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Research Brief

Citizen Perceptions of Sea Level Rise in the San Francisco Bay Area

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Issue

Sea-level rise is one of the most important climate change issues facing the San Francisco Bay Area (Griggs et al. 2017) and other coastal communities across the world (Hauer et al. 2016; Meehl et al. 2005). Civic engagement and citizen awareness of sea-level rise is a key challenge to effective adaptation (Lubell 2017). Many citizens view sea-level rise as a psychologically distant, "slow moving natural disaster", which is not a salient public issue. The resulting lack of citizen support reduces the capacity of policy-makers to create adaptation programs and reduces the likelihood that individual citizens will adopt potentially costly adaptive behaviors. However, there is a growing awareness of sea-level rise in the SF Bay Area, as evidenced by the recent passage of ballot Measure AA to fund the San Francisco Bay Clean Water, Pollution Prevention and Habitat Restoration Program. This policy brief summarizes the initial findings from a household survey of SF Bay Area citizens to understand how their perceptions of sea-level rise relate to their overall support for Measure AA, which has implications for future ballot measures and other adaptation policies.

Key Findings

Sea-level rise is psychologically distant concept; the majority of SF Bay residents think it will not harm them personally, while the most significant harm is for future generations and developing countries. People are more likely to support measure AA if they perceive more harm from sea-level rise, of if they have a high subjective perception of sea-level rise flood risk. However, objective flood risk based on zip-code level hydrodynamic models appears to have little influence on support for Measure AA except among more politically sophisticated respondents. This highlights the importance of understanding the origins of sea-level rise risk perceptions, which are a function of both geography and individual psychological and social factors.

Policy and Management Implications

Developing citizen support for sea-level rise and climate adaptation policy is difficult in the short-run because most citizens do not see an immediate personal harm, in comparison to harm in the future or in other countries. Linking sea-level rise policy to more salient environmental issues such as wetlands and biodiversity is likely to increase support. Increasing awareness of the extent to which citizens are personally at risk from sea-level rise may also increase support, although the characterization of that risk should go beyond the individual household location. At least for some citizens, even if there is flooding in their community, they may not vote to support costly adaptation policies. Hence, it will be important to characterize risks from flooding such as decreasing availability of transportation, loss of power/water, and other vulnerabilities that are not linked to the specific physical household.

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Methodology

The analysis in the study is based on a survey of 2237 households in San Francisco Bay that was fielded from June 5-July 27, 2017. The survey was delivered to every zip code in the 9-county SF Bay region in order to insure spatial coverage. The response rate to the survey varied from 8-12%. The survey used a combination of attitude questions to measure perceptions of harm for sea-level rise, and flood risk. Objective flood risk for each household was characterized using the COSMOS model, based on 100cm (3.2 feet) of sea-level rise with a 100-year storm scenario. According to the recently updated California sea-level rise science guidance, by 2100 there is 67% chance of sea-level rise between 1.6-3.4 feet above the average from 1991-2009.

