



**Laia Bruni, MD,
MPH, PhD**

*Head of Unit,
Unit of Infections and Cancer
Information and Interventions
Catalan Institute of Oncology
(ICO)*

*L'Hospitalet de Llobregat,
Barcelona, Spain
lbruni@iconcologia.net*

The frequency of HPV infection worldwide

Epidemiological research over the last decade has demonstrated that Human Papillomaviruses (HPV) are the most widespread and common sexually transmitted infections worldwide (1). It has been estimated that more than 80% of sexually active women and men will acquire at least one HPV infection by the age of 45 years (2). However, most of them will be transient infections without any clinical impact. In women, 90% of incident HPV genital infections clear within two years (3).

To quantify and compare the burden of HPV infection across populations, in 2010 we combined 194 studies from 59 countries (4) through meta-analysis. This analysis pooled results from close to one million women with normal cytological findings who were tested for HPV with PCR techniques or Hybrid capture 2. Findings showed that on average, 12% of women worldwide had a detectable cervical HPV infection (5). The estimate varied by geography and age (Figure 1 and Figure 2). These cross-sectional measures include both incident and persistent HPV infections, and average the differences that are observed with age in a single estimate.

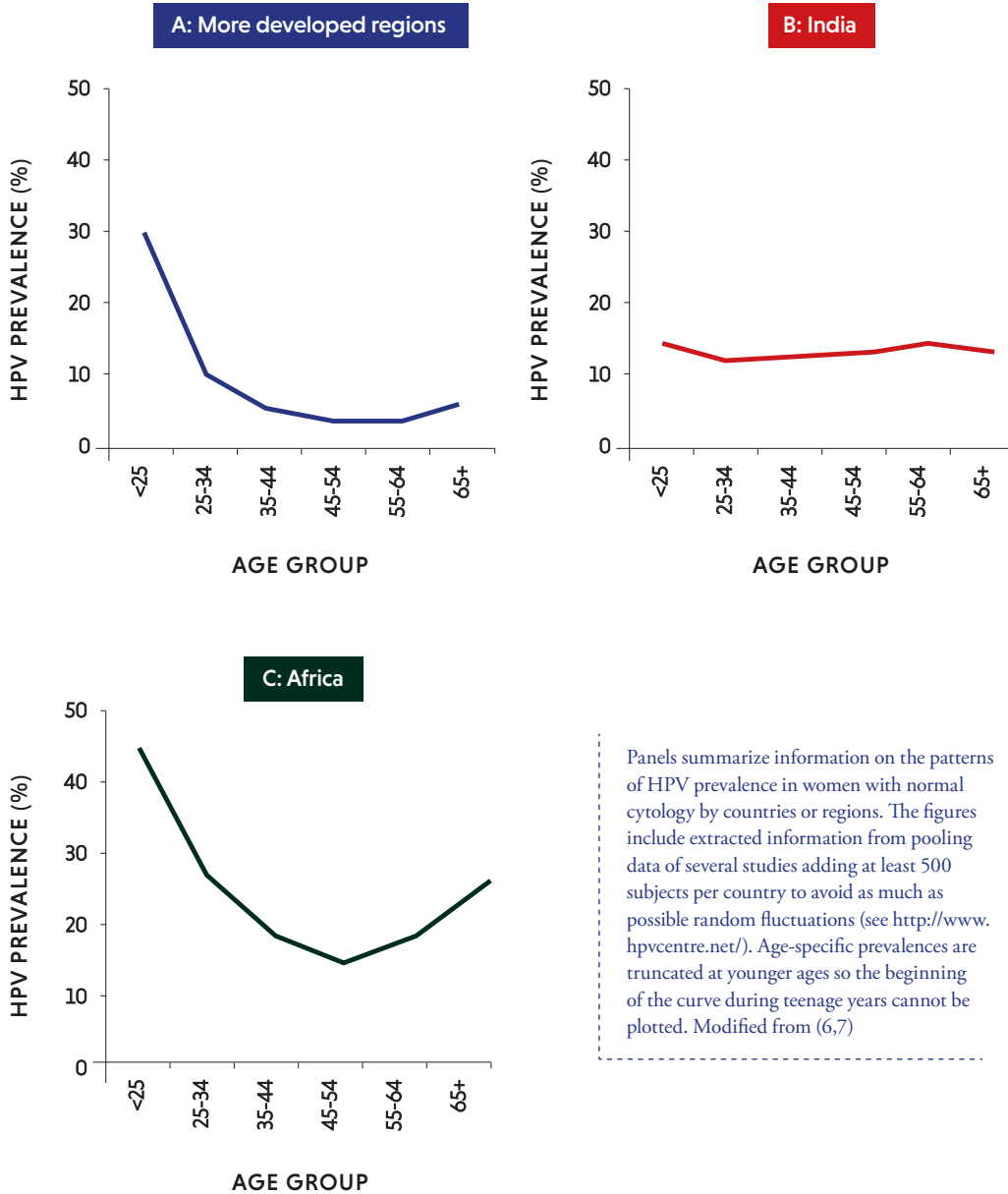
On average, 12% of women worldwide had a detectable cervical HPV infection varying by geography and age

