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Development of a network model to implement the HPV vaccination coverage

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Abstract

Background. *The vaccination coverage of a population is the usual indicator of the effectiveness of vaccination strategies. The study aims to evaluate the effectiveness of an organizational and communication network to implement Human Papilloma Virus (HPV) vaccination coverage both in males and females in the Center Tuscany Local Health Authority.*
Study design. *Experimental study.*
Materials and methods. *In January 2022, a retrospective study was conducted on anti-HPV vaccine coverage (full cycle), of those born from 2007 to 2010, in the Empoli Territorial Area of Florence (240 thousand inhabitants) under the Center Tuscany Local Health Authority. In February 2022, a project (meetings with general practitioners and pediatricians, communication through local media, increased opening hours of vaccination clinics and continuous monitoring of vaccination status) started to recover the females and males non-compliant; in the first five months, in addition to guaranteeing the offer to the reference cohort, it aimed to recover the 2007, 2008 and 2009 cohorts, while in the following six months the anti-HPV vaccine offer was expanded for the 2010 cohort.*
Results. *In January 2022, for all cohorts the average total coverages were 49.2% (49.1% for females and 49.5% for males), while in December 2022 they were 63.9% (65.8% for females and 62.3% for males). Coverage increased by 15.6% (+14.2% for females and +16.8% for males) for the 2007 birth cohort, by 22.3% (+20.6% for females and +23.7% for males) for the 2008 cohort and by 20.9% (+31.4% for females and +10.6% for males) for the 2009 cohort.*
Conclusions. *This model in force in the whole Center Tuscany Local Health Authority for a few years and already activated in the previous Local Health Authority of Empoli, now called Empoli Territorial Area, has allowed to implement the Human Papilloma Virus vaccine coverage for both genders.*

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Introduction

The vaccination against Human Papillomavirus (HPV) is a key preventive measure aimed at safeguarding from the most prevalent sexually transmitted infections globally (1, 2). HPV infections can result in a range of severe health issues, such as genital warts and several types of cancers (3). The primary objective of the HPV vaccine is to significantly lower the chances of developing these HPV-related ailments, with a particular emphasis on cervical cancer and various other cancers affecting the genital regions, anus, mouth, and throat (4, 5). By fortifying the immune system against the virus, the vaccine effectively reduces the risk of contracting and transmitting HPV (6). This preventive strategy is not only vital for individual health but also contributes to public health initiatives by curbing the HPV spread and, subsequently, the incidence of associated diseases (7, 8). Widespread HPV vaccination campaigns hold the potential to bring about a substantial reduction in the burden of these infections and the suffering they cause, offering a brighter and healthier future for communities worldwide (9, 10). HPV vaccines are strongly recommended for both males and females (11). The primary target for vaccination is adolescents, typically around 11 to 12 years old, before they initiate sexual activity. This age range ensures the highest effectiveness as the vaccine is most effective when administered prior to exposure to the virus. Catch-up vaccination is also encouraged for young adults, who missed the vaccine during their teenage years (12, 13). By extending the availability of the vaccine to this group, we aim to provide protection against HPV, reduce the risk of infection, and lower the risk of HPV-related diseases, even after the onset of sexual activity (14, 15). The HPV vaccination schedule typically consists of either two or three doses, determined by the recipients' age when they start the vaccination. For those aged 11-14, a two-dose regimen is recommended, spaced at least six months apart. On the other hand, individuals aged 15 and older usually receive a three-dose schedule (16). The second dose is administered one to two months after the first, and the third dose is given six months following the initial dose (17). This carefully planned schedule ensures optimal immune response and long-term protection against HPV, minimizing the risk of infection and the associated health issues, including certain cancers (18). To achieve high HPV vaccination coverage, several strategies can be employed: education and awareness campaigns, routine vaccination programs, school-based vaccination programs, community outreach, healthcare provider training, reducing financial barriers, reminder and recall systems, multimedia campaigns, tracking and monitoring, addressing vaccine hesitancy and support from Government and nongovernmental organization (19, 20). Through the synergistic implementation of these strategies, nations and communities can make significant strides in achieving comprehensive HPV vaccination coverage. This collective effort serves to lessen the prevalence of HPV-related diseases, thereby enhancing public health outcomes and fostering healthier communities on a global scale (21, 22).