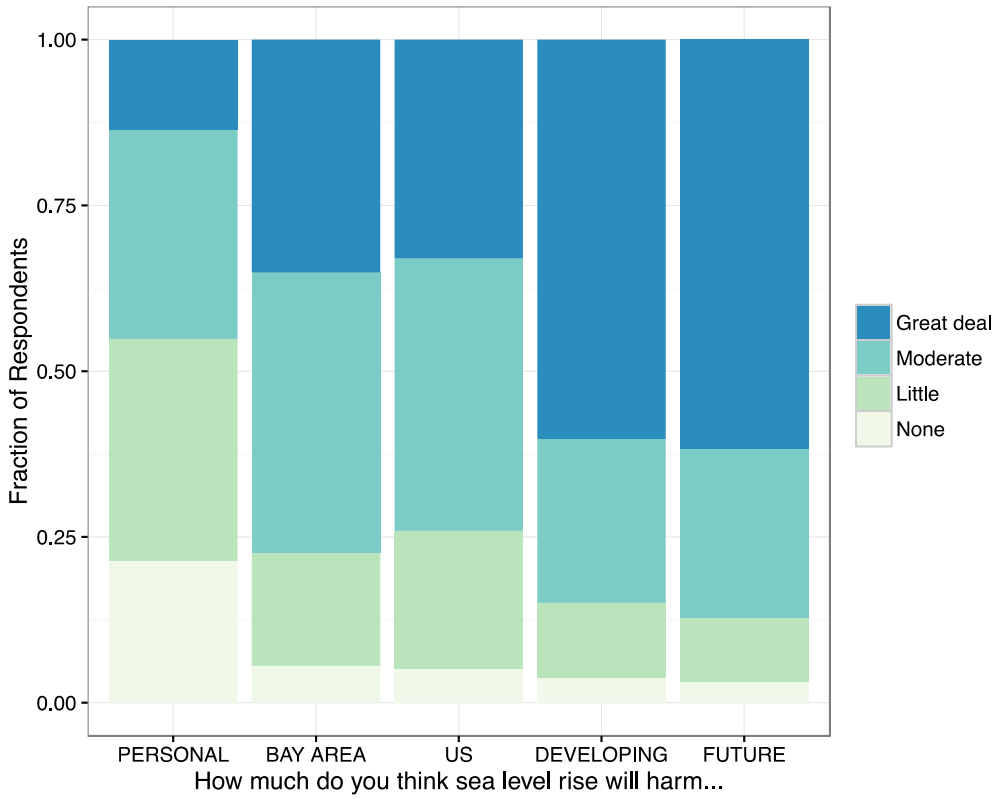
Determining support for Measure AA required a complex survey design because the survey was fielded several months after the 2016 primary election, and thus respondents had to recall their past voting behavior. Respondents were first asked whether they remember voting in the primary, then if they remembered voting for Measure AA, and then if they remember their exact vote choice (e.g.; yes/no). If they did not remember voting in the primary or were in some fashion unsure of their vote for Measure AA, they were asked how they would vote if they had to decide again. For the purposes of this analysis, respondents are classified as supporting measuring AA if they either definitively remember voting "yes" or would vote "yes" given the opportunity to choose. Respondents are coded as opposed if they remember voting "no", or would vote "no" given the opportunity.

Detailed Results

Figure 1 reports the basic results regarding perceived harm from sea-level rise, and shows personal harm at the lowest level, with the highest level of harm perceived for future and developing countries. Figure 2 shows that respondents who support Measure AA expect greater amounts of harm across all dimensions.

Figures 3-6 examine the relationship between objective and subjective flood risk and levels of support for Measure AA. Figure 3 shows that people who live in a zip code that is expected to experience any flooding at all do not have any difference in support for Measure AA, but Figure 4 shows a slight difference among the subgroup of respondents who clearly definitively voting for Measure AA. This suggests people with higher levels of political sophistication may be more likely to see a link between flood risks and their voting behavior. Subjective flood risk has a much stronger relationship to Measure AA preferences. In Figure 5, approximately 61% of respondents that perceive no flood risk report supporting measure AA compared to 82% of respondents that perceive very high flood risks. In contrast to objective flood risk, the correlation between subjective flood risk and measure AA support is similar for all respondents and for voters who specifically remember their vote choices.

Figure 1: Respondent Perceptions of Sea Level Rise Risks



Question wording: PERSONAL= "…you personally"; BAY AREA= "…people in the Bay Area", US= "…people in the United States", DEVELOPING= "…people in developing countries", FUTURE= "…future generations"

