

## The availability of data on risk factors associated with cervical cancer

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### Abstract

Cervical cancer is a prominent public health problem in Europe. In 2012 it caused an estimated 12,977 deaths in the European Union (EU). Incidence and mortality from cervical cancer vary across Europe, with Romania having the highest estimated incidence and mortality rate in the EU in 2012. The significant health threat caused by this disease highlights the need for a comprehensive cervical cancer prevention programme to be fully developed and implemented throughout the EU. Collecting and analysing data on risk factors associated with cervical cancer is a crucial first step to developing a prevention programme. The following risk factors for cervical cancer are discussed in the literature: Human papillomavirus (HPV) infection; smoking; having human immunodeficiency virus (HIV) or another condition that makes it difficult to fight infection; using birth control pills for a long time (five or more years); giving birth to three or more children and having several sexual partners. The goal of this paper is to assess the availability of data in the form of indicators, on risk factors associated with cervical cancer. The first research question addressed is: “What indicators are available in international health databases?” Using Romania as an example, the second research question is: “Do the identified indicators provide data on Romania?” The European Health for All Database (HFA-DB), The Organisation for Economic Co-operation and Development (OECD) and Eurostat are three core international health databases that were used to address the research questions. The results showed indicators were available on smoking, having HIV and giving birth to three or more children. However, not every indicator that was available provided data on Romania. No indicators were available on HPV infection, contraceptive use or having several sexual partners. These results indicate a lack of available indicators related to risk factors associated with cervical cancer in HFA-DB, OECD and Eurostat. In addition, the identified gaps in the availability of data, with regards to Romania, could be detrimental to the development of a comprehensive national cancer prevention programme.

