385	67.9	44.5	5112	26.0	14.9	4196	21.3	13.3	770	3.9	2.0
2006	13,322	67.6	44.2	5212	26.5	14.8	4376	22.2	13.7	814	4.1	2.2
2007	14,484	73.5	47.7	5255	26.7	14.6	4640	23.6	14.3	848	4.3	2.2
2008	14,576	74.0	47.2	5362	27.2	14.7	4820	24.5	14.4	952	4.8	2.4

(*Continued*)

Table 1 (Continued).

A. Breast, Corpus Uteri												
Years	**Breast Cancer**						**Corpus Uteri Cancer**					
	Incidence			**Mortality**			**Incidence**			**Mortality**		
	n	**CR**	**ASR**	**n**	**CR**	**ASR**	**n**	**CR**	**ASR**	**n**	**CR**	**ASR**
2009	15,752	79.8	50.4	5241	26.6	14.1	5061	25.7	15.0	969	4.9	2.4
2010	15,784	79.4	49.6	5226	26.3	13.7	5125	25.8	14.8	1042	5.2	2.5
2011	16,534	83.2	51.8	5437	27.4	14.2	5251	26.4	14.9	1085	5.5	2.5
2012	17,000	85.7	51.9	5574	28.1	14.1	5426	27.4	15.1	1162	5.9	2.7
2013	17,142	86.3	51.8	5816	29.3	14.5	5706	28.7	15.6	1243	6.3	2.8
2014	17,379	87.5	51.6	5975	30.1	14.8	5944	29.9	16.0	1280	6.4	2.7
2015	18,106	91.2	52.9	6319	31.8	14.6	6243	31.5	16.6	1690	8.5	3.3
2016	18,615	93.9	54.1	6493	32.7	14.9	6226	31.6	16.4	1600	8.1	3.2
2017	18,529	93.4	53.0	6670	33.6	15.0	5984	30.2	15.7	1761	8.9	3.4
2018	18,869	95.2	53.3	6895	34.8	14.7	6059	30.6	15.6	1781	9.0	3.2
B. Ovarian, Cervical												
Years	**Ovarian Cancer**						**Cervical Cancer**					
	Incidence			**Mortality**			**Incidence**			**Mortality**		
	n	**CR**	**ASR**	**n**	**CR**	**ASR**	**n**	**CR**	**ASR**	**n**	**CR**	**ASR**
1980	1734	9.5	7.9	1464	8.0	6.5	3539	19.4	16.4	1997	11.0	8.7
1981	–	–	–	–	–	–	–	–	–	–	–	–
1982	1830	9.9	8.3	1397	7.5	6.0	3473	18.7	15.7	1913	10.3	8.1
1983	1856	9.9	8.1	1478	7.9	6.2	3612	19.3	16.0	1946	10.4	8.1
1984	–	–	–	–	–	–	–	–	–	–	–	–
1985	2150	11.3	9.4	1522	8.0	6.3	3843	20.2	16.8	2028	10.6	8.3
1986	–	–	–	–	–	–	–	–	–	–	–	–
1987	–	–	–	–	–	–	–	–	–	–	–	–
1988	2333	12.0	9.7	1731	8.9	6.9	3893	20.1	16.4	2063	10.6	8.1
1989	2370	12.2	9.9	1718	8.8	6.8	3764	19.4	15.6	2020	10.4	8.0
1990	2404	12.3	10.0	1747	8.9	6.8	3658	18.7	15.2	1981	10.1	7.7
1991	2680	13.7	10.9	1787	9.1	6.9	3954	20.2	16.2	2070	10.6	7.9
1992	2765	14.1	11.2	1850	9.2	6.9	3832	19.5	15.5	1997	10.1	7.6
1993	2982	15.1	12.0	1880	9.5	7.2	3903	19.8	15.5	2028	10.3	7.5
1994	2876	14.5	11.3	1794	9.1	6.6	3943	19.9	15.5	2032	10.3	7.5
1995	2993	15.1	11.8	1840	9.3	6.8	3856	19.5	15.1	1992	10.1	7.2

(*Continued*)

Table 1 (Continued).

