

Interventions to improve contact tracing for tuberculosis in specific groups and in wider populations: an evidence synthesis

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Scientific summary

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Background

The tracing and screening of people who have come in to contact with an active case of tuberculosis (TB) is believed to be a critical component in the control of transmission, and the early detection, of TB infection. The threat of TB, even in historically low-incidence countries such as the UK, requires the implementation of TB control strategies, including the use of contact-tracing investigations. Individuals from specific populations (such as homeless people and substance misusers) are known to be at increased risk of infection. Contact investigations for specific groups may need to be specifically tailored to maximise their effectiveness.

Objectives

The review aimed to answer the following research questions:

- What is the effectiveness and cost-effectiveness of specific interventions designed to improve TB contact tracing (such as the use of community outreach workers/cultural facilitators, specific interviewing techniques, home/hostel/workplace visits, home/hostel/workplace screening and follow-up of contacts) in specific population groups (such as migrants/homeless people)?
- What is the acceptability, feasibility, appropriateness and meaningfulness of specific interventions designed to improve TB contact tracing in these population groups?
- What are the barriers to, and facilitators of, the delivery or uptake of contact tracing in these population groups?
- What are the elements of the contact investigation pathway from interventions to impact, for TB contact tracing in wider population groups?
- How might evidence from interventions for wider populations be applied to TB contact tracing in specific population groups, including the similarities and differences, and what elements of the pathway may be important for feasible, applicable and effective interventions?

Methods

The review used a two-stage process. We carried out initial mapping work to develop and refine the scope of the work. We aimed to identify the potential volume of literature that would be available to a full review of TB contact tracing in specific populations, and thereby examine the feasibility and usefulness of carrying out the work. The initial mapping work was then followed by two linked subreviews, comprising a review of contact tracing in specific populations and a review of contact tracing in wider populations. Targeted searches of key databases for research published 1995 onwards were undertaken using search terms from existing reviews, supplemented by the review protocol, and terms harvested from other relevant documents. The databases searched in October 2015 were MEDLINE via Ovid SP, EMBASE via Ovid SP, EconLit via Ovid SP, PsycINFO via Ovid SP, Social Policy and Practice via Ovid SP, Cumulative Index to Nursing and Allied Health Literature via EBSCOhost, Science and Social Science Citation Indices via Web of Science and The Cochrane Library via Wiley Online Library.

The initial focus of the review was TB contact tracing in specific population groups; however, following the mapping phase of the work (which indicated only a small body of literature available), we broadened the scope to include TB contact tracing in any population. The term 'specific population groups' was used to mean any subgroups of whole populations, including individuals or groups who may be at higher risk of

TB infection. To examine the research of most relevance to the UK, we included research carried out in countries that are members of the Organisation for Economic Co-operation and Development. Contact tracing was defined as any intervention or procedure for identifying and evaluating individuals who have been exposed to someone with active TB. We included any documents that included reference to contact tracing as part of a TB control strategy. Literature reporting studies of any design was eligible, including reviews and primary studies, as was grey literature in the form of reports and guidelines.

The search results were exported to a reference management database (EndNote version 7, Thomson Reuters, CA, USA) and the software deduplication process was applied. The database of citations was screened at title and abstract (when available) level initially by one reviewer, and blind second screening of the complete database was shared between two further reviewers. Potentially relevant studies were coded as either 'specific populations' or 'wider populations'. Data in the included studies were systematically extracted to a data extraction form, encompassing first author and date, type of document, study design, country of origin, population, research methods, staff involved, measures used, results/data and main conclusions.

Quality appraisal

We had intended to use standard quality appraisal tools to appraise the evidence identified. However, we found that a large proportion of the studies did not use conventional designs such as experimental or longitudinal methods. Instead, the studies typically provided narrative (descriptive) reports regarding what had happened during investigations, or re-examined documents recording previous investigations. When data were provided, they related to the numbers of people who had been investigated and to test results, and a large proportion of studies did not meet the criteria of the available checklists. We identified only two studies that could be considered evaluative.