**Keywords:** cervical cancer, data availability, health for all database, Romania.

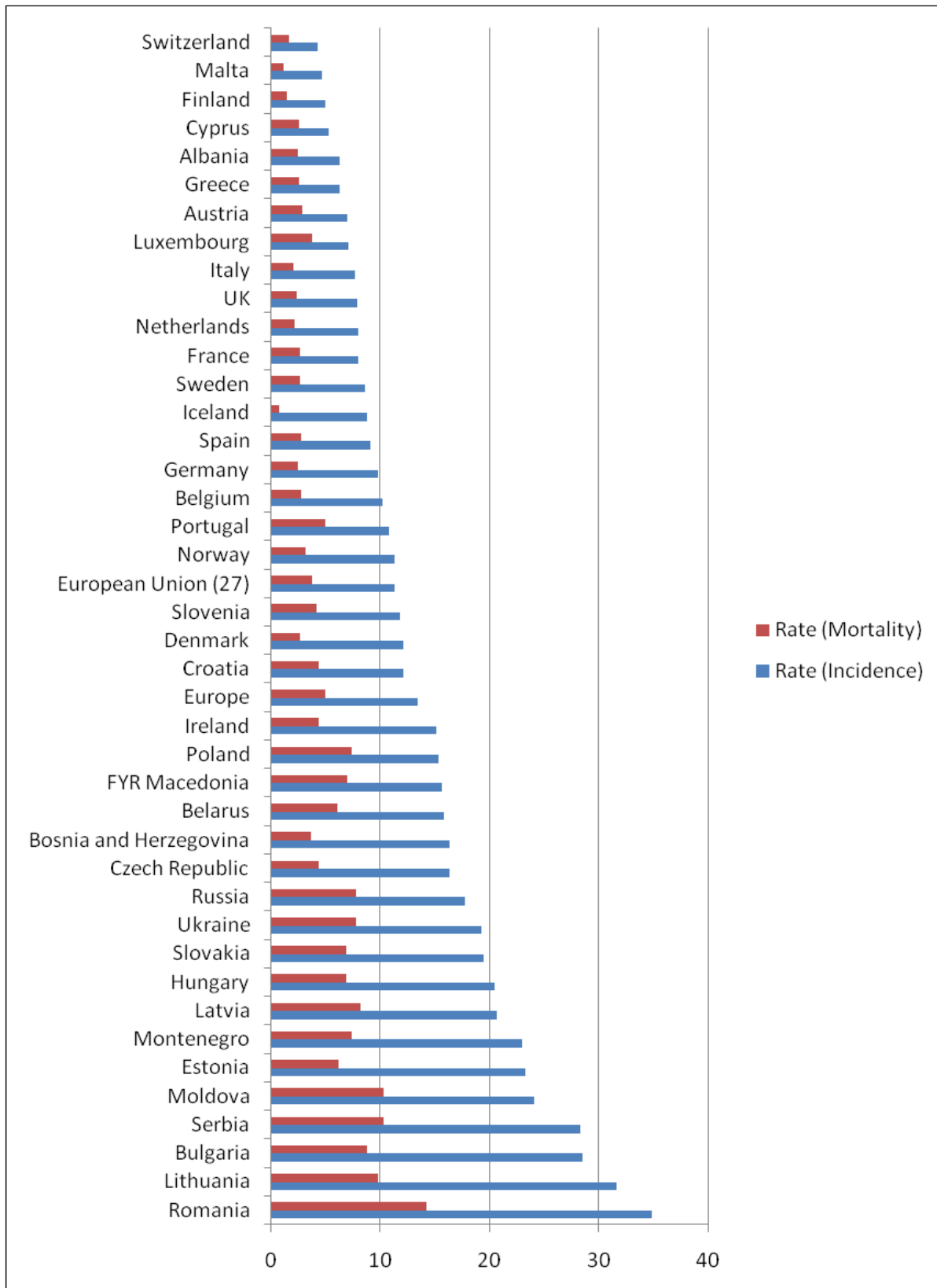
## Introduction

Cervical cancer is the second most common cancer affecting women globally (1). It is a prominent public health problem in Europe, causing an estimated 12,977 deaths in member states of the European Union (EU) in 2012 (2). The incidence and mortality rate among countries in the EU and the World Health Organisation (WHO) European Region differ markedly (3). There are higher rates of incidence and mortality in Central and Eastern Europe compared to countries in Western Europe (3). As illustrated in Figure one, the average estimated incidence rate of cervical cancer in the EU in 2012 was 11.3 per 100,000 (4). Switzerland had the lowest estimated incidence rate of 4.2 per 100,000 in Europe in 2012 (2). Romania, conversely, had the highest estimated incidence rate of 34.9 per 100,000 (4). The estimated mortality rate in Romania of 14.2 per 100,000 in 2012 was significantly higher than the EU estimated average of 3.7 per 100,000 (4). The incidence of cervical cancer in Romania is rising, in contrast to a general trend of reducing incidence in Europe (5). Nessa Childers, Vice President of the Members of European Parliament against Cancer (MAC), explains that the disparity in Europe is “a result of a lack of properly organised prevention programmes and allocation of financial resources” (5). Risk factors associated with cervical cancer are

clearly outlined by the Centers for Disease Control and Prevention (CDC). These include: human papillomavirus (HPV) infection; smoking; having human immunodeficiency virus (HIV) or another condition that makes it difficult to fight infection; using birth control pills for a long time (five or more years); giving birth to three or more children and having several sexual partners (6).

It has been established through research that HPV infection is the main risk factor for developing cervical cancer (7). More than 100 types of HPV exist (7). Type 16 and 18 cause approximately 70% of all cases of invasive cervical cancer worldwide (8,9). The risk of developing cervical cancer could be further increased by additional risk factors. Tobacco smoking has been linked with an increased risk of developing cervical carcinoma in situ and squamous cell carcinoma of the cervix (10,11). There is inconsistency in the literature regarding the exact number of years of oral contraceptive use and the number of births that would place a woman at an increased risk of developing cervical cancer (9,10). Infection with Chlamydia Trichomatis or Herpes Simplex-2 have also been suggested to increase the risk of developing cervical cancer (10,12). Conversely, consuming foods rich in vitamin C and beta carotene have been suggested to reduce the risk (7).

