INTERNATIONAL NETWORK
FOR EPIDEMIOLOGY IN POLICY
Integrity, Ethics, and Evidence in Policies Impacting Health

The Importance of Epidemiologists and Epidemiological Research in the Context of COVID-19
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The International Network for Epidemiology in Policy (INEP) is a consortium of 24 epidemiological societies based around the globe (https://www.epidemiologyinpolicy.org/). INEP's mission is to promote the use of integrity, equity, and evidence in health-related policy making.

Epidemiology is the study of the distribution and determinants of infectious or chronic diseases. The purpose of this letter is to highlight the role of epidemiologists in the generation of high-quality research to combat SARS-CoV-2 and COVID-19. Several organizations are calling for such research to answer a multitude of pressing questions about the pandemic. These organizations include the Cochrane Collaboration,[1] Canadian Institutes of Health Research,[2] National Institute for Health and Care Excellence,[3] and National Institutes of Health,[4] among others.

What do epidemiologists do? Epidemiologists are trained to conduct high-quality research in conformity with the tenets of evidence-based medicine and practice.[5–8] Epidemiologists provide methodological and translation-to-action research expertise to develop and conduct studies[7] that are urgently needed to limit the spread of SARS-CoV-2 and COVID-19. Examples of these studies include vaccine trials for SARS-CoV-2, efficacy trials to examine pharmaceutical and non-pharmaceutical interventions for COVID-19, observational studies to identify and protect vulnerable subgroups of the population (e.g., seniors[9], people of color,[8] essential workers,[9] institutionalized populations[10]), and population-level studies to obtain community data for use in disease models that are designed to predict the future incidence and prevalence of COVID-19. Epidemiologists can also develop studies to investigate items such as infection prevention; acute and chronic supportive care; morbidity and mortality; and short- and long-term health and social consequences for recovered people, their families, and communities. The need for epidemiological studies is timely as jurisdictions move away from strict lockdowns and social ("physical") distancing.

Epidemiologists typically undertake their studies in multidisciplinary teams composed of scientists from diverse backgrounds such as virology, medicine, and public health. Multidisciplinary teams are needed to help reduce the high levels of COVID-19 research waste,[9] which have led to the retraction of numerous published scientific papers, including articles on the effectiveness of masks for preventing SARS-CoV-2 spread,[10] hydroxychloroquine or chloroquine with or without a macrolide for treating COVID-19,[11] and the association between angiotensin-converting enzyme inhibitors or angiotensin II receptor blockers with in-hospital deaths from COVID-19.[12] Epidemiologists can communicate the prudence of waiting for well-designed and executed studies as an alternative to basing clinical or policy decisions on incomplete or poor evidence.

Epidemiologists can lead the design and conduct of rigorous community- or population-level surveillance studies that characterize the prevalence of pre-symptomatic or asymptomatic SARS-CoV-2 infections and subsequent health-related outcomes. To date, INEP knows of no coordinated international effort to comprehensively research major SARS-CoV-2 transmission hotspots. In regions where SARS-CoV-2 diagnostic testing is limited due to infrastructure constraints, or targeted solely at high-risk groups such as healthcare workers, epidemiologists can randomly sample individuals for testing in an effort to obtain accurate prevalence data. Iceland has already done a population-level testing study using a three-pronged recruitment strategy (targeted, random, and by invitation),[11] and other nations are planning similar efforts. Policy makers will hopefully be able to use the data from such studies to more rapidly identify strategies to

forestall subsequent waves of SARS-CoV-2 infection, once scientists resolve issues about the performance and interpretation of antibody tests.[13]

Carefully-conceived and well-conducted epidemiological research offers an antidote to misinformation and disinformation about SARS-CoV-2 and COVID-19. Epidemiologists are needed more than ever to provide unbiased evidence to counter conspiracy theories and false claims about the effectiveness of vaccines and treatments.[14] INEP calls on epidemiologists around the world to serve as voices of reason and moderation against unnecessary hysteria and sensationalism about the pandemic—whether promoted through social media or traditional media outlets such as radio, print, and television.[15] Epidemiologists should also speak out when necessary and provide unbiased evidence to refute xenophobia arising out of the pandemic.[16] At the same time, epidemiologists should support free and open discussion/debate, rather than censorship, as the optimal means of engaging all relevant stakeholders in the formulation of policy.

Table 1 below lists a series of research priorities for epidemiologists during the pandemic. INEP encourages epidemiologists from around the world to form multidisciplinary partnerships and tackle these priorities.

