



LETTERS

Social isolation can affect mental health, putting vulnerable people at greater risk.

Edited by **Jennifer Sills**

Protecting older adults during social distancing

As the coronavirus disease 2019 (COVID-19) pandemic progresses, social distancing has emerged as an effective measure to restrain the spread of infections. Many people are now confining themselves to indoor spaces and communicating with their loved ones only through the use of electronic tools. This may have a detrimental effect on mental health, especially for adults over the age of 65, who may be less comfortable with virtual solutions (1). We must work to prevent social distancing from becoming social isolation among this vulnerable group.

Social isolation in seniors has been linked to increased depression and suicidality as well as to increased pro-inflammatory and decreased anti-viral immune responses (2–4). These effects may further increase the susceptibility of this population to COVID-19. Health care systems and communities must consider the mental health burden of social distancing for the elderly and find ways to keep them engaged and motivated. Mainstream media, such as television and radio, can play an important role by including content focused on the elderly and encouraging seniors to express their views through live calls. Data indicate that the elderly view television as a medium to cope with depressive symptoms and might benefit from such

engagement (5). Volunteers can maintain regular phone contact with the homebound elderly population, providing friendship and fostering a mentoring relationship, as it has been shown that adults over 60 years of age find their life more meaningful when they have the opportunity to give advice (6). Finally, existing mental health support hotlines could add outgoing calls during which mental health professionals could reach out to the elderly and screen for symptoms of anxiety and depression. These measures could improve older adults' compliance with social distancing and help reduce the impact of COVID-19 on their mental health.

Ali Jawaid

Brain Research Institute, University of Zurich, Zurich, Switzerland. Email: jawaid@hifo.uzh.ch

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Aggregated mobility data could help fight COVID-19

As the coronavirus disease 2019 (COVID-19) epidemic worsens, understanding the effectiveness of public messaging and large-scale social distancing interventions is critical.

The research and public health response communities can and should use population mobility data collected by private companies, with appropriate legal, organizational, and computational safeguards in place. When aggregated, these data can help refine interventions by providing near real-time information about changes in patterns of human movement.

Research groups and nonprofit humanitarian agencies have refined data use agreements to stipulate clear guidelines that ensure responsible data practices (1). New tools for specifying different levels of privacy for different users and providing privacy-preserving results, such as the OpenDP platform (2), will effectively manage data access, and aggregation steps have been carefully reviewed on a legal and methodological basis to ensure that the analyses follow ethical guidelines for human participants (3). To monitor social distancing interventions, for example, rather than showing individual travel or behavior patterns, information from multiple devices is aggregated in space and time, so that the data reflect an approximation of population-level mobility (4).

The estimates of aggregate flows of people are incredibly valuable. A map that examines the impact of social distancing messaging or policies on population mobility patterns, for example, will help county officials understand what kinds of messaging or policies are most effective. Comparing the public response to interventions, in terms of the rate of movement over an entire county from one day to the next, measured against a

baseline from normal times, can provide insight into the degree to which recommendations on social distancing are being followed. We will need these estimates, not only now but also when we need to resume life again without risking a major resurgence.

The protection of personal privacy must be paramount. Consent-based data sharing models and data protection laws provide for the legal grounds to use personal data during emergencies, but we do not advocate the use of individual data (5, 6). The measures proposed do not need to run afoul of data protection goals, as a recent statement by the Chair of the European Data Protection Board in the context of the COVID-19 outbreak clarifies (7).

There are already precedents in Asia and Europe (8). Deutsche Telekom has shared aggregated data with Germany to help measure social distancing, in compliance with EU laws (9). The more such analyses are initiated and concluded openly, and in accordance with the law, the greater will be the public trust and our ability to produce reliable analytic insights. Associated risks should be thoughtfully addressed and weighed against the benefits of the data, which could help reduce the death toll in vulnerable populations.