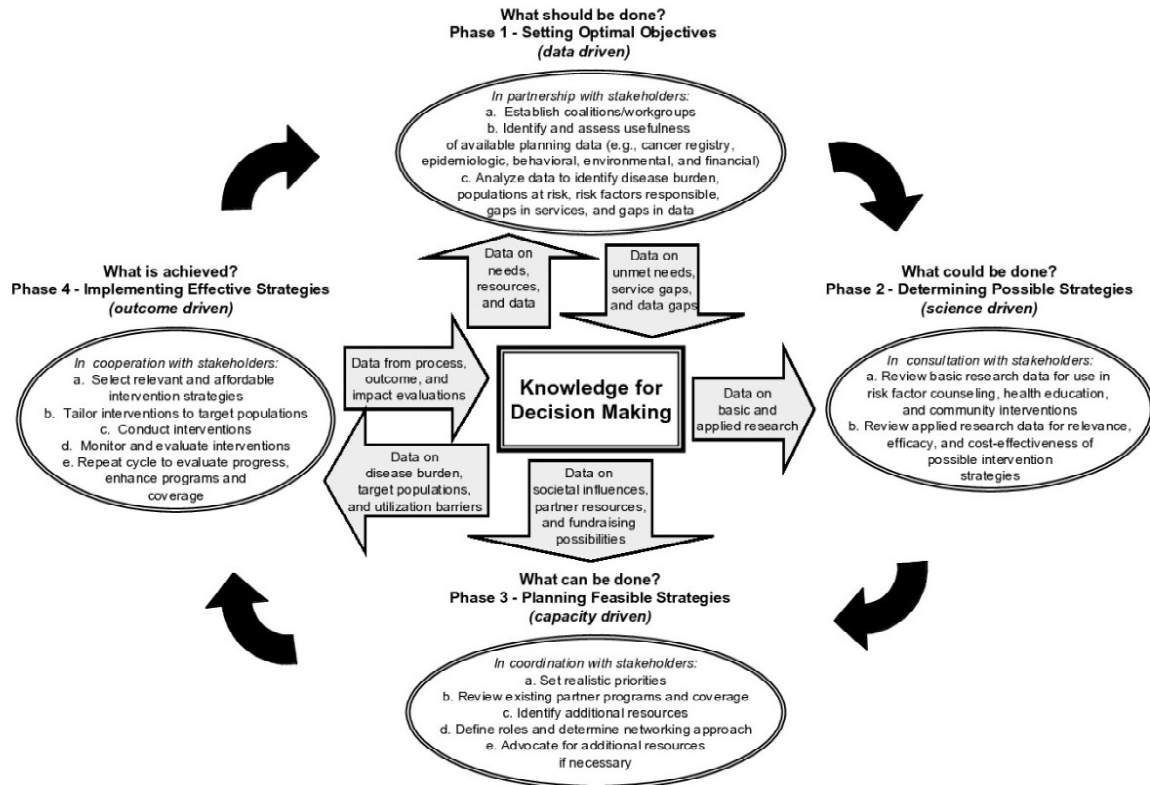
**Figure 1. Estimated Incidence and Mortality Rates from Cervical Cancer in Europe, 2012.**  
**Source: European Cancer Observatory (2)**



One of the key strategies to reducing the incidence and mortality from cervical cancer is establishing an effective prevention programme (5). Figure two outlines a framework for developing a compre-

hensive cancer prevention programme (13). Analysing data on risk factors responsible for developing cancer is a crucial element of the first phase.

