Draft: Information, Ideology, and Anti-Vaccination Attitudes[*]

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Anti-vaccination attitudes are prevalent among individuals affiliated with both major political parties. What determines anti-vaccination attitudes? Using survey responses of 1,000 US adults, I find that individual and state level variables contribute to attitudes towards vaccination. Using data from a 2015 telephone survey, I identify anti-vaccination attitudes using item response models. I show the presence of anti-vaccination attitudes among respondents by looking at responses to survey questions using graded response and nominal response models. I find that respondents from states with higher insured citizens are less likely to have skeptical attitudes towards vaccinations. I established the necessity of looking at vaccinations as latent constructs by showing the difference in model predictions. Using a mixed linear model, I predict values of a latent construct, theta, and the results show relationships that are obscured by looking at direct responses with a multinomial logit.

Keywords: Vaccination, State Politics

Introduction: Resistance to vaccination has existed since vaccination regimens were first administered. During the last several years, opposition to vaccination has been motivated by perceived links to autism. Although links between vaccinations and autism have been refuted, citizens are still concerned. I argue that there are three reasons that should motivate political scientists to explore anti-vaccination sentiments.

First, prominent political figures voiced concerns about links between vaccinations and autism. President Trump, along with Republican candidates Ben Carson and Rand Paul, claimed the current vaccination regimens are linked to autism in the Republican Presidential Debate. Concerns about vaccinations are also voiced by Democratic politicians. Dennis Kucinich, a former US congressman and gubernatorial candidate, argued that parents should determine if their children should get vaccinated. Since voters look to politicians for informational shortcuts, anti-vaccination sentiments have political consequences (Lupia 1994, Lau & Redlawsk 2001).

Second, interest groups defending vaccine freedom have become more prominent. Vaccine freedom groups are active in both Republican and Democratic stronghold states. For example, the Michigan Vaccine Freedom Political Action Committee has endorsed candidates on all major ballots during the 2018 midterm elections. Interestingly, Michigan Vaccine Freedom PAC endorsed Republicans, Democrats, and Independents. Scholars have posited that interest groups can influence the political agenda (Baumgartner & Jones 1991). The fact that interest groups are advocating policy premised on skepticism towards vaccinations should drive scholars to explore anti-vaccination sentiments.

Third, citizens that vote in democracies should be informed. We know that levels of political knowledge are concerning in the United States (Delli Carpini and Keeter 1996).

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[*]The paper's revision history and the materials needed to reproduce its analyses can be found on Github here. Corresponding author: ahmad-qbazard@uiowa.edu. Current version: April 01, 2019.

However, information that leads to concerns about vaccination is not necessarily linked to voter ignorance. While there has been media coverage that refutes links between vaccinations and autism, misconceptions persist. Perhaps evidence of Nyhan and Reifler (2010)'s failure of corrections, media coverage of vaccinations has not eased concern even after measles and mumps outbreaks. Therefore, scholars should explore variations that lead to increased skepticism toward vaccinations.

This article departs from the third motivation for exploring anti-vaccination sentiments. Using a survey of 1000 adults in 50 states, I examine responses to a series of questions that capture anti-vaccination attitudes. First, I proceed to show the existence of anti-vaccination attitudes as a latent construct. I use both graded and nominal response models to show the presence of the latent construct. Then, I incorporate covariates that predict responses to direct questions on concerns about vaccinations. I use a multinomial logit model to predict the probability of particular responses. Finally, I show that individual and state-level covariates predict the parameter of anti-vaccination attitudes. Here, I use a mixed linear model with random coefficients and link the model to the theta parameter in the item response model.

Informational, Ideological, and Recent Perspectives on Anti-Vaccination Attitudes: Concerns about vaccination have been studied extensively by scholars in public health and behavioral sciences. Much of the literature focuses on the sources of information reported by survey respondents. The works underscore the importance of background factors and sources of information in the Theory of Planned Behavior (TPB). The Theory of Planned behavior is a cognitive processing model that links attitudes to behavioral intentions. Attitudes are determined by knowledge, behavioral beliefs, and subjective norms. Kennedy et al. (2011) ask respondents whether they plan on having their children follow recommended vaccine regimens. Surveying 475 individuals, Kennedy et al. show that 93.4 percent of the respondents plan to follow recommended vaccination regimens. In their sample, 81.7 percent of the respondents listed their doctor as the most important source of information on vaccines. Wheeler and Buttenheim (2013) also focus on sources of information on vaccines. They find that non-physician sources of information play an important role in parents' intention to follow alternative immunization regimens. Wheeler and Buttenheim argue that communication from physicians plays an important role in addressing vaccine concerns. Salmon et al. (2004) mail surveys to a sample of 1000 schools in Colorado. Salmon et al. find that children attending schools with a respondent that was a registered nurse were less likely to have vaccine exemptions than children attending school where the respondent was not a nurse.

