Review

"SPEECH": A literature based framework for the study of past epidemics

Antonis A. Kousoulis [a,b,*], Imogen Grant [b]

[a] Vaccine Confidence Project, London School of Hygiene & Tropical Medicine, London, UK
[b] Mental Health Foundation, London, UK

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ABSTRACT

Introduction: This paper details the development of a public health research framework for the holistic examination of past epidemics. The Covid-19 pandemic has further highlighted the influence of a breadth of determinants of infectious disease morbidity and mortality. These are multidisciplinary and act in conjunction with each other. Hence, a broader interdisciplinary framework is required to conduct a comprehensive in-depth study of past epidemics and pandemics which focuses, not only on the epidemiology, but also on the broader political, social, economic and cultural factors which impact upon the public's risk perception and response to infectious disease outbreaks.

Methods: A literature review was performed based on a systematic approach framework. Publications of interest were identified through a search of PubMed/Medline, the Cochrane Library and Google Scholar, the latter especially for additional grey literature, and reference lists were hand searched for further articles to include. Key determinants were extracted and classified based initially on the European Core Health Community Indicators (ECHIs), and further refined through narrative summary.

Results: A total of 45 studies were identified, 13 of which fulfilled the inclusion criteria of comprehensive secondary research. A total of 26 determinants were extracted from the 13 publications, including microbiological, socio-economic, political, meteorological and genetic determinants. Of the 26 identified factors, those prioritised were the 16 most relevant to the aim of applying a public health, rather than a narrow medical, lens to studying epidemics through considering a broader ecosystem of influences. The 16 determinants were summarised and categorised into the SPEECH (Society and Politics, Economy, Epidemiology, Culture, Healthcare and Public Health) framework.

Conclusion: The interdisciplinary SPEECH framework set out in this paper provides the structure for the systematic and holistic in-depth investigation of past epidemics, incorporating the multitude of contextual factors which impact upon infectious disease outbreaks and the public's response to them at a national level.

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* Correspondence to: Unit 2, 193-197 Long Lane, SE1 4PN, London, UK.
E-mail address: antonis.kousoulis@lshtm.ac.uk (A.A. Kousoulis).

Introduction

Disease incidence has historically served as an index and comment on society [1]. Current public health thinking on the determinants of health focuses on the life course through examining the material and social conditions in which people are born, grow, work, live and age, and on the structural drivers of these conditions - the distribution of power, money, and resources [2]. It is known that vulnerable groups are disproportionately affected by infectious diseases [3] and the level and distribution of wealth within a society play a significant role in determining vulnerabilities to communicable diseases [4]. Such social inequalities have persistently influenced both the distribution of emerging diseases and the course of disease in those affected by them [5].

The significance of such social determinants and structural drivers of health inequalities have been thrown into sharp relief during the current Covid-19 pandemic and both academia and activism have called for a social determinants approach in response [6–8]. However, despite a robust evidence base, these determinants are still often neglected when governments and healthcare systems are designing interventions. Their interplay with how the public respond to measures and the growing evidence that emotions have a key role to play in the uptake of public health interventions during public health emergencies is even more neglected, despite increasing awareness of the significance of emotional determinants within public health [9,10].

Significant strides have been made in the past decade in terms of what types of evidence are being considered when addressing epidemics [11]. The influence of a broader mix of factors – including and beyond the social and economic – are now recognised as determinants of infectious disease morbidity and mortality [12]. Effectively addressing outbreaks means no longer debating whether to focus on social or medical, biological or environmental factors but to take multidisciplinary approaches considering all these factors in conjunction with each other [12]. Recent research on Covid-19 has begun to examine the role of social determinants on disease morbidity and mortality [13–15]. However, most of the research on the determinants of infectious disease spread, for example following the much studied flu pandemic in 2009, has largely focused on the determinants of disease severity and outcomes [16,17], or on vaccine acceptance [18,19] and communication strategies [20].

Hence, a broader interdisciplinary framework that includes social and other contextual factors [21] is necessary to enable a more systematic and comprehensive in-depth study of past epidemics and, in turn, to inform future action. The framework set out in this paper was developed to facilitate holistic study of historical infectious disease outbreaks at a national level incorporating the multifaceted factors that determine infectious disease spread, morbidity and mortality.

