Framing and Willingness to Pay for a Local Health Department: Evidence from a COVID-19 Contingent Valuation Experiment

Jennifer Orgill-Meyer
Franklin and Marshall College

Harriet Okatch
Thomas Jefferson University

Wei-Ting Yen
Academia Sinica

Berwood Yost
Franklin and Marshall College

Abstract

Context: Local health departments provide essential public health services, yet many counties lack them, and those that exist struggle with ongoing funding needs. The COVID-19 pandemic politicized public health, raising questions about how political framing affects public willingness to pay for these services.

Methods: Participants in a contingent valuation experiment (N=1,946) were recruited from Lancaster County in south-central Pennsylvania. They received information about local health department services and were randomized into conditions emphasizing either COVID-19 prevention or elevated blood lead level reduction – a less politically salient public health threat. Using interval regression, we estimate willingness to pay (WTP) for local health department services, identify its determinants, and examine treatment effects by party affiliation.

Findings: Mean annual WTP for local health department services was $138.22 (95% CI: $121.34, $139.73). Republicans showed a $165.60 lower WTP to pay than Democrats ($p<0.001$). We observed no statistical differences within political affiliations to issue framing.

Conclusions: Partisan differences in support for local health departments persist, yet preferences remain stable across politicized frames. These findings suggest that polarization in public health attitudes reflects entrenched partisan identities more than frame-dependent views, underscoring the need for strategies that build durable cross-partisan trust and institutional legitimacy.

Keywords Local health departments, willingness to pay, COVID-19

The U.S. public health system is diffuse, with multiple public and private organizations delivering public health programs and activities (Mays and Scutchfield 2010). Public health

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governance varies considerably across states, ranging from centralized state-administered systems to decentralized systems in which local health departments (LHDs) bear primary responsibility for delivering services within their jurisdictions. Since state agencies provide services across large, heterogeneous geographies, resources and attention are distributed across many competing priorities and communities. While residents in jurisdictions without LHDs or without another form of local public health service provision may access to some public health services through state agencies, the absence of a dedicated local entity can create meaningful gapes in coverage. Consistent provision of services at the local level has been shown to drive health improvements. Research has shown that as local public health spending increases, mortality rates fell (Mays and Smith 2017).

LHDs are one organizational form that institutionalizes such local public health provision within a specific community. Services provided by LHDs typically include immunization programs, infectious disease prevention and control, chronic disease prevention, environmental health services, maternal and child health programs, injury and violence prevention, and emergency preparedness and response (National Association of County and City Health Officials 2024; Shah et al. 2014). Research consistently shows that investing in public health at the local level leads to measurable improvements in health outcomes. For example, a study comparing health outcomes in Pennsylvania counties with and without a LHD found that counties without a LHD had poorer health outcomes, even after controlling for race, education, income, access to health insurance, and the urban-rural status of each county (Pszczolkowski et al. 2024). Efficacy of different LHDs vary by institutional capacity, per capita LHD expenditures, and community characteristics (Mays and Smith 2017; Remmert et al. 2013).

Despite the importance of LHD in providing core public health functions, many jurisdictions across the United States do not have a LHD. In Pennsylvania, only seven of 67 counties have LHDs (Pszczolkowski et al. 2024). Rural communities, which typically suffer poorer health outcomes, are more likely to either not have a LHD or to have a poorly resourced LHD (Harris et al. 2016). One of the challenges to creating and funding LHDs is the difficulty in measuring and quantifying the benefits that LHDs offer (Chen et al. 2018; Jacobson and Neumann 2009). Though public support is one essential element of LHD sustainability, it remains challenging to both know and communicate potential value of LHDs to the public (Jacobson and Neumann 2009).

Beyond the challenge of measuring and communicating benefits of LHD services, the COVID-19 pandemic created an additional challenge for public health agencies as they were thrust into an unprecedented political spotlight (Martin and Kronstadt 2020). The politicization of different COVID-19 responses and policies challenged public trust in federal, state, and local public health agencies (Haselswerdt and Gollust 2023; Steelfisher et al. 2023). Such politicization thus raises important questions about how public support for public health departments may vary based on which health issues are emphasized in public discourse. While extensive research has examined public attitudes toward specific health policies during COVID-19 (Algara and Simmons 2023; Allcott et al. 2020; Gadarian, Goodman, and Pepinsky 2021; Grossman et al. 2020; Mehlhaff et al. 2024), less is known about how the politicization of public health issues affects public demand for LHDs compared to emphasizing less politicized health threats. And do these effects vary systematically across political affiliations?

This study addresses these questions by using a contingent valuation experiment, implemented in Fall 2020, that randomized respondents to receive information about LHD

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services on either COVID-19 prevention or elevated blood lead level reduction. Lead exposure represents a significant public health challenge in the selected county, but is a less politically charged public health threat, providing a useful comparison case for understanding how issue politicization affects public support. Contingent valuation (CV) is a survey-based method that measures individuals' willingness to pay (WTP) for public goods or services that lack market prices. Typically, the method presents respondents with hypothetical scenarios describing a specific good or service and asks them through a series of survey questions their willingness to pay for it. By aggregating individual WTP responses, researchers can then estimate the total economic value that society places on a public good (Carson 2000). CV methodology is particularly appropriate for measuring demand for LHD services since they generate diffuse public benefits that are not captured in traditional market transactions. Using interval regression analysis, we estimate willingness to pay for LHD services under each framing condition and examine how these effects differ across political party affiliation. In the CV experiment, respondents received information about LHDs in general but were specifically given information about one particular public health improvement (COVID-19 prevention or elevated blood lead level reduction). To that end, although we interpret the willingness to pay estimates as measures of support for LHD services, it is important to note that they may conservatively reflect the willingness to pay for the specific public health improvement in the framing. We find overall high public support for LHD services in the selected county, though there are significant differences in stated WTP depending on whether respondents were randomized to receive the COVID-19 or blood lead level framings. Independents and Republicans had higher stated demand for LHD public health services with the blood lead level framing, while Democrats appeared less sensitive to the particular framing.

