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Reexamining the Contribution of Public Health Efforts to the Decline in Urban Mortality: Reply[†]

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This rejoinder is written in response to the comment by Cutler and Miller (hereafter CM) on our paper, "Reexamining the Contribution of Public Health Efforts to the Decline in Urban Mortality" (Anderson, Charles, and Rees 2022a). In their comment, CM acknowledge making unambiguous data transcription errors when constructing the infant mortality rates,[1] assess the sensitivity of their filtration estimates to alternative intervention dates, and defend the population denominators they used to construct total mortality rates. In this rejoinder, we focus on the third issue, the population denominators. (*JEL* H75, I12, I18, J13, Q18, Q51, Q53)

In Anderson, Charles, and Rees (2022a), we show that water filtration is associated with a 4 to 8 percent reduction in the total mortality rate (depending upon which intervention dates are used) in CM's sample of 13 major American cities for the period 1900–1936. We calculate the total mortality rate in the standard fashion: namely, total mortality counts from *Mortality Statistics* are divided by population estimates from the US Bureau of the Census (linearly interpolating population for intercensal years; see Anderson, Charles, and Rees 2022b).

In their comment, CM show that our −8 percent estimate (or −8 log points) goes to −12 percent (or −13 log points) when municipal total mortality rates for the years 1900–1917 are taken directly from *Mortality Statistics*.[2] CM, however, do not explain why they are using the mortality rates taken directly from *Mortality Statistics* for the years 1900–1917, nor do they investigate the accuracy of these rates. It is important to note that the mortality rates taken directly from *Mortality Statistics*

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[†]Go to https://doi.org/10.1257/app.20210230 to visit the article page for additional materials and author disclosure statement(s) or to comment in the online discussion forum.

[1] In CM (2005), 79 of 410 infant mortality counts were incorrectly transcribed, or 19 percent of their total sample.

[2] For the years after 1917, CM follow standard practice, dividing total mortality counts from *Mortality Statistics* by population estimates from the census (linearly interpolating population for intercensal years; see Cutler and Miller 2022a, 2022b).

were published before the 1920 census was conducted and, as a consequence, are likely less accurate than mortality rates calculated in the standard fashion.

To assess the accuracy of CM's total mortality rates for the period 1910–1917, we "backed out" the population estimates used to produce them, using total mortality counts and total mortality rates from *Mortality Statistics*.[3] In Figure 1, these estimates are plotted against linearly interpolated population estimates using 1910 and 1920 census data. For some cities, the population estimates used by CM are essentially equivalent to the linearly interpolated estimates (e.g., Chicago and Philadelphia). For other cities, however, the estimates used by CM are clearly inaccurate (e.g., Baltimore, Cincinnati, and Detroit). For instance, CM's population estimate for Detroit is slightly over 600,000 in 1917, while the linearly interpolated estimate would put Detroit's population at over 800,000 in 1917. To take another example, CM's population estimate for Jersey City in 1917 is over 310,000, yet Jersey City's 1920 census population was less than 300,000.

We firmly believe that linear interpolation is the best approach to producing municipal population estimates for intercensal years. The total mortality rates published by *Mortality Statistics* for the period 1900–1917 were based on inaccurate population estimates made before the 1920 census was conducted, and there is simply no justification for using them. Because CM's filtration estimate of −13 log points is based on inaccurate total mortality rates, there is likewise no justification for concluding that municipal water disinfection explains 38 percent of the total mortality decline in the CM sample of 13 major American cities.[4] Future researchers should avoid using the total mortality rates published in *Mortality Statistics*.

[3] Specifically, we used the following formula to calculate the population estimates used in *Mortality Statistics:*

$$population = 100{,}000*(mortality\ count/mortality\ rate).$$

The variables mortality count and mortality rate were transcribed by the authors from *Mortality Statistics.*

[4] Using the same data analyzed by CM (2005), Catillon, Cutler, and Getzen (2018) show that water filtration is associated with a 4 percent reduction in the total mortality rate, which is much closer to our preferred estimate of the effect of filtration than it is to CM's estimate of −13 log points.

