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Case detection rate: what can be estimated without prevalence surveys?

Case detection rate (CDR) defined as the proportion of incident cases of a disease that are detected (i.e. diagnosed and notified) is of great importance both for monitoring the epidemiological situation and for forecasting and operational research. Moreover, case detection rates are used as target indicators in political documents (for example, target 70% CDR for smear-positive tuberculosis had been set by the Millennium Development Goals [1]).

It is often stated that CDR is hard to estimate because it is calculated as the ratio of the routinely notified incidence to an estimate of full (unobserved) incidence, with the latter being very unreliable. In the field of tuberculosis, the usual recommendation is performing regular prevalence surveys to calculate incidence either directly or indirectly. But representative prevalence surveys are rather costly and often logistically complicated. The workarounds for the problem include using expert estimates of CDR [2] and analysis of long-term trends and interactions with HIV [3].

In the talk, presented will be a model that regards case detection and disease progression as competing processes, thus deriving a relationship between the intensity of case detection and the severity (or age) of disease at the moment of detection [4]. In many settings some kind of disease severity measure is available from the routine notification data, and so it is possible to estimate the CDR. For tuberculosis, such a measure may use data on smear microscopy, bacteriological tests, chest X-ray, and the physician's diagnosis.

This approach may be extended to incorporate individual socio-economical properties and their effect on individual case detection intensity [5]. The analysis of the data shows that the cases substantially differ in their availability for detection, with "social involvement" and sex being the most significant factors.

This result erects the question how much the heterogeneity of the population affects the models based on homogeneity assumptions – in this case, on evenly effective detection system. In fact, the model estimates CDR for the social strata readily available for case detection. This estimate alone may be a useful point indicator of practical efficiency of the case detection system. But with some support from prevalence studies (especially targeting the "ill-detectable" strata) it is possible to estimate CDR and incidence accurately for the whole population.

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