Methodology

Rapid review methodology to develop a framework

A literature review was performed based on a systematic approach framework proposed by the WHO and used to inform health policy and systems [22]. This methodology was utilised in order to provide actionable and relevant evidence in a timely and cost-effective manner [23]. The review followed, to the extent possible, the PRISMA guidelines and standards [24].

Publications of interest were identified through a search of PubMed/Medline, the Cochrane Library and Google Scholar, the latter especially for additional grey literature. A staged searching approach was used first to identify existing systematic reviews, then studies and publications with other designs that provided the most rigorous secondary or relevant primary evidence. The search was streamlined using the following eligibility criteria: (i) limited by date (a nominal limit of the past 30 years – since 1988 – was used); (ii) language (publications only in English); (iii) study design (secondary research, or primary research with a clear focus on non-clinical determinants). No contact with authors was attempted. Search terms were selected from both Medical Subject Headings (MeSH) and other glossary databases. The identified terms included: (epidemics OR pandemics) AND (social determinants of health OR socioeconomic factors OR economic recession OR one health OR politics OR public health).

Data extraction was limited by the scope of the review, and a bespoke data abstraction framework was used as a template for recording significant study characteristics, with a focus on relevant neglected determinants. The extracted key determinants were recorded using a simple bespoke form, and subsequently, classified under broad categories under the wider societal and community factors of a standard socio-ecological framework [25]. Initially, the common European Core Health Community Indicators (ECHIs) [26,27] were used to inform this classification. ECHIs include four main categories of indicators understood as one category for the relevant outcome (health status) and three for its determinants (demographic and socioeconomic factors, health systems including health promotion, and determinants of health). However, further classification was undertaken to combine the determinants under categories that would more logically and precisely apply to the study of disease outbreaks. An iterative approach leading to a narrative summary was employed for the results, as is common in rapid reviews [22], and no further statistical or other analyses were undertaken. As the studied research was predominantly secondary and no fatally flawed studies, as suggested in the framework by Dixon-Woods et al. [28], were expected, no further quality appraisal was conducted.

To keep the historical research relevant to public health policy, practice and research, the evidence was synthesised using a "map" of the key themes and topics addressed by previously published primary and secondary research [29].

Results

A total of 41 studies were identified through the database search, nine of which fulfilled the criteria of comprehensive secondary research. A further four publications were identified through a hand search of the references of the included studies, and searches in the grey literature. A brief overview of the included studies based on the limited data extraction is provided in Table 1.

Of the included studies, six addressed the 'health systems' category of the ECHI framework, eight addressed 'determinants of health', eight addressed 'demographic and socio-economic factors', and five address the 'health status' category. A mapping of those studies against the related ECHI categories and the areas of interest to this review is also included in Table 1.

A total of 26 determinants were extracted from the 13 included publications [Table 2]. These factors include microbiological, socio-economic, political, meteorological and genetic determinants. Sixteen of those were most relevant to the aim of applying a public health, rather than medical, lens to studying epidemics through considering a broader ecosystem of influences. Those were prioritised for inclusion in the framework.

Discussion

A framework to study past epidemics (SPEECH)

The main focus of this review is not solely on epidemiology, but also the political, social, economic and cultural factors that impact perceptions of risk and shape responses to infectious disease

Table 1
Overview of included publications identified through a rapid literature review.