Synthesis methods

The content of the literature in each subreview was categorised by characteristics such as country and type of intervention. Narrative synthesis methods were used to provide an overview of the included studies within the two subreviews. The narrative included the exploration of similarities and differences between the subreviews, and highlighted data of importance for TB contact tracing in specific populations. In addition to the narrative, a logic model diagram was used to summarise the findings across the two subreviews. The purpose of the model was to integrate data from both reviews in the form of a pathway for contact-tracing investigations.

Results

The searching of the electronic databases and the screening of reference lists identified 112 articles of relevance to a review of contact tracing. We identified a total of 23 papers relating to specific populations and 89 papers relating to wider populations.

The quality of the available literature, as indicated by the proxy of study design, was generally extremely low. The literature was dominated by descriptive accounts of the management of TB outbreaks, when contact-tracing investigations had been employed. These papers drew on data from examination of records/case notes, and focused on reporting the number of index cases and contacts identified, or provided predominantly narrative (description) regarding the process of the investigations, rather than precise data. The limited nature of the evidence in the area should be fully recognised when considering the findings of the review.

To integrate the elements described in the literature, we developed a logic model which details factors which underpin contact investigations. These factors relate to prioritisation and decision-making prior to and during investigations, investigation strategies, TB detection tools, moderating factors, intermediate outcomes, investigation outcomes and impact. The review of evidence across wider populations tended to echo the findings of the specific populations review, with most elements of the contact investigation pathway outlined being common to both.

There was consensus across the two reviews that the initiation and scope of investigations should be determined by the characteristics of the index case of active TB, the features of the locations of potential exposure and the characteristics of potential contacts. The studies in the two reviews considered approaches to contact investigation that had a focus on population, individual, location and/or increased quality (improved efficiency and/or effectiveness). Both reviews described the value of social network analysis approaches to map connections between cases and contacts, and there was consensus regarding the importance of a location-based approach, not just tracing personal contacts. In terms of population-based approaches, the value of using the media during investigations was emphasised, as was the need to work with local communities to provide information and reassurance. The review of specific populations highlighted the overlap between screening, active case finding and contact tracing within approaches to TB control. The use of screening among high-risk communities was advocated, in particular the use of mobile digital radiography with homeless people. We highlight that these findings are based on a limited set of studies.

We identified little evidence to permit the robust assessment of effectiveness and cost-effectiveness of different interventions. Of the 112 included papers, only two were an (uncontrolled) evaluation of an intervention to improve the efficiency/effectiveness of investigations, and there were few data that permitted associations between strategies and outcomes. The two papers available indicated that interventions such as providing community workers or providing additional training to staff may be of value. The types of outcomes reported by the majority of studies (number of contacts identified and number found to have active or latent infection) are problematic for comparing effectiveness between investigations and between studies, as differing contexts will impact these outcomes.

The papers in the review that used modelling methods to estimate effectiveness and cost-effectiveness indicated that contact tracing is an effective intervention, but there are cautions that this may be the case only if it achieves relatively complete population coverage and includes preventative therapy. Both of these areas were highlighted in the review of specific populations as being challenging for investigations.

We found limited data regarding barriers to and facilitators of investigations. The use of interferon gamma release assay testing rather than tuberculin skin test was suggested to overcome barriers of loss to follow-up, although cost implications were highlighted. The literature described the need for adequate resources and adequate systems for delivering investigations. The role of the fear of stigma and population beliefs/understanding in determining the uptake of contact tracing were common to investigations in both specific populations and wider groups.

The use of molecular epidemiology to augment investigations was described in both reviews, with the added value of the method recognised for both specific populations and wider groups. Partnership working was reported as important to increase the efficiency/effectiveness of investigations across all populations.

