



Acceptability, access, and uptake of human papillomavirus vaccination in mental health populations: a scoping review

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Abstract

Aim The purpose of this study is to describe the scope, breadth, and depth of the existing literature on the acceptability of, access to, and uptake of HPV vaccine in mental health populations.

Subject and methods Human papillomavirus (HPV) is responsible for significant cancer morbidity and mortality. Effective vaccines are available; however, uptake is suboptimal. Mental disorders are common, and people with mental disorders are known to have lower rates of cancer screening and reduced uptake of preventive health measures than the general population. This scoping review involved a comprehensive search of published literature. Two independent reviewers screened articles in duplicate and extracted data. Data were analyzed and mapped using quantification of study characteristics.

Results There were 16 quantitative studies included, all conducted in high-resource countries. Studies were focused on youth and adolescents ($n = 8$), youth and adults ($n = 3$), or adults ($n = 5$); and explored substance use disorder ($n = 9$), mental disorders such as anxiety, depression or others ($n = 6$), or developmental/intellectual disabilities ($n = 4$). One study looked at gender identity disorder. There were studies about access to ($n = 4$), acceptability of ($n = 4$), and uptake of ($n = 13$) HPV vaccination. No studies described a theoretical approach to their work.

Conclusion There is limited research available on the relationship between mental health and HPV vaccination acceptability, access, or uptake. Efforts should be made to extend both quantitative and qualitative literature in this area, including using theoretical frameworks to improve the transferability of research into practice.

Keywords HPV · Vaccine · Immunization · Mental health · Substance use · Review

Introduction

According to the World Health Organization (WHO), human papillomavirus (HPV) is the most common viral infection of the reproductive tract (WHO 2017a). It is projected that 80–90% of sexually active men and women will be infected with at least one strain of HPV in their lifetime (Chesson et al. 2014). HPV infection is responsible for up to 90% of cervical and anal cancers (Arbyn et al. 2018), as well as a substantial proportion of vulvar, vaginal, penile, and oropharyngeal cancers (Razzaghi et al. 2018; Centers for

Disease Control and Prevention 2019). Fortunately, effective vaccines for cancer-causing HPV strains were broadly approved in 2006 (Markowitz et al. 2007; Tunis et al. 2017). A 2018 Cochrane review showed clear evidence that in women aged 15–26, vaccination against HPV was effective at preventing pre-cancerous cervical lesions (Arbyn et al. 2018). If provided early enough to prevent initial infection, the vaccine is also effective in preventing cancers of the anus, vulva, vagina, penis, and oropharyngeal areas in men and women (Hirth et al. 2017; Shabbir et al. 2013; Joura and Pils 2016). The WHO recommends HPV vaccination for girls aged 9–14 years who have not had their sexual debut (WHO 2017a), as well as other specific populations. Additional evidence and policy support the provision of vaccination for boys and adult populations (i.e., adults up to the age of 27 and men who have sex with men) (Tunis et al. 2017; Hirth et al. 2017). To date, over 80 countries have introduced national HPV vaccination programs, with most of these countries being high or upper-middle-income

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countries (Gallagher et al. 2018, Marfo et al. 2022). Unfortunately, vaccine uptake remains suboptimal, with HPV vaccine coverage differing vastly between high- and low-income countries (Bruni et al. 2016).

Poor mental health affects one in four people worldwide and is generally characterized by a combination of abnormal thoughts, perceptions, emotions, behaviors, and relationships with others (WHO 2017b). There are effective strategies and treatments available for mental disorders. However, access to health services and social support play an important role in recovery (WHO 2017b). Research has shown that youth with diagnoses of mental disorders have an increased risk of sexually transmitted infections (STI), with the risk further increased for females (Gerassi et al. 2016). Additionally, internalized and externalized disorder-specific factors (Magidson et al. 2014), as well as experiences of trauma, may increase the risk for STIs (Gerassi et al. 2016).

In addition to the increased risk of STIs, people with mental health disorders have significantly lower rates of cervical cancer screening (Borrull-Guardeño et al. 2019; Lord et al. 2010; Aggarwal et al. 2013; Tilbrook et al. 2010; Tuesley et al. 2019); mammography (Aggarwal et al. 2013; Lord et al. 2010), vaccine uptake, cholesterol screening, lifestyle counselling, and colonoscopy (Lord et al. 2010), as compared to the general population. Access to preventive services is complicated further when gender (Xiong et al. 2014), race and age (James et al. 2017; Xiong et al. 2014), psychiatric co-morbidity (Druss et al. 2002), and access to a primary care provider (Xiong et al. 2014) are factored in. For instance, it is believed that people with mental health disorders encounter significant challenges with accessing preventive health services due to problems of social stigma, personal service user challenges with motivation and organization, systemic problems of diagnostic overshadowing, complex navigation of multiple appointments or processes, and communication issues (Druss et al. 2002). Additionally, genital warts and HPV-related cancers are known to have detrimental effects on the mental health of those affected, with many experiencing increased anxiety, depressive symptoms, and poorer reported quality of life (Lawrence et al. 2009; Drolet et al. 2011).

