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TITLE:
Epidemiology studies in critical care

ABSTRACT:
Epidemiology studies are an essential part of clinical research, often forming the foundation for studies ranked more highly in the hierarchy of evidence-based medicine. Studies of sepsis to date have been conducted on local, regional, national and international scales, with the majority conducted in the past 5 years. Longitudinal epidemiology studies convey an important additional aspect of the healthcare burden from disease, and may additionally serve to compare the effectiveness and efficiency of healthcare systems, to examine specific patient care strategies and to perform quality control analyses.

Value of epidemiology studies in critical care:
Epidemiology studies are often overlooked in the current world of evidence-based medicine. The studies do not rank in the hierarchy of clinical trial data, they are not often considered to influence clinical care and they may be considered merely 'descriptive' of a medical problem. Despite the limitations of epidemiology studies, they remain a critical component of biomedical research without which the remaining 'higher order' studies, such as cohort studies and controlled trials, could not be effectively conducted.
Critical care epidemiology studies, of which the current study from the Intensive Care National Audit and Research Center database is a good example [1], serve a variety of purposes that advance the mission of both practicing intensive care unit (ICU) physicians and scientific researchers. At the most basic level, epidemiology studies convey important information about disease characteristics, the type of patients affected, and the frequency and outcomes of the disease. Importantly, these studies keep medical events in perspective. Epidemiology studies report and reinforce the frequency of deaths related to atherosclerotic disease, cancer and sepsis in developed countries, and of deaths from a variety of infectious diseases and sepsis in developing countries. These reminders are essential in an era of increasing media attention on diseases such as severe acute respiratory syndrome and avian influenza that are less immediate public health concerns.
Descriptive epidemiology studies also inform intensivists about the type of conditions they should expect to encounter in their ICU (i.e. the frequency of disease) and they guide clinicians in treating patients by reporting information on relative causality (such as Streptococcus pneumoniae being the most common cause of community-acquired pneumonia). Local and regional epidemiology data have long been disseminated to tailor therapy for infectious diseases based on local organism resistance patterns. In contrast, larger epidemiology studies are invaluable for determining healthcare resource allocation and for the design and conduct of both observational and interventional clinical trials.

Value of longitudinal epidemiology studies:
Longitudinal studies add a vitally important characteristic to point-prevalence or time-limited epidemiology studies. They permit characterization of temporal changes in affected patients and in disease characteristics, such as in the frequency, complications and outcomes of a disease. Longitudinal studies also permit more detailed planning for healthcare resource allocation, in particular by matching temporal changes in disease or disease-specific outcomes with known changes in underlying patient populations (e.g. HIV-positive) or according to rendered treatments (e.g. antibiotics, chemotherapeutics). Longitudinal epidemiology studies on a local level can be utilized for quality control purposes, to assess the impact of changes in healthcare delivery. In general, longitudinal studies are invaluable for understanding how a disease is changing and how it affects patients in the studied healthcare system.

Institutional, regional, national and international epidemiology studies:
Epidemiology studies that cross physical and geopolitical borders permit broader comparisons than would be possible for observations that are geographically constrained. Most simply, they allow comparisons to be drawn for diseases according to different pressures, such as differing underlying patient populations and different risk factors for disease. More broadly, when

epidemiology studies are conducted they longitudinally create the ability to examine healthcare quality and effectiveness of resource utilization on a regional scale or a national scale in relation to scientific advances. Data of this kind are essential for determining the optimal ICU utilization for a given condition, tracking the effectiveness and efficiency of healthcare systems according to changes in disease incidence or outcome, and for planning research studies according to the characteristics of the disease.

Large-scale longitudinal studies in sepsis:
In the present issue of Critical Care, investigators from the Intensive Care National Audit and Research Center report the results of a longitudinal study of severe sepsis encompassing England, Wales and Northern Ireland in the past 10 years [1]. These data are indispensable as a baseline assessment for a common and lethal condition in the respective countries, where severe sepsis occupies more than one-quarter of ICU beds and carries fatality rates approaching 50%. The data confirm previous secular trends in the incidence and mortality of sepsis [2-4] and define the severity of disease and heterogeneity of case-mix typical of sepsis. With these data in hand, scientists and healthcare administrators may assess the impact of community interventions designed to reduce the incidence of sepsis or medical therapies that may improve outcomes with sepsis.
The value of these data is even more apparent in a system of national healthcare insurance, where tracking of health-related outcomes related to resource allocation is necessary to ensure appropriate healthcare delivery. Other large-scale epidemiology studies exist for sepsis, either by sampling locally, [5] regionally [3,6-9], nationally [4,10-15] or internationally [16,17]. Few available studies cross systems of care or permit direct comparisons of healthcare delivery strategies. Those studies that include longitudinal data provide important additional insights into sepsis epidemiology while minimizing seasonal influences. Continued investigation is necessary to optimize healthcare quality and to compare the effectiveness and efficiency of different ICU utilization and care strategies, both nationally and internationally.

Abbreviations:
ICU = intensive care unit.

Competing interests:
The authors declares that they have no competing interests.