Hypothesis Formulation: Issue Politicization and Demand for Local Health Department Services

Public health and health policy are becoming more politicized and polarized along partisan lines. This polarization not only affects what types of policies are enacted and support for key public health institutions (Oberlander 2024), but also individual health behaviors such as vaccination (Oceno and Yen 2023) and mask use (Mehlhaff et al. 2024b). Research has shown that Republicans are more skeptical about heeding scientific-based recommendations, whereas Democrats tend to be more receptive to the advice of scientific experts (Blank and Shaw 2015). Given how politicized public health and science has become, particularly in the wake of the COVID-19 pandemic, we anticipate partisan differences in baseline WTP for LHD services.

Moreover, because COVID-19 is particularly politicized along partisan lines (Allcott et al. 2020; Gadarian, Goodman, and Pepinsky 2021; Grossman et al. 2020; Mehlhaff et al. 2024b), we expect that there will be asymmetric responses to the politicized issue frame in the CV experiment. Specifically, we anticipate that exposure to a politicized frame referencing COVID-19 will activate partisan identities, leading Republicans to report lower WTP for LHD services relative to Democrats and Independents.

H1 (Baseline political differences): Republicans will have the lowest WTP for LHD services compared to Independents and Democrats.

H2 (Exposure to politicized issue frame): Exposure to a highly politicized public health issue frame (e.g. COVID-19) will reduce Republicans' WTP more than it will reduce that of Democrats and Independents.

We also distinguish between issue politicization, the degree to which an issue is tied to partisan elites and ideological conflict, from issue salience or how personally important or public an issue is. Ciuk and Yost (2016) find that individuals rely more heavily on partisan cues when evaluating low-salience issues and are more likely to incorporate policy-relevant information when issues are high-salience. Our study, on the other hand, focuses on politicization rather than salience: a highly politicized frame heightens partisan identity activation, while a less politicized frame dampens partisan signals and invites more neutral, information-based evaluation.

Given the growing politicization of science, even less controversial public health matters show differential support by political affiliation (Haeder 2023; Motta 2024; Motta, Motta, and Stecula 2023). Of course, lead exposure and lead poisoning policies are not immune from such politicization – past administrations have leant differential levels of support to lead poisoning prevention efforts (Markowitz and Rosner 2003) and there were differential reactions to the handling of the Flint lead water crisis by political affiliation (Egan 2016). While, there is growing politicization of science and public health, we also argue that there is a spectrum of politicization within public health issues. COVID-19 was a highly politicized public health issue at almost level of society, whereas lead exposure is a less politicized issue. Because Republican elites have been especially critical of public health institutions since the pandemic and since COVID-19 was a highly politicized public health issue, we expect Republican respondents to be particularly sensitive to the COVID-19 frame that cue partisan identities. By contrast, a less politicized public health frame such as lead exposure should reduce motivated reasoning and increase Republicans' WTP for LHD services. Democrats and Independents attitudes toward public health are already more stable and less tied to partisan cues, so their WTP should remain relatively consistent across frames.

H3 (Republican responsiveness to less politicized framing): Republicans' willingness to pay (WTP) will be higher when exposed to a less politicized public health frame than when exposed to a highly politicized one.

H4 (Stability among Democrats and Independents): Democrats' and Independents' willingness to pay (WTP) will not differ significantly across highly politicized and less politicized public health frames.

Data and Methods

Study Setting and Survey Design

Lancaster County is located in southern-central Pennsylvania county with a mix of urban and rural municipalities. It has over 500,000 residents, of which roughly 58,000 live in Lancaster City. The per capita income from 2019 was $32,194 (U.S. Census Bureau QuickFacts n.d.). A 2022 Community Health Needs Assessment (CHNA) identified three public health priorities: a healthy environment, healthcare access and quality, and mental health. Within the healthy environment priority, home lead paint contamination was identified as a subpriority. (Penn Medicine and Wellspan Health 2022). Relevant to this study, 55.6% of homes in Lancaster County were reported as being at risk for having lead paint contamination (Penn Medicine and Wellspan Health 2022), and Lancaster county ranked third in PA for having the highest elevated blood lead levels in children under 2 (Pennsylvania Department of Health 2022)(Pennsylvania Department of Health 2022). During the COVID-19 pandemic, COVID-19 was also a large public health concern, in part, due to the large elderly population in the county (Lancaster Online 2020). However, Lancaster faired better than most other PA counties: at the first peak of the

pandemic in Lancaster (December 2020-February 2021), the per-capita COVID-19 death rate was 65 per 100,000, ranking it 55th out of PA's 67 counties (Lancaster Online 2021)

This study setting is an ideal testing ground for a number of reasons. First, Lancaster is similar to other counties in Pennsylvania without a LHD—of the seven out of 67 counties in Pennsylvania with a LHD, most of these encompass or surround the urban centers of Philadelphia and Pittsburgh. Second, while Lancaster County is a traditionally Republican County, it has substantial partisan heterogeneity. (Walker 2020), which is important to testing partisan differences in framing effects. Finally, discussions about a LHD are not new in Lancaster. In 2005, the United Way of Lancaster County commissioned a feasibility assessment for a public health department from Drexel University, which was heavily publicized and met with resistance from conservative county commissioners at the time, who largely cited concerns over cost (Brubaker 2005). This context suggests that debates over a LHD in Lancaster County are neither hypothetical nor unfamiliar to residents, strengthening the real-world relevance of the study's experimental scenario.

