Epidemiology

Phase specific approaches to the epidemiology and prevention of sexually transmitted diseases

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An overview

The recent past has brought an increased appreciation of the temporal dimension in sexually transmitted disease (STD) epidemiology and prevention science. At the individual level there is greater focus on the temporal ordering of people's sexual partnerships. Concepts like sexual trajectories, concurrency, and the gap between partnerships now attract attention as risk factors for the acquisition and transmission of STDs.[1–3] At the population level, the evolution of STD epidemics by predictable phases, characterised by changing patterns in the distribution and transmission of STD pathogens within and between subpopulations, has been a focus of recent work.[4–7] Temporal concepts in STD epidemiology have also been markedly enriched through the impact of mathematical modelling.[8]

There are important links between the temporal dimensions of individual behaviours and epidemic dynamics. The prevalence of particular sexual behaviour trajectory types, concurrent partnerships, and short gaps between partnerships within a population are increasingly considered important determinants of population prevalence and incidence of STDs, and of their rate of spread. Finally, the recent movement in epidemiology in general, towards a focus on social determinants of health conditions and on the historical evolution of those social determinants is also observable in the STD field, and contributes to increased appreciation of evolutionary frameworks.[9] Temporal changes at both the individual and population levels will be influenced greatly by alterations in the social, demographic, cultural, and political context. For example, changes in societal parameters such as the political economy and the sociolegal system are important influences on individual patterns of sexual partnership formation and dissolution, and will also affect the nature of sexual networks within the population. In addition, these societal factors will influence other determinants of STD spread such as the availability, accessibility, and utilisation of appropriate health care, and availability and utilisation of condoms.[10] Despite increased recognition of the importance of the temporal dimension in the field, an integrated framework that brings together all of the diverse paths of inquiry mentioned above is yet to be developed.

An improved understanding of the transmission dynamics of STDs, which is cognizant of the temporal dimension and which postulates evolution of STD epidemics through predictable phases, could have important implications for the design, targeting, and implementation of strategic prevention programmes. Ideally, it could provide programme planners with the ability to develop a "road map" to guide them in the design of phase appropriate prevention strategies.[11] Realisation of such a "road map" requires further work in three areas. Firstly, empirical evidence needs to be gathered to shed light on the situations and populations for which the phase specific theoretical model is most applicable and those for which it may have less importance. Secondly, the phase specific theoretical model[4] describes an ideal typical epidemic course; it is important to elaborate on the model to describe the variations around the ideal typical epidemic course and to identify the determinants and consequences of such variation.[11] Thirdly, the phase specific approach to STD epidemiology suggests a number of important parameters that need to be carefully monitored.[10 11] Methodological work is required to develop standardised measures for this purpose and to describe the properties of such measures.

In October 2000, a scientific meeting was held in Rome, Italy, to address the three domains of further development; empirical validation, theoretical elaboration, and methodological advance. The meeting brought together multidisciplinary public health researchers and programme planners from around the world. Empirical observations were presented on diverse STD epidemics that took place in highly diverse societal, economic, and epidemiological contexts. The programmatic response to the epidemics is highly variable. Discussions also focused on methodological and theoretical issues. Presentations covered STD epidemics in Asia, Africa, Europe, United States, and Canada. This supplement to *Sexually Transmitted Infections* has been compiled to reflect the empirical, theoretical, and methodological body of work that was the focus of the meeting in Rome. The articles by Aral,[10] Garnett,[12] and Blanchard[11] are predominantly theoretical and methodological. While the other articles are predominantly empirical, many of them include important theoretical and methodological insights. For example, the article by Elliott and colleagues[13] presents interesting and innovative approaches to the measurement of the concentration of STD morbidity using Lorenz curves.