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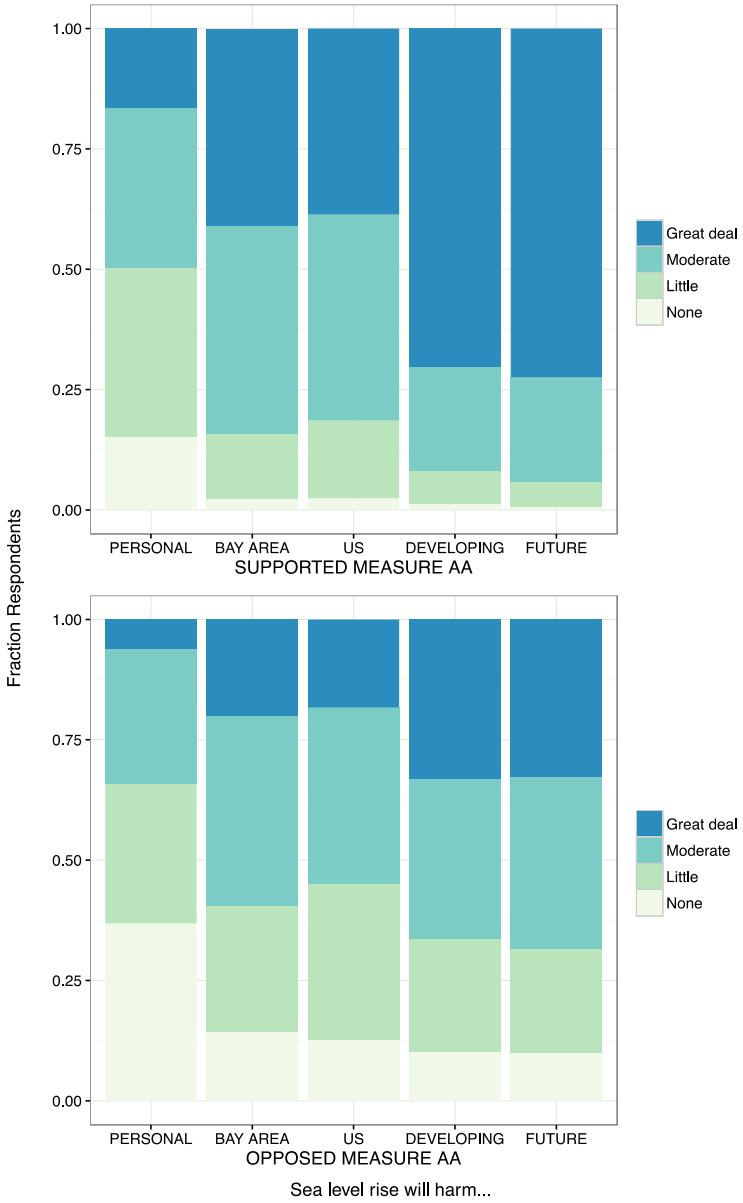
Figure 2: Perceptions of Sea Level Rise Risks by Measure AA Support



Question wording: PERSONAL= "…you personally"; BAY AREA= "…people in the Bay Area", US= "…people in the United States", DEVELOPING= "…people in developing countries", FUTURE= "…future generations"

