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Invited Commentary | Health Informatics

From the Exposome to the Socioexposome in COVID-19 Research—A Call for More Multidisciplinary Research

Sarah Koch, PhD; Liv Yoon, PhD; Bieke Gils, PhD

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Author affiliations and article information are listed at the end of this article.

The coronavirus disease 2019 (COVID-19) pandemic continues to expose how access to health care and delivery of care are important concerns, second only to the primary concern regarding exposure to the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in the first place, and how this exposure can itself in large part be attributed to socioeconomic disparities. Originally called the *Great Equalizer*, it was implied that the virus itself does not discriminate. However, as the pandemic has unfolded, it has become clear that instead, SARS-CoV-2 is a magnifier of existing inequities. As Bonnie Henry, MD, MPH, the Health Minister of British Columbia, Canada, stated: "This is a storm that's affecting the world. But we are not in the same boats."[1] Black, Indigenous, and people of color have been disproportionately affected by the COVID-19 pandemic, laying bare disparities along race and class lines.[2] In their assessment of sociodemographic factors associated with use of telemedicine for ambulatory care during the COVID-19 pandemic, Eberly et al[3] found that older, non–English speaking Asian patients with Medicaid insurance completed fewer telemedicine visits and that older Black and Latina women of lower socioeconomic status made less use of telemedicine with video. These findings suggest that more efficient provision of health care via higher technological tools does not guarantee more access to health care, nor better health outcomes. Furthermore, the study by Eberly et al[3] highlights that more attention must be paid to socioeconomic dimensions shaping avenues of access to care. Without this attention, efforts to address parity in health care delivery could be rendered futile, akin to filling a leaky pot.

Eberly et al[3] propose that this pandemic can be an opportunity to change the normal to which we yearn to return into a new normal that is not fraught with inequity but instead prioritizes the needs of individuals who have been historically marginalized. In our view, the dramatic shift in health care delivery that Eberly et al[3] are calling for cannot materialize without a multidisciplinary approach to thinking about pandemics, or rather, what some are calling a *syndemic*, defined as multiple interrelated epidemics happening at the same time. Syndemics are characterised by biological and social interactions between conditions and states, interactions that increase a person's susceptibility to harm or worsen their health outcomes, and require researchers to investigate the biological and social interactions of the virus, especially its social origins, to effectively combat various forms of social inequality as major health risks.[4] With this background, the study by Eberly et al[3] is valuable in pursuing additional qualitative research to better identify and characterize the barriers to telemedicine to guide implementation strategies. The approach by Eberly et al[3] to refining telemedicine practice is one that deliberately considers inequity in its design; for example, by assessing data from community members at high risk, but also by (eventually, when the qualitative data are available) integrating natural and social sciences to tailor technologies to suit their environments.

This equity-centered orientation and multidisciplinary approach should also be applied to precision health[5] and the exposome approach,[6] which have gained momentum over the past decade and received particular praise for use in COVID-19–related research. Both approaches assess health behaviors, environmental exposures, and other determinants of health on an individual or population level and aim to determine the associations of combinations of behaviors, exposures, and health determinants with various outcomes. In any health-related research, but particularly in COVID-19 research, exposures and outcomes, including access to care, should be interpreted also as

end products of institutions and policies. Thus, we call for more dialogue between natural and social sciences, based on the recognition that pandemics manifest on all levels of health. Expanding the exposome and precision health approaches to integrate methods from social sciences to work with a scientific framework, referred to as the *socioexposome*,[7] is an example of this dialogue. The socioexposome is a multidisciplinary approach in which exposures are analyzed on individual, local, and global levels with the integration of sociopolitical sciences to better understand repercussions of corporate and regulatory practices for public health and social justice.[7]

Precision health– or exposome-based analyses can be controlled for or stratified by social determinants of health. However, only a careful discussion of the findings that includes input from the social sciences can ascertain the roots of disparities. For example, the predominantly Latinx and Black residents of the South Bronx in New York, New York, continue to experience disproportionately high asthma rates owing to higher air pollution exposures.[8] This means that they are more likely to contract and to undergo a more challenging recovery from COVID-19. Furthermore, some suggestions, such as spending time in green space for mental and physical well-being during the pandemic, may miss the mark, as a concentration of polluting industries has left many of these communities with virtually no public parks. Yet, retreating home to escape poor outdoor air quality may not be the solution for individuals who live in social housing, which is known to be poorly maintained and rife with issues, such as mold and inadequate access to heating and cooling.

