

EXAMINING VARIATION IN SURVEYING ATTITUDES ON SAME-SEX MARRIAGE

A META-ANALYSIS

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Abstract Recent polls report majorities of the public supporting marriage recognition for same-sex couples. These reports are not uniform, with some polling organizations still reporting less than a majority in favor. I examine variation in these results using meta-analysis to examine variation among organizations ($n_{org} = 21$) and question wordings ($n_{qw} = 36$). I also examine direct effects that explain variation based on question framing from 1996 to 2014 ($n_{poll} = 138$). The results show that after accounting for this variation, a majority of the public supports same-sex marriage in 2014, and any deviations from that estimate can be explained by question framing and organizational “house” effects. The results indicate that questions that focus on the issue of “same-sex marriage” garner less support than questions on legal recognition of marriages for same-sex couples; this finding suggests that framing accounts for why some polls do not report majorities in favor.

Introduction

Popular media outlets report different conclusions about the state of public support for legal marriage rights for same-sex couples. In June 2013, for example, public support was at 49 percent according to Quinnipiac, but at 55 percent according to CNN. Such variation is concerning, especially when considering that these surveys are attempting to draw inferences on the same

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concept.¹ Agencies designing these surveys make decisions that may influence the results they obtain. Using meta-analysis, an approach to examine variation among results produced by distinct studies, this study categorizes three typologies that may induce variation in the level of support for same-sex marriage: (1) framing effects; (2) the explicit offer to provide a “Don’t Know” response; and (3) the number of response options provided. This framework can be used for other issues where disagreement exists among poll reports, and allows for a greater determination of whether this variation is simply random or is a product of systematic differences among the decisions made by different agencies.

Public opinion on same-sex marriage has undergone a rapid change (Baunach 2011, 2012; Flores 2014). Opinions regarding gay rights, particularly same-sex marriage, are considered “easy” issues (Carmines and Stimson 1989; Haider-Markel and Meier 1996). Change should be gradual and generational (Carmines and Stimson 1981). These recent changes in public opinion pose challenges to these theories and have fostered substantial research. Previous investigations of these trends have either focused on a single survey source to avoid confounding question wordings and other potential errors (Baunach 2011, 2012) or used multiple surveys with clear attempts to control for potential biases (Brewer and Wilcox 2005; Lewis and Oh 2008). Aggregated meta-analysis employing Bayesian hierarchical models of polling provides an opportunity to better understand these opinion changes by simultaneously evaluating a broader range of polls than is allowed by other techniques.

By examining variation in polling on popular support for legal recognition of same-sex marriages, I am also contributing to the ongoing development of poll analysis that moves beyond simple aggregation. Hillygus (2011) notes that the recent surge in poll aggregating has occurred without methodological approaches to systematically analyze such data. These aggregators, with notable exceptions such as Nate Silver’s 538 blog and Drew Linzer’s VOTAMATIC blog, tend to report toplines from multiple surveys, and some provide a naïve average, assuming that every poll is essentially equal.² Hillygus (2011) notes that applied analytical methods can improve poll-aggregation analysis.

One area where there are numerous differences among agencies is how they ask the public for its opinion. The words agencies choose may lead people to rely on different frames of reference and alter their responses. Focusing solely on the issue of “same-sex marriage” may be factually equivalent to the “legal recognition of marriages for same-sex couples,” but factually equivalent phrases may not be interpreted the same way (Tversky and Kahneman 1981, 1987). A recent, popular example is the difference between public attitudes in favor of the Affordable Care Act versus “Obamacare,” with survey results showing greater support for the former (Newport 2013). Implicit primes to

1. Sample size of the Quinnipiac poll was 2,014 with a margin of error of $+/-2.01$, and the CNN poll was 1,014 with a margin of error of $+/-3.02$. The upper and lower bounds indicate that these two surveys had significantly different results: Quinnipiac 49 percent [47,51] and CNN 55 percent [52,58].

