Spatial Analysis of an Outbreak of Q Fever

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OBJECTIVE

As part of the epidemiological investigation of an outbreak of Q fever in a factory in Scotland, we aimed to utilise a spatial scan statistic to aid in identification of areas associated with increased relative risk of infection.

BACKGROUND

Q fever is caused by *Coxiella burnetti*. Infection may be asymptomatic or present clinically with a range of symptoms including fever, cough, malaise and gastro-intestinal symptoms. Diagnosis is confirmed by serology, with a rise in titres in Phase 2 IgM antibody in the acute phase. An outbreak of Q fever occurred in a factory in Scotland prompting an epidemiological investigation.

METHODS:

179 individuals undertook a questionnaire which included drawing their route in to work on a factory plan, and indicating their main place of work. Serological status for all individuals was ascertained. Confirmed cases were defined as those with IgM titres >= 256 and probable cases as those with IgM titres >=64 and <256. Positive and negative groupings of the individuals, using the serological case definitions, were constructed. The factory plan was overlaid with a grid and routes spatially coded. Analysis of the routes was undertaken in SaTScan 8.0 alpha3 (1). We used multiple co-ordinates to reflect the route of entry to work and place of work for each individual.

RESULTS

There were 75 confirmed and 23 probable cases. Positives were categorised as confirmed cases and compared with probable and negative cases. Using a circular scan window, two areas were identified with increased risk, focused on a courtyard (relative risk (RR) 2.01, p=0.02) and a stores area (RR 1.82, p=0.05). Using an elliptical scan window, the same areas remained significant. Positives were then recategorised as confirmed and probable cases, and compared with negative cases. The courtyard remained significant with a circular window (RR=1.82, p<0.01) or elliptical (RR=1.87, p<0.01). Areas associated with a decreased relative risk were also identified.

CONCLUSION

Using a spatial scan statistic and entering route data for individuals, an area of increased risk was clearly identified. The finding was robust to the inclusion of probable cases with confirmed cases. The courtyard area coincided with the clinical working hypothesis of the source of the outbreak. Utilisation of this technique should be considered in other outbreaks to aid in identification of putative environmental sources.

REFERENCES

(1) Kulldorff M. A spatial scan statistic. Communications in statistics. Theory and Methods, 26:1481-1496, 1997.

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