B. Ovarian, Cervical												
Years	**Ovarian Cancer**						**Cervical Cancer**					
	Incidence			**Mortality**			**Incidence**			**Mortality**		
	n	**CR**	**ASR**	**n**	**CR**	**ASR**	**n**	**CR**	**ASR**	**n**	**CR**	**ASR**
1996	3220	16.2	12.2	1909	9.6	6.7	3990	19.6	15.0	2025	10.2	7.2
1997	–	–	–	–	–	–	–	–	–	–	–	–
1998	–	–	–	–	–	–	–	–	–	–	–	–
1999	3151	15.9	11.4	1959	9.9	6.7	3565	18.0	13.3	1859	9.4	6.4
2000	3157	15.9	11.2	2032	10.2	6.7	3777	19.0	13.8	1987	10.0	6.8
2001	3193	16.1	11.2	2152	10.8	6.9	3604	18.1	13.2	1826	9.2	6.0
2002	3267	16.6	11.3	2171	11.0	6.9	3610	18.3	13.2	1855	9.4	6.2
2003	3371	17.1	11.5	2271	11.5	7.1	3439	17.5	12.4	1825	9.3	6.0
2004	3264	16.6	10.9	2273	11.5	7.0	3345	17.0	11.9	1819	9.2	5.9
2005	3355	17.0	11.1	2357	12.0	7.0	3263	16.6	11.5	1796	9.1	5.7
2006	3291	16.7	10.8	2390	12.1	7.0	3226	16.4	11.3	1824	9.3	5.6
2007	3214	16.3	10.4	2485	12.6	7.2	3431	17.4	11.8	1907	9.7	5.9
2008	3280	16.6	10.6	2507	12.7	7.1	3270	16.6	11.2	1745	8.9	5.3
2009	3474	17.6	11.1	2510	12.7	7.0	3102	15.7	10.5	1748	8.9	5.3
2010	3587	18.1	11.3	2547	12.8	7.0	3078	15.5	10.3	1735	8.7	5.1
2011	3527	17.8	10.9	2558	12.9	6.9	2968	14.9	9.8	1656	8.3	4.8
2012	3544	17.9	10.8	2432	12.3	6.4	2783	14.0	8.9	1669	8.4	4.8
2013	3639	18.3	11.0	2603	13.1	6.8	2909	14.6	9.3	1669	8.4	4.6
2014	3722	18.7	11.1	2678	13.5	6.9	2807	14.1	8.8	1628	8.2	4.5
2015	3735	18.8	11.2	2768	14.0	6.9	2723	13.7	8.5	1585	8.0	4.2
2016	3717	18.7	10.9	2639	13.3	6.4	2622	13.2	8.1	1570	7.9	4.1
2017	3775	19.0	10.9	2670	13.5	6.3	2502	12.6	7.7	1609	8.1	4.2
2018	3734	18.8	10.7	2829	14.3	6.5	2360	11.9	7.1	1593	8.0	4.0
C. Vulvar and Vaginal												
Years	**Vulvar Cancer**						**Vaginal Cancer**					
	Incidence			**Mortality**			**Incidence**			**Mortality**		
	n	**CR**	**ASR**	**n**	**CR**	**ASR**	**N**	**CR**	**ASR**	**n**	**CR**	**ASR**
1999	378	1.90	1.10	212	1.07	0.53	85	0.43	0.25	67	0.34	0.20
2000	406	2.04	1.18	195	0.98	0.49	89	0.45	0.25	66	0.33	0.17
2001	420	2.11	1.15	207	1.04	0.52	102	0.51	0.31	73	0.37	0.20

(*Continued*)

Table 1 (Continued).