2. Nate Silver’s (2013) and Flores’s (2014) analyses on same-sex marriage, however, do essentially treat all of these polls as equal.

underlying racial animus on issues like welfare tend to result in greater disapproval of the issue (Gilens 1999). Equivalent frames may or may not induce variation. For example, referencing undocumented immigrants with different, equivalent terms makes no difference (Merolla, Ramakrishnan, and Haynes 2013). It remains unknown whether factual equivalence on same-sex marriage results in no difference in the results reported or if they systematically alter findings. I find that “same-sex marriage” frames systematically underestimate popular support.

Previous research on survey measurement has shown that explicitly offering a “Don’t Know” option may or may not obscure measurement (Alwin and Krosnick 1991; McClendon and Alwin 1993; Scherpenzeel and Saris 1997; Alwin 2007). Such wordings increase the number of response options for respondents, offering one more category to select than in other situations. The number of response options provided to respondents may encourage or discourage respondents to indicate support or opposition. Particularly, research shows that providing an odd number of response options (e.g., favor, oppose, and neither favor nor oppose) tends to allow respondents to pick the neutral category, and ultimately produces less reliable results (Alwin 2007). Questions with an odd number of responses would be expected to affect the results of some polls relative to others that do not provide a “Don’t Know” option explicitly in the question and thus have two or four response options as opposed to three.³ In some survey settings, questions can provide both a neutral and a “Don’t Know” response option. The present discussion is whether the question wording explicitly offers the respondent an additional option that does not express support or opposition to an issue. There are no questions in the present study that explicitly offered respondents *both* a neutral response and a “Don’t Know” response.

Most of the questions used on same-sex marriage offer only two response options. These questions provide respondents the choice between two alternatives (e.g., favor or oppose; legal or not legal; and should or should not). A less common alternative to this type of question simultaneously asks for the direction and strength of opinion. For example: “Do you strongly favor, somewhat favor, somewhat oppose, or strongly oppose...?” Though subtle, the change in the number of response options may account for some of the variability in the results.

In addition to the question typologies, news agencies and pollsters may have systematic “house” effects, in which variation in results may be due to unique sampling and weighting strategies, question wording, reporting strategies, and sample size. To partition question wording and other forms of house effects, the data in this analysis are cross-classified among questions and agencies,

3. This categorization is not how the survey administrator documents “Don’t Know” responses versus refusals to offer a response. It is whether the question itself explicitly allows the respondent to identify a third category that is neutral. There are no questions in this analysis that offer five response options.

allowing an analysis that can evaluate unique contributions from these two sources of variation. I assess these sources in order to evaluate whether, after accounting for the three question typologies, there is still systematic variation among organizations and question wordings.

This analysis also provides a way to assess the aggregated level of support for same-sex marriage, while controlling for the components that produce differences. Previous investigations of survey results on statewide same-sex marriage bans show that measuring support for those bans is less reliable (Egan 2010; Powell 2013). This analysis focuses on popular support for same-sex marriage, as these measurements are likely more reliable and less a product of social desirability than measurement of opposition.

Overall, I find that a majority of Americans support same-sex marriage in 2014. There are no systematic biases in different question wordings when the model includes direct effects for whether the question provided only two response options, explicitly offered a “Don’t Know” response, and used a same-sex marriage issue frame. However, some news agencies and pollsters have significant deviations even after controlling for attributes about their question wording, suggesting that “house effects” result in some organizations systematically over-reporting or under-reporting support. Finally, the methods applied here can be used for other issues, providing a way to compare multiple sources of variation among polls and identify the potential sources of such variation.

Data and Analysis

This analysis relies on 136 national polls reporting support for same-sex marriage among registered voters. I sample the results of surveys from 1996 to 2014, which are available through news websites, poll results archives (e.g., PollingReport.com), and polling archives (e.g., Roper iPOLL). Details of the underlying data are provided in figure 1, which describes how frequent these polls are over time and question typology for each agency in the analysis.