Although there are many studies of HPV vaccine uptake in various populations (Walling et al. 2016), and much research has been done on the disparities in access to public health interventions for people living with mental ill-health (Lord et al. 2010; James et al. 2017; Aggarwal et al. 2013; Xiong et al. 2014; Tilbrook et al. 2010; Druss et al. 2002; Tuesley et al. 2019; Lawrence et al. 2009; Drolet et al. 2011; Walling et al. 2016; Primm et al. 2010), there appears to be limited research about HPV vaccination in people with mental health disorders. Therefore, we conducted a scoping review to describe the extent and type of research on HPV vaccination acceptability, access, and uptake in people with

mental health disorders. Our primary goal was to identify the research priorities or gaps that need to be addressed to inform further research, practice, and policy.

Materials and methods

This scoping review utilized the five-step approach developed by Arksey and O'Malley (2005) and adapted by Levac et al. (2010). This methodology enabled us to map the extent, range, and nature of literature in a topic area while identifying gaps and opportunities for further research (Fernández-Sánchez et al. 2020). The protocol for the study was defined *a priori* and is available from the authors by request. The five stages of this review included identifying the research question; identifying relevant studies; selecting studies and conducting quality assessment; extracting and charting data; and collating, summarizing, and reporting the results (Fernández-Sánchez et al. 2020).

The question that guided our scoping review was: what is the nature and extent of research on HPV vaccine acceptability, access, and uptake for people affected by mental ill-health? We defined mental ill-health as people diagnosed with a mental disorder, which for this review included any diagnosis described in the DSM-5 (for a full list of diagnoses and diagnostic criteria, please visit the APA website). We also included more general descriptions of mental ill-health, such as psychiatric disorders or poor mental health.

The search terms from three categories were combined following Peters et al. (2015) recommendations: population, concept, and context. For this review, the population of interest is people with mental health disorders; the concepts are vaccine acceptability, access, and uptake; and the context is anywhere in the world. With the assistance of an academic library scientist, we searched eight electronic databases on May 16, 2019, with an updated search on August 6, 2021. Databases that we searched included: Ovid MEDLINE, PsychINFO, EMBASE, The Cochrane Library, CINAHL, Scopus, the Web of Science Core Collection, ERAS, and Dissertations and Theses Global. See Appendix 1 for the search strategy. We chain-searched the reference lists of included studies and relevant reviews.

The *a priori* inclusion criteria for this scoping review were: primary original research studies about the acceptability of, access to, or uptake of HPV vaccine in people with mental health disorders, available in English, Spanish, or French (as the authors were proficient in each of the languages). We included peer-reviewed published articles, as well as grey literature in the form of theses and dissertations. We excluded systematic/literature reviews, non-human studies, conference abstracts, studies that were *in vitro* or *in silico*, commentaries, editorials, websites, blogs, and other

informal publications. There was no date limit for including studies up to the final search date.

Two independent reviewers (HFS and KDK) screened and selected the articles using Covidence™, online software for conducting systematic reviews. Initially, each reviewer independently screened the titles and abstracts for inclusion. The full texts of the included articles were then screened. Any disagreements between the reviewers were resolved by discussion.

For eligible studies, we developed, piloted, and modified a data extraction form in an iterative process. We extracted data on author and publication information, study location, study aims, focus of the study (acceptability, access, uptake), theoretical framework, study design, data collection methods, sample characteristics (including the age range of participants and mental health disorders identified), sampling method, data collection period, key findings, implications, and recommendations (see Appendix 2). We categorized studies as “acceptability” if they reported on the willingness or unwillingness to vaccinate for HPV, “access” if they reported on or made recommendations related to barriers or enablers to vaccination for HPV, and “uptake” of HPV vaccine if they reported vaccination rates in specific populations. Studies that reported on more than one of these areas were classified with whatever combination of areas of study they met. To document results, implications, and recommendation data, whenever possible, direct quotes from studies were used. In some cases, paraphrasing extraneous wording was done for brevity.