C. Vulvar and Vaginal												
Years	**Vulvar Cancer**						**Vaginal Cancer**					
	Incidence			**Mortality**			**Incidence**			**Mortality**		
	n	**CR**	**ASR**	**n**	**CR**	**ASR**	**N**	**CR**	**ASR**	**n**	**CR**	**ASR**
2002	407	2.06	1.13	203	1.03	0.49	84	0.43	0.23	48	0.24	0.13
2003	408	2.07	1.09	213	1.08	0.50	111	0.56	0.32	61	0.31	0.15
2004	382	1.94	0.99	194	0.98	0.44	103	0.52	0.28	80	0.41	0.22
2005	406	2.06	1.05	169	0.86	0.39	95	0.48	0.26	92	0.47	0.22
2006	419	2.14	1.10	186	0.94	0.39	87	0.44	0.22	67	0.34	0.16
2007	439	2.23	1.11	280	1.42	0.62	95	0.48	0.25	81	0.41	0.16
2008	414	2.10	1.00	265	1.34	0.58	84	0.43	0.21	55	0.28	0.13
2009	436	2.21	1.03	232	1.18	0.49	85	0.43	0.24	53	0.27	0.13
2010	491	2.47	1.15	273	1.37	0.56	83	0.42	0.21	45	0.23	0.10
2011	463	2.33	1.06	270	1.36	0.54	101	0.51	0.26	44	0.22	0.09
2012	489	2.46	1.08	273	1.37	0.52	84	0.42	0.21	57	0.29	0.12
2013	490	2.47	1.06	303	1.53	0.55	136	0.68	0.32	63	0.32	0.12
2014	515	2.59	1.13	267	1.34	0.49	107	0.54	0.23	42	0.21	0.09
2015	581	2.93	1.25	315	1.59	0.57	104	0.52	0.23	65	0.33	0.12
2016	498	2.51	1.05	326	1.64	0.55	106	0.53	0.24	64	0.32	0.12
2017	539	2.72	1.09	315	1.59	0.56	106	0.53	0.27	56	0.28	0.10
2018	573	2.89	1.13	3.19	1.61	0.70	106	0.53	0.23	68	0.34	0.12

Notes: Missing data for 1981, 1985–1986, and 1997–1998. No data on vulvar and vaginal cancers before 1999 are available because of the lack of separate codes for them in the International Classification of Diseases, 9th revision.
Abbreviation: ASR – age-standardized ratio; CR – crude ratio.

regarding BC incidence has been observed. Nonetheless, increasing trends have become more pronounced in women ages 30–34, 70–74, and 80–84 years, whereas stable trends have appeared in ages 55–59 and 65–69 years. BC Increasing mortality trends have been observed in women older than age 65 years and in women of all ages since approximately the beginning of the second decade of the 21st century.[30] Nevertheless, BC incidence and mortality trends in Poland are worse compared with those of other countries in the European Union or elsewhere in the world.[31–33] Unfavorable results of comparisons between Poland and other European countries regarding trends in BC mortality have also been presented in a study by Wojtyla et al that covered 1980–2017. The results of BC mortality trend analysis of that study in all ages are in line with findings presented in our study; both studies showed stable trends during the entire study period and an increasing trend starting from approximately 2010. However, Wojtyla et al did not analyze trends in BC mortality by 5-year age groups.[34] According to Carioli et al, reduction in overall BC mortality was the smallest within the European Union; similarly, in a study by Malvezzi, OC mortality in 2002–2012 showed a small reduction.[35,36] In the first decade of the 21st century, a reversal in the CUC mortality trend, from declining or stable to significantly increasing or an acceleration of an increasing trend, was found in all women age ≥50 years. Similar tendencies have been observed in other highly developed countries, and the trends generally correlate with the human development index.[37] In the United

Table 2 Age-Specific Incidence and Mortality of Breast, Corpus Uteri, Ovarian (A), Cervical, Vulvar, and Vaginal (B) Cancers in Poland, 1980–2018

