

# Does Multi-dimensional Heaping Aggravate Attenuation Bias?\*

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## Abstract

We expose previously unrecognized sources of attenuation bias in survey data on timing of events. When asked to identify when past events occurred, survey respondents answer in ways that are clearly approximations. For example, surveys frequently ask how old a respondent was when a particular event occurred. When asked about temporally distal events, respondents are more likely to report ages that are evenly divisible by five - even when events occur stochastically. We document that, when surveys ask respondents to report either the calendar year of the event or the time that has elapsed since the event occurred, they similarly report calendar years or elapsed time that are evenly divisible by five. To try to minimize the prevalence of rounded answers, some surveys offer respondents all three response frames. They let respondents choose which frame they use to answer. We document that this strategy fails to achieve its goal. No matter which survey framing respondents choose, respondents heap answers and do so in approximately the same degree. We also show that, when using any one of the response frames, respondents heap answers in that frame using the dimensions of all three response frames. Existing literature documents that such heaping attenuates coefficients of interest toward zero. We show that the extent of the attenuation bias is deeper and more widespread than currently recognized. That finding has important implications for all studies that use timing of events to exploit temporal variation in exogenous explanatory factors. We document the range of domains where heaping occurs and the extent of heaping of each type in two major surveys - the US Panel Study of Income Dynamics and German Socio-economic Panel. We then document the attenuation bias that results in both data sets that offer different response frames in models of the probability smokers quit.

*Keywords:* Heaping, Rounding, Attenuation Bias

*JEL Classification:* I12, J12, J13, J26, J64, C33, C41

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