Since each study surveys a different number of respondents, the analysis incorporates the sample size explicitly. By taking the weighted number of respondents who support same-sex marriage, n_i , I model the level of support as having a binomial distribution (Equation 1):

$$n_i \sim \text{Binomial}(N_i, \pi_i) \quad (1)$$

The proportion of those in favor of same-sex marriage (π_i) is then analyzed while accounting for the size of the sample in the survey (N_i). Equation 1 facilitates in modeling the variation that is present in the surveys while permitting sample size to affect the confidence of the proposed estimate of support.

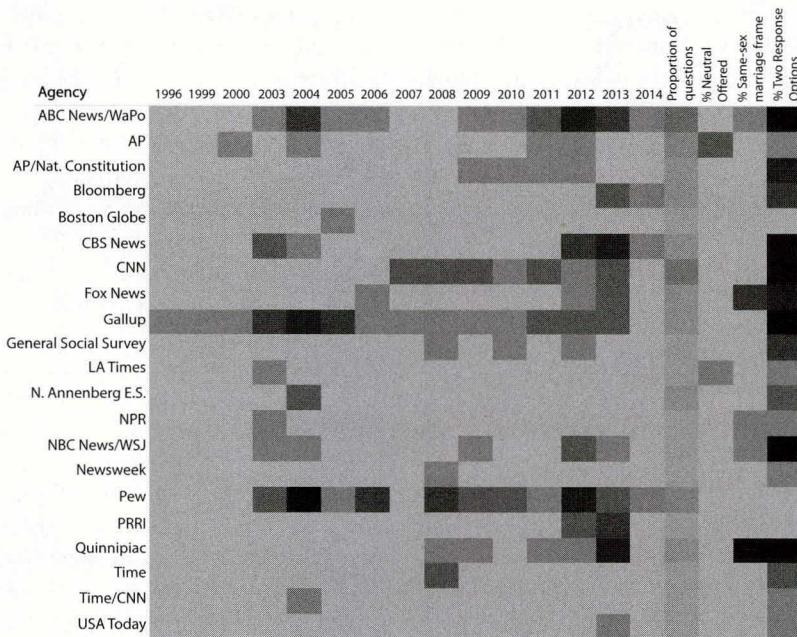


Figure 1. Heat Map Summarizing Question Types by Agency. Darker colors indicate a greater frequency of the category, and the lightest color indicates no observations in that cell.

The proportions of those in favor are then transformed to a logit scale, as the measures are bounded between 0 and 1.⁴ The mixed-effects model then applies covariates and random effects onto the proportion in support (Equation 2):

$$\text{logit}(\pi_i) = \beta_0 + \beta_1 * \text{Don'tKnow}_i + \beta_2 * \text{TwoItems}_i + \beta_3 * \text{SSMFrame}_i + \alpha_{j[i]}^{\text{year}} + \alpha_{k[i]}^{\text{org}} + \alpha_{l[i]}^{\text{qw}}; \quad (2)$$

$$\alpha_j \sim N(0, \sigma_{\text{year}}^2) \text{ for } \text{year} = 1996, \dots, 2014;$$

$$\alpha_k \sim N(0, \sigma_{\text{org}}^2) \text{ for } \text{org} = 1, \dots, 21;$$

$$\alpha_l \sim N(0, \sigma_{\text{qw}}^2) \text{ for } \text{qw} = 1, \dots, 36$$

4. Variations on this modeling strategy have been explored by Gelman et al. (2014, 241–44) and Linzer (2013).

The covariates in the model capture three components common to questions used to measure same-sex marriage opinions: (1) whether a neutral option is provided; (2) whether only two response options are provided (questions with four response options are the reference group); and (3) whether the questions focus solely on the issue of “same-sex marriage” versus an equivalent frame about legal recognition of marriage for gay and lesbian couples.