A. Breast, Corpus Uteri, Ovarian						
Age, years	**Breast Cancer Trends**		**Corpus Uteri Cancer Trends**		**Ovarian Cancer Trends**	
	Incidence, APC (95% CI)	**Mortality, APC, (95% CI)**	**Incidence, APC (95% CI)**	**Mortality, APC (95% CI)**	**Incidence, APC (95% CI)**	**Mortality, APC (95% CI)**
0–4	–	–	–	–	–	–
5–9	–	–	–	–	–	–
10–14	–	–	–	–	1980–2018: −2.01* (−3.5 to −0.5)	–
15–19	–	–	–	–	1980–2018: −0.44 (−1.7 to 0.8)	–
20–24	1980–2018: −1.38* (−2.6 to −0.1)	–	–	–	1980–2018: −0.33 (−1.1 to 0.4)	1980–2018: −3.15* (−5.1 to −1.2)
25 − 29	1980−2018: 1.37* (0.8 to 2.0)	1980–2018: −2.43* (−3.8 to −1.0)	–	–	1980–2011: −0.32 (−1.2 to 0.5) 2011–2018: 6.32 (−1.0 to 14.2)	1980–2018: −3.50* (−4.8 to −2.2)
30–34	1980–1996: −0.09 (−1.3 to 1.2) 1996–2018: 2.67* (1.9 to 3.5)	1980–2018: −1.26* (−1.9 to −0.6)	1980–2018: 2.29* (0.7 to 3.8)	–	1980–2018: −0.43 (−0.9 to 0.0)	1980–1988: 6.44 (−7.3 to 22.3) 1988–2018: −3.82* (−4.8 to −2.8)
35–39	1980–2018: 1.70* (1.5 to 1.9)	1980–2010: −2.46* (−3.1 to −1.8) 2010–2018: 1.63 (−2.5 to 5.9)	1980–2018: 1.71* (1.0 to 2.4)	–	1980–2018: −0.26 (−0.7 to 0.1)	1980–2018: −2.72* (−3.2 to −2.3)
40–44	1980–1988: 4.66* (2.2 to 7.2) 1988–2018: 1.34* (1.2 to 1.5)	1980–1990: 1.44 (−1.2 to 4.1) 1990–2018: −2.20* (−2.7 to −1.7)	1980–2018: 1.47* (1.1 to 1.9)	1980–2018: −3.21* (−4.1 to −2.3)	1980–1991: 3.54* (1.9 to 5.2) 1991–2018: −1.31* (−1.7 to −0.9)	1980–1993: 1.44 (−0.6 to 3.5) 1993–2018: −3.01* (−3.7 to −2.3)

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45–49	1980–1996: 4.06* (3.3 to 4.8) 1996–2018: 0.76* (0.3 to 1.2)	1980–1994: 0.57 (−0.4 to 1.6) 1994–2018: −2.16* (−2.6 to −1.7)	1980–2018: 1.35* (1.0 to 1.7)	1980–2018: −3.04* (−3.9 to −2.1)	1980–1993: 3.22* (2.3 to 4.1) 1993–2018: −0.96* (−1.3 to −0.7)	1980–1992: 0.81 (−1.0 to 2.6) 1992–2014: −1.63* (−2.3 to −0.9) 2014–1018: −8.75* (−16.2 to −0.7)
50–54	1980–1990: 1.30 (0.0 to 2.7) 1990–2000: 6.42* (4.7 to 8.1) 2000–2018: 0.63* (0.2 to 1.1)	1980–1995: 0.37 (−0.4 to 1.2) 1995–2018: 1.63* (−2.0 to −1.2)	1980–1993: 3.51* (2.5 to 4.6) 1993–2018: 0.73* (0.4 to 1.1)	1980–2008: −2.70* (−3.5 to −1.9) 2008–2018: 2.44 (−1.0 to 6.0)	1980–1995: 3.16* (2.3 to 4.0) 1995–2018: −1.02* (−1.5 to −0.6)	1980–2006: 0.21 (−0.3 to 0.8) 2006–2018: −2.21* (−3.7 to −0.7)
55–59	1980–1992: 1.58* (0.5 to 2.6) 1992–2002: 6.54* (5.0 to 8.1) 2002–2018: 0.09 (−0.5 to 0.7)	1980–2003: 0.18 (−0.2 to 0.5) 2003–2018: −1.43* (−1.9 to −0.8)	1980–2002: 2.43* (2.0 to 2.9) 2002–2018: 0.46 (−0.1 to 1.0)	1980–2006: −2.18* (−2.7 to −1.7) 2006–2018: 2.80* (1.4 to 4.3)	1980–1994: 3.30* (2.6 to 4.0) 1994–2018: −0.38* (−0.7 to −0.1)	1980–2018: −0.14 (−0.3 to 0.0)
60–64	1980–2004: 3.07* (2.7 to 3.4) 2004–2007: 13.57 (−2.1 to 31.7) 2007–2018: −0.54 (−1.5 to 0.5)	1980–2018: 0.11 (−0.1 to 0.3)	1980–2008: 3.08* (2.8 to 3.3) 2008–2018: −0.61 (−1.6 to 0.3)	1980–2001: −1.09* (−1.8 to −0.4) 2001–2018: 0.85* (0.0 to 1.7)	1980–1996: 2.40* (1.8 to 3.0) 1996–2018: −0.01 (−0.4 to 0.4)	1980–2018: 0.23* (0.0 to 0.4)
65–69	1980–2004: 3.07* (2.7 to 3.4) 2004–2011: 6.63* (4.1 to 9.3) 2011–2018: −0.04 (−1.9 to 1.9)	1980–2004: −0.13 (−0.4 to 0.1) 2004–2018: 0.86* (0.3 to 1.4)	1980–1993: 5.85* (4.5 to 7.2) 1993–2018: 2.38* (1.9 to 2.8)	1980–1996: 0.95 (0.0 to 2.0) 1996–2004: −2.67 (−7.6 to 2.5) 2004–2018: 3.97* (2.9 to 5.1)	1980–1991: 4.08* (2.3 to 5.9) 1991–2018: 0.58* (0.2 to 1.0)	1980–2018: 0.91* (0.7 to 1.2)
70–74	1980–1988: 1.02 (−1.5 to 3.6) 1988–1993: 7.63* (3.4 to 12.1) 1993–2006: 0.91* (0.1 to 1.7) 2006–2018: 3.08* (2.3 to 3.9)	1980–1983: 11.41* (3.8 to 19.5) 1983–2009: −0.07 (−0.4 to 0.3) 2009–2018: 2.30* (1.0 to 3.6)	1980–1994: 6.52* (5.7 to 7.4) 1994–2018: 3.01* (2.6 to 3.4)	1980–2007: −0.15 (−0.6 to 0.3) 2007–2018: 5.47* (3.8 to 7.2)	1980–1993: 4.29* (3.0 to 5.6) 1993–2018: 0.75* (0.3 to 1.2)	1980–2018: 1.56* (1.3 to 1.8)