REFLECTIONS ON PHASE SPECIFIC APPROACHES TO THE EPIDEMIOLOGY AND PREVENTION OF STDs

Discussions in Rome revealed several, rather striking patterns. Firstly, while a considerable volume of data is available in most areas, much more empirical data are required to describe phases of epidemics as they are influenced by social, economic, political, legal, and epidemiological contextual factors. Particularly, behavioural data and contextual data were unavailable in most countries. In addition, there is a clear paucity of longitudinal or temporal trend data that are essential in studying phase related concepts. Longitudinal data on behaviours and societal factors were unavailable in most cases; however, longitudinal morbidity data were also unavailable in many cases. It appears that research and surveillance activities predominantly focus on STDs themselves and to a limited extent on individual behaviours associated with STD acquisition. Moreover, most research and surveillance activity tends to be conducted within local boundaries, without much attention to sexual links that relate local sexual networks to each other. It may be important to consider the establishment of surveillance systems that include monitoring of contextual parameters and social determinants at regional and global levels.[10 14] Not surprising is the variation in data availability between resource poor and resource rich settings. However, even in resource rich settings data are not being collected in standardised ways that permit comparative longitudinal analyses across societies, across pathogens, and through time. This latter type of analysis would be most helpful to the further development of phase specific approaches.

Secondly, measurement and classification of epidemic phases is highly variable. Not surprisingly, there is inconsistent interpretation of levels of STD

prevalence and incidence, inflection points in the course of epidemics, and epidemic phases.[11] Clearly, STD prevalence and incidence levels that are considered hyperendemic in low prevalence societies may be considered low prevalence plateaus in high prevalence societies. Clarification of phase versus morbidity level concepts and development of methodologies that allow measurement and monitoring of phase related parameters would be helpful in this regard.

Easy to use, rapid measurements of network related parameters constitute another important need. Standardised measures of the extent and nature of sex work within populations and the size and nature of the interactions among core groups, bridge populations, and the general population would help both research efforts and programmatic activities.[10 11]

Thirdly, the phase specific model, in its current form, is particularly applicable in resource rich environments, even though it is implicitly used in many resource poor settings. Whether future elaborations of the model may increase its applicability in resource poor environments remains to be seen. In its current form the phase specific STD epidemiology model is a unilinear evolutionary model. Consideration of variations of epidemic trajectory around the postulated ideal typical course may render the model more applicable in resource poor settings. It appears that in resource poor settings the programmatic activities postulated by the model are not realised at the scale assured in the model. As a result, the dynamic tension between STD spread and the programmatic forces that limit such spread, which is central to the phase specific model, and which is clearly observable in resource rich settings, is absent in resource poor settings.

RECOMMENDATIONS AND FUTURE DIRECTIONS

A number of recommendations emerged as a result of discussions in Rome, some of which have been mentioned above. At the theoretical level, there was broad agreement that the phase specific model has important theoretical and practical implications and that future work should focus on continuous refinement of phase related concepts through theoretical and empirical research. At the empirical level, there was agreement that a phase specific approach to the collection of epidemiological data was helpful and this framework should be utilised. In this context it was clear that the lack of behavioural and contextual data limited both our understanding of the evolution of STD epidemics and the ability of STD programmes to develop interventions for the prevention of STDs. The recommendation is that behavioural, contextual, and STD data be collected longitudinally, suggesting a major investment and reorientation in STD surveillance systems.[14]

In the methodological domain recommendations included the development of phase relevant measures, and standardised measures to assess and monitor the size of core groups and core bridge general population interactions.[10 11] It was also recommended that such measures be utilised in empirical work globally to allow comparative analyses of STD epidemiology across countries. Another methodological recommendation involved the development of summary measures describing sexual networks to be incorporated in mathematical models of STD transmission dynamics.

In addition, the group suggested that empirical work with sex worker populations, their clients, and other high risk groups adopt quantitative approaches, which may permit better assessment of the size of such groups and the extent of sexual mixing across groups.

Recommendations for STD prevention programmes varied somewhat between resource poor and resource rich settings. However, the recommendation that the phase of the epidemic be considered in programme planning and in targeting programmatic interventions was applicable to all environments. Similarly, the suggestion that programmatic attention be focused on sex workers was applicable to all environments.

Finally, several suggestions were made for the formation of special interest groups and there was broad agreement that a similar meeting should be held in 3–5 years' time. In this context, a meeting focusing on the development of summary measures of sexual networks to be incorporated in mathematical models of STD transmission dynamics is scheduled to take place in April 2002, and a work group focusing on sex workers has been established and will start functioning shortly.

STD epidemiology and prevention science has expanded greatly in the past two decades. The increased interaction among programme planners, mathematical modellers, network analysts, social scientists, and epidemiologists promises even greater advances in the future. Following up on the suggestions included in this supplement through multidisciplinary efforts may bring us closer to innovative, science based, and effective prevention programmes.

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