A benefit of Bayesian modeling is its flexibility with hierarchical models incorporating random effects. Random effects are a way to account for components of error variance among the polls (see also Sutton and Abrams 2001; McCarron et al. 2011). I model varying effects for the year, agency/pollster, and question wording. Since these variables are cross-classified, variation in marriage opinions is partitioned to these different components. The varying effect for year accounts for the upward trend in support for same-sex marriage, and it avoids serial correlation as described in figure 2. The left panel of figure 2 shows the residuals of an auxiliary model without a year component clearly evidencing serial correlation, and the right panel is the same plot accounting for time. The organization effect accounts for variation across organizations that, given the covariates and alternative sources of variation, would indicate that some organizations have a systematic tendency to report

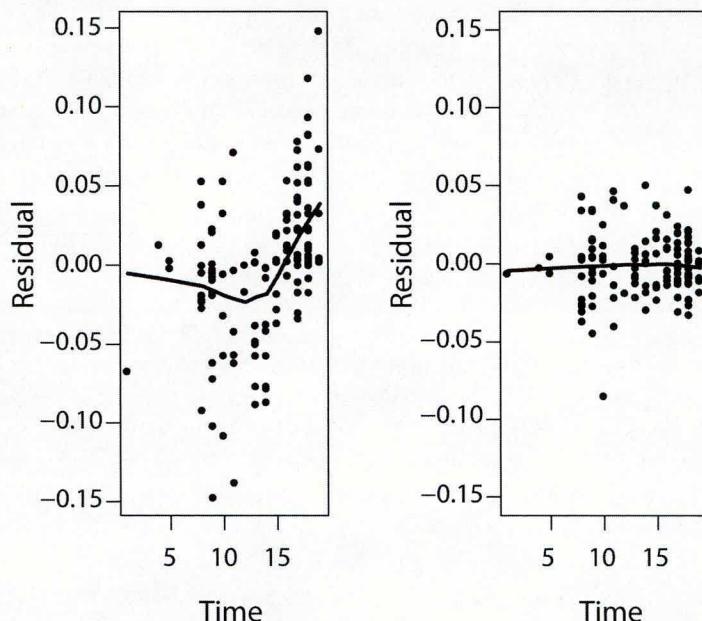


Figure 2. Residuals Plotted over Time. An auxiliary model (left panel) and the current model (right model) are plotted to convey serial correlation and its correction in the current analysis.

estimates above or below the national average. The question-wording effect examines remaining variation among the different questions. There is overlap among question wordings and organizations, so it is possible to analyze these components separately.

The model is estimated with three Markov chains for 100,000 iterations.⁵ The Gelman-Rubin $\hat{R} \approx 1$ for all parameters, indicating successful model convergence (Gelman et al. 2014). The number of polls reporting on same-sex marriage likely has a relationship to significant historical events relating to the issue; I subsequently test alternative models accounting for this, but I do not report those results here, as the results remain consistent but worsen model fit.

Results

The model results for the covariates and the variance parameters are plotted in figure 3, with the tails of the parameter estimates indicating a 95 percent uncertainty interval. The covariates indicate that support for same-sex marriage is significantly lower in surveys with questions that provide neutral options. Polls providing two response options tend to overstate support, though the tail indicates that this is not significant. Questions that focus primarily on the “same-sex marriage” frame have significantly lower levels of support than questions that use other descriptions. There is very little remaining variation among question wordings, as the variance component is small. This indicates that the covariates explain the variation that would otherwise exist due to different question wordings.⁶ The organizational and year variance components indicate that there is still a measurable amount of variation among organizations and among years.

To clarify the magnitude of the covariate effects, I compare the min-to-max effects of the covariates while averaging over the other covariates. Surveys that have neutral options report on average 7.18 percent lower support than surveys that do not, with a 95 percent uncertainty interval [3.77, 10.81]. Surveys that provide two response options report on average 1.44 percent greater support than surveys that do not, but the 95 percent uncertainty interval indicates that this inference is not significant [-0.8, 3.70]. The average effect of same-sex marriage issue frames lowers reports of support by 2.90 percent, and this effect has a 95 percent uncertainty interval [0.90, 5.09].