(*Continued*)

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Table 2 (Continued).

75–79	1980–1995:3.74* (2.6 to 4.9) 1995–2018: 2.44* (1.9 to 3.0)	1980–1994: 2.09* (1.6 to 2.6) 1994–2011: −0.15 (−0.6 to 0.3) 2011–2018: 2.57* (1.2 to 4.0)	1980–2018: 3.99* (3.7 to 4.3)	1980–2007: −0.12 (−0.7 to 0.5) 2007–2018: 6.85* (4.7 to 9.1)	1980–1995: 4.56* (3.6 to 5.6) 1995–2018: 0.77* (0.3 to 1.3)	1980–2003: 2.81* (2.2 to 3.4) 2003–2018: 1.33* (0.4 to 2.3)
80–84	1980–2000: 3.43* (2.5 to 4.3) 2000–2007: −0.57 (−4.7 to 3.8) 2007–2018: 4.28* (2.5 to 6.1)	1980–2014: 1.12* (0.8 to 1.4) 2014–2018: 6.06 (−0.9 to 13.6)	1980–2018: 4.24* (3.8 to 4.6)	1980–2007: 0.12 (−0.6 to 0.8) 2007–2018: 8.40* (5.9 to 10.9)	1980–2002: 3.54* (2.7 to 4.3) 2002–2018: −0.05 (−1.1 to 1.0)	1980–2018: 2.72* (2.4 to 3.0)
85+	1980–1995: 3.10* (1.9 to 4.3) 1995–2018: 0.99* (0.4 to 1.6)	1980–2005: 2.76* (2.3 to 3.3) 2005–2013: −0.47 (−3.3 to 2.5) 2013–2018: 10.75* (5.5 to 16.3)	1980–1995: 4.53* (2.9 to 6.1) 1995–2004: 0.64 (−3.4 to 4.9) 2004–2018: 5.07* (3.5 to 6.7)	1980–2007: 1.02 (0.0 to 2.1) 2007–2018: 11.34* (7.5 to 15.3)	1980–1996: 5.72* (3.9 to 7.6) 1996–2018: −0.28 (−1.4 to 0.8)	1980–2018: 3.30* (2.7 to 3.9)
B Cervical, Vulvar, and Vaginal						
Age, years	**Cervix Cancer Trends**		**Vulvar Cancer Trends**		**Vaginal Cancer Trends**	
	Incidence, APC (95% CI)	**Mortality, APC (95% CI)**	**Incidence, APC (95% CI)**	**Mortality, APC (95% CI)**	**Incidence, APC (95% CI)**	**Mortality, APC, (95% CI)**
0–4	–	–	–	–	–	–
5–9	–	–	–	–	–	–
10–14	–	–	–	–	–	–
15–19	–	–	–	–	–	–
20–24	1980–1999: 0.35 (−4.2 to 5.1) 1999–2003: −29.66 (−60.9 to 26.4) 2003–2018: 4.45 (−0.6 to 9.8)	–	–	–	–	–
25–29	1980–2018: −2.87* (−3.4 to −2.3)	1980–2015: −6.01* (−7.1 to −5.0) 2015–2018: 30.96 (−14.0 to 99.3)	–	–	–	–