In the summer of 2020, researchers met with different stakeholders in Lancaster County to understand potential economic, social, and health concerns related to the COVID-19 pandemic in the region. Those conversations informed a survey to more fully assess the effects of COVID-19 in the county. Embedded in the survey was a CV experiment to assess demand for LHD services in Lancaster, which is described later in this paper. The survey was approved exempt by the Franklin & Marshall Institutional Review Board. In August 2020, we pretested the survey on 53 respondents to ensure comprehension of questions and consistency in CV responses.

The COVID-19 Survey was conducted from September 28 – November 8, 2020 and resulted in 2,094 completed interviews. Households were randomly sampled using an addressed-

based sampling methodology that is based on the United States Postal Service's Delivery Sequence File (DSF). The DSF includes more than 98 percent of Pennsylvania households, which gave nearly all area residents an opportunity to participate whether they had a landline telephone or not. After selecting a household via the DSF sample, one of the household members was also selected randomly.[1]

The interviewing was conducted by an academic survey research organization housed within a liberal arts college located in Lancaster County. English and Spanish versions of the survey were available to all respondents. A mixed-mode survey was used to collect data for this project. Mixed-mode designs use multiple interviewing methods (i.e., live-interviewer and/or self-administered interviewing) to maximize the positive aspects of telephone and self-administered surveys. These mixed-mode designs tend to produce higher response rates and increased representativity. The final data includes information gathered from 919 web-based interviews and 1,175 telephone interviews.

A pre-notification postcard was mailed to all sampled respondents. This notification provided respondents with the option of completing the survey via a live-interviewer, telephone interview or using a self-administered web survey, based on their preference. Follow-up telephone calls with sampled respondents who did not respond to the pre-notification mailing were made.

Interviewers attempted callbacks to each number in the sample, with most taking place during weeknights and weekends. Follow-up calls to numbers yielding no answers, busy signals, or answering machines/voice mail were scheduled at varying times, including mornings and afternoons, depending upon when previous contacts were attempted. Potential respondents who

[1] The AAPOR Response Rate is 9% and response codes are provided in Supplementary Materials Table S4.

initially refused to be interviewed were re-contacted a minimum of two times by specially trained interviewers.

Contingent Valuation Experiment

To measure public preferences for LHD services, we use contingent valuation (CV), a survey-based method that measures individuals' willingness to pay (WTP) for public goods or services that lack market prices. Typically, the method presents respondents with hypothetical scenarios describing a specific good or service and asks them through a series of survey questions their willingness to pay for it. By aggregating individual WTP responses, researchers can then estimate the total economic value that society places on a public good (Carson 2000). Though originally used in environmental economics to value non-market environmental resources such as clean air in wilderness areas, and biodiversity preservation, public health researchers have increasingly used the method to assess demand for public health improvements (Diener, O'Brien, and Gafni 1998; Hanley, Ryan, and Wright 2003; Olsen and Smith 2001). Indeed, contingent valuation has been used to measure willingness to pay for reductions in childhood obesity (Cawley 2006; Kesztyüs et al. 2014), reductions in gun violence (Ludwig and Cook 2001), Alzheimer's prevention (Basu 2013), weight-control treatment (Liu, Tsou, and Hammitt 2009), health insurance reform (Lavetti, Simon, and White 2014), and domestic violence prevention programming (Sorenson 2003). Beyond these specific applications of the contingent valuation method in public health, it has also been used in a cross-country study to measure demand for better healthcare services (Gugushvili 2022), different public health services in Indonesia (Shono et al. 2014), and improved public health care services in Saudi Arabia (Al-Hanawi, Alsharqi, and Vaidya 2020). We build off this latter strand of literature by measuring demand for public health

services provided by a hypothetical LHD in Lancaster County. These types of services are particularly appropriate for CV methodology, because they generate diffuse public benefits that are not captured in traditional market transactions.

One of the concerns that stakeholders raised during survey design was the lack of a centralized county health authority to which health providers report data, which created difficulty in identifying and responding to COVID-19 outbreaks. Stakeholders reported that the lack of a county health department also made coordinating testing and vaccinations challenging.

A contingent valuation exercise was embedded within the survey to explore resident demand for a LHD services in Lancaster County. Our sample was randomly assigned to either a COVID-19 condition or a lead condition.[2] The COVID-19 condition group received a contingent valuation prompt that focused on potential benefits of a health department to reduce COVID-19 cases in Lancaster County, whereas the lead condition group received a contingent valuation prompt that focused on potential benefits of a health department to reduce the number of children with high lead levels in Lancaster County. The prompts that each condition received are shown in Table 1.

[Table 1 here]

Both conditions contain four components: 1) They introduce the public health situation and set up the hypothetical referendum, 2) they provide examples of benefits that a potential public health department can provide, 3) they set up a probabilistic potential benefit, which is critical to reduce overstatement of demand, and 4) they frame the question as for or against with the option to refuse or abstain.

[2] A randomization check shows that there were no differences at the 95% significance level in group assignment by demographic groups (see Supplementary Materials Table S1).