5. The model is estimated using Markov chain Monte Carlo simulations using WinBUGS and R (Lunn et al. 2000; Sturtz, Ligges, and Gelman 2005). I use non-informative (flat) prior distributions, and I run the model for 100,000 iterations. Half of the iterations are discarded as a burn-in process, and of those remaining, I keep every 300th iteration, resulting in 1,002 simulations for parameter estimates.

6. The variance component without any covariates is 0.33, with a 95 percent uncertainty interval [0.24, 0.53].

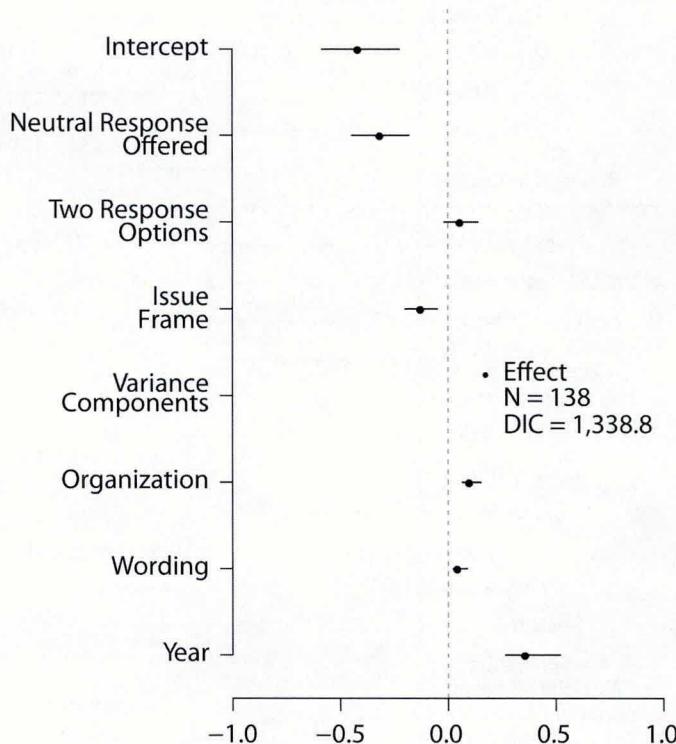


Figure 3. Mixed-Effects Logistic Regression Results on Surveys Reporting Support for Same-Sex Marriage, 1996–2014. Points indicate the median estimate, while the tails represent the 95 percent uncertainty interval.

The unique effects of each news agency or pollster are plotted in figure 4, with the tails indicating a 95 percent uncertainty interval. Even after controlling for the direct effects, agencies have had unique effects upon the survey results reported. Quinnipiac University, Fox News, and the National Annenberg Election Survey tend to report lower levels of support on average. Quinnipiac and Fox News commonly use a “same-sex marriage” frame, since the model already accounts for this, more than just that attribute affects the level of support reported by these two agencies. Significant positive effects are also observed for ABC News/*Washington Post*, *Time*, and Associated Press/National Constitution Center. Overall, 15 out of the 21 agencies have no significant house effect. This indicates that, with some exception, most national polls measuring support for same-sex marriage tend not to be influenced by systematic attributes of the agency.