Figure 3: Support for measure AA by Zip-level Flood Risk

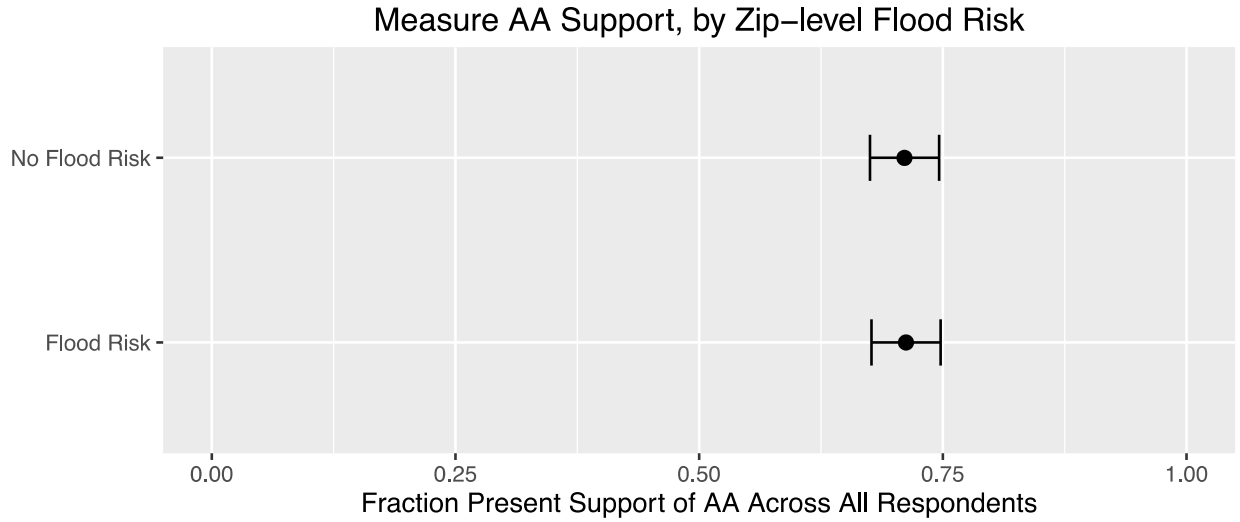


Figure 4: Measure AA Voting Behavior by Zip-level Flood Risk

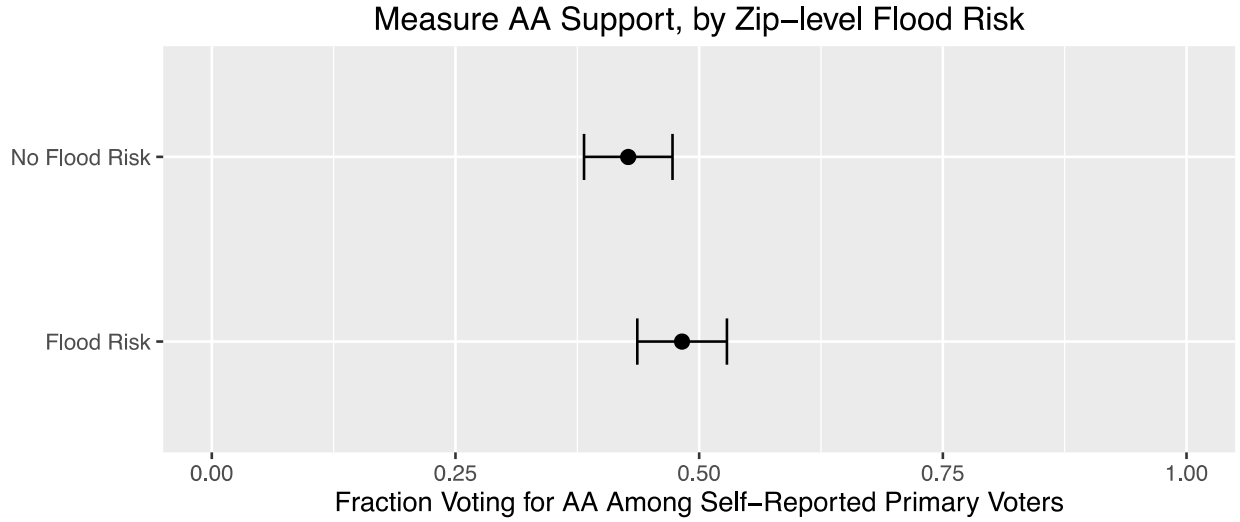


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Figure 5: Support for Measure AA by Self-Reported Risk Level