Careful survey design is necessary to reduce potential hypothetical survey bias, in which respondents may overstate demand given the hypothetical nature of the question (Carson 2000). In our case, the stated 25% reduction of cases may have inflated demand. However, it is necessary within a CV study to be as specific as possible about what the good or service would provide. We use a probabilistic benefit of a 25% reduction in consultation with local health experts in Lancaster to try to elicit how a respondent would value a LHD that could achieve a meaningful public health improvement in the stated condition, while also providing reference to other benefits the LHD may provide. While a well-functioning LHD would almost certainly reduce both COVID-19 and lead poisoning cases, as well as providing other myriad public health benefits, our study focuses instead on how framing the public health benefit around one public health condition shifts stated support for a LHD.

Moreover, a panel of experts from NOAA created a series of best practices for creating contingent valuation survey questions, which include: 1) Use of a probability sample; 2) using face-to-face or telephone interviews when available; 3) measuring willingness to pay rather than willingness to accept; 4) pretesting the CV questionnaire; 5) phrasing CV question as hypothetical referenda in which respondents cast a simple yes or no response to a proposed increased in taxes if the referenda passes; 6) providing a "would not vote" or "abstain" option; 7) reminding respondents of their budget constraint when considering their willingness to pay; and 8) breaking down willingness-to-pay by a variety of respondent characteristics (Arrow et al. 1993). The design of our CV survey question adheres to each of these recommendations, and we further explore willingness-to-pay by a variety of respondent characteristics in the results section of this paper.

We used a double-bounded CV model, in which survey respondents are asked a sequence of questions that progressively narrows down the willingness to pay. We set the initial hypothetical $50 tax increase based on pre-testing responses and budgets of neighboring county public health departments. For those that voted for the tax increase, they then were asked a follow up at $100/year and then if they voted for the tax increase again, they were asked a second follow up at $250/year. For those that voted against the initial hypothetical $50 increase, they were then asked a follow up at $25/year and if they voted against again, they were then asked a second follow up at $5/year. Based on their responses, respondents ended up in one of the following categories of willingness-to-pay in dollars: <5, (5, 25), (25,50), (50, 100), (100, 250), >250. The distribution of respondents in each interval is displayed in Table 2. Given that CV experiments can suffer from hypothetical bias, we convert "do not know" and "abstain" responses into no responses to generate more conservative estimates of WTP.

[Table 2 here]

Sample Overview

Comparing the demographic data from the survey to census data from Lancaster County, our survey data contained an oversample of certain subpopulations, namely higher-income, educated and older individuals. We calculated post-stratification raking weights so that any analyses more closely reflect the actual population. The variables used to calculate the weights were region, age, gender, education, and race/ethnicity. Table 3 contains summary demographic data showing both the pre-weighted and post-weighted data.

[Table 3 here]

Statistical Model

We assume that each person i has a willingness to pay for a local public health department that is equal to Y_i^* and is related to a person's characteristics X_i such that $Y_i^* = \beta X_i + \varepsilon_i$ where ε_i is assumed to be mean zero and normally distributed. We do not observe Y_i^* but know the willingness to pay of person Y_i^* lies in an interval $[Y_{i1}, Y_{i2}]$ because of the responses they provided to a series of CV questions. Therefore, the likelihood contribution is $Pr\ Pr\ (Y_{i1} \leq \beta X_i + \varepsilon_i \leq Y_{i2})$. For left-censored data (for which the lower bound is not known), the likelihood contribution is $Pr\ (\beta X_i + \varepsilon_i \leq Y_{i2})$ and for right-censored data (for which the upper bound is not known), it is $Pr\ (Y_{i1} \leq \beta X_i + \varepsilon_i)$.

We estimate willingness to pay using interval regression, which models a latent continuous WTP variable y_i^* that is only observed within intervals defined by the respondent's lower and upper bid amounts. The latent WTP is specified as:

$$y_i^* = \beta_0 + \beta_1 COVID_i + \beta_2 X_i + \varepsilon_i \qquad (1)$$

$COVID_i$ is an indicator variable equal to 1 if respondent i received the COVID-19 framing and 0 if they received the blood lead level framing (see Table 2), X_i is a vector of socioeconomic and demographic covariates, and we assume the error term, ε_i, is normally distributed.

The observed interval data take the form $[LB_i, UB_i]$ where LB_i and UB_i represent the lower and upper bounds of respondent i's stated WTP range. The likelihood function for interval regression is thus:

$$L = \Pi_i[\Phi\left(\frac{UB_i - \beta X'_i}{\sigma}\right) - \Phi\left(\frac{LB_i - \beta X'_i}{\sigma}\right)] \qquad (2)$$

$\Phi(\cdot)$ is the standard normal cumulative distribution function and $\beta X'_i$ represents the full linear predictor including the intercept. We estimate the maximum likelihood function and individual predicted WTP values are then calculated as $E[X_i] = \hat{\beta} X'_i$ and bootstrap standard errors (1,000

replications) are used to calculate 95% confidence intervals for the mean and median WTP across the sample. We estimate four interval regression specifications. The first model is a base model that only includes an indicator for whether the individual received the COVID-19 or lead condition as shown in Table 2. Model 1 tests the unconditional framing effect, or the average treatment effect of the COVID-19 framing. The second model adds socioeconomic, demographic, and political controls both to assess the robustness of the unconditional framing effect in Model 1 and to generate overall WTP predictions, since these characteristics are independently predictive of WTP. The third model extends Model 2 by including interactions between political affiliation and treatment condition that allows us to test whether framing effects are heterogeneous by political identity. Finally, the fourth model replicates Model 3 but restricts the sample to phone respondents to account for prior research showing that WTP estimates are sensitive to survey mode.