The effect of each question wording is plotted in figure 5, and these effects all have uncertainty intervals crossing zero, indicating minimal differences

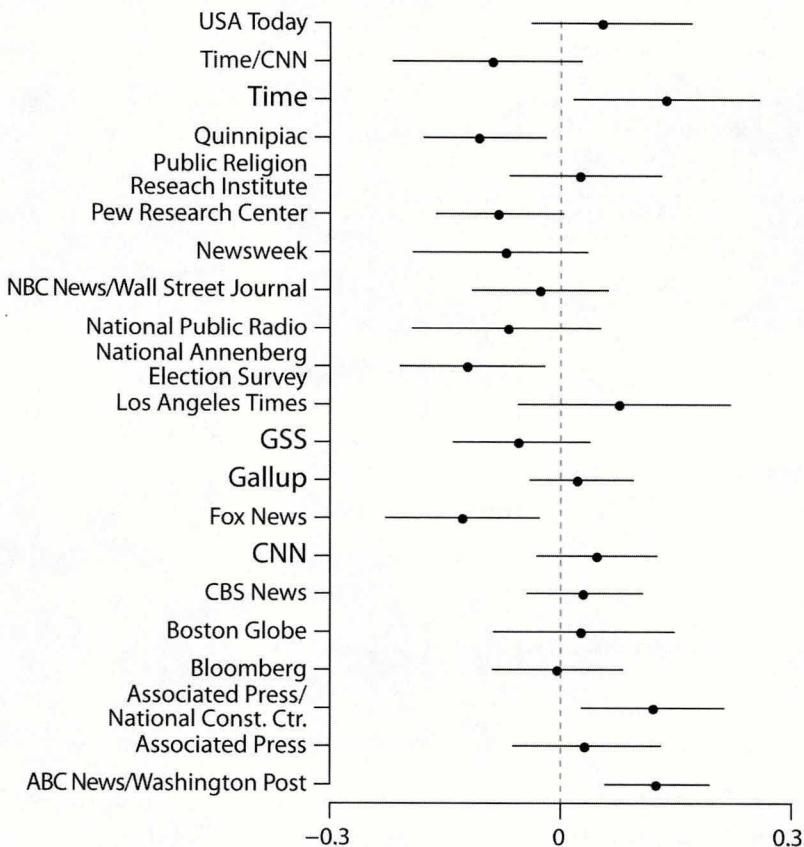


Figure 4. News Agency or Pollster Random Effects on Reporting Support for Same-Sex Marriage, 1996–2014. Points indicate the median estimate, while the tails represent the 95 percent uncertainty interval.

among wordings. This finding indicates that the covariates modeled about the questions account for the variation that exists among different question wordings. Figure 5 contains the actual questions used in measuring public attitudes on same-sex marriage. The 36 different wordings also provide some context to understand the coding scheme of question typologies. Other potential effects, such as the question in the context of the survey, are not examined here. However, previous research has identified that measures of opinions on same-sex marriage are little influenced by question context, though the strength of support may be (McCabe and Heerwig 2012).

As a byproduct of this analysis, an estimate for popular support of same-sex marriage can be obtained by combining the annual effect and the intercept of the regression. Figure 6 provides the model predictions for popular support by year. These questions intend to measure the same underlying concept, but how