30–34	1980–2018: −2.96* (−3.4 to −2.5)	1980–1990: −1.38 (−5.7 to 3.1) 1990–2018: − 6.03* (−6.8 to –5.2)	–	–	–	–
35–39	1980–1991: 1.11 (−0.6 to 2.8) 1991–2018: −4.19* (−4.6 to −3.8)	1980–1994: −0.18 (−1.6 to 1.2) 1994–2016: −6.04* (−6.7 to –5.3) 2016–2018: 14.39 (−12.8 to 50.1)	1999–2018: −5.30* (−9.3 to −1.1)	–	–	–
40–44	1980–1992: 2.96* (2.0 to 3.9) 1992–2007: −3.7* (−4.3 to 3.1) 2007–2018: −5.63* (−6.5 to 4.8)	1980–1996: 1.40* (0.2 to 2.6) 1996–2018: −5.93* (−6.6 to −5.2)	1999–2018: −5.01* (−7.9 to −2.1)	–	–	–
45–49	1980–2000: 0.92* (0.2 to 1.7) 2000–2018: −5.57* (−6.2 to −4.9)	1980–2004: −0.58* (−1.1 to –0.0) 2004–2018: −6.10* (−7.1 to −5.1)	1999–2016: −1.42 (−3.6 to 0.8) 2016–2018: −43.12 (−69.8 to 7.0)	–	–	–
50–54	1980–2008: −0.46* (−0.9 to 0.0) 2008–2018: −6.85* (−8.5 to −5.1)	1980–2009: −0.38 (−0.8 to 0.0) 2009–2018: −6.95* (−9.0 to −4.9)	1999–2018: −1.26 (−2.8 to 0.3)	1999–2015: 2.56 (−0.8 to 6.1) 2015–2018: −32.25 (−56.4 to 5.3)	1999–2018: −3.91* (−7.2 to −0.5)	1999–2018: −4.85* (−9.5 to 0.0)
55–59	1980–1993: −2.61* (−3.5 to −1.7) 1993–2010: 0.06 (−0.6 to 0.7) 2010–2018: −6.65* (−8.3 to −5.0)	1980–2001: −2.48* (−3.1 to −1.8) 2001–2007: 3.96 (−1.1 to 9.2) 2007–2018: −4.16* (−5.6 to −2.7)	1999–2018: 0.35 (−1.6 to 2.3)	1999–2018: 2.37 (−1.0 to 5.8)	1999–2018: 1.38 (−1.9 to 4.8)	1999–2018: −2.89 (−7.8 to 2.3)
60–64	1980–2004: −2.40* (−2.8 to −2.0) 2004–2007: 5.51 (−9.1 to 22.4) 2007–2018: −2.49* (−3.5 to −1.5)	1980–2005: −2.17* (−2.7 to −1.6) 2005–2018: −0.17 (−1.4 to 1.1)	1999–2018: 1.28 (−0.1 to 2.7)	1999–2018: 0.54 (−1.5 to 2.6)	1999–2018: 0.99 (−1.6 to 3.6)	–

(*Continued*)

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Table 2 (Continued).