The study aims to evaluate the effectiveness of an organizational and communicative network, for the implementation of anti-HPV vaccination coverage developed in the Empoli Territorial Area belonging to the catchment area of Center Tuscany Local Health Authority (CT-LHA).

Material and methods

First phase

In January 2022, a retrospective study was conducted out on anti-HPV vaccination coverage (full cycle) data in the Empoli Territorial Area. It included eleven municipalities in the Province of Florence and four municipalities in the Province of Pisa, with a population of about 242,000 inhabitants (51.2% females). This area belongs to the catchment area of the CT-LHA.

In the study, all boys and girls born in period 2007-2010 were included, for a total of 9,313 young people (4,869 boys). Data was extracted from the Collective Prevention Information System (CPIS) of Tuscany Region, which was integrated with those of health registry platform of the CT-LHA and those of vaccination centers databases of the studied Area.

In addition, in cases where there was no information in the CPIS, the reference family has been contacted by general practitioners (GPs) or by family pediatricians (FPs) to have information on HPV vaccination.

Second phase

In February 2022, a project was initiated by the Area Public Hygiene and Nutrition Functional Unit to catch up with non-compliant adolescents and children. During the first five months (February-June 2022), in addition to ensuring coverage for the reference birth cohort, the project aimed to reach the most delayed birth cohorts (2007-2008-2009). In the subsequent six

months, efforts were focused on expanding the HPV vaccine offering to the 2010 cohort. For each cohort, a group of 'referral' healthcare workers was established to oversee the project. An active call management system was implemented, and the involvement of GPs and FPs with their non-compliant patients was strengthened.

Additionally, the following networking strategies were developed:

- Saturday morning meetings between GPs, FPs, healthcare workers, and the Director of the Functional Unit of Public Hygiene and Nutrition to discuss the progress of the recovery project and to develop strategies to persuade hesitant parents for HPV vaccination, while ensuring maximum accessibility;
- Promoting HPV vaccination through local newspapers and radio stations;
- Distributing specific information materials in vaccination center waiting rooms;
- Promoting vaccination at community educational events;
- Scheduling additional vaccination sessions at user-friendly times, including increasing sessions on weekday afternoons in 2022 to accommodate children and youth during extracurricular hours;
- Conducting vaccination sessions during the summer school closure period, including morning sessions;
- A comprehensive review of the activity plans of all professionals involved, prioritizing, and ensuring the sustainability of strategic recovery choices;
- Employing a guided pro/active leadership approach to steer towards a well-informed outcome in terms of impact and spillover;
- Dynamic process and performance monitoring with accompanying corrective actions.

Third phase

In January 2023, vaccination coverage was evaluated again, at 31/12/2022, to assess the effectiveness of project of coverage increase.

Results

Figure 1 shows the percentage of HPV vaccination coverage (full cycle) for the birth cohort studied. In the studied period, the total HPV vaccination coverage decreased up to those born in 2009; in this year for the females the values were lower than the total sample. For males the lower values were observed for those born in 2008.

Finally, an increase in HPV vaccination coverage was observed for those born in 2010, this was more pronounced for the females (+11.2%). Lastly, the average coverage over the four years studied is almost identical between the two genders (49.1% females and 49.5% males).

Figure 2 shows the percentage of HPV vaccination coverage (full cycle) after the project, cohort from 2007 to 2010. After the project, the average values, for all sample, were over 60%; for the females the values