**Figure 2. Framework for Comprehensive Cancer Prevention and Control Programme.**  
Source: Abed et al. (13)



Primary prevention of cervical cancer focuses on preventing initial infection with HPV. Currently, the WHO recommends primary prevention of cervical cancer to involve vaccinating girls who have not yet become sexually active (14). The current guidelines advise vaccinating girls between nine and thirteen years old (1,14). Looking specifically at Romania, the HPV vaccination programme was initially introduced in 2008 (15). However, this programme suffered poor uptake and nationwide coverage despite providing vaccination free of charge to the target population (females aged nine to twelve years old) (15). The vaccination programme was re-launched in February 2010, provoking a mainly negative reaction from the general public and consequent low coverage of the

target population (15). The programme was discontinued in 2011, but was launched for the third time in April 2013 (15).

Secondary prevention of cervical cancer involves cytological evaluation of the Papanicolaou smear (Pap smear) (1,14). This allows detection of cytological abnormalities at the earliest possible point (1,14). Currently, the WHO recommends that secondary prevention commences in women over the age of thirty (1).

Representatives of the European Commission state that well-organised prevention programmes, that involve comprehensive treatment and follow-up of patients with abnormal cervical cytology, have proven to reduce the incidence of cervical cancer by at least eighty percent (5). A key element of

well-organised prevention programmes that achieve high coverage is their ability to reach women who are at risk of cervical cancer. Opportunistic screening, on the other hand, is less successful at reaching this at risk group (5). According to expert opinion, the majority of cervical cancer screening in Romania is opportunistic (5).

The European Institute of Women's Health (EIWH) calls for the development of a comprehensive European framework for cervical cancer prevention and for immediate action to be taken to develop and implement effective prevention programmes throughout the whole of the EU (5). The goal of this paper is to assess the availability of data in the form of indicators, on risk factors associated with cervical cancer because gathering knowledge is a crucial first step in the development of a prevention programme. The first research question addressed is: "What indicators are available in international health databases?" The second research question is: "Do the identified indicators provide data on Romania?" The example of Romania is discussed in this paper as the availability of data on risk factors would be particularly important for developing prevention strategies in Romania as it has the highest estimated incidence and death rate from cervical cancer in Europe (2).

## Methods

The CDC outlines six distinct risk factors associated with cervical cancer, as highlighted in the introduction. The availability of indicators reflecting these risk factors was assessed on three core international health databases: European Health for All Database (HFA-DB), Organisation for Economic Co-operation and Development (OECD) and Eurostat.

These three international health databases were selected as they provide data for countries in the EU and WHO European Region. HFA-DB is part of the WHO (16). Eurostat is the main statistical office of the EU and part of the European Commission (16,17). The OECD receives input from the European Commission. It provides statistics on

health and healthcare systems for the 34 member countries (18).

The online version of the HFA-DB was accessed on 18<sup>th</sup> September 2013. Individual indicators, definitions and the source of each individual indicator were accessed on the online version of the database. In order to identify the most recent data on Romania, a retrospective search was performed. The search started in 2012 and concluded in 1997. The search was not extended beyond 1997 because indicators did not provide any data on Romania prior to this date.

The OECD database was accessed on 22<sup>nd</sup> September 2013. Individual indicators were identified under the health theme. The definition of each indicator and data source was outlined on this online database.

Eurostat was accessed on 25<sup>th</sup> September 2013. All available indicators were identified under the population and social conditions theme. The definition of each indicator and data source was outlined in the reference metadata section.

## Results

Table two outlines the available indicators identified in each of the three international health databases. Table two also displays the definition of each indicator; the availability of data on Romania and the source of this data. When an indicator provides data on Romania, the most recent year of data available is also recorded.

A search of the three international health databases showed there were no available indicators for the three following risk factors: HPV infection; using an oral contraceptive for five years or more and having several sexual partners. Data could not be obtained for Romania because these indicators were not available.