Findings were analyzed using pivot tables in Microsoft Excel 2016, enumerating study types, locations, designs, methods, and characteristics. We planned to analyze qualitative data using qualitative thematic analysis (as per Levac et al. (2010)); however, no qualitative studies were identified. Results of the review were reported using the population, concept, and context (PCC) framework.

Results

As shown in Fig. 1 (PRISMA Diagram) (Liberati et al. 2009), we identified 973 records, 966 through database searching and seven from chain-searching reference lists. After duplicates were removed, 350 articles remained. One study (Cadman 2006) could not be retrieved despite attempts to contact the author. After title and abstract screening and full-text screening, as well as hand-searching reference lists of included articles, 16 articles remained for analysis.

Characteristics of the included studies

Key characteristics of the included studies are summarized in Table 1. The geographic distribution of the 16 studies included five countries: ten were completed in the United

States of America (USA), two in Canada, two in the United Kingdom, one in Australia, and one in Hungary. All the included studies were quantitative, with six of the 16 being cohort studies and ten cross-sectional designs. The study sample sizes ranged from 33 to 221,908. Two studies did not report the dates during which data were collected; those that did report that data was collected between 2007 and 2018. Half of the studies ($n = 8$) did not report their sampling methods; those that did, included population-based random sampling, non-probabilistic sampling, two-stage cluster representative sampling, convenience sampling, and respondent-driven sampling (See appendix 2, supplementary data). None of the included studies reported a theoretical framework informing their research.

Population characteristics

Eight studies examined adolescent populations, three looked at adolescents and adults, and five were conducted with only adults (see Table 2 for study characteristics by age group). Mental health disorders studied included three studies using general terms such as mental illness (Apaydin et al. 2018), any psychiatric condition (Forinash et al. 2020) or poor mental health (Bass et al. 2015). Additional studies described more specific diagnoses, including nine that studied substance use disorder (Apaydin et al. 2018; Forinash et al. 2020; Bass et al. 2015; Heckman et al. 2012; Linares et al. 2015; Remes et al. 2014; O'Neill et al. 2019; Reiter and McRee 2016; Winn et al. 2016), three that described depression and anxiety (Lawrence et al. 2009; Drolet et al. 2011; Linares et al. 2015) and four that addressed intellectual disabilities (Reiter and McRee 2016; Marek et al. 2016). Additionally, one study looked at gender identity disorder (Nocka et al. 2021), and one study included a variety of mental health conditions, including bipolar affective disorder, schizophrenia, and post-traumatic stress disorder (Forinash et al. 2020).

Acceptability studies

Four studies reported specifically on the acceptability of HPV vaccination (Bass et al. 2015; Heckman et al. 2012; Marek et al. 2016; Emerson et al. 2019). All four acceptability studies were conducted with adolescents. While three focussed on substance use disorder, one looked at intellectual disabilities. One study also included “poor mental health days” as a variable (Bass et al. 2015) (refer to Table 3 for full breakdown). Acceptability studies were completed in the USA ($n = 2$), the UK ($n = 1$), and Hungary ($n = 1$). Three acceptability studies used a survey design, with sample sizes ranging from 59 to 1080, and one was a secondary data analysis of parental report data, with a sample of 1745. Sampling methodologies included non-probabilistic, random, convenience, and cluster representative sampling.

