

CAUSAL INTER-RELATIONS BETWEEN PSYCHOLOGICAL WELL-BEING AND DISEASE SEVERITY IN HIV INFECTION AND AIDS

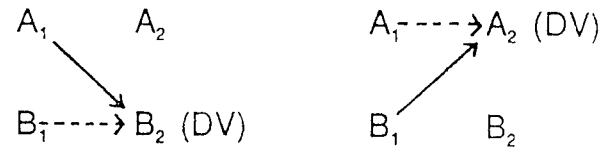
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Behavioural and psychosocial measures are often correlated with measures of disease severity. However such associations are difficult to interpret since the behavioural measures may be the direct *cause* of differences in severity, or alternatively differences in the behavioural measures may be *caused by* differences in disease severity. In this study we describe a method for differentiating these directions of causality, and we apply it to the question of how measures of psychological well-being are related to disease severity in HIV infection and AIDS.

Directions of causality cannot be determined in transverse studies in which a population is studied on one occasion. However it is possible to make inferences about causality in longitudinal or panel studies, in which the same subjects are assessed on two or more occasions. This is most conveniently done using a multiple regression approach, which circumvents the statistical problems associated with the older method of cross-lagged panel correlations (Plewis, 1985). The method can be understood by considering two variables, A and B, which are found to be correlated. These may be causally related in the sense that A causes B, B causes A, or A and B are both caused by some third variable C; in each case A and B would be correlated at any particular moment. The causal relationships can be understood if A and B are each measured on two separate occasions, A_1 , A_2 , B_1 and B_2 . In simple terms we can infer that A causes B if A_1 predicts B_2 , after B_1 is taken into account; and conversely, we can infer that B causes A if B_1 predicts A_2 , after A_1 is taken into account. It should be noted that it is quite feasible both that A causes B and B causes A, and the above method allows such reciprocal causation to be detected. In practice the method is readily implemented using multiple regression, in which to assess whether A causes B, B_2 is set as the dependent variable, B_1 is entered at the first step, and the improvement in fit is assessed when A_1 is entered at the second step. The converse is used for assessing whether B causes A. The diagram below summarises the analyses.

i Does A cause B? ii Does B cause A?



The dashed line indicates the variable to be entered at the first step in the multiple regression, the solid line indicates the variable at the second step, and the dependent variable is indicated by the letters DV.

Method

Subjects. The initial study population consisted of 111 homosexual males who had been diagnosed as having HIV infection. They completed a series of questionnaires at time 1, and then six months later were asked to complete the same questionnaires again. Of the original 111 subjects, 87 completed the questionnaires on both occasions, dropouts being due to 14 subjects who were not traceable, 8 who had moved without a forwarding address, 1 who withdrew and 1 who had died of AIDS.

Psychological measures. Three separate psychological measures were assessed. *Perceived health* was measured using the Nottingham Health Profile (Hunt *et al*, 1981), which provides six sub-scales entitled Energy, Pain, Emotional Reaction, Sleep, Social Isolation and Physical mobility. *Life-events* were assessed using our own 63-item questionnaire, based on a number of other such questionnaires, but which asked subjects not only to indicate the presence or absence of events, but also the amount of distress, the amount of adjustment involved, and whether the outcome was positive or negative. Nine separate measures were derived from the life-events questionnaire. *Social support* was assessed by asking about the frequency, emotional satisfaction and availability of 14 separate groups of individuals. Three separate measures were derived from the questionnaire.

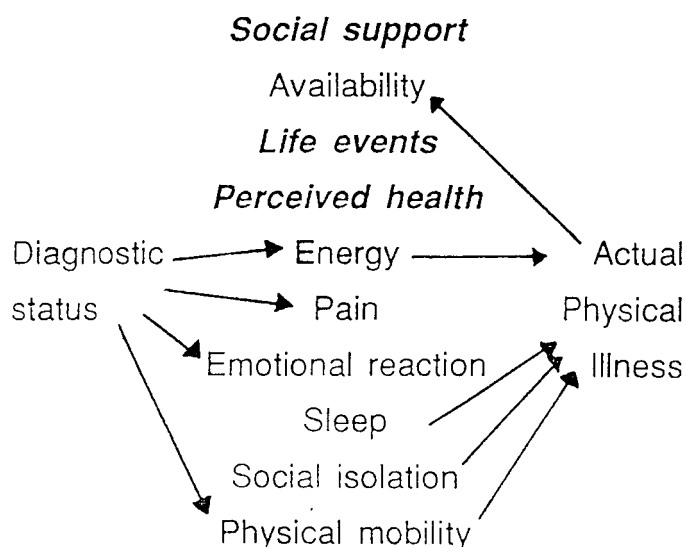
Disease severity measures. The *diagnostic status* of subjects was assessed using the CDC criteria. On the second occasion of testing, 26 subjects were in stage II (Asymptomatic), 21 were in stage III (Persistent generalised lymphadenopathy), and 40 were in stage IV

(AIDS or AIDS-related complex). *Actual physical illness* in subjects was assessed using a questionnaire which assessed the presence or absence of 25 separate HIV/AIDS associated symptoms or conditions. Symptoms were weighted according to their severity and known association with AIDS, and a single composite score derived. The correlations between diagnostic status and actual physical illness at time 1 and time 2 were 0.567 and 0.451, indicating that the two measures are somewhat independent. To a large extent this reflects the fact that while symptoms may vary from occasion to occasion, diagnostic status may only progress in one direction.

Results

The causal relationship between the two measures of disease severity, and the various measures of life events, social support and perceived health, were assessed using multiple regression, evaluating each relationship in the two causal directions. In the figure below all the causal relationships shown are significant at the 5% level, and the relationships between diagnostic status and energy, pain and emotion, and between mobility and actual physical illness are significant at the 1% level.

Significant causal relationships between psychological measures (in centre) and disease severity measures (on left and right) are shown by arrows indicating the direction of causality.



The most important results concern the relationships between disease measures and perceived health as assessed by the Nottingham Health Profile (NHP). Diagnostic status was related to four measures on the NHP, and in each case the direction of causality was that disease status caused greater problems in perceived health. In contrast actual physical illness was related to five of the NHP measures; in four cases greater perceived problems on the NHP caused increases in actual physical illness, and in the case of the sole exception, increased emotional reaction was caused by increased physical illness. Social support was unrelated to diagnostic status, and only the measure of availability was related to actual physical illness, which caused increased availability of social support. None of the measures of life events were causally related to the measures of disease severity. A more complex multiple regression, in which the correlated components of diagnostic status and actual physical illness were removed from each other, confirmed that indeed these two measures were reflecting very different aspects of the patients' condition.

Discussion

The direction of causality between psychological measures and measures of disease severity is complex. As might be expected from theories of psychosomatics, there is evidence that changes in actual physical illness can be caused by previous psychological changes. However in contrast, changes in diagnostic status are not caused by the psychological measures, but instead are causally responsible for changes in the psychological measures. The latter result is perhaps best interpreted in terms of a labelling process: it is patients' knowledge of a changed diagnostic status in themselves which causes subsequent changes in perceived health.

References

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