Smoking was the risk factor with the most abundant number of indicators. Seven indicators were identified across the three internal health databases. Two indicators were identified in HFA-DB, three in OECD and two in Eurostat. Out of a total of seven indicators, only four indicators provided data specifically on the female population. These were: percentage of regular smokers, aged

15 years or older and female (provided by HFA-DB); percentage of females aged 15 years or older who are daily smokers (provided by OECD); daily cigarette smokers who are female (provided by Eurostat) and female smokers by number of cigarettes (provided by Eurostat). Data on Romania was available in three of these four indicators, as illustrated in table two. The most recent data available for women who smoke in Romania was in 2012. This was provided by the indicator: percentage of regular smokers, aged 15 years or older who are female (provided by HFA-DB). The source of data was different for the above mentioned indicators. The global adult tobacco survey provided data for the indicator in HFA-DB, whilst the European health survey provided data for the two indicators in Eurostat.

No data was provided on Romania in any of the smoking indicators within OECD.

Only one indicator was identified in relation to incidence of HIV. This was only available in one out of the three databases. No indicators on HIV prevalence were identified in the international health databases. Data on HIV incidence in Romania was available for 2011 in HFA-DB. Data for Romania came from two possible sources, as detailed in table two.

Total fertility rate was used to represent the risk factor of having given birth to three or more children. This indicator was available in HFA-DB and Eurostat. Both databases provided data for Romania. The definition of this indicator differed slightly between the databases and it is unclear if the data sources were the same for each indicator. Eurostat provided the most up to date data on total fertility rate in Romania.

**Table 1. Key for Results**

Abbreviation	Description
Risk Factor A	HPV Infection
Risk Factor B	Smoking
Risk Factor C	Having HIV
Risk Factor D	Using oral contraceptive for 5 years or more
Risk Factor E	Having given birth to three or more children
Risk Factor F	Having several sexual partners
n/a	not available
*	indicator not adjusted for sex

**Table 2. Indicators for Risk Factor Associated with Cervical Cancer: The example of Romania [Source: HFA-DB, OECD and Eurostat (17,19,20)]**

Risk Factor	Database where a relevant indicator is available	Indicator	Definition of indicator provided by database	Data available for Romania	Source of indicator for Romania	Most recent year of data available
A	n/a	n/a	n/a	n/a	n/a	n/a
B	HFA-DB	Percentage of regular smokers, age 15+, female	No clear definition provided	Yes	Global adult tobacco Survey-Romania 2011	2012
	HFA-DB	Number of cigarettes consumed per person per year*	Total number of cigarettes sold/ consumed in the country. Calculated from official national statistics on production, import and export of cigarettes.	Yes	Tobacco Journal International	1997

Risk Factor	Database where a relevant indicator is available	Indicator	Definition of indicator provided by database	Data available for Romania	Source of indicator for Romania	Most recent year of data available
C	HFA-DB	HIV incidence per 100 000*	Number of new persons to whom HIV seropositive test was found during the calendar year.	Yes	Strategic Health Authority (SHA) unit at WHO/EURO or from the European Centre for AIDS monitoring in Paris.	2011
D	n/a	n/a	n/a	n/a	n/a	n/a
E	HFA-DB	Total Fertility Rate	The average number of children that would be born per woman if all women lived to the end of their childbearing years and bore children according to a given set of age-specific fertility rates	Yes	Data usually provided by Central Statistics Office. Additional sources are the report of the World Bank, United Nations Development Programme and country statistical yearbooks.	2010
	Eurostat	Total Fertility Rate	The mean number of children that would be born alive to a woman during her lifetime if she were to pass through her childbearing years conforming to the fertility rates by age of a given year	Yes	National Statistics Institutes	2011
F	n/a	n/a	n/a	n/a	n/a	n/a
	OECD	Grams per capita (15+)*	Annual consumption of tobacco items (e.g. cigarettes, cigars) in grams per person aged 15 years old or more.	No data available from 1960	n/a	n/a
	OECD	Cigarettes per smoker per day*	The average number of cigarettes per smoker per day.	No data available from 1960	n/a	n/a
	OECD	Percentage of females aged 15+ who are daily smokers	Daily smokers is defined as the percentage of the population aged 15 years old or over who report that they are daily smokers.	No data available from 1960	n/a	n/a
	Eurostat	Daily cigarette smokers, female	Proportion of female people reporting to smoke cigarettes daily	Yes	European Health Interview Survey	2008
	Eurostat	Smokers by number of cigarettes, female	Proportion of female persons who smoke less / more than 20 cigarettes per day	Yes	European Health Interview Survey	2008