65–69	1980–1985: 4.72 (−1.6 to 11.4) 1985–2006: −2.99* (−3.6 to −2.4) 2006–2018: 0.04 (−1.1 to 1.2)	1980–1988: 1.60 (−2.2 to 5.6) 1988–2001: −3.93* (−5.1 to −2.7) 2001–2018: −0.52 (−1.2 to 0.2)	1999–2018: 0.30 (−0.8 to 1.4)	1999–2018: −0.29 (−2.5 to 1.9)	1999–2014: −3.18* (−5.9 to −0.4) 2014–2018: 18.29 (−4.4 to 46.4)	–
70–74	1980–1995: −0.20 (−0.9 to 0.5) 1995–2005: −4.86* (−6.3 to −3.4) 2005–2018: −0.53 (−1.3 to 0.2)	1980–1995: −0.75 (−1.7 to 0.3) 1995–2008: −4.08* (−5.5 to −2.7) 2008–2018: 0.92 (−0.7 to 2.6)	1999–2018: 0.73* (0.1 to 1.4)	1999–2018: 0.26 (−1.2 to 1.8)	1999–2018: 1.04 (−1.5 to 3.7)	1999–2018: −4.14* (−7.3 to −0.9)
75–79	1980–1994: 0.29 (−1.0 to 1.6) 1994–2018: −3.02* (−3.6 to −2.5)	1980–1999: −0.21 (−0.9 to 0.5) 1999–2002: −8.60 (−24.0 to 9.9) 2002–2018: −1.85* (−2.5 to −1.2)	1999–2018: 0.73 (−0.1 to 1.5)	1999–2018: 0.50 (−0.8 to 1.8)	1999–2018: −1.59 (−4.3 to 1.2)	1999–2018: −2.73 (−5.5 to 0.1)
80–84	1980–1999: 0.50 (−0.7 to 1.7) 1999–2018: −3.28* (−4.1 to −2.4)	1980–1999: 0.02 (−1.2 to 1.3) 1999–2018: −2.46 (−3.4 to −1.6)	1999–2018: 0.08 (−1.1 to 1.3)	1999–2018: 0.83 (−0.6 to 2.3)	1999–2018: −2.70* (−4.9 to −0.4)	1999–2018: −3.41* (−6.0 to −0.8)
85+	1980–2018: −1.23* (−2.0 to −0.4)	1980–2018: 0.46 (0.0 to 0.9)	1999–2018: 1.71* (0.6 to 2.8)	1999–2018: 2.64* (1.3 to 4.0)	1999–2018: 1.21 (−2.2 to 4.8)	1999–2018: −0.01 (−2.9 to 3.0)

Notes: *Statistically significant. Missing data for 1981, 1985–1986, and 1997–1998. No data on vulvar and vaginal cancers before 1999 are available because of the lack of separate codes for them in the International Classification of Diseases, 9th revision.

Abbreviation: APC - annual percentage change; CI - confidence interval.

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States, increases in both incidence and mortality rates of CUC were noted in 1999–2015, with the differences in incidence mostly resulting from increases in endometrial cancer.[38]

The introduction of screening for CC proved to be a turning point in CC prevention worldwide, leading to striking decreases in the prevalence of CC in those countries in which Pap smears are generally available.[39] Widespread use of secondary prophylaxis of CC in Poland, which includes Pap smear, HPV testing, and colposcopy, together with an implementation of vaccinations against HPV and an improvement in socioeconomic status, are most likely the reason for declining trends in the incidence and mortality of CC that have begun and are now present in all age groups combined as well as in 5-year age groups. In the first decade of the 21st century, stabilization of trends in CC incidence were reported in Norway and in the United States, presumably because the upper limits of the potential of existing screening program aimed at decreasing incidence rates were reached.[40,41] In Poland, structured, nationwide CC screening programs adhering to European guidelines were launched in 2007, and, to some degree, may have accelerated reductions in incidence and mortality observed in the 50–54 years and 55–59 years age groups. The incidence and mortality of VUC and VAC in younger women may have been reduced by CC screening to some extent as well.

