



Response to Invited Commentary

Kramer and Casper Respond to “A-P-C . . . It’s Easy as 1-2-3!”

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We appreciate Dr. Harper’s thoughtful and thorough commentary (1) on our paper (2). From our vantage point, there are more areas of agreement than disagreement. Although we do not deny being intrigued by the “buried epidemiologic treasure” of an observed cohort effect, our motivation was not to champion age-period-cohort (APC) analysis as a faultless method but instead to use the APC toolbox to examine another elusive process: the temporal evolution of a population health disparity.

The ubiquity of racial disparities in health can make them seem inevitable. However, trends in black-white disparities in heart disease mortality suggest that such inequity is not a fixed constant but a time-varying phenomenon. Instead of examining *why* disparities arose, we focused on *when* they arose. As a descriptive tool, the APC toolbox—consisting of nonparametric graphical tools in addition to the 3-factor regression on which Dr. Harper primarily focused attention—offers a set of analytical approaches for describing the time components conflated in secular trends.

Regrettably, several assumptions underpinning our analysis were left unclear. Our decision to constrain the first 2 periods in order to make the 3-factor regression identifiable reflected our somewhat unorthodox approach to APC analysis, which primarily examined *rate ratios* rather than *rates*. While the first 2 periods saw substantial secular declines in death *rates*, these periods also had relatively stable *rate ratios*.

Regarding the scale for reporting disparity trends, Dr. Harper correctly notes that our reliance on the relative scale needed explanation (1), and we are grateful for his effort in producing complementary absolute measures. In general, we agree that both ratios and differences provide valuable information about the nature of health disparities, but in this setting we suggest that the relative scale measures fundamental mechanisms hypothesized in the evolution of health disparities. The dramatic declines in heart disease mortality rates for all groups over a period of 4 decades in the United States are impressive and meaningful. However, the “rising tide lifts all boats” perspective—all race-sex groups have lower rates now than in 1973—may obscure persistent patterns of unequal access to novel heart disease prevention efforts. One

explanation for emerging disparities in the face of overall declines is that as new knowledge of heart disease prevention arises, economically advantaged groups gain access to the new knowledge and treatments before groups with less economic advantage (3). The result is not a complete exclusion from “progress” but instead delayed or incomplete access to its benefits. Because absolute rates are declining, the absolute difference may look good, while the relative gap more sensitively marks a disparity in the diffusion of progress.

As we discussed (2) and Dr. Harper elaborated on (1), there are many pitfalls in APC analysis and the underlying assumptions necessary to gain useful information. However, we do not fully agree that there are “wildly differing” results among studies concerning the influence of period and cohort effects on racial differences in heart disease mortality. In contrast, we find a great deal of qualitative if not exact numerical agreement. Considering the question of when racial disparities emerge, Dr. Harper’s analyses on both the relative and absolute scales are generally supportive of our conclusion (and the conclusion of Masters et al. (4), whom he cites) that cohort differences contributed more to racial disparities in heart disease mortality than did period differences. The largest difference in conclusions between our analysis and Harper’s rate difference analysis is on the age scale: We reported large disparities among younger adults on the relative scale (2), but given lower rates at younger ages, these differences are quite small on the absolute scale. We argue that both truths are relevant. Ultimately, the APC toolbox accomplished the task for which it is suited: not making causal inferences but instead describing aspects of the temporal dynamics which make up secular trends. As with many descriptive tools, the results are hypothesis-generating, and the discussion engendered here has indeed raised several questions worthy of further study.

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REFERENCES

1. Harper S. Invited commentary: A-P-C . . . It's easy as 1-2-3! *Am J Epidemiol.* 2015;182(4):313–317.
2. Kramer MR, Valderrama AL, Casper M. Decomposing black-white disparities in heart disease mortality in the United States, 1973–2010: an age-period-cohort analysis. *Am J Epidemiol.* 2015;182(4):302–312.
3. Phelan JC, Link BG, Tehranifar P. Social conditions as fundamental causes of health inequalities: theory, evidence, and policy implications. *J Health Soc Behav.* 2010;51(suppl):S28–S40.
4. Masters RK, Hummer RA, Powers DA, et al. Long-term trends in adult mortality for U.S. blacks and whites: an examination of period- and cohort-based changes. *Demography.* 2014;51(6): 2047–2073.