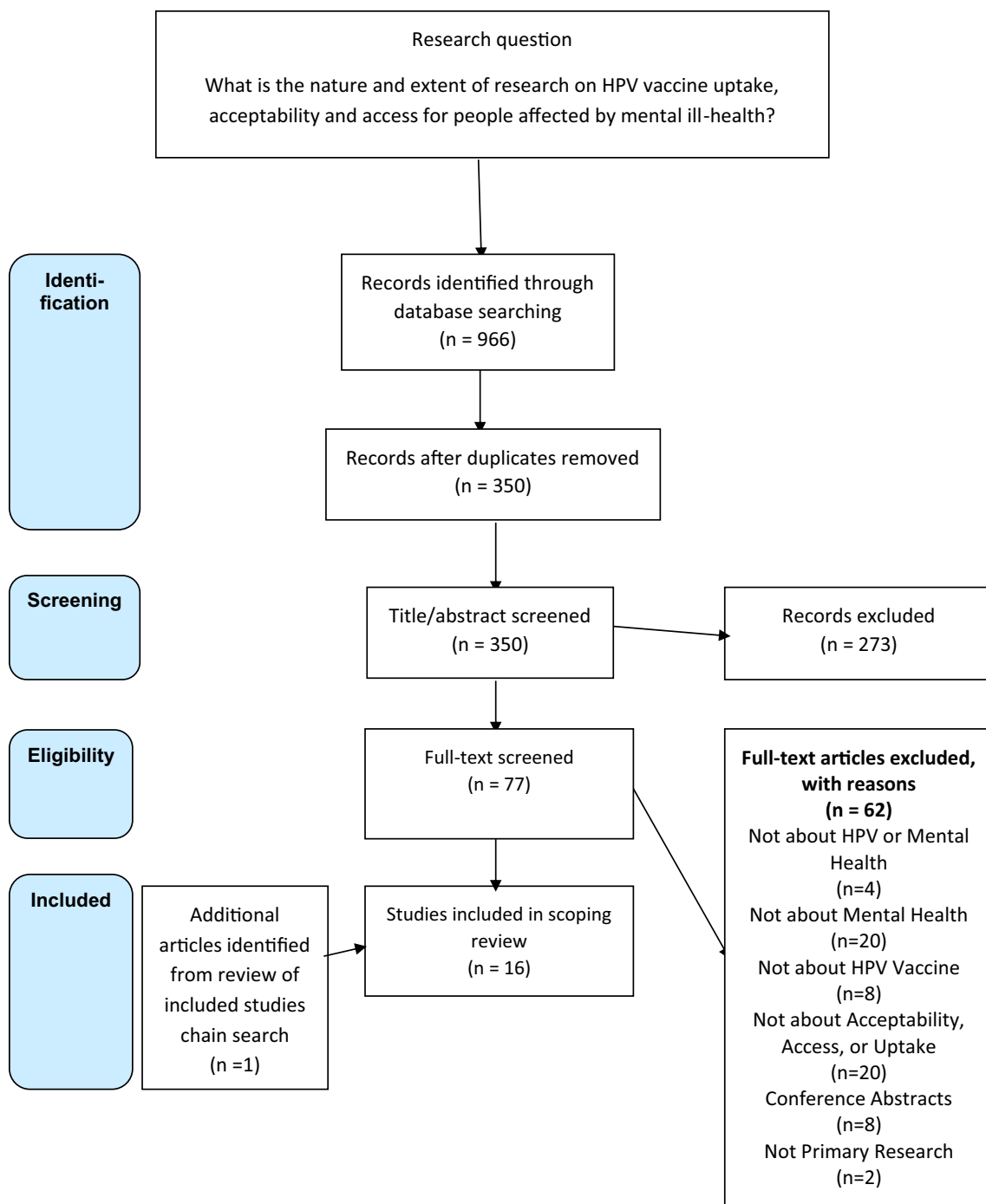


Fig. 1 PRISMA Diagram

Acceptability studies ranged from measuring willingness to receive the vaccine (Bass et al. 2015; Heckman et al. 2012; Marek et al. 2016) to reasons for not vaccinating (Emerson et al. 2019). Measures of willingness were not well defined, but ranged from 33% (Heckman et al. 2012) to 66% (Bass et al. 2015). One study simply stated that female participants expressed a willingness to

be vaccinated (Marek et al. 2016). Reasons for not vaccinating fell into seven categories, including parental choice, service/administration errors, child wellness at time of vaccination, adverse reactions or contraindications, family disorganization, pending appointments, or other (Emerson et al. 2019). See Appendix 2 for a full summary of study findings.