Early age at first intercourse and multiple sexual partners are proven risk factors for the development of CC, VUC, and VAC.[42–44] Age at the onset of sexual activity has decreased significantly in the past 50 years in Poland. Population-based studies point to a decrease in the mean age at onset of sexual activity by 1 or even 2.5 years among women born in the 1990s or early 2000s compared with women born during the 1960s and 1970s.[21,45] The average number of sexual partners is also presumed to have increased in recent times. For these reasons, increasing trends in the incidence and mortality of these cancers, especially among younger women, may be expected. Results from our study appear contrary to those assumptions.

Because VAC is rare and thus prone to inconsistencies in incidence among consecutive years, it is hard to detect significant trends. Nevertheless, the generally decreasing trends in the incidence of VAC observed in our study are similar to results from some other countries. In the United States and Japan, a statistically significant average annual decrease in the incidence of VAC has been reported, whereas no such trends have been noted in England and Norway.[40,46–48] Improving socioeconomic status, accessible gynecological care, and advancements in assessment and management may have been responsible for the observed reductions in the incidence and mortality of primary VAC, which was most remarkable in the 50–54 years age group, and for the reduced trends in the incidence of VUC among younger women. However, increasing trends in VUC incidence in older women may reflect previous underdiagnosis in this population. Moreover, because advanced age is more likely to be associated with a diagnosis of late-stage VUC, increasing incidence in older age groups may help explain the trends of increasing mortality found in our study among the oldest and the all-ages groups. Trends in VUC incidence in Poland stand in stark contrast to trends observed in other countries, such as in Germany, England, Norway, and the Netherlands, where increasing trends in incidence have been reported, especially in women younger than age 60 years.[49–52] Increasing incidence rates in younger women have also been observed in Denmark and Australia,[53,54] whereas a decline in the incidence rate in all ages in Italy has been noted; the change in Italian rates is attributed mostly to decreasing incidence among older women.[55] Diminishing popularity of cigarette smoking during 1995–2015 may also have contributed to the reductions in the incidence and mortality of VUC, VAC, and CC among younger women, because being a current smoker is associated with a higher HPV baseline load and is a risk factor for HPV-related squamous cell carcinoma development.[42,56–58]

The 1980–2018 period was associated with significant changes in gynecological cancer and BC incidence and mortality. The observed tendencies raise concerns, especially because the trends are usually worse compared with those in other European countries, as discussed earlier in this section. Furthermore, the recent SARS-CoV-2 pandemic may have a negative impact on mortality tendencies observed in the next few years because of postponed screening and diagnostic processes and treatment delays.[59] Moreover, continually increasing rates of CUC incidence and mortality and trends of increased BC incidence might be expected as a result of observed socioeconomic changes, predicted increases in obesity prevalence, and the exhaustion or lack of viable screening methods.[60] Nevertheless, increasing awareness, growing recognition of screening importance, and the introduction of new accessible therapeutic options may eventually lead to more favorable tendencies in the future. Finally, the possible introduction of a long-awaited national anti-HPV

vaccination program would carry great potential for reducing CC, VUC, and VAC incidence and mortality rates in the future, as shown in Norwegian and Australian analyses.[40,61]

The strength of our study lies in the volume of data available for analysis. The population data were reliably collected, ensuring that the results of this study are valid for the entire Polish population. The age-standardized rates were calculated using the world standard population as a reference, thus allowing use of the results to compare trends in Poland with those in other countries. This study also has some limitations. First, the registry of data did not reveal the causes for changes in documentation. Second, this study does not take into consideration specific histological types, the incidence of which varies depending on the age of the patient. Moreover, the statistical analyses performed in the Joinpoint Regression Program do not include the use of Bayesian methods.

Conclusion

The results of this study showed significant increases in the incidences of OC, CUC, and BC and a decrease in the incidence of CC and VAC. The incidence trends for VUC were stable Mortality trends for BC fluctuated during the study period; since 2010, BC mortality has begun to increase. Throughout the study period, mortality from VUC and CUC increased, whereas mortality from CC decreased. Mortality from OC was stable and not significant. Furthermore, analysis of the data showed a correlation between age groups and rates of incidence and mortality of each cancer, even among very rare malignancies, such as VUC and VAC. The observed trends need additional analysis.

Data Sharing Statement

Data from the Polish National Cancer Registry are publicly available.

Ethics Approval

Not required since publication of data from the Polish National Cancer Registry is permitted generally.

Disclosure

The authors report no conflicts of interest in this work.

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