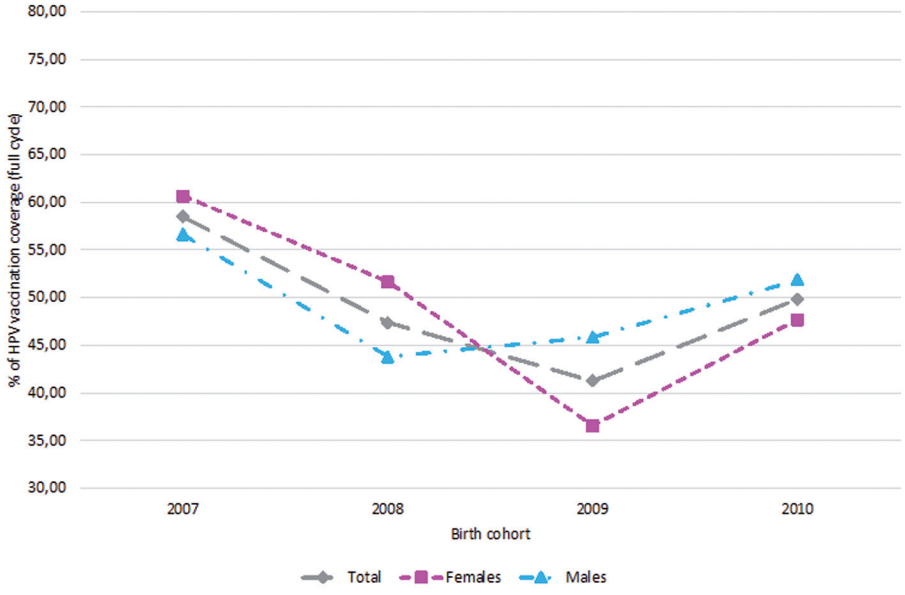

Figure 1 – Percentage of HPV vaccination coverage (full cycle) in January 2022.

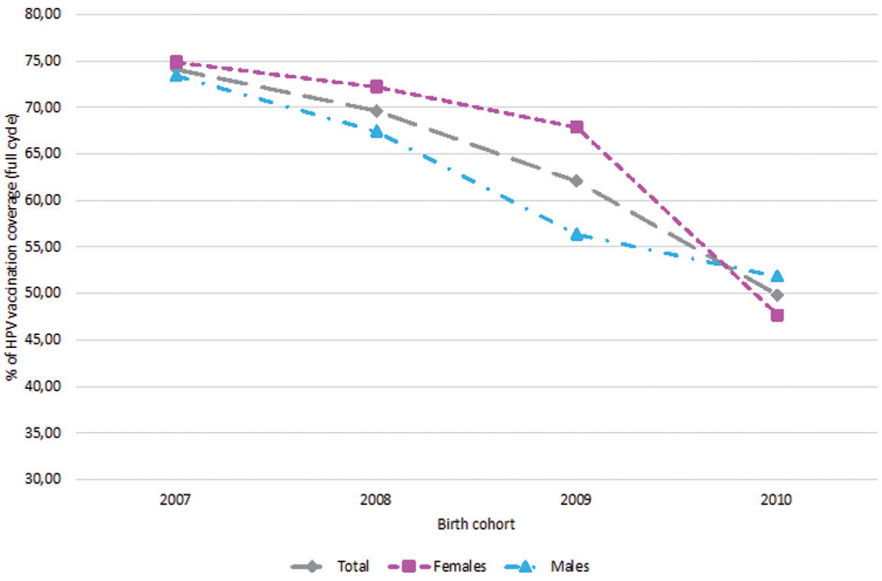

Figure 2 – Percentage of HPV vaccination coverage (full cycle) in December 2022.

were over 65%. A difference between female and male coverage was evident (71.7% vs 65.8%).

Figure 3 shows the different percentage of HPV vaccination coverage after the project, cohort from 2007 to 2009. A greater percentage increase in total vaccinated was observed in the 2008 (+20.6%) and 2009 (+20.9%) birth cohorts than those born in 2007 (+14.2%).

The increase for the first two birth cohorts studied (2007 and 2008) was higher for males than for females: +14.2% for females and +16.8% for males (2007) and 20.6% for females and +23.7% for males (2008). For the last cohort (2009) it was higher for females (+31.4%) than for males (+10.6%).

Discussion

Vaccines are the best and most effective choice for the prevention of HPV infections (23, 24). Since

