

Edited by Jennifer Sills

Ebola: Mobility data

UNDERSTANDING HUMAN movement and mobility is important for characterizing, forecasting, and controlling the spatial and temporal spread of infectious diseases. Unfortunately, the current West African Ebola outbreak is taking place in a region where mobility has changed considerably in recent years. Efforts must be made to better understand these mobility patterns. For example, mobile phone call records provide insight into how people move within countries, particularly if they move from hotspots of disease. Analyses of Orange Telecom data have produced initial maps of movement in Senegal and Ivory Coast (1, 2), and endeavors are under way to obtain similar data for Sierra Leone, Guinea, and Liberia.

Additional sources are needed to gain a more complete picture of mobility and infer patterns of disease spread. For example, information on land border crossings would elucidate regional movement. Genomic surveillance data can genetically link cases across time and space ("Genomic surveillance elucidates Ebola virus origin and transmission during the 2014 outbreak," S. K. Gire *et al.*, Reports, 12 September, p. 1369; published online 28 August). More

of interventions. However, modeling efforts are limited in the absence of good mobility data. Existing data sources for West Africa include air transportation data, which have been used to model the local, regional, and global spread of Ebola (4) and newly updated world population data sets (5). However, newer census data are vital to underpin the mobility data. Keeping this information up to date while developing more comprehensive mobility data sets will greatly benefit intervention planning and resource allocation.

Such data should not necessarily lead to travel restrictions, such as flight route cancellations and border closures, which hamper relief efforts. Rather, the information should be used to create more valid models of transmission, which can then be used to plan and evaluate potential interventions. Better quantification of the impact of potential interventions will be critical in the coming weeks as the outbreak continues to grow.

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Ebola: Public-private partnerships

ACCORDING TO THE World Health Organization, the current Ebola epidemic is unlikely to be controlled in the coming months (1). With the exception of the compassionate use of unregistered compounds (2), no specific medical interventions, including the use of antiviral drugs, antibodies, or vaccines, are available. Some candidate compounds and vaccines have entered into limited clinical trials for safety and immunogenicity in healthy individuals. Most of these trials have been carried out by governmental organizations, such as the National Institute of Allergy and Infectious Diseases (NIAID), or by small or medium-size biotechnology companies with public funding. Private-sector investment has been very limited because past filovirus outbreaks were largely self-limiting and therefore believed to provide insufficient financial return on investment. We argue that this is a misconception of the very nature of emerging viruses.

Effective medical intervention strategies against the Ebola and other emerging viruses should address the following needs: local or regional antiviral treatment or vaccination of a limited number of individuals, including health care workers, while prepandemic conditions continue to be observed; stockpiling of antiviral treatments or vaccines to address the potential threat of a large-scale epidemic or pandemic; and antiviral treatments or vaccines for travelers and humanitarian volunteers. These needs can be addressed



Liberian health care workers collect the body of an Ebola victim.

complete data are needed on the routes taken by trucks and buses, which have been implicated in disease spread. Quantifying recurrent seasonal migration in response to climate, harvest cycles, or cultural events is important for anticipating fluctuations in transmission rates (3).

All these types of data can be used in dynamic transmission models to provide case projections, help focus resources and interventions, and assess the success

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by the private sector in the context of public-private partnerships and fast-track regulatory procedures.

Public-private partnerships include a range of Innovative Medicines Initiative projects in Europe and programs of the Defense Advanced Research Projects Agency and National Institutes of Health in the United States. For example, a public-private partnership has been formed between the NIAID and the pharmaceutical company GlaxoSmithKline for the accelerated clinical trial of a vaccine candidate against the Ebola virus. Meanwhile, regulatory agencies, including the European Medicines Agency and the U.S. Food and Drug Administration, are dedicated to implementing fast-track regulatory procedures and adaptive licencing programs (3). Rethinking the mechanisms to involve the private sector in developing antiviral compounds and vaccines before the onset of an emerging epidemic would not only benefit the pharmaceutical industry but also society at large.

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Ebola: Social research overlooked

INTENSIVE RESEARCH ON potential therapies and vaccine candidates to control Ebola ("Ebola vaccines racing forward at record pace," J. Cohen, *In Depth*, 12 September, p. 1228) should not overlook the urgent need for instructions on how to implement curative strategies in non-Western settings. Recurrent incidents targeting health care providers and counterproductive behaviors leading to preventable infections clearly demonstrate that control of such an outbreak cannot be effective without the local population's cooperation.

Culturally tailored procedures should be elaborated and based on the expertise of medical anthropologists. We must

prioritize research on such strategies to enrich the few resources already available on the subject (1). We need more data on the best ways to incorporate local beliefs and practices into patient care and response efforts, limit the mistrust regarding experimental vaccines and therapies in affected communities, and ease the informed consent collecting process.

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TECHNICAL COMMENT ABSTRACTS

Comment on "A Jurassic ornithischian dinosaur from Siberia with both feathers and scales"

Theagarten Lingham-Soliar

Godefroit *et al.* (Reports, 25 July 2014, p. 451) reported scales and feathers, including "basal plates," in an ornithischian dinosaur. Their arguments against the filaments being collagen fibers are not supported because of a fundamental misinterpretation of such structures and underestimation of their size. The parsimonious explanation is that the filaments are support fibers in association with badly degraded scales and that they do not represent early feather stages.

Full text at <http://dx.doi.org/10.1126/science.1259983>

Response to Comment on "A Jurassic ornithischian dinosaur from Siberia with both feathers and scales"

Pascal Godefroit, Sofia M. Sinitsa, Danielle Dhouailly, Yuri L. Bolotsky, Alexander V. Sizov, Maria E. McNamara, Michael J. Benton, Paul Spagna

Lingham-Soliar questions our interpretation of integumentary structures in the Middle-Late Jurassic ornithischian dinosaur *Kulindadromeus* as feather-like appendages and alternatively proposes that the compound structures observed around the humerus and femur of *Kulindadromeus* are support fibers associated with badly degraded scales. We consider this hypothesis highly unlikely because of the taphonomy and morphology of the preserved structures.

Full text at <http://dx.doi.org/10.1126/science.1260146>