Caroline O. Buckee^{1*}, Satchit Balsari², Jennifer Chan^{3,4}, Mercè Crosas⁵, Francesca Dominici⁶, Urs Gasser⁷, Yonatan H. Grad¹, Bryan Grenfell⁸, M. Elizabeth Halloran^{9,10}, Moritz U. G. Kraemer^{11,12}, Marc Lipsitch¹, C. Jessica E. Metcalfe⁸, Lauren Ancel Meyers¹³, T. Alex Perkins¹⁴, Mauricio Santillana^{15,12}, Samuel V. Scarpino¹⁶, Cecile Viboud¹⁷, Amy Wesolowski¹⁸, Andrew Schroeder¹⁹

¹Center for Communicable Disease Dynamics, Harvard T.H. Chan School of Public Health, Boston, MA 02115 USA. ²Emergency Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA 02115, USA.

³Emergency Medicine, Feinberg School of Medicine, Northwestern University, Chicago, IL 60611. ⁴NetHope, Inc., Fairfax, VA 22030, USA. ⁵Institute for Quantitative Social Science, Harvard University, Boston, MA 02138, USA.

⁶Harvard Data Science Initiative, Harvard University, Boston, MA 02138, USA. ⁷Berkman Klein Center for Internet and Society, Harvard University Harvard Law School, Boston, MA 02138, USA. ⁸Princeton University, Princeton, NJ 08540, USA. ⁹Center for Inference and Dynamics of Infectious Diseases, Fred Hutchinson Cancer Research Center, Seattle, WA 98109, USA. ¹⁰University of Washington, Seattle, WA 98195, USA. ¹¹Department of Zoology, University of Oxford, Oxford OX1 3SZ, UK. ¹²Boston Children's Hospital, Boston, MA 02115, USA. ¹³The University of Texas at Austin, Austin, TX 78702, USA. ¹⁴Department of Biological Sciences and Eck Institute for Global Health, University of Notre Dame, Notre Dame, IN 46556, USA. ¹⁵Department of Pediatrics, Harvard Medical School, Boston, MA 02115, USA. ¹⁶Network Science Institute, Northeastern University, Boston, MA 02115,



Disinfectants used to combat the spread of COVID-19 will end up in the environment.

USA. ¹⁷Fogarty International Center, National Institutes of Health, Bethesda, MD 20892, USA.

¹⁸Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD 21205, USA. ¹⁹Direct Relief, Santa Barbara, CA 93117, USA.

*Corresponding author.

Email: cbuckee@hsph.harvard.edu

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COMPETING INTERESTS

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Disinfection threatens aquatic ecosystems

In an effort to contain the spread of coronavirus disease 2019 (COVID-19), China has been applying chlorine disinfectants to both indoor and outdoor spaces. To minimize opportunities for the severe acute respiratory syndrome–coronavirus 2 (SARS-CoV-2)—the virus that causes COVID-19—to thrive, China has dispensed at least 2000 tons of disinfectants in Wuhan City alone (1). These chemicals can get into sewage systems and pollute drinking water resources (1). Both the direct runoff and indirect sewage effluents will eventually end up in lakes and rivers, putting aquatic ecosystems at risk (2).

Chlorine disinfectants threaten aquatic plants and wildlife in two ways. First, chlorine can directly harm organisms by destroying their cell walls or damaging their proteins by oxidation (2). Second, the chemicals in the disinfectants can bond with other materials to form harmful compounds. In surface water, dissolved organic matter is extremely high (3), which could allow the synthesis of disinfection by-products, such as trihalomethanes or haloacetic acids (2). These by-products have been shown to be very toxic to aquatic organisms (4). In addition, disinfectants could combine with nitrogen, forming chloramine or N-nitrosodimethylamine (5), both of which have been identified as carcinogens (6).



As COVID-19 spreads across the globe, the increased use of disinfectants could lead to worldwide secondary disasters in aquatic ecosystems. We appeal to the governments of China and other affected countries to conduct aquatic ecological integrity assessments (7) during and after the pandemic. This could save biodiversity and protect humans from future health threats stemming from polluted water.

