Assessing the Burden of HPV-Associated Cancers in the United States

Supplement to ***Cancer***

Toward Using National Cancer Surveillance Data for Preventing and Controlling Cervical and Other Human Papillomavirus-associated Cancers in the US

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This supplement, known as the ABHACUS (Assessing the Burden of HPV-Associated Cancers in the United States) supplement, contains 22 articles. Together, these articles provide a comprehensive snapshot of data related to the occurrence and control of multiple cancers that have been associated with the human papillomavirus (HPV). These analyses highlight the burden of HPV-associated cancers in the US population as a whole and among vulnerable population subgroups. We anticipate that these findings will be an important resource for enhancing existing strategies for the prevention and control of HPV-associated cancers.

HPV is estimated to be responsible for 5.2% of the cancers diagnosed worldwide.[1] Virtually 100% of cervical cancers are causally associated with HPV, and there is increasing evidence of the role that HPV plays in other anogenital cancers and oropharyngeal cancers. With the recent approval and recommendation of an HPV vaccine that contains HPV–16 and HPV–18, interest in quantifying the

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spectrum and burden of cancers is heightened. The International Agency for Research on Cancer (IARC) has determined that there is sufficient evidence for the carcinogenicity of HPV–16 in the cervix, vulva, vagina, penis, anus, oral cavity, and oropharynx.[2] The IARC has found sufficient evidence of the role HPV–18 plays in cervical cancer, with limited or no evidence in other sites. Together, cervical cancer combined with the other HPV-associated cancers potentially afflicts an additional 25,000 persons every year in the US.

Worldwide and in the US, the excitement and concern surrounding the HPV vaccine has been profound. The excitement derives from the potential of the vaccine to reduce the burden of cervical cancer in countries that have no screening infrastructure as well as in countries such as the US, in which nearly 11,000 women each year are told they have invasive cervical cancer and 4000 die from this disease, despite the availability of screening. The HPV vaccine also has the potential to impact a significant proportion of other cancers for which there typically is no routine screening. Conversely, the concern is that vaccine recipients may not continue to undergo screening for cervical cancer. Yet another concern is that if vaccine uptake is lower in those groups at highest risk of developing cervical cancer, current racial/ethnic or geographic disparities could increase. We hope that the articles in this supplement will highlight the burden and disparities associated with these cancers before vaccine implementation.

This supplement includes an in-depth analysis of cancer incidence and mortality data from population-based central cancer registries that house high-quality data. Fourteen articles are based mainly on cancer occurrence, using incidence data from population-based central cancer registries that participate in the Centers for Disease Control and Prevention (CDC)'s National Program of Cancer Registries (NPCR) and/or the National Cancer Institute (NCI)'s Surveillance, Epidemiology, and End Results (SEER) program. The NPCR program, which was established through the Cancer Registries Amendment Act passed by the US Congress in 1992, began providing financial support and technical assistance to population-based central cancer registries in 1994. This program currently supports central registries in 45 states, the District of Columbia, and 3 US territories; these registries cover approximately 96% of the US population. The SEER program, which was established as a result of the National Cancer Act of 1971, currently supports 14 such registries and 3 supplemental registries, covering approximately 26% of the US population. The population-based central cancer registries collect information on all reportable cancer cases within a state or another defined geographic area. Today, the NPCR and SEER programs together cover 100% of the US population, and data regarding more than 1 million new invasive cancer cases are added each year. Medical records are the primary source of the data. Both the NPCR and SEER data are collected and reported with the use of uniform data items and codes, as documented by the North American Association of Central Cancer Registries.[3] The Institute of Medicine has recognized the importance of these 2 programs as valuable resources for studies on cancer.[4]

National and regional population coverage of cancer registry data has been achieved only within the last few years. Such coverage now allows for the unprecedented examination of rare cancers, as well as a focus on cancer burden by age, sex, race, histology, geography, and other variables. This supplement leverages US population-based cancer registries by demonstrating the current burden of disease for all 6 HPV-associated cancers in each of the individual site-specific chapters (cervical, vaginal, vulvar, anal, penile, and oropharyngeal cancers).[5–10] Before engaging in any analyses, the steering committee spent a considerable amount of time establishing common definitions. Watson et al describe the registries in more detail and provide some standardized analytic criteria used in the site-specific analyses.[11] Benard et al highlight some of the applications of cancer registry data, augmented with linked census-based socioeconomic data, thereby to our knowledge underscoring for the first time general patterns that are observed for each of the HPV-associated cancers.[12] Ryerson et al focus on the HPV-associated cancer burden for oral cavity and oropharyngeal cancers, using anatomic subsites as a proxy for HPV association.[5]

Several articles take advantage of the unique attributes of certain central cancer registries or go beyond the description of cancer occurrence. For example, data from the California Cancer Registry allow for the computation of cancer incidence rates for Asian subpopulations, some of which have been known to have the highest incidence of cervical cancer in the US.[13] Despite the 1996 recommendation to discontinue the collection of data regarding carcinoma in situ (CIS) of the cervix, the Michigan Cancer Surveillance System continued to collect these data; Copeland et al present current trends related to cervical CIS.[14] Hopehayn et al and Coughlin et al examine the burden of cervical cancer in areas with disproportionate burdens: Appalachia and those states bordering Mexico.[15,16] Additional articles use

cancer registry data to examine treatment patterns for female HPV-associated cancers and the risk of other HPV-associated cancers among cervical cancer survivors.[17] Finally, an examination of the years of potential life lost and mortality-related productivity costs of all HPV-associated cancers is presented.[18]

Because of the importance of primary prevention and screening for cancer control, another aim of this supplement is to update the reader with pertinent information related to vaccination and screening. Dunne et al describe the epidemiology of HPV and the HPV vaccine.[19] Tiro et al examine various national behavioral surveillance systems related to cervical cancer screening and vaccination.[20] Castle et al comment on the potential impact of the HPV vaccine on cervical cancer screening in the years to come.[21] Whiteside et al present an overview of what is known concerning the molecular mechanisms involved in HPV oncogenesis to help readers interpret data regarding HPV causality in noncervical cancers and understand the new molecular markers proposed for screening.[22] Gillison et al discuss the role of HPV in noncervical cancers and apply worldwide and US estimates of attributable fractions to further define the burden of HPV-associated cancers.[22] Another article comments on the role the cancer registries can play in monitoring the impact of the HPV vaccine.[23] Lastly, Khan et al describe 2 key CDC programs related to cervical cancer prevention (the Vaccines for Children Program) and screening (the National Breast and Cervical Cancer Early Detection Program) that target uninsured individuals and other vulnerable populations.[24]

A few years ago, the National Coordinating Council for Cancer Surveillance developed a national framework for cancer surveillance in the US.[25] This supplement represents the application of this cancer surveillance framework to HPV-associated cancers. To be effective, cancer surveillance requires coordination and cooperation among government, professional, nonprofit, and private organizations, and the articles contained in this supplement demonstrate the success that can be achieved through such collective efforts. Greater than 100 investigators and 30 peer reviewers from various divisions at the CDC, various parts of the NCI, population-based cancer registries (Arkansas, Arizona, California, Florida, Idaho, Illinois, Kansas, Kentucky, Louisiana, Maine, Michigan, New Mexico, New York, South Dakota, Tennessee, Texas, and Washington DC), academic institutions, and the American Cancer Society worked diligently and collaboratively over the past year and a half to produce this supplement. We wish to express our deepest gratitude to them.

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