Table 1 Summary of study characteristics

	Author information	Country	Focus	Population (age group)	Population (Mental Health)	Study design	Study methods	Sample	Sampling
1	O'Neill et al. 2019	Australia	Access & uptake	Adolescents	Intellectual disability	Cohort	Secondary data analysis (AD)*	<i>n</i> = 72	Not specified
2	Apaydin et al. 2018	USA	Access	Adults	Mental illness, substance use disorder	Cross-sectional	Survey	<i>n</i> = 33	Not specified
3	Reiter and McRee 2016	USA	Uptake	Adolescents	Intellectual disability	Cross-sectional	Secondary data analysis (AD)	<i>n</i> = 604	Population-based random sample
4	Marek et al. 2016	Hungary	Uptake & acceptability	Adolescents	Substance use disorder	Cross-sectional	Survey	<i>n</i> = 555	Non-probabilistic
5	Linares et al. 2015	USA	Uptake	Adolescents	Substance use disorder, anxiety, depression	Cohort	Survey & cervical sample	<i>n</i> = 745	Not specified
6	Bass et al. 2015	USA	Uptake & acceptability	Adolescents	Substance use disorder, poor mental health	Cross-sectional	Survey	<i>n</i> = 1080	2 Stage cluster representative
7	Remes et al. 2014	Canada	Uptake	Adolescents	Substance use disorder	Cohort	Secondary data analysis (AD)	<i>n</i> = 144,047	Not specified
8	Heckman et al. 2012	USA	Uptake & acceptability	Adolescents	Substance use disorder	Cross-sectional	Survey	<i>n</i> = 59	Convenience
9	Drolet et al., 2011	Canada	Access	Adults	Anxiety, depression	Cohort	Medical assessment, survey	<i>n</i> = 272	Not specified
10	Lawrence et al. 2009	UK	Access	Adults	Anxiety, depression	Cohort	Survey	<i>n</i> = 112	Not specified
11	Sadang et al. 2021	USA	Uptake	Adults	Substance use disorder	Cross-sectional	Survey	<i>n</i> = 139	Respondent-driven sampling
12	Forinash et al. 2020	USA	Uptake	Adolescents & adults	Substance use disorder, depression, anxiety, bipolar, schizophrenia, PTSD, Any psychiatric condition	Cross-sectional	Chart review	<i>n</i> = 99	Not specified
13	Owens et al. 2020	USA	Uptake	Adults	Substance use disorder	Cross-sectional	Survey	<i>n</i> = 144	Respondent-driven sampling
14	Emerson et al. 2019	UK	Uptake & acceptability	Adolescents	Intellectual disabilities	Cross-sectional	Secondary analysis (AD)	<i>n</i> = 1745	Random sample of administrative records
15	Roden et al. 2019	USA	Uptake	Adolescents & adults	Intellectual disabilities	Cohort	Chart review	<i>n</i> = 1417	Not specified
16	Nocka et al. 2021	USA	Uptake	Adolescents & adults	Gender identity disorder	Cross-sectional	Secondary analysis (AD)	<i>n</i> = 221908	Convenience

*AD = administrative data, which included hospital admission data, electronic health record, and vaccine registry data

Access studies

Four studies focused on barriers or enablers to HPV vaccination access (Lawrence et al. 2009; Drolet et al. 2011; Apaydin et al. 2018; Reiter and McRee 2016). Of these, one discussed adolescents (Reiter and McRee 2016), and three reported on adults (Lawrence et al. 2009; Drolet et al. 2011; Apaydin et al. 2018). Mental health disorders identified in studies on access included: intellectual disabilities (*n* = 1), substance use disorder (*n* = 1), anxiety/depression (*n* = 2), and mental

illness/psychiatric disorder (*n* = 1) (refer to Table 3 for full breakdown). Studies on access were completed in Australia (*n* = 1), USA (*n* = 1), Canada (*n* = 1), and the UK (*n* = 1). Methods used in access studies included survey (*n* = 3), and secondary data analysis using chart audit methods (*n* = 1).

Of the four studies that included elements of access to HPV vaccination, two of them examined the impact of anogenital warts on the mental health of participants, and made recommendations for improved access to vaccination (Drolet et al. 2011; Lawrence et al. 2009). One study examined

Table 2 Study characteristics by age group

Study design	Population (age group) (<i>n</i> = 16)			Total
	Adolescents	Adolescents and adults	Adults	
Cohort	3	1	2	6
Cross-sectional	5	2	3	10
Study country (context)				
USA	4	3	3	10
Canada	1	0	1	2
Australia	1	0	0	1
Hungary	1	0	0	1
United Kingdom	1	0	1	2

primary care provider's perceptions of barriers to vaccination and found that mental illness and substance use disorders were contributing factors to uptake of HPV vaccines (Apaydin et al. 2018). The final study in this group examined different types of disability and found that children with intellectual disabilities faced additional barriers to vaccination (O'Neill et al. 2019). See Appendix 2 for a full summary of study findings.