HPV prevalence is strongly associated with age. We observed three main patterns of HPV distribution by age (Figure 1). Most of the populations showed a large peak of HPV incidence in the first years after the onset of sexual activity (mostly during adolescence and in their twenties), which decreased and stabilised thereafter (Figure 1A). The two additional patterns included a flatter pattern across age groups observed mainly in Asian countries, represented here by the data in India (Figure 1B), and a bimodal pattern (Figure 1C), especially in Latin America but also observed in Africa, with a first prevalence peak at younger ages (just after sexual debut), a lower prevalence plateau at middle ages, and a variable rebound at older ages (≥ 45 years).

Age-specific and overall HPV prevalence is significantly determined by long-term patterns of sexual behaviour of the population both in women but also in their male counterparts, and the impact of cervical cancer preventive practices (7). These age and sexual patterns translate into the observed geographical differences in the overall prevalence (Figure 2). African and Latin American regions showed higher average HPV prevalence estimates than European, Northern American and Asian regions. Country-specific adjusted HPV prevalence ranged from 1.6% to 41.9%. It is important to note that in our meta-analysis, we found that heterogeneity in the HPV detection methods and the selection and representativeness of the populations were the most influential variables to explain geographical differences.

Figure 1

HPV prevalence estimates in women with normal cytology by age group



Panels summarize information on the patterns of HPV prevalence in women with normal cytology by countries or regions. The figures include extracted information from pooling data of several studies adding at least 500 subjects per country to avoid as much as possible random fluctuations (see <http://www.hpvcentre.net/>). Age-specific prevalences are truncated at younger ages so the beginning of the curve during teenage years cannot be plotted. Modified from (6,7)

When including more recent surveys, the ICO/IARC HPV Information Centre (www.hpvcentre.net) shows increasing prevalence from the low-risk regions depicted in [Figure 1](#) and a tendency towards similar levels of baseline HPV prevalence globally (6). In recent years, with the widespread use of HPV DNA detection techniques and their inclusion in screening programmes, the number of studies reporting the prevalence of HPV infection in samples approximating the general population has rapidly expanded, as has the use of more standardised and therefore comparable methodologies. One of the main challenges in the interpretation of meta-analyses is to accommodate the methodological heterogeneity across studies.

