

Reemergence of *Schistosomiasis Japonicum* in Sichuan Province, China: A pilot study

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Schistosomiasis is a water-borne parasite that each year infects approximately 180 million people worldwide and nearly 1 million people in China. Despite China's long history of efforts to control schistosomiasis, disease transmission is emerging in areas that had previously established control. In Sichuan Province, 7 of 20 counties that had established control now show evidence of re-emergent transmission. This study took place in 4 of the 7 re-emergent counties in the Chuanbei Hilly Region of northern Sichuan. We hypothesize that disease re-emergence on the production-group level is a function of a production group's internal potential to sustain transmission (P) and its connectedness to other populations (C). Between May 15 and June 15 2005, we conducted a survey of production group leaders in 80 production groups – 40 re-emergent, and 40 still under control – to collect information related to P and C. In addition, we interviewed five households from each production group to gather data related to P and C that would be more difficult to obtain from a production group leader. The primary purpose of the study was to assess our ability to collect production-group-level data related to P and C through questionnaires administered to production group leaders and individual households and to refine our protocol for collecting data through a questionnaire process. Secondary to this, we wanted to summarize the data collected from the questionnaires to gain a better understanding of the study population and to develop hypotheses for future research.

Bearing in mind that this is a pilot study, and it has limited statistical power to detect an association between the variables that we measured and re-emergence, we performed several statistical analyses on the data. A χ^2 analysis of the production-group level treatment and snail-control history suggests that low SES, larger numbers of livestock, and the water resources that a group utilizes may all influence whether or not a village develops an infection. The historical data also suggest that many of the variables that we measured related to schistosomiasis treatment history and snail-control activities may in fact be consequences of re-emergence rather than determinants of it. We also performed a logistic regression measuring the odds of re-emergence against P and C variables. Among the individuals that we interviewed, the model revealed that an increase in the mean number of days spent performing labor exchanges within one's production group in the past year reduced the odds of re-emergence for that group (OR = 0.4, $p = 0.33$). It also suggested that having a higher percentage of cultivated land that is terraced may increase the odds of re-emergence (OR = 1.9, $p = 0.081$) though the effect was not statistically significant. In a second logistic regression we included snail survey data that three of the counties provided to us. The data revealed that the size of the snail habitat in a village could be a strong predictor of re-emergence (OR = 8.6, $p = 0.008$). In the second model, labor exchanges within the production group no longer appeared to have an association with re-emergence, and neither did the fraction of cultivated land that was terraced. However, the data suggest that the mean number of days people spent hosting an individual in a labor exchange may increase the odds of finding a new infection in a production group (OR = 2.1, $p = 0.088$).

Much of the information that we wanted to collect was difficult to extract from production group leaders and sometimes it was difficult to find a production group leader to interview. However, potential alternative sources of information were identified including former production group leaders and accountants. Individuals were often difficult to locate for the household interviews and many apparently no longer lived in the production groups. This is potentially the result of the waning restrictions on mobility for individuals and an increasing population of migrant workers leaving rural areas to work in urban areas. Production group leaders confidently answered questions regarding the number of material possessions in a group such as automobiles, motorcycles, tractors, and cattle. But the information that they gave on crop-specific fertilization practices was far too general and conflicted with information obtained from household interviews. Household questionnaires appeared to be useful for gathering data on water resources, information related to livestock and agricultural practices, and information on labor exchanges. However, future studies should include procedures to validate responses given in both the production-group-leader and household interviews. Our observational data suggest that roads may confound the relationship between connectivity and re-emergence by increasing both mobility of individuals and accessibility of villages for workers from anti-schistosomiasis stations. Moreover, our observational data suggest that we should include children as a means of connectivity. Future studies will have to be cautious to avoid some of the bias that was introduced in the delivery of the questionnaire, in the selection of the production groups, and in the selection of individuals for household interviews.