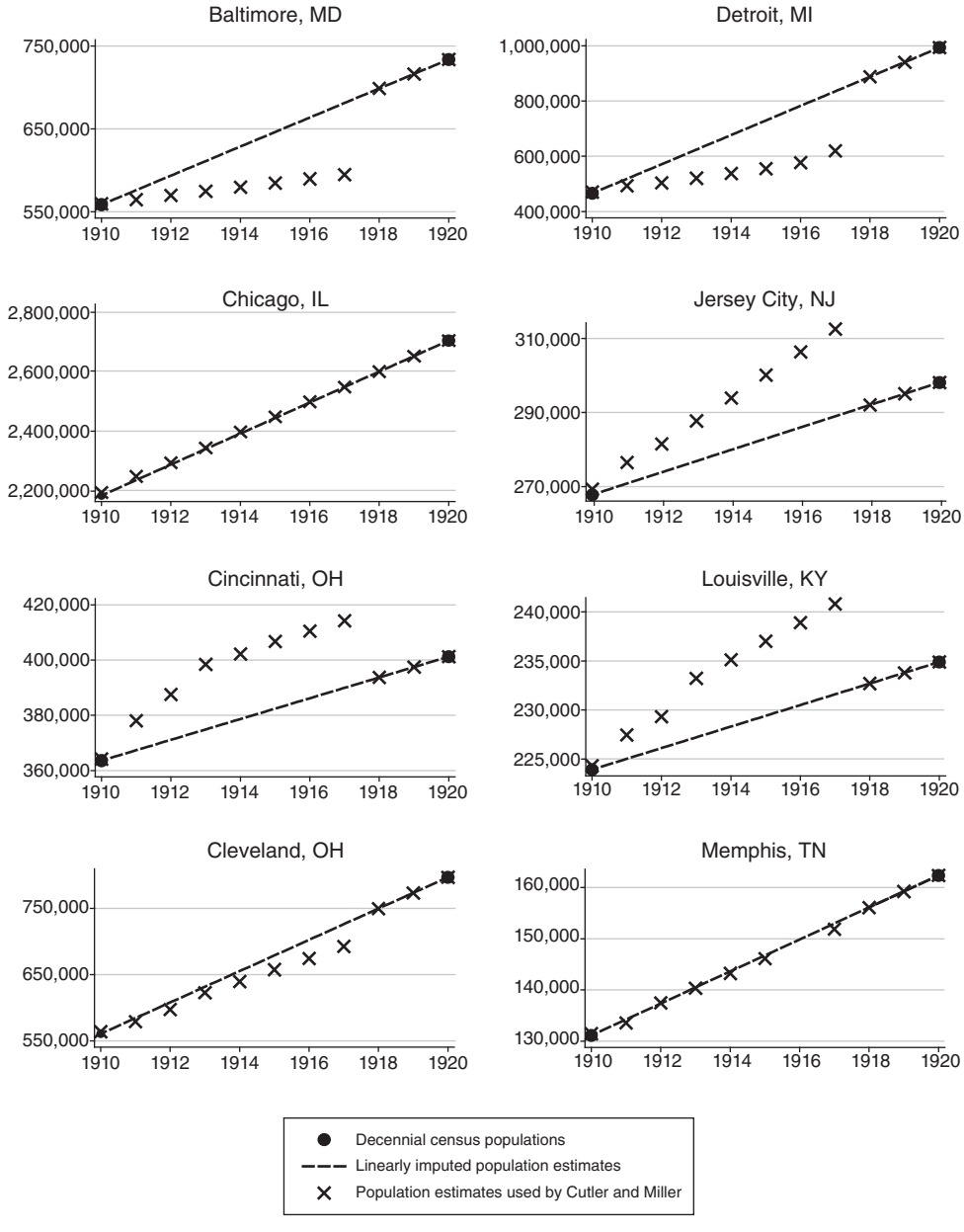

FIGURE 1. POPULATION ESTIMATES USED BY CUTLER AND MILLER

(*Continued*)

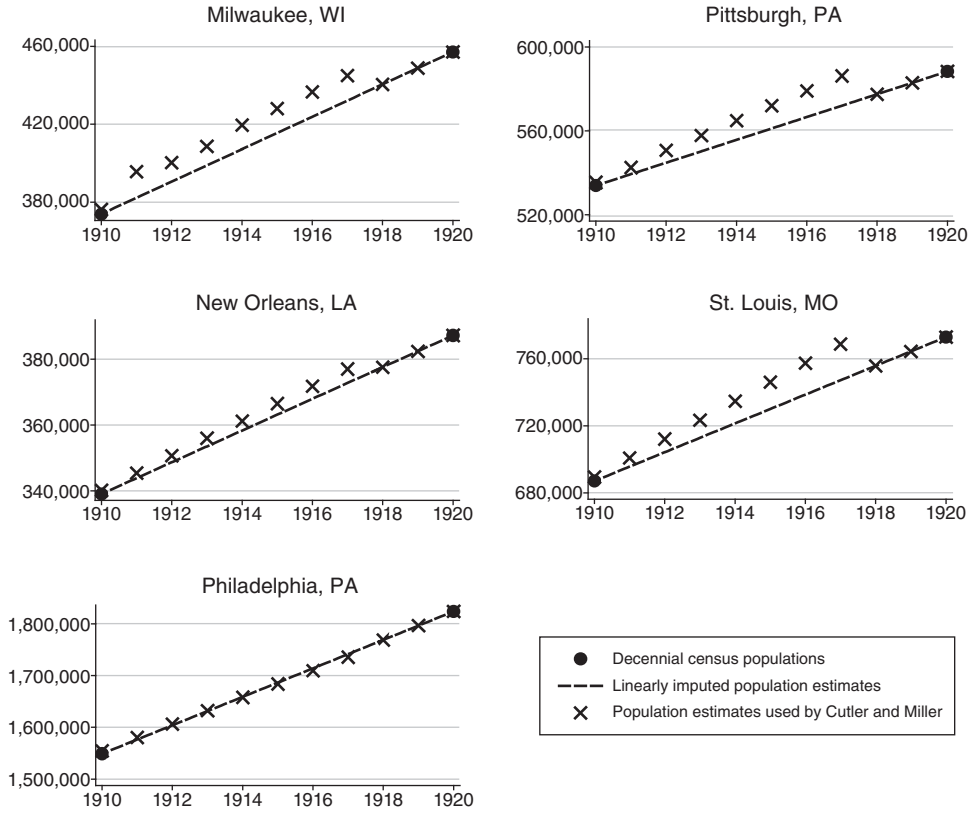

FIGURE 1. POPULATION ESTIMATES USED BY CUTLER AND MILLER (*Continued*)

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