In women with normal cytology, high-risk HPVs account for 70% of HPV infections

Another important aspect of this study's findings referred to type-specific HPV prevalence in women with normal cytology. The vast majority of detected HPV infections included high-risk HPV types. HPV 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, and 59—classified as group 1, “carcinogenic to humans” by IARC—were found to be the most common types everywhere, accounting for 70% of HPV infections. Vaccine-targeted types 16 and 18 were the most frequent types worldwide, with HPV16 being the most common type everywhere. HPV18 and other oncogenic types, such as types 52, 31, 58, 39, 56, and 51, shared similar prevalence and were the most common HPV types after HPV16. HPV31 was very common in Europe and Latin America but was much less common in North America or Asia, where it was surpassed by HPV52. HPV18 ranked in the top positions in most regions. ■

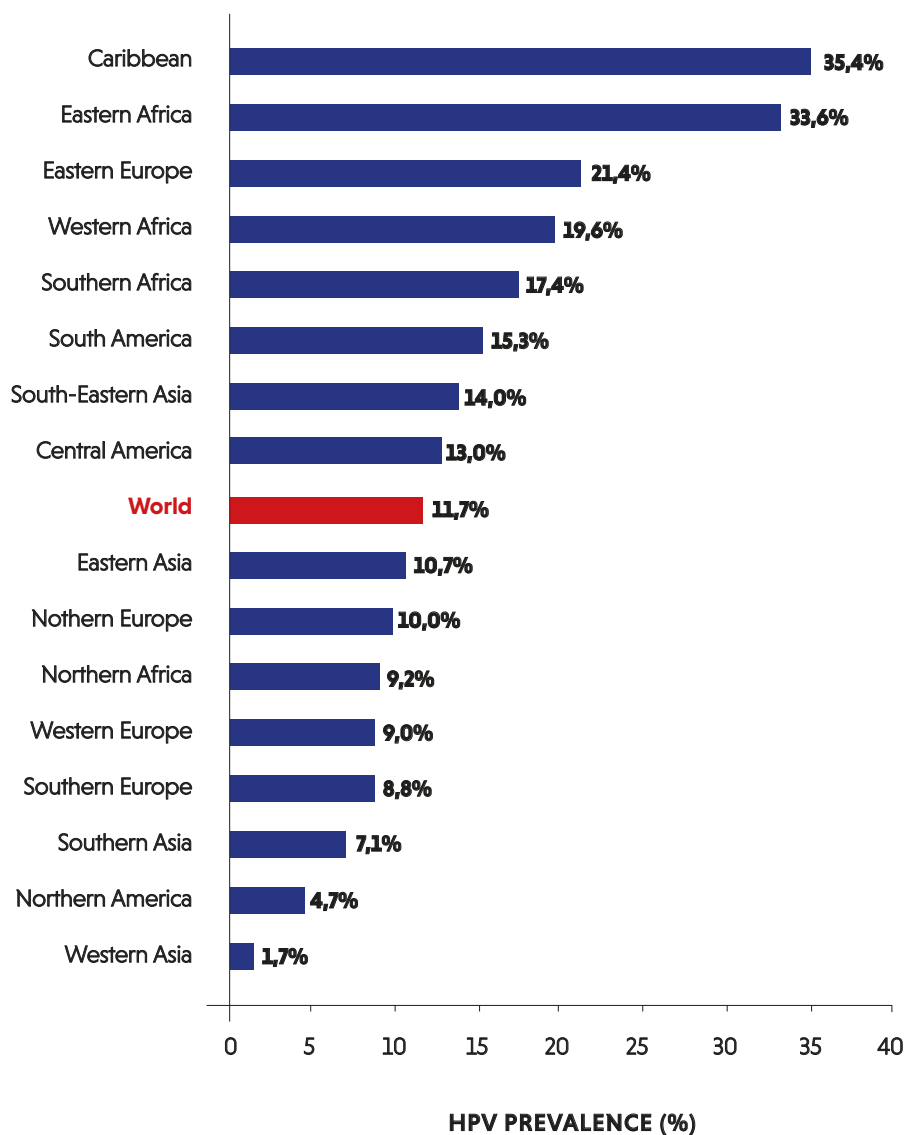
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Figure 2

HPV Prevalence in women with normal cytology by geographical regions



Meta-analysis of 1,016,719 women with negative cytological results. Adjusted HPV prevalence standardized by the regional geographical structure. Ref. (6)