Uptake studies

There were 13 studies concerning HPV vaccine uptake, with series completion (i.e., uptake of all three vaccine doses) ranging from 8.6% (Sadang et al. 2021) to 87.4% (Emerson et al. 2019). Eight studies measured uptake in adolescents, three in both adolescents and adults, and two studies looked

only at adults. Some studies reported uptake by sex, with significant differences in HPV vaccine series completion between male and female adolescents (Emerson et al. 2019; O'Neill et al. 2019; Reiter and McRee 2016; Bass et al. 2015; Heckman et al. 2012), while only one study looked at HPV vaccine series completion by gender (Nocka et al. 2021). Mental health disorders identified in uptake studies included intellectual disabilities (*n* = 3), substance use disorder (*n* = 8), depression/anxiety/poor mental health days/any psychiatric condition (*n* = 3), as well as one study examining gender identity disorder specifically. Studies on uptake were completed in the USA (*n* = 9), Australia (*n* = 1), Canada (*n* = 1), the UK (*n* = 1), and Hungary (*n* = 1). Data were collected using surveys (*n* = 6), retrospective audit and secondary data analysis (*n* = 5), or chart review (*n* = 2) methods, with a wide range of sample sizes (*N* = 59 to 221,908).

The 13 studies that explored uptake measured concepts of vaccine initiation, coverage, series completion, compliance, refusal, and uptake. Uptake of at least one dose of HPV vaccine ranged from 8.6% in women with substance use disorder (Sadang et al. 2021), to as high as 87.4% in girls with intellectual disabilities (Emerson et al. 2019). Multiple factors were associated with uptake, including having a mental or intellectual disability (O'Neill et al. 2019; Roden et al. 2019; Emerson et al. 2019), sex, having preventive check-ups, living in a household with some college education, (Reiter and McRee 2016), psychosocial index score, injecting drugs (Owens et al. 2020), suicidality, substance use, HIV positive status, (Bass et al. 2015), seeing a pharmacist during postpartum care (Forinash et al. 2020), gender identity (Nocka et al. 2021), smoking (Heckman et al. 2012), unprotected sex,

Table 3 Study population and focus

Population/focus	Access	Access & uptake	Uptake	Uptake & acceptability	Total
Adolescents	0	1	3	4	8
Intellectual disabilities	0	1	1	1	3
Substance use disorder	0	0	1	2	3
Substance use disorder, depression, anxiety	0	0	1	0	1
Substance use disorder, poor mental health days	0	0	0	1	1
Adolescents and adults	0	0	3	0	3
Gender identity disorder	0	0	1	0	1
Intellectual disabilities	0	0	1	0	1
Substance use disorder, depression, anxiety, bipolar affective disorder, schizophrenia, PTSD, any psychiatric condition	0	0	1	0	1
Adults	3	0	2	0	5
Mental illness, substance use disorder	1	0	0	0	1
Substance use disorder	0	0	2	0	2
Anxiety, depression	2	0	0	0	2
Total	3	1	8	4	16

one-night relationships (Marek et al. 2016) and income level (Remes et al. 2014). Factors associated with refusal included having a diagnosis of Down's Syndrome or Autism, fewer physician visits, previous refusal of vaccines, a diagnosis of obesity and living in an area of high deprivation (Remes et al. 2014). See Appendix 2 for a full summary of study findings.

Discussion

This review identified 16 peer-reviewed primary research studies published between 2009 and 2021 that explored HPV vaccination acceptability, access, and uptake in people with mental health disorders. Most studies were focused on adolescents and addressed uptake of the HPV vaccine, with fewer studies looking at acceptability or access to vaccination. Studies examining access to vaccines focused more on adults than adolescent populations, identifying barriers to HPV vaccination in people with mental health disorders or recommending HPV vaccination in mental health populations based on their findings.

Through our review, we uncovered that the literature exploring acceptability, access, and uptake of HPV vaccination in mental health populations is very limited. Considering the prevalence of poor mental health, the strong recommendations around HPV vaccination globally, and the link between mental health and STIs, the number of studies identified in this review is surprisingly small.

There are significant challenges with increasing vaccination rates globally (Gallagher et al. 2018; Bruni et al. 2016; Heckman et al. 2012; Finocchiaro-Kessler et al. 2016; Bhui et al. 2012). Interventions aimed at preventing mental ill-health (particularly around substance use, anxiety, and depressive disorders) may have additional benefits in reducing morbidity from HPV-related genital warts and cancers (Mutamba et al. 2013; Farrer et al. 2013; De Hert et al. 2011). Given the poor physical health outcomes faced by people living with mental health and substance use disorders (De Hert et al. 2011; Druss et al. 2002; Ferrer et al. 2014), effective cancer prevention interventions (including HPV vaccination) must be designed for this population.

Additional research exploring the relationships between mental health and HPV vaccine acceptability, access, and uptake is warranted. There is a need for increased research examining the impact of different specific mental disorders (i.e., anxiety, depression, psychosis, attention deficit hyperactivity disorder, etc.) on HPV vaccination uptake and decision-making in both adolescents, and their parents, who often influence vaccination behavior (Sisson and Wilkinson 2019; Walhart 2012; Brazil et al. 2005).