Table 1. Research Priorities for Epidemiologists during the SARS-CoV-2 and COVID-19 Pandemic

Immediate Priorities
1) Reduce morbidity and mortality during the COVID-19 pandemic.
a. What is the optimal means of defining a case (including sensitivity and specificity of case definitions)?
b. Can we provide more meaningful metrics of area-based case-reporting, including reporting delay, incubation-period delay, and testing-frequency adjusted incidence?
c. What environmental factors, e.g., air pollution, population density, are risks for human SARS-CoV-2 infection acquisition and COVID-19 morbidity and mortality?
d. What is the role of underlying comorbid disease in human SARS-CoV-2 infection acquisition and COVID-19 survival?
e. What genetic/biological/social factors may predispose people to severe COVID-19 symptomatology or death (e.g., sex, race/ethnicity)?
f. What behavioral interventions (e.g., physical activity, nutrition, smoking, and alcohol consumption) are associated with improved survival and health-related quality-of-life outcomes from COVID-19?
g. What factors are associated with pre-symptomatic and asymptomatic COVID-19 viral shedding?
h. How do environmental conditions alter exposure pathways and anatomic exposure routes of SARS-CoV-2 transmission (e.g., nasopharyngeal droplet, airborne, fomite, oral fecal, blood, sweat, other body fluids)?
i. What strategies can limit environmental transmission in high-risk settings (e.g., hospitals, intensive care units, seniors' residences, long-term care and aged-care facilities, correctional facilities, public transport)? This includes access to personal protective equipment for persons who work in high-risk settings.
j. Does recovery from COVID-19 confer immunity to reinfection, or pose a risk of more severe disease if re-infected[13,17,18] with SARS-CoV-2? How long does the immunity last? If re-infection does occur, then what is the nature of the subsequent illness in terms of severity, symptomatology, and recovery time?

k. What are the most effective and efficient methods for quarantining the close contacts of persons with COVID-19, and for monitoring quarantine behavior?

l. What is the diagnostic accuracy of tests used for identifying active and past infection with SARS-CoV-2 (e.g., sensitivity and specificity of RT-PCR tests and of commercial antibody tests)?

m. What is the effectiveness and safety of proposed treatments for COVID-19? By extension, what are the data about the role of medications and SARS-CoV-2 susceptibility?

n. What are potential long-term effects of experimental treatment regimens for COVID-19?

o. Given observations that fecal shedding may persist beyond oral shedding of the virus in some age groups,[31] what is the role of virus transmission via fecal-oral routes? What proportion of cases might be attributed to this route of transmission, and what environmental settings are at most risk of fostering such transmission?

2) What is the efficacy and effectiveness of different vaccine candidates to prevent infection from SARS-CoV-2? What is the role of host genome and possible disruption of environmental exposures in vaccine response?

3) How do disease modelling approaches compare to actual events (e.g., comparability of predicted and actual deaths over a certain time period)?

4) How can public health authorities establish nation-specific COVID-19 case registries that respect privacy guidelines?

5) Are there reasonable alternatives to population-wide lockdowns and physical (social) distancing policies?

a. What criteria/health indicators can be used to determine if jurisdictions should ease or resume population-wide lockdowns and physical (social) distancing policies?

b. What are the alternatives to population-wide lockdowns and physical ("social") distancing, and what is the evidence for the efficacy/effectiveness of such alternatives (e.g., mask wearing[32])?

c. How can vulnerable groups such as senior citizens,[33] low income recipients,[34] racial/ethnic minorities,[8] or substance abusers[35] be protected from infection?

Intermediate and Longer-term Priorities

1) What are key factors in case under-reporting and case ascertainment differences between countries?

2) What was the total of excess deaths during the pandemic period not caused by COVID-19? What other medical conditions went untreated, what were the end results of this lack of treatment, and how can we implement plans to avoid this problem in the future?

3) What public health policies most reduce the number of total infection rates and total death rates from COVID-19 in different jurisdictions (e.g., mandatory versus optional use of facemasks in public areas).

4) Identify the public health messages and messaging protocols that are most effective in educating and incentivizing the general public to take preventive action against SARS-CoV-2/COVID-19.

5) Investigate the degree of rigour by which different jurisdictions handled case identification, case isolation, quarantine of case contacts, and enforcement of quarantine. What were the end results of these differences?

6) Assess the extent to which population-level lockdowns and physical ("social") distancing are effective.

   a. What were the short- and long-term adverse health consequences of population-level lockdowns and physical (social) distancing (e.g., depression, anxiety,[36] escalation of domestic violence,[37] delays in immunization schedules for children,[38] loss of household income, switching to lower efficacy cancer therapies to redirect hospital resources to COVID-19[39])? How did these outcomes compare with the health benefits of the policy?

   b. In the event governments opt for population-level lockdowns and physical (social) distancing policies in the future, what concomitant support systems or interventions will be necessary to counteract the adverse consequences of social distancing, especially with regard to vulnerable sub-groups of the population?

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