Results

The main results from the interval regression model are shown in Table 4. In each model, the dependent variables are the lower bound and upper bounds of the intervals as displayed in Table 2.

[Table 4 here]

Column 1 contains the base model which explores differences in WTP between those given the COVID-19 and lead conditions, controlling only for mode of response (i.e. phone or online). We observe that those receiving the COVID-19 frame reports $21.59 lower WTP for a LHD than those receiving the lead frame, on average (*p=0.039)* Column 2 includes other demographic and socioeconomic covariates to identify predictors of WTP for a local public

health department. The framing effect attenuates slightly with the inclusion of these covariates; in this model, participants receiving the COVID-19 frame have a -$17.66 lower WTP for a LHD, on average, compared to those receiving the lead frame (*p=0.052)*. We also observe how different identities affect WTP, on average. Those that politically identify as Republicans and Independents have a significantly lower WTP than Democrats. Compared to non-Hispanic Whites, non-Hispanic Blacks and other racial groups also report lower WTP, on average. Compared to those with a high school diploma or less, those with a Bachelors degree or higher report a higher WTP, on average. We do not find that age, sex, or city versus country residence are significant predictors of WTP. Importantly, mode of survey is an important predictor of WTP with phone respondents reporting higher WTP than online respondents.

Since COVID-19 was a highly politicized issue, perhaps the lower observed demand in the COVID-19 condition group was due, in part, to such politicization. Column 3 includes interaction terms between political party affiliation and the COVID-19 versus lead condition groups. The unconditional framing effect observed in Model 1 largely attenuates in this specification, suggesting that responses to the different frames were driven more by political heterogeneity than by the framing itself, though we do observe a weakly significant difference in framing effects between Independents and Democrats. We further restrict the sample to phone only respondents in Column 4, given that prior research has shown that CV results are sensitive to interview mode. We do not observe statistically different results between models 3 and 4, with the exception that the WTP difference between Democrats and Independents loses significance. To further elucidate our findings, we use results from model 3 to predict mean WTP for different political affiliations across assigned treatment conditions (see Table 5).

[Table 5 here]

Consistent with H1, we find that across both conditions, Republicans have significantly lower WTP for LHD services. Similarly, consistent with H2, we find that exposure to the politicized COVID-19 frame reduces Republican WTP more than it reduces that of Independents or Democrats (63% reduction for Republicans versus 44% and 0.28% for Independents and Democrats, respectively). However, we note that within each political affiliation, the difference in mean WTP is not statistically significant between conditions, thus causing us to reject H3. While the mean WTP for Republicans is higher under the less politicized public health frame, the difference is not significant. H4 predicted stability among Democrats and Independents across the different public health frames, which we do observe. However, the confidence intervals for Independents are substantially wider than for Republicans and Democrats, limiting our ability to draw strong conclusions about treatment effects within this subgroup. A larger sample of Independents may reveal effects that are obscured in the current analysis. Given that CV results can be sensitive to survey mode, we replicate Table 5 using only phone respondents and find similar results (see Supplementary Materials Table S2).

Turning to overall WTP for a LHD, we use Model 2 regression results to predict individual WTP. We select Model 2 because it includes demographic and socioeconomic controls, which are highly predictive of individual WTP. We bootstrap standard errors (1000 replications) to obtain mean and median WTP for a local public health department for our sample. Across our sample, mean WTP is $140.32 (95% CI: $128.35, $152.29) and median WTP is $162.86 (95% CI: $145.89, $179.82). We generate similar mean and median WTP values using Model 1 and Model 3 for comparison (see Supplementary Table S3). There are not statistically significant differences between Model 2 and Model 3, though mean and median

WTP values are lower when using Model 1 predictions. As noted above, however, we argue that Models 2 and 3 are more appropriate for predicting individual WTP given their inclusion of demographic characteristics.

[Figure 1 here]

We further break down mean WTP by select demographic groups as shown in Figure 1, with 95% confidence intervals shown as error bars. While we do not observe much of a difference in mean WTP by gender or age,[3] we observe educational and racial differences. College graduates have substantially higher average WTPs (mean WTP=$181.95, 95% CI: $161.75, $202.14) than those with some college (mean WTP=$118.22, 95% CI: $97.66, $138.77) or those with a high school diploma or less (mean WTP=$87.52, 95% CI: $70.67, $104.37). Further, white respondents in our sample have a higher average WTP (mean WTP=$148.05, 95% CI: $135.69, $160.41) than non-white respondents (mean WTP=$74.44, 95% CI: $42.86, $106.01).[4] We also repeat this analysis breaking down each demographic group by framing condition and do not find that individual demographic groups were sensitive to public health frames (see Supplementary Material Figure S1).

Discussion

In this paper, we use contingent valuation methodology to estimate willingness to pay for local public health department services. Since a local public health department is a broad public good for which to estimate WTP, we used two different prompts that focused on specific public health improvements that the local public health department would provide – one focusing on reducing

[3] Note: no respondents in our sample identified as non-binary or transgender.
[4] Note: we group non-white respondents together in this analysis because of the small sample sizes of any given non-white race in our data.

COVID-19 and one focusing on reducing elevated blood lead levels in children. Using interval regression, we find that overall demand for public health department services is high. In our base model, we find that the COVID-19 frame reduced demand for LHD services by $21.48 compared to the lead frame. These framing effects lose significance when we include framing and party affiliation interactions, suggesting that the differences in observed WTP are largely political.