Lead Author	Year	Publication Type	ECHI Categories Addressed	Primary area of study of determinants
Farmer[5]	1996	Secondary, Perspective	Health systems, Determinants of health	Society & Politics, Economy
Stephens et al.[47]	1998	Expert panel	Demographic and socio-economic factors, Health systems	Epidemiology, Healthcare & Public Health
Smolinski et al.[48]	2003	Book	Health systems, Determinants of health	Epidemiology, Healthcare & Public Health
Morens et al.[49]	2004	Secondary, Review	Demographic and socio-economic factors, Determinants of health	Society & Politics, Economy, Culture
Phua et al.[44]	2005	Secondary, Overview	Health status, Demographic and socio-economic factors	Economy, Healthcare & Public Health
World Health Organisation[50]	2005	Report	Health systems, Determinants of health	Epidemiology, Society & Politics
Morens et al.[35]	2008	Secondary, Review	Demographic and socio-economic factors, Determinants of health	Society & Politics, Economy, Culture
Brien et al.[51]	2012	Secondary, Review	Health status, Demographic and socio-economic factors	Society & Politics, Culture
Lowcock et al.[16]	2012	Secondary, Routine data	Health status, Demographic and socio-economic factors	Society & Politics, Economy, Epidemiology
Kousoulis et al.[52]	2014	Secondary, Routine data	Health status, Determinants of health	Epidemiology, Economy
Quinn et al.[53]	2014	Secondary, Review	Health status, Demographic and socio-economic factors, Health systems	Society & Politics, Economy, Culture
Grantz et al.[54]	2016	Secondary, Routine data	Demographic and socio-economic factors, Determinants of health	Society & Politics, Economy, Culture
Quick et al.[41]	2018	Book	Health systems, Determinants of health	Society & Politics, Healthcare & Public Health

Table 2
Population factors involved in epidemic emergence and spread.

Animal disease ecology	Media and social media influences
Breakdown of public health measures	Microbial adaptation and change
Changing ecosystems	Poverty and social inequality
Climate	Preparedness (planning, governance, surveillance)
Confidence between systems actors	Presence of genes from human strains
Economic development and land use	Public trust in governmental interventions
Economic recession and austerity	Season
Education	Severity of illness
Geographical location	Technology and industry development (including agricultural intensification)
Government and political system	Vaccination availability and trust
Human behaviour	Virus' rate of transmission
Human demographics and crowding	War and famine
Human resource and infrastructure	
Intent to harm	
International trade and commerce	

outbreaks. The 16 identified determinants have been summarised and categorised [see Table 3], using the acronym SPEECH (Society and Politics, Economy, Epidemiology, Culture, Healthcare and public health) for ease of reference and memory of the multi-faceted framework:

1. Society and Politics: Social structures and social and political determinants are critical in influencing how a nation or region responds to an epidemic threat. In most past and recent examples of infectious diseases outbreaks, cases and deaths have been distributed according to a social gradient [30]. Emerging infectious diseases are influenced by a circle of viral-social-political-ecological interactions, and reactionary narratives and responses heavily depend on the state of government, institutions, and the levels of trust between their stakeholders [31,32].

2. Economy: The link between economic downturns and emerging infectious diseases is well evidenced. Not only are periods of recession sometimes followed by epidemics (with poorer living circumstances facilitating the spread of infections), but health outcomes worsen during recessions [33], and major epidemics often have severe economic impacts [34]. Further, poverty and financial inequality are key drivers of morbidity, mortality and distribution of an infectious disease [35].

Table 3
The SPEECH framework of key factors interacting with emotions in relation to epidemic emergence and spread.

Area of Study	Relevant Determinants
SOCIETY & POLITICS	Government and political system
	Human demographics and crowding
	Public trust in governmental interventions
	War and famine
ECONOMY	Economic recession and austerity
	Poverty and social inequality
EPIDEMIOLOGY	Geographical location
	Severity of illness
	Virus' rate of transmission
CULTURE	Confidence between systems' actors
	Human behaviour
	Media and social media influences
HEALTHCARE & PUBLIC HEALTH	Breakdown of public health measures
	Vaccination availability and trust
	Human resource and infrastructure
	Preparedness (planning, governance, surveillance)

3. Epidemiology: The epidemiological characteristics of an infection, such as the severity of illness it causes or the mode of transmission, can impact people's risk perception and behaviours. Understanding epidemiological dynamics, however, can be challenging during an outbreak when mortality rates may be high and practical concerns, such as the safety of healthcare workers, need to be prioritised [36]. Coupled with demographic, environmental and geographical factors that affect transmission and spread [35,37], responses can vary heavily depending on the nature of the infection.