Conclusions

The review identified a substantive number of studies relating to contact investigations. The literature is predominantly descriptive, however, with very little empirical work evaluating investigations in either specific or wider populations. Currently, studies that have used mathematical or economic modelling methods are the predominant means of examining the effectiveness of contact investigations and the

outcomes of different strategies. Studies using evaluative designs are required if robust conclusions regarding the associations between different contact investigation methods and outcomes are to be made. The results of the review highlight the complexity of the pathway from initial decision-making to achieving long-term impact on the health of the population. The differing nature of the context of each investigation is problematic when endeavouring to make comparisons between the effectiveness of different contact investigations.

The literature on investigations for specific populations has much concordance with that reporting research findings from wider population groups. The literature relating to both specific populations and wider groups highlights limitations of conventional contact-tracing approaches, in particular in asking index patients to name contacts. Recognised limitations of conventional investigation methods may, however, be exacerbated in specific populations. The conventional method of dividing contacts into groups of close versus casual contacts also requires further consideration and clarification. Particularly for specific populations, casual contacts may be of most importance in transmission, and conventional prioritisation systems may need revising. The importance of considering contacts at locations of potential transmission was highlighted across both of the subreviews, although here again this strategy may be of particular importance for investigations in specific populations.

Currently, there are indicative studies to suggest that the quality (efficiency and/or effectiveness) of investigations may be enhanced by the use of additional testing such as molecular epidemiology. Few studies describe how systems and processes during investigations may be optimised to overcome the range of moderating factors that are described in the literature. The examination of outcomes more closely relating to these systems and processes may help to address the limitations of the current evidence base examining the relative effectiveness of different contact-tracing strategies.

The limited nature of the evidence available should be fully recognised when considering the following implications for health care and research.

Implications for health care (in priority order)

1. Existing studies indicate the potential limitations of contact naming, with location-based methods recommended to establish a complete picture of contact networks. In particular, a location-based strategy may be a more effective approach in specific populations. This finding was based on studies that described contact investigations rather than evaluated interventions.
2. The available research suggests that contact investigations in specific populations may require greater prioritisation of investigation of casual contacts (non-household) than in other groups. This finding was based on studies that described investigations rather than evaluated interventions.
3. The results of the review suggest that an emphasis on the evaluation of processes and intermediate outcomes (such as engaging with treatment) may provide valuable data regarding factors determining the effectiveness of investigations.
4. The available research indicates that adequate systems, process and resources, including local expertise and skilled staff, sufficient workforce capacity, data management systems and effective co-ordination between agencies, are important. This finding is based on descriptions and recommendations in the included literature, rather than on empirical work. One evaluative study provided limited evidence that additional staff training may be beneficial.
5. Research studies suggest that the use of mass media and other avenues for provision of information and advice may be effective in improving communication with communities and individuals at risk during investigations. This finding is based on recommendations in the included literature, rather than on empirical work.

Implications for research (in priority order)

1. Future studies should aim to adopt an evaluative approach to increase the evidence base regarding the associations between different contact investigation strategies and outcomes. We identified only two studies that could be considered evaluative.
2. Research studies should further explore the development of measures that can be used to compare the effectiveness of different contact investigations. The reporting of numbers of contacts, or numbers who tested positive, identified during an investigation has considerable limitations as a measure of success.
3. Interventions targeting local expertise and staff skills, workforce capacity, systems and processes (such as data management and co-ordination between agencies), and lay knowledge, beliefs and behaviour should be developed and evaluated to address the moderating factors reported in the literature. This is based on findings from qualitative studies, and recommendations from descriptive studies outlining contact investigations.
4. Researchers should include the measurement of intermediate indicators of effectiveness, such as the timing of identification of cases/clusters, the promptness and efficiency of investigation, the accuracy and completeness of information and the awareness of symptoms/need for testing among contacts, when reporting investigations that have been undertaken. These factors were not reported in the literature, yet our logic model indicates that they may be important elements of the investigation pathway.

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