Using back of the envelope calculations, assuming roughly 280,000 working adults in Lancaster County[5] and the estimated annual mean WTP of $140.14, the annual expected budget of a local public health department would be $39.2 million or $70.68 per capita.[6] Given the limited number of LHDs in Pennsylvania, most of which serve urban counties, it is difficult to compare this estimate to budgets of comparable county health departments. Chester County offers the best comparison in terms of geographic proximity and recent estimates indicate an annual LHD budget of $16.9 million or $31.24 per capita.[7] Of course, this comparison should be interpreted cautiously. While the WTP estimates are higher than Chester County's total per capita budget (which includes local, state, and federal contributions), this comparison likely understates the feasibility of local funding. Our estimate reflects only what residents would contribute through local taxes, which in practice would be supplemented by state and federal sources. Our study area also has worse health outcomes, which may genuinely drive higher demand for health services. Additionally, since CV estimates capture the valuation of improved public health services under hypothetical conditions, they should not be interpreted as direct

[5] Based on Data USA data: https://datausa.io/profile/geo/lancaster-county-pa
[6] Based on 2023 population estimate of 555,151: https://datausa.io/profile/geo/lancaster-county-pa
[7] Based on Chester County Board of Health Minutes from October 2024: https://www.chesco.org/DocumentCenter/View/77459/09-October-15-2024-Board-of-Health-Agenda?bidId=#:~:text=MINUTES,$3%2C434%2C266%20(34%25) and 2023 population estimate of 540,896: https://datausa.io/profile/geo/chester-county-pa

predictions of implementable tax policy. At the same time, the magnitude of these estimates suggests that residents place substantial value on specific public health protections even when those preferences are not fully reflected in local governmental financing decisions.

Perhaps more important than the actual WTP estimates themselves is the relative WTP estimate across political affiliation and frames. We find lowest support for a LHD among Republicans. Moreover, the COVID-19 frame reduced Republican support more than it did for Independents and Democrats. However, we find that within each political affiliation, demand for a LHD was quite stable and not very sensitive to the politicized issue framing**.** We offer two possible explanations for these findings: entrenchment of support levels, and sensitivity to the temporality of the public health issue. Polarization may operate more through entrenched differences in support levels than through responsiveness to messaging. The results suggest that while partisan identity shapes baseline support for local public health institutions, individual preferences do not seem malleable to framing effects. These findings highlight the challenge—and potential limits—of communication strategies that rely solely on reframing politicized health issues to broaden public backing for local health departments. Alternatively, respondents may have viewed the COVID-19 pandemic as temporary and been less likely to support a LHD when given this frame rather than when provided a frame centering a long-lasting public health concern such as lead exposure.

We also break down mean WTP by different subgroups and reveal important educational and racial differences in demand for LHD services. Income effects are likely obvious drivers of the educational differences that we observe – there is a correlation between income and education and those with more income have more ability to pay for LHD services. These differences may also reflect that more educated individuals tend to have more concerns about

public and community health (Shin et al. 2019). Comparing white to non-white respondents, we observe considerably higher average WTP among white respondents, which may be due to educational or income differences. These differences may also, in part, reflect structural racism that has created more distrust in public health institutions, research, and medicine among non-white individuals (Bagasra, Doan, and Allen 2021; Madorsky et al. 2021).

There are, of course, limitations to this study. Given the double-bounded CV model, there may be some degree of starting point bias given that all respondents started at the same price point ($50). However, we do not observe clustering of our sample in the intervals surrounding the $50 price point suggesting that starting point bias was not as much of a problem in our sample. While we designed the survey and analysis to minimize hypothetical bias, it often remains a concern with CV studies. However, even if we assume some degree of hypothetical bias, there still seems to be fairly high demand for public health services. Moreover, the relative demand between groups is likely less affected by hypothetical bias. Importantly, COVID-19 attitudes were rapidly evolving and so our results are tied to a specific moment in time. Moreover, given that the issue of LHD was not new in our setting (Brubaker 2005), our experiment may have suffered from pre-treatment effects that created entrenched opinions over the issue (Druckman and Leeper 2012). Given that public health is extremely local and our study covered one specific county, this may limit external validity. Moreover, since the CV scenarios focused on specific public health improvements, WTP estimates may reflect respondents' valuation of those particular outcomes in addition to, or even instead of, broader support for LHDs. Such framing thus may limit the extent to which findings generalize to support for LHD public health spending more broadly.

Despite these limitations, our findings offer important insights for public health policy and practice. First, we show how CV studies can elicit measures of demand for local health department services. The substantial magnitude of estimated WTP, even after accounting for potential hypothetical bias, suggests meaningful support for local health department services. This finding is particularly important in light of the challenge of measuring and communicating LHD value to the public (Jacobson and Neumann 2009). Furthermore, the lack of differential sensitivity to political framing across partisan groups reveals that attitudes may be deeply entrenched and not sensitive to issue framing. A complementary explanation is that respondents may have discounted the COVID-19 frame not because of partisan identity, but because they viewed the pandemic as a temporary threat unlikely to require a permanent institutional response. These findings suggest that public valuation of LHDs is primarily shared by entrenched partisan identities rather than responsiveness to politicized issue framing, though perceptions of whether the health threat is temporary may also play a role. Efforts to strengthen public support may therefore depend less on message reframing and more on sustained trust-building and demonstrating the visible local impact of public health institutions in addressing persistent health challenges that communities face.