4. Culture: The cultural context in a country is often a critical mediating factor in how both public health professionals, governments and the public respond to an epidemic, or the risk of it. This is linked to broader questions of how people are influenced socially and by the specific contexts in which they live [38]. The media plays a key role here, as media coverage often provides the framing for an emerging infection [39], which is further amplified in modern societies by the capacity of social media platforms to spread dis- or mis-information based on a variety of media sources blended with personal views and commercial interests [40].

5. Healthcare and public health: Issues such as the state and funding of national or regional healthcare systems, governance, surveillance systems, and the resilience of public health systems often steer the direction that an epidemic will take in a specific area, hence impacting citizens' responses [41]. Vaccines remain, of course, one of the most effective ways to intervene at a population level during an epidemic, but a decline in public confidence has been noted in recent decades, driven by a range of psychological, sociocultural and political factors [42].

Addressing historiographical issues in using the SPEECH framework

This review provides a simple literature-based framework on a number of factors to consider when studying past infectious disease outbreaks to inform future action. This has happened extensively during the Covid-19 pandemic but has not been approached in a systematic way.

Recognising that complex and interrelated social, economic, political and demographic factors – rather, processes – contribute in tandem to the emergence and spread of outbreaks and the public's response to them, is in line with the framework of syndemics. In syndemic theory, it is proposed that factors such as those above – for example violence, poverty, infrastructure – and the spread of infectious diseases are not separate phenomena occurring concurrently, but are closely related [43]. The multidisciplinary SPEECH framework set out in this paper recognises the fluidity and interconnectivity of these issues and disease outbreaks, and provides a consistent structure for the in-depth study of historical outbreaks at a national level.

This premise is not entirely new. In 1996, a perspective in the journal *Emerging Infectious Diseases* posed the question of "*how large-scale social forces influence unequally positioned individuals in increasingly interconnected populations*". It further called for a critical epistemology of infectious outbreaks and an analysis of social factors and inequalities that contribute to epidemic emergence and spread, arguing that such an analysis should be historically deep and geographically broad, incorporating concepts of change [5]. Around ten years later, another perspective in the *Journal of Public Health Policy* identified serious gaps. It proposed that the traditional public health research approach should be combined with broader sociological analysis in order to develop a better and deeper understanding of what factors affect the occurrence of epidemic disease outbreaks, and, eventually, lead to developing better programmes to combat disease outbreaks [44]. Yet, another decade later, in 2014, the *Cambridge Anthropology* journal devoted a whole special issue to the gaps in relation to the analytical question that has remained neglected in

medical anthropology and medical humanities as a whole: "*What is the relation between the epidemiological reality of outbreaks as conditioned by long-term social, political economic, demographic and ecological factors, and the empirical reality of outbreaks as ruptures of the social, political and economic continuum*" [45,46]? This framework seeks to answer such repeated calls for broader sociological analysis in public health and provide the tools to explore such questions in a structured manner, incorporating the variety of multifaceted factors which influence the life cycle of an epidemic in a specific context.

Despite the relevance and interactions between the 16 identified determinants in the SPEECH framework, more often than not, when outbreaks occur, they are experienced on the ground as short-term catastrophic events (as opposed to long-term processes leading to their emergence), with a need to attribute the outbreak to a single cause [45]. Hence, it is important in studying previous epidemics to combine a scientific understanding of these persistent and long-term determinants, with the public understanding of how such events transform social resources and affect local communities far beyond the duration of international and government emergency response.

Conclusion

Common and interactive co-determinants of infectious disease outbreak emergence and spread have been increasingly documented and studied, yet not systematically and consistently until now. There are fundamental determinants, typically acting in concert, that seem to underlie the emergence and spread of, as well as responses to, epidemics. The multidisciplinary SPEECH framework set out in this paper recognises the fluidity and interconnectivity of complex social, economic, political and demographic factors, and their role in disease outbreaks, spread and response. The framework presented here is intended to support researchers to follow a consistent approach to the study of past epidemics, incorporating these diverse, multifaceted influences, enabling a holistic examination of historical infectious disease outbreaks.

Conflict of interest statement

No competing interests to declare.

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