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Tracking Ignorance: Examining Changes in Immigrant Population Innumeracy in the United States from 2005 to 2013

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Abstract

Citizens' tendency to overestimate the size of immigrant populations has been the subject of several studies over the past three decades. While we have learned a great deal about the extent, causes, and potential consequences of this population innumeracy, our understanding remains static. The current letter offers the first longitudinal consideration of immigrant population size misperceptions with an analysis across a nine-year span in the U.S. This study considers: 1) whether misperceptions have changed over time; 2) how these changes compare to the growth of the actual foreign-born population size; and 3) whether these changes are related to demographic and ideological factors. Results indicate that misperceptions have grown rapidly in the U.S, far outpacing the modest, actual increases across the period. Pooled cross-sectional analyses indicate that demographic factors do not explain the growth in misperceptions. However, the overestimates of politically conservative Americans have grown increasingly extreme over time.

Keywords: immigration; misperceptions; United States; longitudinal analysis; population innumeracy.

Introduction

Ask citizens how many foreigners reside in their country and they will most likely provide an overestimate. This population innumeracy has now been documented in Europe and the U.S. for almost two decades (Hjerm 2007; Semyonov, Raijman, Yom Tov and Schmidt 2004; Semyonov, Raijman and Gorodzeisky 2008; Sides and Citrin 2007; Citrin and Sides 2008).¹ Its presence has raised concern among researchers about potential links to xenophobia. Further, anti-immigrant political figures like President Trump or far-right parties throughout Europe may be able to manipulate these misperceptions to gain support. Accordingly, some researchers recommend the widespread dissemination of correct information to counteract the potential consequences of population innumeracy (Alba et al. 2005; Nadeau et al. 1991; Sides and Citrin 2007; Sigelman and Niemi 2001).

Presently however, our knowledge of this phenomenon is limited because all previous analyses are cross-sectional. It is unknown whether rates of population innumeracy have increased, decreased, or held steady over time. The current letter addresses this gap in the literature by examining misperception patterns longitudinally across three representative U.S. samples. The analysis presents a dynamic examination applying pooled cross-sectional regression to data from the 2005 Citizenship, Involvement, Democracy Survey (CIDS), and the 2009 and 2013 waves of the Transatlantic Trends Survey (TATS). Equal spacing of independent samples across a 9-year

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¹ Similar research dating back to the 1990s identifies misperceptions regarding African American, Hispanic, Asian, and Jewish populations in the U.S. (Alba et al. 2005; Nadeau et al. 1991; Sigelman and Niemi 2001; Kunovich 2016; Wong 2007; Herda 2013a).



span allows for a clean assessment of aggregated population innumeracy levels across time. This letter examines in detail whether misperceptions have changed in the U.S., and how these changes compare to growth in the actual foreign-born population size.

Further, this study considers why innumeracy levels have changed by examining associations with demographic factors. Early innumeracy research established that these misperceptions were not simple random ignorance by demonstrating associations with variables like age, sex, socio-economic status, ethnic background, immigrant status, and political identification (Nadeau et al. 1991; Sigelman and Niemi 2001; Alba et al. 2005). The regression models presented below predict whether demographic characteristics mediate any longitudinal changes in innumeracy. Additionally, through an analysis of statistical interactions, this study determines if any particular categories of individuals have grown more or less innumerate over time. Such an endeavor will help researchers to understand how and among whom these misperceptions are most likely to develop.

Existing Literature and Theory

The growing literature on the perceptions of immigrant population sizes tells a consistent story of inflated perceptions (Hjerm 2007; Semyonov, Raijman, Yom Tov and Schmidt 2004; Semyonov, Raijman and Gorodzeisky 2008; Sides and Citrin 2007; Herda 2010). For instance, in Citrin and Sides's (2008) study of attitudes toward immigration in the U.S. and Europe, respondents in all of the 21 countries analyzed overestimated their immigrant population on average. However, the authors described Americans as some of the most "egregious overestimators" (42) with an absolute size estimate of 28 percent. At the time of the data collection, the U.S. had about 12 percent foreign-born residents, indicating that on average Americans viewed the immigrant population to be 16 percentage points or 133.33 percent larger than the reality. Indeed, this is a high level of over-estimation relative to European countries with similarly sized foreign-born populations. For example, in Hjerm's (2007) analysis of out-group population size and perceived threat, he finds that in Sweden, Austria, and Germany, (actual sizes: 12, 12.5, and 12.5 respectively), respondents' size estimates averaged only 20.29, 20.26, and 19.98 percent respectively.