## Discussion

The results from a search of three international health databases showed there were indicators available for three out of the six risk factors associated with cervical cancer: smoking, HIV, and giving birth to three or more children. One can conclude from these findings that indicators reflecting the risk factors associated with cervical cancer are not readily available on these international health databases. In addition, data on Romania was not provided by all the available indicators, highlighting a gap in data availability.

Infection with HPV is pivotal to the development of cervical cancer. One of the main findings in this paper was the lack of availability of indicators on HPV infection. Ideally, data on the incidence, prevalence and type of HPV infection within female populations would be available and provided on international databases. This is highlighted as an important area for further research due to its key role in cervical cancer development. One suggestion for addressing this lack of data would be to regard HPV vaccination as a protective factor for developing cervical cancer. As a result, not having the HPV vaccine could be considered a risk factor for developing cervical cancer. Consequently, data on HPV vaccination uptake and coverage could be indicators utilised in international health databases. However, it is important to highlight that HPV vaccines do not provide protection from all types of HPV and there is still a great deal of controversy regarding the vaccine, undoubtedly affecting its rate of uptake (21).

There were notable limitations to this study. One of the limitations was that three of the indicators for smoking were not adjusted for sex. As a result, these indicators could not be used reliably for analysing cervical cancer risk factors as the data would not solely represent the female population. Another potential limitation was the discrepancy

amongst the databases in the source of data for the indicators. Taking one individual indicator into consideration, this is unlikely to pose a significant problem. However, with multiple indicators for a single risk factor (as seen with smoking), the different sources of data are likely to produce differing results, potentially limiting the accurate identification of risk factors.

Another challenge encountered in this study was the lack of indicators outlining the years of contraceptive use and number of sexual partners. Both these quantifiable variables could theoretically be collected. However, the lack of data on international databases suggests that this data is not available at a national or local level. Collecting data on the number of sexual partners could be a particular challenge due to the sensitive nature of this topic. However, this is an area that has been highlighted for further research as it could aid identification of the population at risk of cervical cancer.

In order to deliver a well-suited prevention programme or to implement policy change, it is essential that data on risk factors are as current as possible. The most recent available data for Romania ranged from 2012 back to 1997. This inconsistency may result from different sources and methods used for data collection. It is clear that the lack of current data on these international databases could be a hindrance to the initial phase of developing an effective prevention programme.

This paper has identified the lack of available indicators reflecting the risk factors associated with cervical cancer in HFA-DB, OECD and Eurostat. In addition, the identified gaps in the availability of data, with regards to Romania, could be detrimental to the development of a comprehensive national cancer prevention programme. Future research on international, national or regional levels is required to fully assess the risk factors associated with cervical cancer and henceforth suitably inform policy formation.