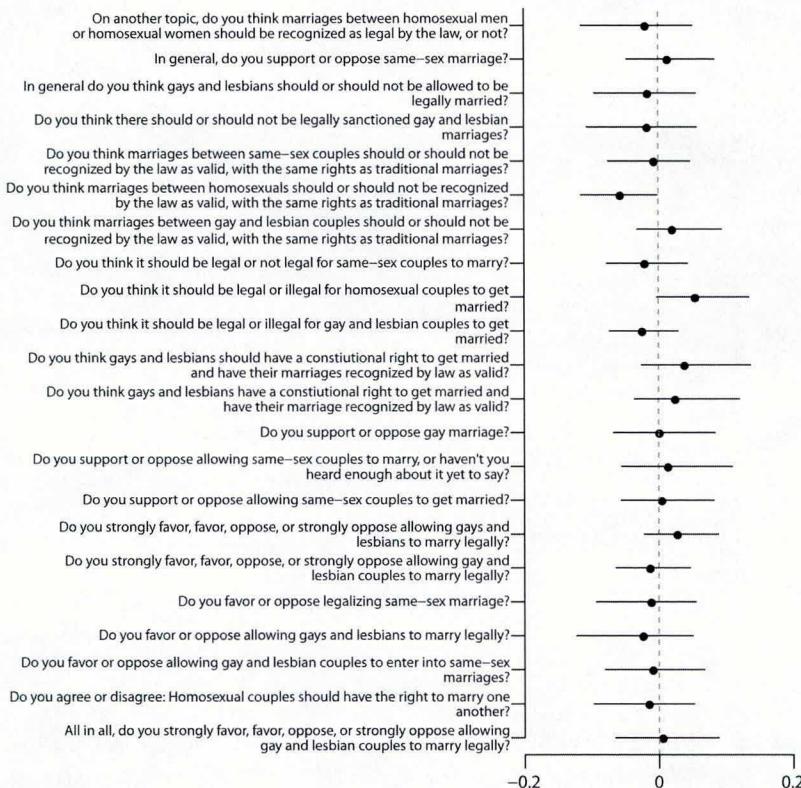


Figure 5. Question Wording Random Effects on Reporting Support for Same-Sex Marriage, 1996–2014. Points indicate the median estimate, while the tails represent the 95 percent uncertainty interval.

these concepts are measured induces other sources of variation. These annual estimates are, in essence, a sample size weighted average of the combined polls, controlling for the other factors that may induce variation in reported results. The point estimate for 2014 indicates that a majority of the American public favors same-sex marriage, and there is no overlap between the uncertainty intervals for 2011 and 2014, indicating a significant rise in favorability. The rise in support for same-sex marriage is both sharp and recent.

Discussion

This analysis provides a comprehensive examination of surveys of the American public on same-sex marriage. The results indicate that politicized issue frames and explicit offering of a “Don’t Know” response option tend to reduce estimates of popular support. The results also indicate significant

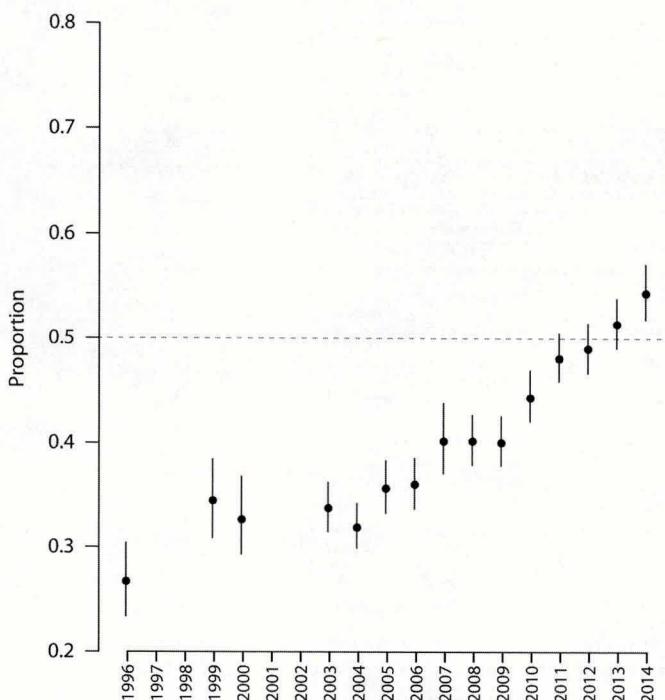


Figure 6. Annual Level of Support for Same-Sex Marriage, 1996–2014. Points indicate the median estimate of $\text{logit}^{-1}(\beta_0 + \alpha_j^{\text{year}})$, while the tails represent the 95 percent uncertainty interval.

“house effects”; some organizations systematically overestimate or underestimate support for gay marriage. These results suggest that estimates of support for same-sex marriage coming from Quinnipiac or Fox News should be taken as lower bounds, while polls from ABC News/*Washington Post* should be considered upper bounds.⁷ Most agencies have no detectable unique effect.