We noted a complete lack of application of theoretical frameworks in this review of the literature. This is problematic as there is evidence that the absence of a theoretical basis to inform research and interventions makes it difficult to

incorporate and connect health service research and practice (Gray et al. 2017). We suggest that future research on this topic should incorporate theoretical frameworks. For example, when researching access to HPV vaccination, theoretical frameworks such as intersectionality theory (Truong-Vu 2021), the social determinants of health (Thompson et al. 2019), or the life course approach (WHO 2020) may be useful in framing the research to improve comparability and reproducibility in this population. Other theoretical approaches that have been used to describe acceptability issues in vaccine research include cultural attraction theory (Miton and Mercier 2015), fuzzy-trace theory (Reyna 2008, Reyna and Brainerd 1992), or the health belief model (Fallucca et al. 2022). One review of theoretical applications in HPV vaccine uptake studies found that psychological health behavior models or frameworks, socio-cultural models or theories, and ecological frameworks would be useful in improving uptake research broadly (Batista Ferrer et al. 2015).

Additionally, there was a dearth of research in this area from middle and low-resource settings, with all the included studies being from European, North American, and Australian settings. While research is occurring in low and middle-income countries (LMICs) on both mental health (Yasamy et al. 2011) and HPV vaccination (Bingham et al. 2009), it appears as though these concepts have not been looked at together in these settings, providing an opportunity for further research in this area, as this is a recognized challenge in many LMICs (Brisson et al. 2020).

There was also a distinct absence of qualitative studies that might illustrate the experiences or phenomena associated with the acceptability, access, or uptake of the HPV vaccine in mental health populations. In Bingham et al. (2009) work examining socio-cultural issues in the introduction of HPV vaccines in low resource settings, descriptive qualitative synthesis of a survey, focus group, and interview data contributed significantly to the understanding of access and acceptability in various settings, but did not address mental health. We suggest that further qualitative exploration of the experiences of acceptability and access to HPV vaccines for people with mental health disorders may help shed light on some of the quantitative uptake data reported.

Additionally, researchers may wish to examine further intersectional categories of identity, such as race and racialization, sex and gender differences, sexual orientation, class, and disability, that may provide significant insight into issues of access and acceptability faced by the diversity of people living with mental health disorders, as initial quantitative work has already begun to examine some of these factors individually and collectively (Cadman 2006; Heckman et al. 2012; Linares et al. 2015; Remes et al. 2014; O'Neill et al. 2019; Reiter and McRee 2016; Marek et al. 2016; Winn et al. 2016; Nocka et al. 2021; Sadang et al. 2021; Emerson et al. 2019; Finocchiaro-Kessler et al. 2016; Hankivsky 2012;

Bhui et al. 2012; Mutamba et al. 2013; Farrer et al. 2013; De Hert et al. 2011; Ferrer et al. 2014; Sisson and Wilkinson 2019). Intersectional research in health equity in mental health (Seng et al. 2012) and sexual health (Brazil et al. 2005) is already underway, identifying interactions among categories of identity and hidden systems of oppression that lead to health inequities. This approach may be useful in exploring the relationships between HPV vaccination acceptability, access, and uptake concerning mental health and disability.

Limitations

There were potential limitations to this review. While we made every effort to optimize our search strategy, relevant studies may have been missed, particularly studies published in non-peer-reviewed journals, or grey literature (other than theses and dissertations), or studies that were published in languages other than English, French, or Spanish.

Conclusion

The burden of HPV infection on people and healthcare systems is significant. There is limited published peer-reviewed information regarding the relationship between mental health and HPV vaccination. Major gaps exist in the literature on the impact poor mental health has on the acceptability of, access to, and uptake of HPV vaccination in adolescents and adults for cancer prevention. Additional high-quality research is needed to understand the uptake of HPV vaccines in people experiencing mental disorders, as well as the barriers and enablers to accepting and gaining access to vaccines, particularly in medium and low-resource settings. Furthermore, the lack of qualitative research on mental health and HPV vaccination is concerning. More research is needed to improve our knowledge about the health of people experiencing mental health disorders and to appropriately explore ways to improve acceptability, access, and uptake of HPV vaccines in this population.