■■■

Jennifer Orgill-Meyer is an Associate Professor of Government and Public Health at Franklin & Marshall College. She holds a Ph.D. in environmental economics and policy from Duke University. Her research focuses on demand for environmental health improvements and the impacts of environmental health policies on long-term health and human development. Her work is interdisciplinary, bridging environmental economics, epidemiology, and health policy. She has served as a consultant for organizations including the World Health Organization, USAID, the Millennium Challenge Corporation, and RTI-International.
jorgill@fandm.edu

Harriet Okatch is an Associate Professor of Public Health at Thomas Jefferson University in Philadelphia. She holds a Ph.D. in Chemistry from the University of Botswana and a MPH from the University of Pennsylvania. Her research focuses on lead exposure and lead poisoning

prevention (globally and locally), and climate change and health. She teaches various courses including Epidemiology, Environmental Health and Public Health Research Methods. Harriet is a member of statewide Lead Free Promise Project that aims to engage with organizations, community members, and policy makers to identify effective strategies to address lead exposure.

Wei-Ting Yen is an assistant research fellow at the Institute of Political Science at Academia Sinica. Previously, she was an assistant professor of the Government Department at Franklin and Marshall College in Pennsylvania. Dr. Yen studies democratic governance, comparative political economy, and welfare state development in Asia.

Berwood Yost is the Director of the Center for Opinion Research and the Co-Director of the Floyd Institute for Public Policy at Franklin & Marshall College where he also teaches courses in research methods and public health. He is also the Director of the Franklin & Marshall College Poll, which tracks public attitudes toward public policy issues and political campaigns. His scholarship is multidisciplinary and has appeared in journals that include the fields of criminology, human rights, political science, psychology, and public health.

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Table 1 Contingent Valuation Prompts

COVID-19 Condition	Lead Condition
In August 2020, Lancaster County had over 6,500 confirmed cases of COVID-19. Over 400 people have died due to COVID-19 in Lancaster County. Imagine there was a new voter referendum in Lancaster County which proposed to create a Public Health Department to improve community health. For example, the Health Department could provide better contact tracing, testing and education about preventing COVID-19. Imagine that having the Health Department would lower the cases of COVID-19 by 25% and promote better public health. Imagine that if the referendum to create a Public Health Department passes, you and everyone else in Lancaster County will have to pay $50 more in taxes every year. Given your current budget, would you vote for or against creating a Public Health Department? For, Against, Don't know, Refused, Abstain	Lancaster city ranks second highest in Pennsylvania for children with high levels of lead in their blood. High lead levels can cause physical and mental health problems, including lower IQs. Imagine there was a new voter referendum in Lancaster County which proposed to create a Public Health Department to improve community health. For example, the Health Department could give more lead testing and better education about lead. Imagine that having the Health Department would lower the number of children with high lead levels by 25% and promote better public health. Imagine that if the referendum to create a Public Health Department passes, you and everyone else in Lancaster County will have to pay $50 more in taxes every year. Given your current budget, would you vote for or against creating a Public Health Department? For, Against, Don't know, Refused, Abstain

Table 2 Contingent Valuation Intervals (Weighted Regression Sample N=1946)

Interval	Sample Size
<$5	432 (22.2%)
($5, $25)	104 (5.3%)
($25, $50)	119 (6.1%)
($50, $100)	312 (16.0%)
($100, $250)	407 (20.9%)
>$250	572 (29.4%)

Table 3 Sample Overview

	Census Estimates[8]	Pre-weighted Data (N=2015)	Weighted Data (N=2015)
Men	48%	44%	47%
Women	52%	55%	53%

[8] All estimates are from the 2018 5-year American Community Survey data, US Bureau of the Census, accessed 11/11/2020.

18 - 34	29%	9%	27%
35 - 54	31%	26%	29%
55 plus	40%	64%	45%
Non-Latinx White	90%	87%	84%
Non-Latinx Black	4%	3%	4%
Latinx	9%	5%	8%
HS or less	51%	24%	46%
Some college	22%	24%	20%
Bachelors +	27%	51%	34%
Republican	N/A	39%	45%
Independent	N/A	8%	9%
Democrat	N/A	53%	46%
Lancaster City	11%	31%	18%
Lancaster County (non-City)	89%	69%	82%

Table 4 Interval Regression Results

	(1)	(2)	(3)	(4)
COVID-19 Condition Group (0=Lead Condition Group)	-21.48**	-17.66*	-0.817	-28.55
	(10.41)	(9.071)	(13.25)	(17.79)
Phone respondent (0=Online respondent)	-2.349	47.42***	47.55***	
	(10.85)	(10.12)	(10.12)	
Republican (0=Democrat)		-177.4***	-165.3***	-165.6***
		(10.16)	(13.77)	(17.81)
Independent (0=Democrat)		-79.06***	-47.74**	-47.08
		(18.40)	(24.16)	(28.77)
COVID-19 Condition X Republican			-23.83	5.531
			(18.66)	(24.19)
COVID-19 Condition X Independent			-68.76*	-49.97
			(37.35)	(47.49)
Male (0=Female)		13.89	14.52	22.43*
		(9.136)	(9.152)	(11.93)
City resident (0=County resident)		11.94	11.87	16.72
		(13.53)	(13.35)	(16.95)
Age: 35-54 (0=18-34)		-6.036	-4.809	-14.24
		(13.94)	(13.93)	(19.17)
Age: 55+ (0=18-34)		-14.84	-14.36	-15.06
		(13.34)	(13.33)	(17.39)

