



Original article

Socioeconomic Predictors of Human Papillomavirus Vaccination Among Girls in the Danish Childhood Immunization Program



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ABSTRACT

Purpose: In 2009, human papillomavirus (HPV) vaccination was introduced in the Danish national childhood immunization program targeting all 12-year-old girls. Previous findings suggest that 10%–13% of girls born in 1996–1997 have not initiated vaccination despite free access. This study aims to identify socioeconomic predictors of initiation and completion of HPV vaccination.

Methods: Girls born in 1996–1997 and their guardians were identified through the Danish Civil Registration System. Information on socioeconomic variables and HPV vaccination status was obtained by linkage to Statistics Denmark and the Danish National Health Insurance Service Register. Through logistic regression, we examined associations between socioeconomic variables and HPV vaccine initiation (N = 65,926) and completion (N = 61,162).

Results: Girls with immigrant ethnicity (odds ratio [OR] = .49; 95% confidence interval [CI], .42–.57) had lower HPV vaccine initiation than Danish girls. Girls of mothers with basic education (OR = .75; 95% CI, .69–.82) or low disposable income (OR = .67; 95% CI, .61–.73) had decreased initiation compared with girls of mothers with higher education/income. Girls of unemployed mothers (OR = .75; 95% CI, .69–.82) or mothers being unmarried (OR = .70; 95% CI, .65–.76) had lower initiation than girls of employed or married mothers. Finally, vaccine initiation varied depending on place of residence. The predictors of HPV vaccine completion were similar to those of initiation.

Conclusions: We found social inequality in the initiation and completion of HPV vaccination despite free access. As socioeconomic risk factors identified for cervical cancer also are associated with decreased HPV vaccination, social inequalities in cervical cancer have the potential to increase.

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IMPLICATIONS AND CONTRIBUTION

Despite an overall successfully implemented, free-of-charge human papillomavirus (HPV) vaccination, the same socioeconomic risk factors identified for cervical cancer are also associated with lower HPV vaccination. Therefore, social inequalities in cervical cancer have the potential to increase. This article provides individual-level socioeconomic predictors of HPV vaccine initiation and completion.

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Disclaimer: The corresponding author (S.K.K.) hereby declares that everyone who contributed significantly to the work is listed on the title page.

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Human papillomavirus (HPV) is one of the most common sexually transmitted infections [1] and the high-risk HPV types are recognized as necessary for developing cervical cancer and its precursor lesions [2]. Worldwide, cervical cancer is the third most frequent female cancer with about 530,000 new cases per year [3]. Two prophylactic HPV vaccines are now available and have been shown to be generally safe and efficacious in preventing new HPV infections with HPV 16 and 18, which together cause approximately 70% of cervical cancers [4,5]. The quadrivalent HPV vaccine also protects against HPV 6 and 11, which cause up to 90% of genital warts. In January 2009, HPV vaccination was introduced as a routine vaccination in the Danish national childhood immunization program. The quadrivalent HPV vaccine (Gardasil; Merck, Kenilworth, NJ) was selected through a tender process [6] and has since then been offered to all girls 12 years of age until they turn 15 years, that is, girls born in 1996 or later. Two catch-up programs have been added, and by December 2013, all girls and women from birth cohorts 1985–2001 (age, 12–28 years) have been offered the three-dose vaccination schedule [7,8].

At the start of HPV vaccination in the childhood immunization program in 2009, the Danish Health and Medicines Authority initiated the mailing of invitation letters and information about HPV vaccination initially to all girls born in 1996. Subsequently, public health strategies to improve vaccination coverage have been conducted, primarily through the Danish Health and Medicines Authority. Furthermore, a national network communication campaign, initiated by the Danish Cancer Society, has been used to disseminate knowledge about prevention of HPV. The free-of-charge HPV vaccination is provided by the general practitioner (GP) in an office setting. Because the GP is responsible for the preventive children's medical checkups and vaccinations, the GP also has a central role in the education of the girl's guardians about HPV vaccination.