Hong Zhang^{1,4*}, Wenzhong Tang^{1,4}, Yushun Chen^{2,4}, Wei Yin³

¹State Key Laboratory of Environmental Aquatic Chemistry, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, Beijing 100085, China. ²State Key Laboratory of Freshwater Ecology and Biotechnology, Institute of Hydrobiology, Chinese Academy of Sciences, Wuhan, Hubei 430072, China. ³Changjiang Water Resources Protection Institute, Wuhan, Hubei 430051, China. ⁴University of Chinese Academy of Sciences, Beijing 100049, China.

*Corresponding author.

Email: hongzhang@rcees.ac.cn

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TECHNICAL COMMENT ABSTRACTS

Comment on "Late Upper Paleolithic occupation at Cooper's Ferry, Idaho, USA, ~16,000 years ago"

Sturt W. Manning

Davis *et al.* (Research Articles, 30 August 2019, p. 891) report human occupation at Cooper's Ferry, Idaho, USA, ~16,000 years ago, well before Greenland Interstadial 1 (GI-1). Critical review suggests that this early date is not supported by the evidence. Human occupation might have begun in the mid-16th millennium before the present, but it would have been more likely after ~15,000 years ago, coeval with GI-1.

Full text: [dx.doi.org/10.1126/science.aaz4695](https://doi.org/10.1126/science.aaz4695)

Response to Comment on "Late Upper Paleolithic occupation at Cooper's Ferry, Idaho, USA, ~16,000 years ago"

L. G. Davis, L. Becerra-Valdivia, D. B. Madsen, T. Higham

Manning builds an inappropriate Bayesian age model to assert that the initial occupation at Cooper's Ferry began only ~15,935 ± 75 to 15,130 ± 20 cal yr B.P., suggesting that our estimation of ~16,560 to 15,280 cal yr B.P. is unsupported. However, this analysis both ignores evidence of human occupation from the earliest undated cultural deposits and reflects a misapplication of Bayesian age-modeling techniques. Consequently, his results are unreliable.

Full text: [dx.doi.org/10.1126/science.aaz6626](https://doi.org/10.1126/science.aaz6626)

ERRATA

Erratum for the Report: "An sp-hybridized molecular carbon allotrope, cyclo[18]carbon" by K. Kaiser *et al.*, *Science* **367**, eabb5604 (2020). Published online 13 March 2020; 10.1126/science.abb5604

Erratum for the Report: "A room-temperature single-photon source based on strongly interacting Rydberg atoms" by F. Ripka *et al.*, *Science* **367**, eabb4382 (2020). Published online 6 March 2020; 10.1126/science.abb4382

Erratum for the Review: "What would it take for renewably powered electrosynthesis to displace petrochemical processes?" by P. De Luna *et al.*, *Science* **367**, eabb0992 (2020). Published online 6 March 2020; 10.1126/science.abb0992

Erratum for the Report: "Synthesis and characterization of the pentazolate anion cyclo-N₅⁻ in (N₅)₆(H₂O)₃(NH₄)₄Cl" by C. Zhang *et al.*, *Science* **367**, eabb2965 (2020). Published online 21 February 2020; 10.1126/science.abb2965

Erratum for the Report: "Fluorination of arylboronic esters enabled by bismuth redox catalysis" by O. Planas *et al.*, *Science* **367**, eabb2416 (2020). Published online 14 February 2020; 10.1126/science.abb2416

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Caroline O. Buckee, Satchit Balsari, Jennifer Chan, Mercè Crosas, Francesca Dominici, Urs Gasser, Yonatan H. Grad, Bryan Grenfell, M. Elizabeth Halloran, Moritz U. G. Kraemer, Marc Lipsitch, C. Jessica E. Metcalf, Lauren Ancel Meyers, T. Alex Perkins, Mauricio Santillana, Samuel V. Scarpino, Cecile Viboud, Amy Wesolowski and Andrew Schroeder

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