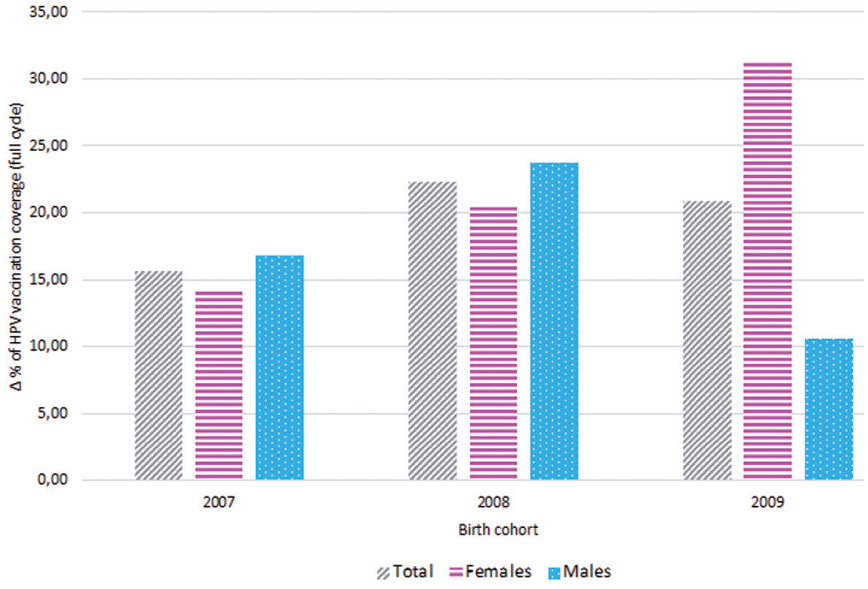

Figure 3 – Difference (Δ %) of vaccination coverage (full cycle) between December and January 2022.

the beginning of the 21st century, over 110 countries have implemented their HPV vaccination campaigns, but only around 40 countries introduced a "gender-neutral" program. The first to do so were Australia and the United States in 2011 and 2013, respectively (25, 26). The aim of this study was to evaluate the effectiveness of an organizational and communication network for implementing HPV vaccination coverage for 12-year-old cohorts to ensure gender-neutral coverage.

According to data from the Italian Ministry of Health (27), the improving trend in coverage for HPV vaccination in both genders has been confirmed for the 1997-2009 birth cohorts. However, low values are recorded in the primary targets of the vaccination intervention. For females in the 2009 birth cohort, the national average is 53% for vaccination with one dose and 32.2% for the full cycle, while the Tuscany Region showed vaccination coverage of 68.9% for one dose and 57.2% for the full cycle. Our results show that the vaccination coverage for the full cycle, by 2022, for females in the Empoli Area was 67.9%, which is above both the national and regional averages.

For males born in 2009, the national-level vaccination coverage was 45% for those vaccinated with one dose and 26.75% for the complete cycle, while the Tuscany Region recorded vaccination coverage of 58.31% for one dose and 45.43% for the complete cycle. Here, as with the female gender in the Empoli Area, male coverage (56.4%) is above both the national and regional averages.

It should be noted that ministerial data is updated to 2021, and various Italian regions may have implemented strategies to enhance HPV vaccine coverage. However, the Tuscany Region, and specifically the studied area, has higher vaccine coverage values than the national average.

Notably, among the strategies adopted that facilitated the implementation of HPV vaccination coverage, active calls, as highlighted in another study (28), played a key role in achieving this outcome. Indeed, the active monitoring of vaccination status by GPs or FPs allows the early identification of non-compliant adolescents. Furthermore, clear, and strategic communication enables effective messages to be conveyed to the audience regarding the importance of HPV vaccination (29). In our case, it appears that the use of various media channels facilitated reaching a significant portion of the target population.

Certainly, the introduction of additional vaccination sessions during the summer periods has also proven to be a strategic intervention. As demonstrated in another study (30), adolescents' willingness to vaccinate against HPV substantially increases during the summer months.

In this current era, when vaccines are a daily topic of discussion, it is of fundamental importance to guarantee and disseminate information that is as clear, simple, and reliable as possible, targeting both adolescents and parents. Moreover, since discussing HPV vaccination inevitably involves conversations about sexual health, there is an opportunity to provide scientifically accurate information on sexually transmitted diseases and sex education in general. A recent systematic review identified perceived lack of vaccine efficacy, concerns about possible side effects, mistrust in health authorities, and inadequate and biased information as the main reasons for hesitation towards HPV vaccination in Europe (31).

Therefore, it is essential, as already recommended (32-33), to try to implement both vaccination catch-up and to continue vigorously with the current vaccination program, involving more professionals who work closely with adolescents and their families, such as GPs, gynecologists, midwives, and teachers. The roles of GPs and FPs are particularly vital, since they are often the first healthcare professionals to interact with adolescents and their families. Providing updated and ongoing training on HPV vaccination is essential to maintain their focus on this issue, encouraging them to engage in discussions with adolescents and their parents (34-35). All of this is crucial in the post-pandemic period, as highlighted in another study (36), where the impact of COVID-19 was substantial, particularly during the second wave, resulting in very low coverage rates for the targeted adolescents/teens. In our study, this was particularly noticeable in the female gender.