Where the limitations of existing approaches may lie is in the explicit focus on outcomes associated with health disparities, rather than on the roots of health disparities. A study by Rasmussen et al[5] suggested tailoring prevention messages to specific racial/ethnic groups if that population has a higher proportion of persons at risk. Targeted approaches in pursuit of equitable access and use of (tele-) health care are of course necessary on their own; however, they risk putting the onus on the individual without regard for the structural factors that led them to face the severe risk in the first place. Having tailored prevention and treatment messages to specific racial/ethnic groups and addressing systemic roots of disparities are not mutually exclusive. However, without the latter, precision medicine, for example, could effectively lend itself to the discourse of healthism, in which health is perceived as the responsibility of the individual without regard for social, political, environmental, and historical determinants that influence the health of an individual and a population. The same is true for focusing on delivery of care, such as telemedicine, without tending to the sociodemographic factors that shape one's access to and knowledge about health care in the first place. For instance, using technology, such as smartphones and wearable health trackers, for gathering health data or delivering care could result in overlooking those with less access to and knowledge about such devices, ultimately leading to an even bigger health disparity.

A socioexposome approach could help fill the gaps in many current approaches by combining expertise in the fields of genomics, environmental exposures, and health behavior sciences with the expertise pooled in social sciences.[7] With this multidisciplinary framework, researchers can situate and contextualize natural science data and findings across the individual, local, and global scales, rendering a full picture of the interplay among biological disease pathways and social and environmental forces. Thus, as an extension of the existing exposome and precision health models, implementing the multidisciplinary socioexposome approach could help create policies (eg, an equity-focused delivery of telemedicine care) that address these realities informed by multiple layers of influencing factors. Such a multilayered approach is a must as we reimagine health research methods in a world where zip codes matter more than genetic codes. We look forward to learning of the disparities associated with use of telemedicine in future work by Eberly et al[3] once the qualitative research findings are available to be presented combined with the quantitative findings in this issue.

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Corresponding Author: Sarah Koch, PhD, Barcelona Institute of Global Health, Barcelona Biomedical Research Park, Doctor Aiguader, 88, 08003 Barcelona, Spain (sarah.koch@isglobal.org).

Author Affiliations: Barcelona Institute for Global Health, Barcelona, Spain (Koch); Universitat Pompeu Fabra, Barcelona, Spain (Koch); The Earth Institute, Columbia University, New York, New York (Yoon); Department of Sociomedical Sciences, Mailman School of Public Health, Columbia University, New York, New York (Yoon); Department of Sports, Physical Education and Outdoor Studies, University of South Eastern Norway. Bø, Norway (Gils).

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REFERENCES

1. Porter C. The top doctor who aced the Coronavirus test. *New York Times*. June 5, 2020. Accessed November 3, 2020. https://www.nytimes.com/2020/06/05/world/canada/bonnie-henry-british-columbia-coronavirus.html

2. APM Research Lab Staff. The color of coronavirus: COVID-19 deaths by race and ethnicity in the US. Updated November 12, 2020. Accessed November 3, 2020. https://www.apmresearchlab.org/covid/deaths-by-race

3. Eberly LA, Kallan MJ, Julien HM, et al. Patient characteristics associated with telemedicine access for primary and specialty ambulatory care during the COVID-19 pandemic. *JAMA Netw Open*. 2020;3(12):e2031640. doi:10.1001/jamanetworkopen.2020.31640

4. Horton R. Offline: COVID-19 is not a pandemic. *Lancet*. 2020;396(10255):874. doi:10.1016/S0140-6736(20)32000-6

5. Rasmussen SA, Khoury MJ, Del Rio C. Precision public health as a key tool in the COVID-19 response. *JAMA*. 2020;324(10):933-934. doi:10.1001/jama.2020.14992

6. Naughton SX, Raval U, Harary JM, Pasinetti GM. The role of the exposome in promoting resilience or susceptibility after SARS-CoV-2 infection. *J Expo Sci Environ Epidemiol*. 2020;30(5):776-777. doi:10.1038/s41370-020-0232-4

7. Senier L, Brown P, Shostak S, Hanna B. The socio-exposome: advancing exposure science and environmental justice in a postgenomic era. *Environ Sociol*. 2017;3(2):107-121. doi:10.1080/23251042.2016.1220848

8. Shearston JA, Johnson AM, Domingo-Relloso A, et al. Opening a large delivery service warehouse in the South Bronx: impacts on traffic, air pollution, and noise. *Int J Environ Res Public Health*. 2020;17(9):3208. doi:10.3390/ijerph17093208