Previous studies have shown that attitudes have rapidly changed on same-sex marriage (Baunach 2011, 2012; Flores 2014). These recent changes pose challenges to what would be traditionally expected from “easy” issues (Carmines and Stimson 1981, 1989). Previous analyses of these trends have made great strides to understand why attitudes have changed, with caution about what surveys to include in those analyses (e.g., Baunach 2011, 2012; Brewer and Wilcox 2005; Lewis and Oh 2008). Those approaches neglect

7. The differences among organizations may be due to differences in sampling frames, as many are of the national adult population while some are of registered or likely voters. An auxiliary analysis suggests that this may be the case; however, the current data set does not have sufficient overlap among different sampling frames across organizations that would be required to sufficiently address this question.

the breadth of polling data that exists on the subject. It leaves an open question about the magnitude of the attitude shift with respect to the many ways polls may ask people their opinions on this subject. The analytical strategy employed here provides a better understanding of these opinion changes by evaluating a broader range of polls and identifying some of the sources of variation among them.

Beyond same-sex marriage, the methods provided in this note may be extrapolated to other issues where there is variation among reports of popular opinion. As poll aggregation has become something of a cottage industry in public opinion research (for a review, see Hillygus [2011]), methods of analysis are still developing. This note provides one such way to account for sampling variability, house effects, and question wording. It also provides a way to model the effects of question typologies, providing opportunities for fuller and theoretically compelling explanations for variability in polling results.

Appendix

The analysis relies on surveys that were obtained from searches of the Roper Center iPOLL Databank, University of Connecticut, and from reports from PollingReport.com. All polls are of the American adult public and were collected via telephone. The average sample size is 1,323 respondents, with a minimum sample of 443 and a maximum of 4,509.

ABC News/*Washington Post* (9/03, 1/04, 2/04, 3/04, 8/05, 5/06, 4/09, 2/10, 3/11, 7/11, 3/12, 5/12, 7/12, 11/12, 5/13, 6/13, 5/14), Associated Press (5/00, 11/04, 8/11, 6/12), Associated Press/National Constitution Center (9/09, 8/10, 8/11, 8/12), Bloomberg (5/13, 9/13, 3/14), *Boston Globe* (5/05), CBS News (7/03, 12/03, 2/04, 7/12, 9/12, 11/12, 2/13, 3/13, 5/13, 7/13, 2/14), Cable News Network (8/07, 10/07, 6/08, 12/08, 4/09, 5/09, 8/10, 4/11, 9/11, 5/12, 3/13, 6/13), Gallup (3/96, 2/99, 1/00, 6/03, 10/03, 12/03, 2/04, 3/04, 7/04, 3/05, 4/05, 8/05, 5/06, 5/07, 5/08, 5/09, 5/10, 5/11, 12/11, 5/12, 11/12, 5/13, 7/13, 5/14), General Social Survey (2008, 2010, 2012), *Los Angeles Times* (11/03), NBC News/*Wall Street Journal* (7/03, 3/04, 10/09, 2/12, 12/12, 4/13), National Annenberg Election Survey (2/04, 5/04), National Public Radio (12/03), *Newsweek* (12/08), Public Religion Research Institute (3/12, 6/12, 5/13, 1/13, 11/13), Pew Research Center (10/03, 11/03, 2/04, 3/04, 7/04, 8/04, 12/04, 7/05, 3/06, 6/06, 7/06, 5/08, 6/08, 8/08, 4/09, 8/09, 7/10, 8/10, 2/11, 4/12, 6/12, 10/12, 3/13, 5/13, 2/14), Quinnipiac (7/08, 4/09, 7/11, 11/12, 2/13, 3/13, 4/13, 6/13), *Time* (6/08, 7/08), *Time/Cable News Network* (2/04), *USA Today* (6/13).

Supplementary Data

Supplementary data are freely available online at <http://poq.oxfordjournals.org/>.

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