Empowering people to fight killer flu with mobile phones and social networking

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Introduction

This is a discussion poster on possible ways to use mobile communications and Internet-based social networking to empower people to avoid getting infected during an epidemic.

In the 19th Century it was the civil engineers who did the most to banish disease, by delivering clean water for drinking and washing, and by building drains to separate foul water from the clean.

In the 21st Century there is a different challenge: in a world of crowded cities and rapid global travel, how to defend against a sudden global epidemic of a new disease? Once again, it may be engineers who provide the best defense, this time using applications for mobile phones and social networking.

New infectious diseases emerge frequently, but most of them fail to spread. Epidemics are either huge or tiny, and most are tiny. But there is a risk that a new infectious disease could emerge and cause a sudden, severe epidemic, spreading rapidly all over the world. When SARS emerged in 2003, doctors were prompt and heroic in tracing contacts and containing the epidemic before it spread. Will we be so lucky next time? What can be done to prepare?

It would be worthwhile to develop software tools that people could use to protect themselves, and that local communities could use to coordinate.

Communications technology could be used in (at least) four ways during an epidemic: for **reduction of social contacts** (`social distancing'); for **real-time epidemiology**; for **estimating personal risk of infection**; and **in enabling local communities to communicate and coordinate** mutual assistance, without having to hold public meetings to set such a system up. Ideally, software applications for all four of these uses should be developed on a precautionary basis, before any epidemic starts.

Reduction of Social Contact: 'Social Distancing'

To prevent an epidemic from spreading, it is sufficient to reduce the average number of people that each sick person infects. This number varies over time during an epidemic: at time t it is denoted R_t At the start of an epidemic, $R_0 > 1$, but as the epidemic continues, R_t falls because the fraction of susceptible, uninfected people falls. When R_t falls below 1, the epidemic peters out.

There are numerous ways in which people could use technology to reduce social contact, and hence reduce R_t : every small reduction would help.

During an epidemic, social distancing is common sense. Nevertheless it may be useful to prepare some software applications in advance of any epidemic, so that people will not have to invent and develop them after an epidemic has started.

For example, it would be worthwhile to develop an application that would enable any small shop to put its stock on-line, and to accept customer orders, as quickly and simply as possible.

Real-Time Epidemiology

Data from social networks and from the localisation of mobile phones could in principle provide very rapid information about the recent contacts of newly reported or self-diagnosed cases of the disease. From the point of view of epidemiology, this information would be of unprecedented detail and coverage, and might enable modes of disease transmission to be identified in detail.

Techniques for gathering this information, protocols for preserving confidentiality personal information, and methods of analysing the information, need to be developed beforehand.

Estimation of Personal Risk of Infection

Social distancing is costly and inconvenient, and people will not be able to reduce social contact effectively for long. It would therefore be desirable for people to be able to estimate their personal risk of infection from day to day, based on accurate real-time data of local prevalence of disease, so that people make an informed decision as to what precautions to take.

Local data from real-time epidemiology would in principle be a detailed resource that people could use to estimate their own risk of infection: once again, issues concerning confidentiality and rules for data handling, and methods of summarising and displaying it in a form that people could use, need to be developed.

Coordination of Local Community Response

During an epidemic, local communities would need to coordinate ways that were not previously necessary. Communities – such as the residents of an apartment complex or of a street – would need to:

- coordinate care for the sick
- support families in household quarantine
- coordinate to avoid mutual infection (eg in use of lifts in a tower block)
- respond to law-breaking and other emergencies if normal emergency services are over-stretched

In may city streets or apartment complexes, the residents may not even know each other: in this case, they would need to initiate cooperation without having large public meetings.

It would be common sense to use social networking software to initiate cooperation – but this software has not been designed with this application in mind. It may be worthwhile to consider the requirements of community cooperation during an epidemic, and to ensure that social networking

software does have the necessary privacy features to enable to people to join local groups and organise them, without having to give away

Conclusion

During an epidemic, social distancing, real-time contact tracing, estimates of personal risk, and methods for community organisation would be complementary and would reinforce each other in mitigating the epidemic. Software support for these activities should be provided in advance.

If an epidemic of a new, highly contagious disease should break out, people will spontaneously attempt to avoid being infected by making use of mobile and internet communications – this would be common sense. But people could be empowered to protect themselves better if suitable applications were developed and tested in preparation before any epidemic started.