Working with stakeholders from advocacy groups, public health research institutions, and policymakers would be useful to link health information that is routinely collected on mental health and vaccination status to better inform research and application of research in this important area. As research priorities are set, it may be useful to explore further the various aspects of mental health and substance use that relate to vaccine-preventable illnesses, to optimize outcomes in this often-stigmatized population (Primm et al. 2010). Consideration should be given to these findings when prioritizing research in this population when it comes to preventive health, and efforts should be made to encourage further exploration of the topic among policy and research stakeholders.

Appendix 1

Search Strategy Scoping Review - HPV vaccination/Mental Illness

Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Daily <1946 to Current>

- 1 exp Papillomavirus Vaccines/
- 2 exp Papillomavirus Infections/ and exp Vaccination/
- 3 ((hvp or human papilloma*) and (vaccin* or immuniz* or immunis*)).mp.
- 4 1 or 2 or 3
- 5 exp Mental Disorders/
- 6 (mental* ill* or mental disorder* or psychiatric disorder* or depression or depressive disorder* or bipolar or anxiety disorder* or personality disorder* or schizophrenia).mp.

7 5 or 6

8 4 and 7

PsycINFO <1806 to Current>

- 1 exp Human Papillomavirus/ and exp Immunization/
- 2 ((hvp or human papilloma*) and (vaccin* or immuniz* or immunis*)).mp..

3 1 or 2

4 exp Mental Disorders/

- 5 (mental* ill* or mental disorder* or psychiatric disorder* or depression or depressive disorder* or bipolar or anxiety disorder* or personality disorder* or schizophrenia).mp.

6 4 or 5

7 3 and 6

Embase <1974 to Current>

- 1 exp papillomavirus infection/ and exp vaccination/
- 2 ((hvp or human papilloma*) and (vaccin* or immuniz* or immunis*)).mp.

3 1 or 2

4 exp *mental disease/

- 5 (mental* ill* or mental disorder* or psychiatric disorder* or depression or depressive disorder* or bipolar or anxiety disorder* or personality disorder* or schizophrenia).ti,ab,kw.

6 4 or 5

7 3 and 6

Cochrane Library (Advanced Search/Search Manager)

#1 [mh "Papillomavirus Vaccines"]

#2 [mh "Papillomavirus Infections"] and [mh Vaccination]

#3 ((hvp or human papilloma*) and (vaccin* or immuniz* or immunis*)):ti,ab,kw

#4 #1 or #2 or #3

#5 [mh "Mental Disorders"]

#6 (mental* ill* or mental disorder* or psychiatric disorder* or depression or depressive disorder* or bipolar or anxiety disorder* or personality disorder* or schizophrenia):ti,ab,kw

#7 #5 or #6

#8 #4 and #7

CINAHL

(MH "Papillomavirus Vaccine") OR ((hvp or human papilloma*) n3 (vaccin* or immuniz* or immunis*)) OR ((MH "Papillomavirus Infections") AND (MH Immunization))

AND

(MH "Mental Disorders+") OR (MH "Psychiatric Patients+") OR "mental* ill*" or "mental disorder*" or "psychiatric disorder*" or depression or "depressive disorder*" or bipolar or "anxiety disorder*" or "personality disorder*" or schizophrenia

Scopus

((hvp or human papilloma*) and (vaccin* or immuniz* or immunis*))

AND

"mental* ill*" or "mental disorder*" or "psychiatric disorder*" or depression or "depressive disorder*" or bipolar or "anxiety disorder*" or "personality disorder*" or schizophrenia

Web of Science Core Collection

((hvp or human papilloma*) near/3 (vaccin* or immuniz* or immunis*))

AND

"mental* ill*" or "mental disorder*" or "psychiatric disorder*" or depression or "depressive disorder*" or bipolar or "anxiety disorder*" or "personality disorder*" or schizophrenia

Dissertations and Theses Global

((hvp or human papilloma*) and (vaccin* or immuniz* or immunis*))

AND

"mental* ill*" or "mental disorder*" or "psychiatric disorder*" or depression or "depressive disorder*" or bipolar or "anxiety disorder*" or "personality disorder*" or schizophrenia

Appendix 2

Data Extraction Table

See uploaded Excel Spreadsheet

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s10389-023-01918-0>.

Author contribution All authors whose names appear on the submission made substantial contributions to the conception or design of the work; the acquisition, analysis, or interpretation of data; drafted the

work or revised it critically for important intellectual content; approved the version to be published; and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Declarations

Ethics statement This review did not require ethics approval per the University of Alberta Research Ethics Board.

Conflict of interest Keith D King has no conflicts of interest to disclose. Keith is affiliated with the University of Alberta Faculty of Nursing and Alberta Health Services (Provincial Health Authority).

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