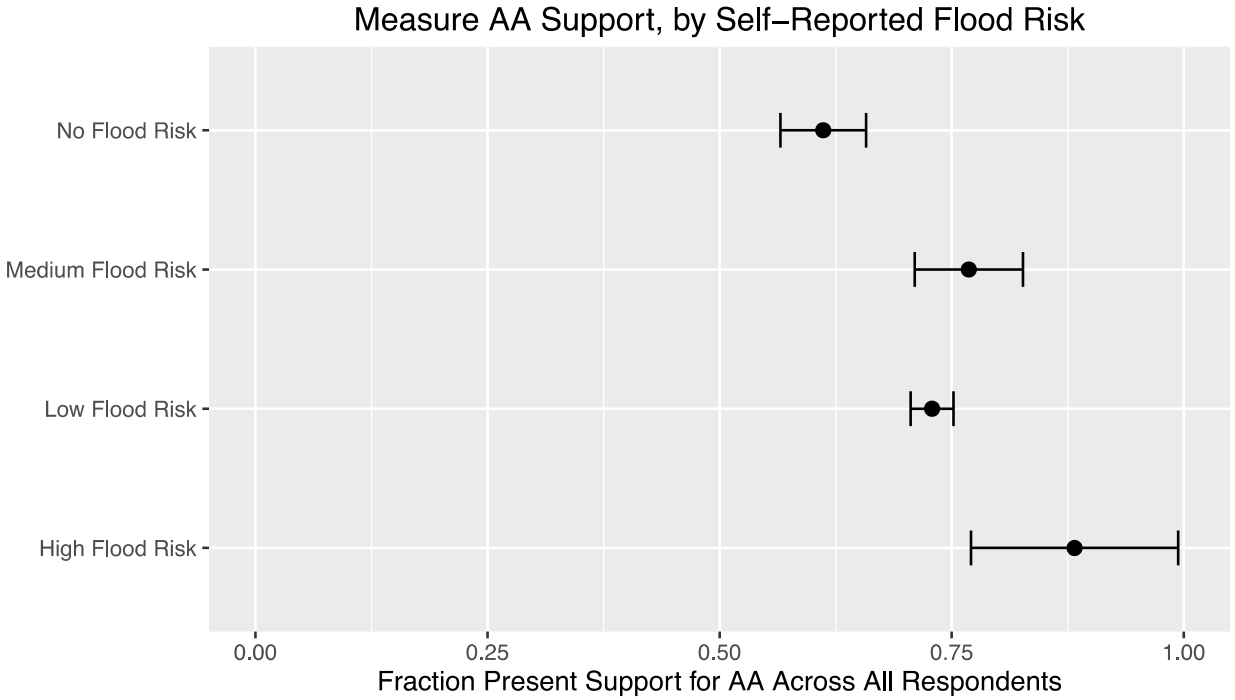
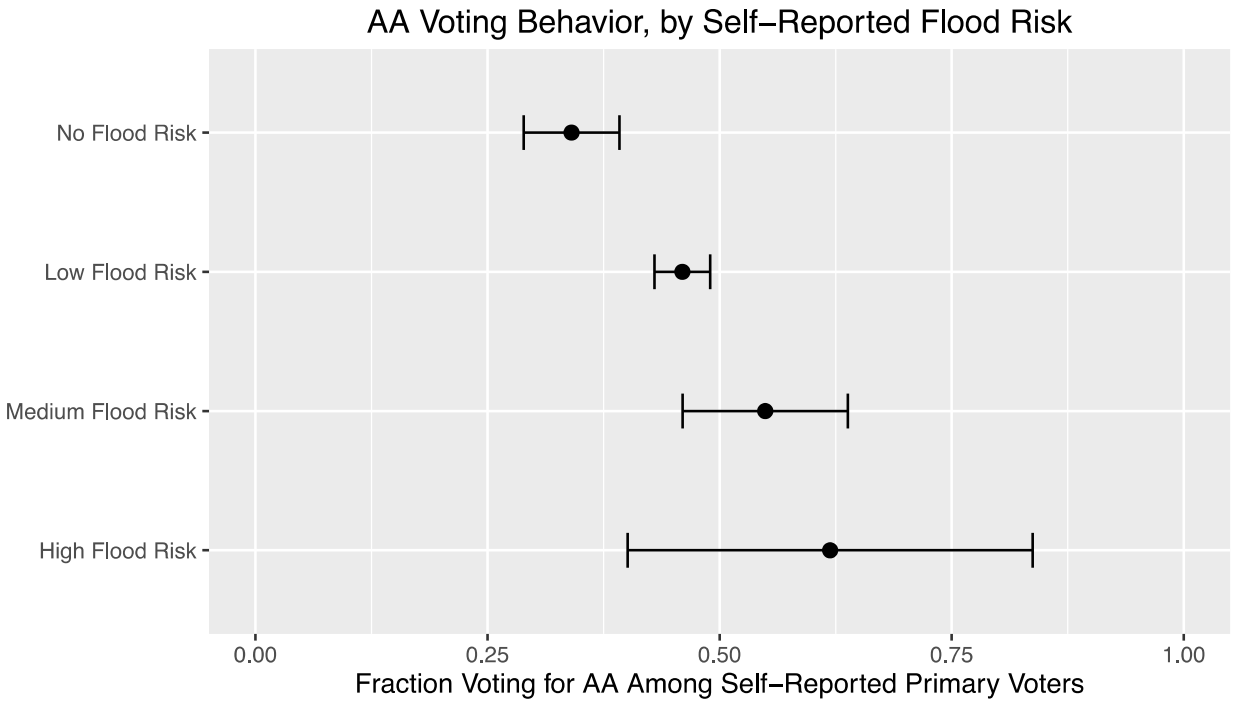


Figure 6: Measure AA Voting Behavior by Self-Reported Risk Level



New Research Directions

Our analysis suggest that finer spatial resolution is needed to fully understand the link between subjective and objective flood risk, and political behavior such as support for Measure AA. Specifically, zip-code level spatial analysis is not granular enough to know whether or not an individual's home or place of work is expected to be directly affected by potential flooding. More research is also needed to understand other predictors such as general attitudes towards climate change, demographics, or political ideology may influence sea-level rise risk perceptions. Finally, comparative research is needed to ascertain whether the same types of processes affect sea-level rise risk perceptions among citizens in other parts of the country, or other regions of the world, that are also vulnerable to sea-level rise. This promises to be particularly interesting for regions with different political cultures or predicted to experience more severe sea-level rise (e.g.; Miami, Florida), or who have experienced an extreme storm event potentially related to climate change (e.g.; New York/New Jersey and Superstorm Sandy or Houston and Hurricane Harvey).

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