Global burden of cancer attributable to infections: the critical role of implementation science

See Articles page e180

Despite significant advances in methodology and data quality since the first estimation of the global burden of cancer attributable to infections, one key fact remains: infections are responsible for at least a sixth of all cancer cases worldwide.[1–4] In the latest set of estimates in this issue of *The Lancet Global Health*, Catherine de Martel and colleagues[5] use newly released 2018 GLOBOCAN cancer incidence data to estimate for the first time age-standardised incidence rates of infection-attributable cancers at the country, regional, and global level. While many sources of uncertainty remain (including global variations in data completeness, quality of case detection and inclusion in cancer registries, and challenges in estimation of population denominators), incidence rates, as opposed to attributable fractions, provide policy makers with a more actionable metric of the burden of infection-associated cancers within and between populations over time. De Martel and colleagues report an astounding 25 cases of infection-attributable cancer per 100 000 people in 2018, with global variation ranging from 38 and 33 cases per 100 000 in eastern Asia and sub-Saharan Africa, respectively, to 14 cases per 100 000 in northern Europe and western Asia.

Equally as important as the magnitude of the public health burden highlighted in the Article by de Martel and colleagues is the emphasis they place on the ever-improving landscape of evidence-based interventions to combat this persistent, yet preventable, fraction of the global burden of cancer. The four main oncogenic agents responsible for approximately 90% of the infection-attributable cancer cases worldwide—*Helicobacter pylori*, human papillomavirus (HPV), hepatitis B virus (HBV), and hepatitis C virus (HCV)—are either vaccine-preventable (HPV, HBV) or treatable (*H pylori*, HCV) infections, and all are amenable to some level of behavioural intervention focused on reducing infection transmission. Consideration of the role of HIV as a co-factor in the incidence (and mortality) of many infection-associated cancers—currently not taken into account in the estimates by de Martel and colleagues—further expands our opportunities to reduce the burden of infection-associated cancers through coordinated HIV prevention and early treatment strategies.

The pressing question to the global community of researchers, policy makers, health-care delivery specialists, public health programmers, and clinicians now is how can we accelerate sustainable implementation of these evidence-based interventions such that the sixth version of the global burden of infection-associated cancer estimates will reflect achievable progress? WHO recently released its plans towards ending viral hepatitis and eliminating cervical cancer.[6,7] If achieved, these combined efforts will have an enormous impact on the incidence rates of cancers attributable to HPV, HBV, and HCV. To date, great strides have been made in hepatitis B vaccination, but progress to achieve widespread coverage of HPV vaccination has been slow in many world regions[8] and more research is needed on the use of antibiotic treatment for *H pylori* in the reduction of cancer. Global disparities in cancer incidence and mortality persist not due to lack of evidence-based options for the prevention and control of these cancers, but in large part due to measurable gaps between evidence and practice in cancer control, including management of infectious diseases. It is clear, then, that meeting these calls to action will necessarily require a fundamental change in prioritisation of research efforts to foster the development of "practice-based evidence" for successful adoption and scale-up of coordinated programmes of cancer control.

Dissemination and implementation science, or implementation research, fill this critical gap by providing a formal framework to adapt evidence-based interventions for effective implementation in diverse settings and to evaluate the implementation process in order to estimate, understand, and respond to successes and failures in programme adoption, scale-up, and sustainability. Dissemination and implementation science is formally defined as the scientific study of methods to promote the systematic uptake of evidence-based practices into real-world contexts to prevent disease and improve the quality and effectiveness of health care services.[9] If our research is going to make an impact on policy and practice or inform the scale-up and sustainability of programmes—critical to vaccination and widespread treatment for infectious

agents in cancer—then it needs to be conducted under the conditions in which interventions are expected to be implemented, including management and financing.[10] This is particularly important in low-income and middle-income countries where resource constraints require innovative approaches to implementing evidence-based practices, such as task shifting, ensuring cold chain, affordability models, and cross-sector collaborations, which must be systematically explored and evaluated in a given context.[11]

Effective implementation of cancer-associated infection control should be prioritised by both funders and policy makers. Infectious disease control programmes and national cancer control plans should cease being siloed, and systems approaches should be employed to identify synergies across health-care platforms for sustainable delivery opportunities (eg, emergency rooms, maternal health programmes, outreach campaigns, school-based campaigns, etc). While the strategies to meet this demand for comprehensive disease control may be debated, surely we can all agree that no health intervention—no matter how efficacious it is found to be in clinical trials and other controlled research settings—can work if it is not used, either because people cannot use it (access, affordability, etc) or will not use it (knowledge, health perception, etc). Closing the evidence-practice gap will be essential to combatting these infection-attributable cancers and to making progress in the ongoing elimination challenges.

I declare no competing interests.

Anne F Rositch
arositch@jhu.edu

Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD 21205, USA

1 Pisani P, Parkin DM, Munoz N, Ferlay J. Cancer and infection: estimates of the attributable fraction in 1990. *Cancer Epidemiol Biomarkers Prev* 1997; **6:** 387–400.
2 Parkin DM. The global health burden of infection-associated cancers in the year 2002. *Int J Cancer* 2006; **118:** 3030–44.
3 de Martel C, Ferlay J, Franceschi S, et al. Global burden of cancers attributable to infections in 2008: a review and synthetic analysis. *Lancet Oncol* 2012; **13:** 607–15.
4 Plummer M, de Martel C, Vignat J, Ferlay J, Bray F, Franceschi S. Global burden of cancers attributable to infections in 2012: a synthetic analysis. *Lancet Glob Health* 2016; **4:** e609–16.
5 de Martel C, Georges D, Bray F, Ferlay J, Clifford GM. Global burden of cancer attributable to infections in 2018: a worldwide incidence analysis. *Lancet Glob Health* 2020; **8:** e180–90.
6 World Health Organization. Draft: global strategy towards the elimination of cervical cancer as a public health problem. Geneva: World Health Organization, 2019. https://www.who.int/docs/default-source/documents/cervical-cancer-elimination-draft-strategy.pdf (accessed Dec 13, 2019).
7 World Health Organization. Global health sector strategy on viral hepatitis 2016-2021. Geneva: World Health Organization, 2016.
8 Bruni L, Diaz M, Barrionuevo-Rosas L, et al. Global estimates of human papillomavirus vaccination coverage by region and income level: a pooled analysis. *Lancet Glob Health* 2016; **4:** e453–63.
9 Peters D, Tran N, Adam T, Alliance for Health Policy and Systems Research, World Health Organization. Implementation research in health: a practical guide. Geneva: World Health Organization, 2013.
10 Alonge O, Rodriguez DC, Brandes N, Geng E, Reveiz L, Peters DH. How is implementation research applied to advance health in low-income and middle-income countries? *BMJ Glob Health* 2019; **4:** e001257.
11 Yapa HM, Barnighausen T. Implementation science in resource-poor countries and communities. *Implementation Sci* 2018; **13:** 154.