**Conflicts of interest:** None declared.



## References

- World Health Organisation. WHO Guidance Note: Comprehensive Cervical Cancer Prevention and Control: A Healthier Future for Girls and Women 2013. [http://apps.who.int/iris/bitstream/10665/78128/3/9789241505147\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/78128/3/9789241505147_eng.pdf). Accessed May 11, 2014.
- European Cancer Observatory. EUCAN, Cervical Cancer. <http://eco.iarc.fr/EUCAN/Cancer.aspx?Cancer-One.=25&Gender=2#block-table-f>. Accessed May 11, 2014.
- Kesic V, Poljak M, Rogovskaya S. Cervical Cancer Burden and Prevention Activities in Europe. *Cancer Epidemiol Biomarkers Prev* 2012;2:1423-33.
- Ferlay J, Steliarova-Foucher E, Lortet-Tieulent J, Rosso S, Coebergh JWW, Comber H, et al. Cancer incidence and mortality patterns in Europe: Estimates for 40 countries in 2012. *Eur J Cancer* 2013;49:1374-403.
- European Institute of Women's Health. Promoting a Cervical Cancer Prevention Strategy for Europe 2012. [http://ec.europa.eu/health-eu/doc/cervical\\_eiwh.pdf](http://ec.europa.eu/health-eu/doc/cervical_eiwh.pdf). Accessed May 11, 2014.
- Centers for Disease Control and Prevention. Cervical Cancer Risk Factors. [http://www.cdc.gov/cancer/cervical/info/basic\\_risk\\_factors.htm](http://www.cdc.gov/cancer/cervical/info/basic_risk_factors.htm). Accessed May 11, 2014.
- Franco EL, Duarte-Franco E, Ferenczy A. Cervical Cancer: epidemiology, prevention and the role of human papillomavirus infection. *Can Med Assoc J* 2001;164:1017-25.
- IARC Working Group on the Evaluation of Carcinogenic Risks to Humans. Volume 90 Human papillomaviruses. France, International Agency for Research on Cancer; 2007. <http://monographs.iarc.fr/ENG/Monographs/vol90/mono90.pdf>. Accessed May 11, 2014.
- World Health Organisation. Human Papillomavirus Vaccines WHO Position Paper 2009. <http://www.who.int/wer/2009/wer8415.pdf>. Accessed May 11, 2014.
- Smoking and Oral Contraceptive as Risk Factors for Cervical Carcinoma in Situ. *Int J Cancer* 1999;81:357-65.
- De Gonzalez AB, Sweetland S, Green J. Comparison of risk factors for squamous cell and adenocarcinomas of the cervix: a meta-analysis. *Br J Cancer* 2004;90:1787-91.
- Chlamydia Trachomatis and Invasive Cervical Cancer: A Pooled Analysis of the IARC Multicentric Case-Control Study. *Int J Cancer* 2004; 111:431-9.
- Abed J, Reilley B, Butler MO, Kean T, Wong F, Hohman K. Developing a Framework for Comprehensive Cancer Prevention and Control in the United States: An Initiative of the Centers for Disease Control and Prevention. *J Public Health Manag Pract* 2000;6:67-78.
- Maver PJ, Seme K, Korac T, Dimitrov G, Dobrossy L, Engele L, et al. Cervical cancer screening practices in central and eastern Europe in 2012. *Acta Dermatovenerol Alp Panonica Adriat* 2013;22:7-19.
- Seme K, Maver PJ, Korac T, Canton A, Castkova J, Dimitrov G, et al. Current status of human papillomavirus vaccination implementation in central and eastern Europe. *Acta Dermatovenerol Alp Panonica Adriat* 2013;22:21-5.
- World Health Organisation, Regional Office for Europe. European Health For All Database (HFA-DB). <http://www.euro.who.int/en/what-we-do/data-and-evidence/data-bases/european-health-for-all-database-hfa-db2>. Accessed May 11, 2014.
- European Commission. Eurostat. [http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search\\_database](http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database). Accessed May 11, 2014.
- Organisation for Economic Co-operation and Development. Members and Partners. <http://www.oecd.org/about/membersandpartners>. Accessed May 11, 2014.
- World Health Organisation Regional Office for Europe. European Health For All Database (HFA-DB). Available from: <http://data.euro.who.int/hfad/>. Accessed May 11, 2014.
- Organisation for Economic Co-operation and Development. OECD. StatExtracts. <http://stats.oecd.org/Index.aspx>. Accessed May 11, 2014.
- Intlekofer KA, Cunningham MJ, Caplan AL. The HPV Vaccine Controversy. *Virtual Mentor* 2012; 14:39-49.