Although Denmark has achieved a very high participation rate in the national HPV childhood vaccination program [9], previous findings suggest that still 10%–13% of girls born in 1996 and 1997, the two initial birth cohorts to whom HPV vaccination was offered through the childhood immunization program, have not initiated HPV vaccination [10], despite the opportunity of receiving it free of charge.

A correlation between lower socioeconomic status and incidence of cervical cancer has been found in both developing and developed countries [11]. This is also observed in Denmark where a nationwide cohort study has shown that women with lower socioeconomic status (lower education and disposable income, no affiliation to working market, and being unmarried/divorced) have both an increased incidence and a decreased relative survival after a diagnosis of cervical cancer [12]. Thus, having a health care system with free and equal access [13] does not necessarily secure social equality. HPV vaccination could potentially diminish the social inequality in cervical cancer incidence if distributed equally across the target group. In this context, it is interesting to investigate whether the socioeconomic risk factors for cervical cancer are also determinants for participation in the HPV vaccination program. A Danish study has previously examined demographic predictors of HPV vaccine initiation and found low initiation rates among girls with mothers younger or older than 25–34 years, with more than five siblings, and among girls born in other European Union/European Free Trade Association countries than Denmark [14]. However, the follow-up period was limited to the first year of the vaccination program and socioeconomic factors, and determinants for completion of the three-dose vaccination schedule were not investigated [14].

The aim of our study was to identify socioeconomic and demographic predictors of initiation and completion of HPV vaccination among girls from the two birth cohorts (born in 1996 or 1997), which were the first to be included in the national childhood HPV vaccination program in Denmark, covering the whole period where the girls were eligible for the vaccination program.

Methods

Data sources and study population

Every citizen in Denmark has, since 1968, been registered in the Danish Civil Registration System with an assigned unique 10-digit personal identification number (PIN) [15], which is used universally in society. This ensures correct and high-quality linkages between different registers. On the basis of the Civil Registration System, which contains information on gender, date of birth, and dates for immigration, emigration, and death if relevant, we identified our study population, which comprised all girls from the initial two birth cohorts included in the HPV childhood vaccination program (born 1996 or 1997). It was also possible to identify the guardian of each girl, by the accurate linkage of PINs between guardians and children in the Civil Registration System.

Using the PINs as key identifiers, the two birth cohorts of girls were linked to the Danish National Health Insurance Service Register [16] to obtain the individual HPV vaccination status of each girl. This register contains information on services held by the primary health care professionals. HPV vaccines given within the vaccination program were identified through service numbers for each dose (the first dose of HPV vaccination 8328, second dose 8329, and third dose 8330). Furthermore, by linkage to Statistics Denmark's population-based databases [17], which contain individual socioeconomic information about all residents in Denmark, we obtained information on socioeconomic variables.

Inclusion in the study population for both the analysis of initiation (first vaccination) and that of completion of the three-dose HPV vaccination schedule required that the girls resided in Denmark from the program start (1 January, 2009) until the end of the program (31 December, 2011 and 2012 for birth cohorts 1996 and 1997, respectively). Therefore, girls born in 1996 were included in the program for 3 years and girls born in 1997 had 4 years to receive the HPV vaccination within that program. If girls were vaccinated before the program start, they were excluded. Information on HPV vaccinations, received outside the program was obtained from the National Prescription Registry, which contains information on all pharmacy-purchased HPV vaccines [18]. The study was approved by the Danish Data Protection Agency. According to the Danish law, ethical approval is not relevant in register-based studies.

Statistical analysis

In the present study, indicators of socioeconomic status included place of residence, ethnicity, highest attained education, disposable income, employment status, and marital status, which are all commonly used in the social epidemiology in quantifying inequalities in society. All variables were defined at program start and refer to the mothers of the girls, except for ethnicity and place of residence, which refer to the girls. If information on the socioeconomic status of the mother was not available, the socioeconomic status of the father was used instead.

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