Another line of literature emphasizes ideology and argues against the "knowledge deficit" approach. Baumgaertner et al. (2018) show that ideology has direct effects on anti-vaccination attitudes. Baumgaertner et al. find that conservative respondents are less likely to hold pro-vaccination attitudes. In work that emphasizes the role of ideology, political ideology is defined as a set of beliefs that influences an individual's perception of normative order in society (Douglas & Wildavsky 1982, Baumgaertner et al. 2018). The literature on ideology also links ideology to cognitive decisions and evaluation of risk. Therefore, there is an expectation for ideology to influence attitudes towards vaccinations directly.

Testing the Knowledge Hypothesis with State Level Variation: I argue that there is an indirect relationship between health policy and anti-vaccination attitudes. More specifically, I predict that individuals from states that facilitate more interaction with medical professionals will be less likely to hold anti-vaccination attitudes. The relationship between health policy and attitudes is premised on knowledge deficit theory which explains anti-vaccination attitudes. Knowledge based theories emphasize interaction with medical professionals as reliable sources of information. States that have health policy that facilitates more interaction should be expected to have individuals that are less likely to be skeptical towards vaccines. While interaction with doctors is primarily determined by the behavior of individuals, state health care policy may be designed to facilitate more interaction with medical professionals. By state health care policy, I am referring to the determinants of health insurance enrollment. I use data from the Kaiser Family Institute to account for state level variation in citizen interaction with medical doctors and health insurance coverage. The data is merged with individual level data from the 2015 Pew Center Survey.

When studying anti-vaccination attitudes, the primary concern is with the individuals. However, Salmon et al. (2004) show that variation at the group level, in their case the school level, leads to variation at the individual respondent level. Salmon et al. show that the presence of registered school nurses is associated with less rejection of physician recommended vaccine regimens. Available data allows for an assessment of the state-level background factors. Previous work has shown that information from medical professionals leads to less skepticism towards vaccines (Wheeler and Buttenheim 2013). I test whether factors lead to more access to medical professionals can be linked to anti-vaccination attitudes. I look at, both, the percent of individuals that had not seen doctors in over a year and the percent of uninsured individuals in a state. We may know the percent in the state that have not seen doctors. However, we can not be sure whether this is the case because of access to doctors or merely due to the behavior of an individual. Looking at the percent uninsured in a state reflects more policy variation. Therefore, I hypothesize that:

- H1: Individuals from states with less interaction with medical professionals are more likely to hold anti-vaccination attitudes.

- H2: Individuals from states with higher uninsured populations are more likely to have anti-vaccination attitudes.

Anti-Vaccination Attitudes in the Pew Center Survey:

[Insert Table 1 here]

I show that, in the 2015 Pew Center Survey, there is evidence of the existence of anti-vaccination attitudes. My work differs from previous work because I treat anti-vaccination attitudes as latent constructs, measuring them using item response theory. I argue that measuring attitudes as latent constructs is superior to previous approaches because it uses responses to a range of questions. I proceed by looking at a collection of questions relevant to vaccination and concerns about side effects. In addition to collecting the demographics of the survey participants, the survey asks five direct questions about vaccinations. First, the survey asks about the importance of vaccinations. Second, the survey asks how much

information a respondent heard about the advantages of vaccinations. Third, respondents are asked about exposure to information about the disadvantages of vaccinations. Fourth, respondents are asked if the vaccinations are more dangerous than the diseases they are designed to prevent. Fifth, the survey asks respondents if they think certain vaccines cause autism. The responses are coded as ordinal ranging from, for example, "Not at all important" to "Extremely Important."

To establish a relationship between questions or to uncover a latent construct, I employ item response models because of the nature of the questions and responses. I do not use additive models because these models treat each question with equal weight. Moreover, additive models do not reflect measures of uncertainty (Warshaw 2018). I do not use factor analysis models because they are not well suited for dichotomous and ordinal responses (Kaplan 2004, Treier & Hillygus 2009). Item response models are the most appropriate models for ordinal and nominal responses (Johnson and Albert 2006). Given that models taken from item response theory are the most appropriate, I employ both a graded response model and a nominal response model.

Categorical Item Response Models: To test for the existence of a latent construct from responses to the five major questions, I use a graded response model and a nominal response model. Both models calculate difficulty and discrimination parameters given responses to survey questions. The graded response model is an extension of a standard two parameter item response model. Graded response models are unique because they allow items to vary in their discriminations and difficulty parameters. The responses to the five questions are ordered. Assume the order is from 0 to k. The following equation illustrates how the model determines the probability of a particular response:

$$Pr(Y_{ij} \geq k | \alpha_i, \beta i, \theta_j) = \frac{exp(\alpha_i \theta_j - \beta_{ik})}{1 + exp(\alpha_i \theta_j - \beta_{ik})}$$

where alpha is the discrimination parameter for a particular item. Beta represents the cut point k between each response. Theta is the latent tr ******

Tables and Figures

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Appendix

Citations

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