An important pattern has emerged in measures of US health and well-being. People living in high-income locations tend to live longer than their counterparts in low-income locations. Hsia et al² used 2014 data from a registry of ambulance activations coupled with US Census data to demonstrate that this pattern holds for ambulance response times for cardiac arrest; high-income zip codes have on average faster ambulances than low-income zip codes. Controlling for time of day, day of the week, and urban status, they show that total transport time is approximately 3.75 minutes longer in the poorest zip codes when compared with the wealthiest zip codes. This result is a potentially important driver of the national income-mortality disparity; if poor areas have relatively slower emergency response, then the slower responses could be a cause of higher mortality in poor locations via cases such as acute myocardial infarction that have been shown to be sensitive to transport time with regard to patient mortality.³

The association found in the study by Hsia et al² also opens a valuable avenue for new policy to close the income-mortality gap; perhaps equalizing locational emergency response times could help to equalize locational mortality. Policies with this goal would require a thorough understanding of why the association between income and ambulance response time exists. Hsia et al² offer 2 explanations. First is availability. Hospital closures in low-income areas coupled with increased investment in specialty centers (such as cardiac centers) in high-income areas could be creating a gap in ambulance travel time.⁴ Their second explanation was strategic behavior by for-profit ambulance companies, who may choose to deploy more resources in locations where patients have better ability to pay. Both of these explanations suggest that policies aimed at the distribution of hospital care and the behavior of private ambulance companies could help the problem. Though both of these mechanisms are possible, they are by no means the only plausible explanations for the demonstrated response time gap.

An alternative story for why income is associated with differences in ambulance response times pins the blame on how households sort among locations. Ambulance companies operate with a degree of market exclusivity owing to local governance. Ambulances either are a true publicly provided good owned and operated by the local government, or operate via a public-private partnership in which an ambulance company is contracted with to cover a specific geographic area. Local governments are largely funded in the United States via taxes, most notably the property tax. Economists have long argued that households shop for neighborhoods with tax and public good packages that match their personal preferences (a phenomenon known as Tiebout sorting).⁵ If high-income households are willing to pay more (in the form of higher taxes) for higher-quality public services or more valuable contracts within public-private partnerships, then under Tiebout sorting these households move to places where taxes are high and public services are of high quality and then subsequently vote to maintain this status quo. This pushes low-income households to locations with relatively lower-quality public services. For an easy-to-understand example of this phenomenon, think about household sorting between school districts. This explanation for the results leads to a different set of policy prescriptions aimed at the behavior of local governments instead of the behavior of private entities.

Like the explanation given by Hsia et al,² the Tiebout sorting explanation suggests that income disparities cause ambulance response time disparities. But there is nothing in the analysis provided...
by Hsia et al\textsuperscript{2} that proves this to be the case. It is possible, and even likely, that a large part of the result is due to a different set of circumstances that are related to both income and ambulance response times. The prime example of such a situation is the possibility that Hsia et al\textsuperscript{2} are actually picking up increased ambulance congestion in poor areas owing to large increases in health insurance coverage for those places in the wake of the Patient Protection and Affordable Care Act (ACA).

The study by Hsia et al\textsuperscript{2} does not control for the level of health insurance coverage in the zip code, and the data came solely from 2014, the first year of full implementation of the ACA. Recent research demonstrates that locations with increased growth in insurance enrollment owing to the ACA also had a statistically significant increase in ambulance response times, starting in 2014. Further, the locations with the largest enrollment increases were those with the lowest rates of health insurance enrollment before the implementation of the ACA.\textsuperscript{6} The increase in insurance coverage causing ambulance slowdown result is likely owing to ambulance system congestion from increased use of ambulances for low-acuity cases by the newly insured, a form of ex-post moral hazard.\textsuperscript{7} These results are problematic for a claim of income inequality causing response time inequality if the locations with low rates of health insurance immediately before the implementation of the ACA are also low-income locations, which is indeed the case. In 2013, the last year before full ACA implementation, 22.5\% of those making less than $25,000 annually were uninsured as compared with 14.8\% of those making between $50,000 and $74,999, or 6.2\% of those making $100,000 or more.\textsuperscript{8} Thus, the low-income locations studied by Hsia et al\textsuperscript{2} were both the locations with the lowest pre-ACA insurance coverage rates and also the locations with the largest subsequent insurance enrollment growth. The study by Hsia et al\textsuperscript{2} may actually be detecting disparities in ambulance system congestion owing to differences in levels of ACA insurance expansion as opposed to an effect truly driven by income disparities. In this case, policy might be most effective if aimed at ambulance congestion, perhaps by curbing unnecessary patient use of emergency transport.

The insurance expansion and ambulance system congestion story is not the only noncausal explanation for the association between income and ambulance response times. A final explanation is that there are unaccounted-for market characteristics associated with local income and ambulance response times that explain the results. For example, 2014 is a year in which ride-share services such as Uber were rapidly expanding. High-income areas were natural targets for companies like Uber, and recent research shows that when Uber expanded to a location, the level of ambulance use in that location dropped (possibly owing to low-severity cases substituting Uber transport for ambulance transport).\textsuperscript{9} The results found in the study by Hsia et al\textsuperscript{2} could be in part due to a story like this, where an external force related to both income and response times is a hidden culprit.

The final takeaway should be 2-fold. First, there is no denying that the association between income and ambulance response times is important, and shines a light on inequality not just in wealth but in health care opportunities in the United States. However, it is important to understand that the reason for this inequality is not completely understood, and the cause or more likely group of causes responsible for response time inequality may require more than 1 single policy approach if the societal goal is to close the income-based gap in access to high-quality emergency transport.

**ARTICLE INFORMATION**

Published: November 30, 2018. doi:10.1001/jamanetworkopen.2018.5201

Open Access: This is an open access article distributed under the terms of the CC-BY License. © 2018 Friedson AI. JAMA Network Open.

Corresponding Author: Andrew I. Friedson, PhD, Department of Economics, University of Colorado Denver, Campus Box 181, PO Box 173364, Denver, CO 80217-3364 (andrew.friedson@ucdenver.edu).

Author Affiliation: Department of Economics, University of Colorado Denver, Denver.

Conflict of Interest Disclosures: None reported.
REFERENCES