This is why we must persist in advocating for a gender-neutral approach to HPV vaccination. Providing adequate protection to all adolescents can lead to significant benefits for the general population, increased protection for the male population, especially males who have sex with males, as they do not benefit from vaccination in the female population. Finally, this approach can enhance vaccination resilience (37-39)

Limitations

Despite the significant findings of this study, it is essential to recognize its limitations. The results of this research only belong the Empoli Area of the CT-LHA; therefore, the results may not be representative

of the entire LHA. Finally, our data analysis is limited to 2022, as the project was renewed in 2023, we are unable to assess the impact of these strategies on the 2010 cohort.

Conclusions

The work aimed at experimenting 'in the field' in a contextual, synergic, and dynamic way, several strategies for the recovery of vaccination activities indicated by the Ministry of Health, specifically for the recovery of the cohorts of 12-year-old HPV vaccination defaulters. The methodology and tools used have therefore seen an initial planning and sharing of the project with all the professionals involved, the stakeholders, the institutions and the community network, and a planning and reshaping of the governance of the process in a logic of priority and transversal skills.

The role played by social media was also considered central, however, carefully considering the "infodemic" period, we have been going through.

The organizational model that has been active in the CT-LHA from some years, and which had already been activated with a regional agreement for 15 years in the previous Empoli LHA, now the Empoli Territorial Area, made it possible to implement anti-HPV vaccination coverage for both genders.

The results achieved on the vaccination coverage that is the subject of this work, push towards a fine-tuning of the model for the offer of all vaccinations to the pediatric and adolescent population and certainly for the offer to cohorts for the HPV vaccination.

Conflict of Interest: The Authors declare that there is no conflict of interest.
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Riassunto

Sviluppo di un modello di network per l'implementazione delle coperture vaccinali anti-HPV

Premessa. La copertura vaccinale di una popolazione è l'indicatore abituale dell'efficacia delle strategie vaccinali. Lo studio si propone di valutare l'efficacia di una rete organizzativa e comunicativa per implementare la copertura vaccinale contro l'HPV sia nei maschi che nelle femmine nell'Azienda USL Toscana Centro.

Disegno dello studio. Studio sperimentale.

Materiali e metodi. Nel gennaio 2022, è stato condotto uno studio retrospettivo sulla copertura vaccinale anti-Human Papilloma Virus (ciclo completo), dei nati dal 2007 al 2010, nella Zona Territoriale di Empoli di Firenze (240 mila abitanti) sotto l'Azienda USL Toscana Centro. Nel febbraio 2022 è stato avviato un progetto di recupero (incontri con medici e pediatri di libera scelta, comunicazione attraverso media locali, aumento degli orari di apertura degli ambulatori vaccinali e monitoraggio continuo dello stato vaccinale) delle femmine e dei maschi inadempienti; nei primi cinque mesi, oltre a garantire l'offerta alla coorte di riferimento, si è puntato a recuperare le coorti 2007, 2008 e 2009, mentre nei sei mesi successivi l'offerta del vaccino anti-HPV è stata ampliata per la coorte 2010.

Risultati. A gennaio 2022, le coperture totali medie erano del 49,2% (49,1% per le femmine e 49,5% per i maschi), mentre a dicembre 2022 erano del 63,9% (65,8% per le femmine e 62,3% per i maschi). La copertura è aumentata del 15,6% (+14,2% per le femmine e +16,8% per i maschi) per la coorte di nascita 2007, del 22,3% (+20,6% per le femmine e +23,7% per i maschi) per la coorte 2008 e del 20,9% (+31,4% per le femmine e +10,6% per i maschi) per la coorte 2009.

Conclusioni. Questo modello in vigore in tutta l'Azienda Azienda USL Toscana Centro da qualche anno e, già attivato nella precedente Azienda USL di Empoli, ora Ambito Territoriale di Empoli, ha permesso di implementare la copertura vaccinale HPV per entrambi i sessi.

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