Hispanic (0=Non=Hispanic White)		-25.18	-25.22	-30.59
		(22.14)	(22.11)	(26.15)
Non-Hispanic Black (0=Non-Hispanic White)		-61.29***	-63.58***	-81.16***
		(22.33)	(22.08)	(26.70)
Other (0=Non-Hispanic White)		-64.28**	-66.19**	-88.00**
		(28.46)	(27.82)	(41.18)
Some College (0=HS or Less)		25.33**	25.02**	34.54**
		(11.79)	(11.78)	(14.35)
Bachelors Plus (0=HS or Less)		78.94***	79.50***	96.35***
		(12.15)	(12.16)	(16.08)
Constant	120.9***	156.1***	146.6***	195.3***
	(10.22)	(18.38)	(19.53)	(22.53)
Sample	Full	Full	Full	Phone Only
Log-Likelihood	-3726.48	-3421.09	-3421.09	-1805.42
AIC	7460.97	6290.28	6287.28	3642.85
BIC	7483.26	6372.62	6380.6	3722.01
Mc-Fadden Adjusted R2	0.000	0.081	0.081	0.069
Observations	1,946	1,789	1,789	1,041

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5 Predicted Willingness to Pay by Political Party and Prime Condition ($)

	Lead Condition	Covid-19 Condition
Republicans	36.57	13.38
	(18.71, 54.43)	(-5.78, 32.54)
Independents	155.91	87.04
	(112.04, 199.77)	(36.04, 138.04)
Democrats	198.08	197.54
	(178.52, 217.63)	(178.84, 216.24)

Reported WTP is estimated mean WTP based on Model 3 from Table 4.
95% confidence intervals are shown in parentheses.

Figure 1 Mean WTP by Demographic Group

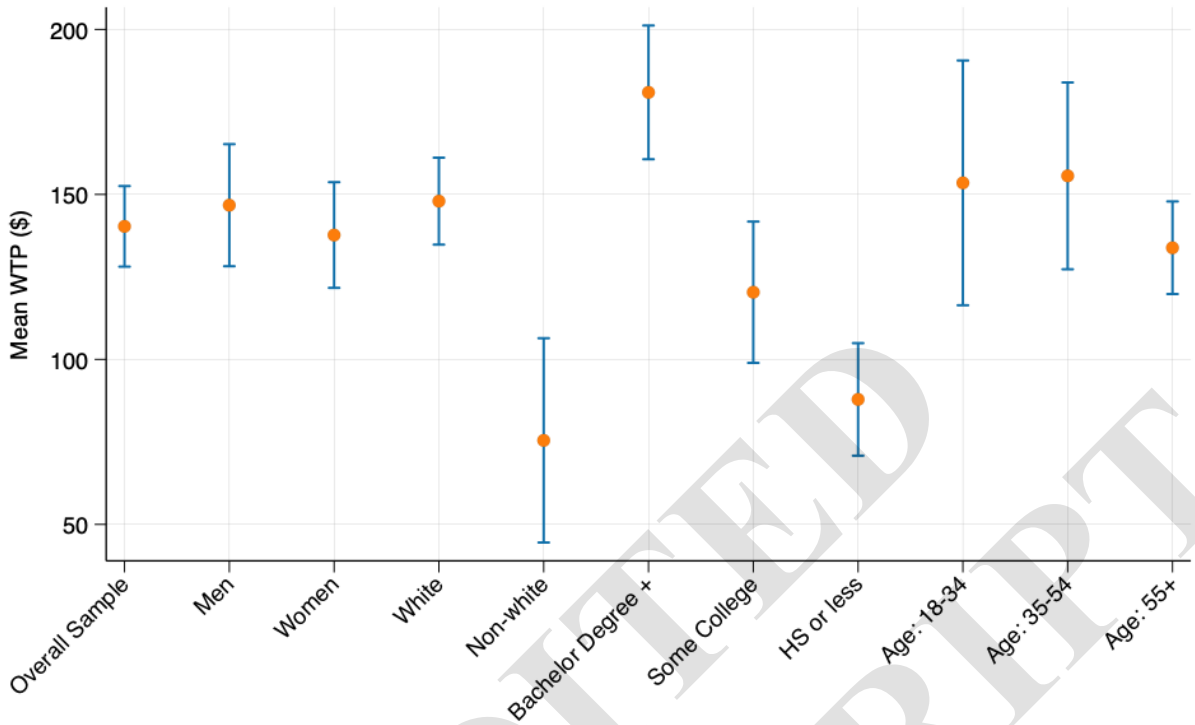

Figure 1 Alt Text: Scatter plot of mean WTP values for different demographic groups with 95% confidence intervals

Figure 1 Long Description: Figure 1 is a scatter plot of mean WTP values and 95% confidence intervals for the overall sample and for the following subpopulations: men, women, whites, non-whites, those with Bachelor's degrees or higher, those with some college, those with HS degrees or less, ages 18-34, ages 35-54, and ages 55+. The mean value for the overall sample is $140.32 with a 95% confidence interval ranging from $128.35 to $152.29. Most of the subpopulations do not have statistically different mean WTPs from the overall sample. The data is summarized in the following table:

	Mean WTP	Lower 95% Confidence Interval	Upper 95% Confidence Intervall
Overall	$140.32	$127.96	$152.67
Men	$146.74	$128.36	$165.12
Women	$137.70	$120.85	$154.54
White	$147.96	$135.15	$160.78
Non-White	$75.46	$45.21	$105.72
Bachelor Degree +	$180.93	$161.27	$200.59
Some College	$120.36	$99.59	$141.14
HS or less	$87.87	$71.30	$104.44
Age: 18-34	$153.50	$116.43	$190.58
Age: 35-54	$155.63	$99.34	$211.91
Age: 55+	$133.84	$120.11	$147.56

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