Modelling cervical cancer elimination

Published Online
October 2, 2018
http://dx.doi.org/10.1016/S2468-2667(18)30189-0

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In May, 2018, at the World Health Assembly, the Director-General of WHO made a global call for action towards the elimination of cervical cancer as a public health problem.[1] The present focus of this initiative is to develop a global strategy and supporting approaches that can achieve this ambitious goal in every country within the 21st century.

In their Article in *The Lancet Public Health*, Michaela Hall and colleagues[2] take advantage of an extensively validated dynamic model of human papillomavirus (HPV) vaccination, natural history, and cervical screening[3] to estimate the timeframe until cervical cancer elimination in Australia. Depending on the incidence threshold used to define public health elimination, cervical cancer will be eliminated by 2020 (based on a rare cancer threshold of fewer than six new cases per 100 000 women annually) or by 2028 (based on a lower threshold of four new cases per 100 000 women annually). The authors also predict that the mortality associated with cervical cancer could decrease below one death per 100 000 women by 2034.

Beyond the specific merit of modelling cervical cancer elimination in Australia, the study by Hall and colleagues exemplifies a process that is likely to be replicated in most countries when they address elimination of cervical cancer. Worldwide, mathematical modelling has become a standard approach in the planning and evaluation of public health interventions.[4] To be reliable, model based-projections must use valid data and realistic assumptions. From that perspective, the Australian modelling team had access to the best possible sets of data that were essential to make their projections.[3] Furthermore, the routine monitoring of the prevalence of HPV, precancerous lesion detection rates, cervical cancer incidence, and the performance of HPV vaccination and screening programmes will enable adjustments of the predictions where necessary.

At the global level, countries seeking to design, plan, and evaluate their own programmes for cervical cancer elimination can, in theory, rely on model-based projections that are informed by local datasets. However, in most low-income and middle-income countries (LMIC), where elimination remains a more distant prospect than predicted in Australia by Hall and colleagues, access to modelling is not to be taken for granted. Most published models have been primarily developed by international or academic institutions and have been used to assess the effects of preventing cervical cancer in high-income countries.[5] In some cases, these models have been adapted to predict the expected effects of preventing cervical cancer in LMIC.[6,7] Evidently, access to open-source, validated, and well documented models to quantify the long-term medical, societal, and economic benefits of vaccination and screening in LMIC is essential. Technical guidance and transfer of modelling skills to LMIC must also be addressed.

A more basic concern is the poor availability of data on cervical cancer incidence worldwide, particularly in LMIC. Although the feasibility of cervical cancer elimination, the definition of aspirational targets, and tailored in-country strategies might be driven by mathematical models, sensitivity analyses indicate that trends in the incidence of cervical cancer have a greater effect on future global estimates of elimination than other model parameters. At present, the likely future of the incidence of cervical cancer in most LMIC remains unknown. Taking the 47 constituent countries of sub-Saharan Africa as a regional example, only Uganda (Kampala) and Zimbabwe (Harare) have longstanding high-quality population-based cancer registries that are capable of providing such crucial information, and both report increasing trends in the incidence of cervical cancer.[8,9] On a global scale, about a third of countries (68 countries) have high-quality national (or subnational) data on cancer incidence[10] and about a quarter of countries (51 countries) can report all-cause mortality data to WHO;[11] in both instances, most of these countries are classified as high-income.

Given the global status of recorded health data in general, a compelling case for a shift away from the ongoing investments in global health estimations and towards building the capacity of countries to collect and analyse their own data was made in 2018 by Ties Boerma and colleagues.[12] The growing burden of cancer worldwide reinforces the need for national implementation of tailored surveillance, with incidence—alongside risk factor and mortality data—as a core indicator of cancer surveillance programmes that are built around population-based cancer registries. These data systems permit governments to

effectively monitor progress in national cancer control programmes.

Cancer data inequities also need to be addressed in LMIC. Registries are often overlooked at the planning phase of cancer control, and their sustainable development requires their complete integration into broader political commitments, including the 2017 WHO Cancer Resolution, which was unanimously adopted by governments in 2017, to scale up and implement national cancer control programmes. Technical assistance is available to governments that seek to instigate surveillance plans, through the Global Initiative for Cancer Registry Development, which is a partnership of leading cancer organisations that aims to radically increase the quality, comparability, and use of cancer data in developing countries in informing their cancer policies and cancer research.

For the **Global Initiative for Cancer Registry Development** see http://gicr.iarc.fr

In conclusion, the study by Hall and colleagues is a clear example of how modelling can contribute to assessing national progress in cancer control. Access to models and high-quality data are key in enabling countries to plan and effectively monitor health problems generally, and in tailoring preventative actions that one day will lead to the global elimination of cervical cancer as a major public health problem.

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IB reports grants from the Bill & Melinda Gates Foundation and the European Commission (CoheaHr). FB declares no competing interests.

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