Regardless of magnitude, these misperceptions are concerning if one considers them within the context of group threat theory. This perspective views group prejudice as arising when the dominant population views minorities as a competitive threat for social resources (Blumer 1958; Bobo 1983). The former considers itself as entitled to jobs, schools, neighborhoods, and other resources. Any perceived encroachment into these arenas by a subordinate group elicits prejudice and anti-minority sentiments as a defensive reaction. According to Blalock (1967), the simple presence of out-groups can produce feelings of threat, especially when the relative size of minority population is large. Subsequent researchers have examined this possibility, often confirming significant associations (Quillian 1995; 1996; Scheepers, Gijsberts, and Coenders 2002; Schneider 2008; Semyonov, Raijman, and Gorodzeisky 2006; 2008; Savelkoul, Scheepers, Tolsma, and Hagendoorn 2011).

Logically then, if one *perceives* the actual size to be artificially large, it may produce some of the same attitudinal consequences, including support for anti-immigrant or anti-minority policies and claimsmakers. In particular, thinking there are many immigrants, may lead respondents to believe that there are too many immigrants. Several studies find this general pattern. For instance, across Europe, overestimating the immigrant population is associated with support for lowering immigration levels, curtailing immigrants' rights, and stricter deportation criteria (Sides and Citrin 2007; Semyonov et al. 2008; Herda 2013b). In the U.S., over-estimates of black and Latino



populations predict greater opposition to affirmative action policies and to legislation intended to help immigrants (Alba et al. 2005).

These possibilities demonstrate the need to understand population size misperceptions fully, including the degree to which they are changing over time and the factors that make them more likely. Unfortunately, consideration of the former is missing from the existing research. Whether or not these misperceptions are growing, shrinking, or holding steady remains a largely open question, along with the factors that are producing increases or decreases. The current study moves to expand our knowledge of this phenomenon by presenting a longitudinal analysis of misperceptions in the U.S. Further, it considers whether demographic factors help to explain any extant changes in misperceptions.

Data, Variables, and Methods

Data

The current study analyses these questions across three representative cross-sectional surveys covering a nine-year span. Data from 2005 are from the CIDS, which was collected by Georgetown University's Center for Democracy and Civil Society with the goal of studying American civic engagement. Administrators selected household members aged 18 and older via cluster sampling and conducted interviews door-to-door during the summer of 2005 (see Howard, Gibson, and Stolle 2006 for a detailed discussion). Data from 2009 and 2013 are from two separate waves of the TATS, which is an international sample gathered by the German Marshall Fund to "identify attitudes and policy preferences of the general public." (Wunderlich et al. 2009). Both waves sampled adults aged 18 and older via Computer Assisted Telephone Interviewing of both landline and mobile numbers. Administrators selected respondents via stratified multi-stage random sampling (see Wunderlich et al. 2009 and Stelzenmueller et al. 2013 for more detail). These particular data sources were chosen because of their equal spacing of four years between each survey and because they included largely similar questions for the variables considered.

Variables

Immigrant population size perceptions constitutes the variable of focus for the analysis. It is derived from an open-ended question asking "In your opinion, what percentage of the total [U.S.] population are immigrants? You can answer any number between 0 and 100." The phrasing is identical in the two TATS surveys, but is as follows for the CIDS: "Out of every 100 people living in the U.S., how many do you think were born outside of the country?" The final variable is described in detail in the analysis section.²

It is logical to expect that reality informs people's perceptions and that an increasing actual size will result in an increased average estimate. There is some evidence for such a pattern in the existing research (Kunovich 2017). The current analysis compares changes in these size estimates to the actual growth of the immigrant population sizes across the survey years. These data are from Pew Research (2015)³, which provides statistics from 2000 to 2014 for both documented and undocumented foreign-born populations. The analysis below compares these actual population sizes to the aforementioned perceived sizes.

² The current analysis uses a continuous innumeracy variable, as originally measured. However, parallel models using a categorical size perceptions variable ("Correct": estimates within 5 points of the correct answer for their survey year; "Underestimators": estimates below 5, "Overestimators" estimates beyond 5 points of correct; "High Overestimators": estimates beyond the mean for their survey year; and "Missing": those not providing an estimate) yield results that are largely similar to those presented (not shown).

³ Pew generated these estimates from analyses of the IPUMS Current Population Surveys.



Table 1: Sample Percentages and Means of Independent Variables Across Survey Year

		2005	2009	2013
Sex	Male	48.32	48.75	48.3
	Female	51.68	51.25	51.7
Age		43.73	46.02	48.11
Immigrant Status	Native Born	90.51	88.23	91.57
	Foreign Born	9.49	11.77	8.43
Race/Ethnicity	White	70.86	75.96	70.12
	Black	11.34	7.99	11.4
	Hispanic	12.51	8.21	10.51
	Other	5.29	7.83	7.98
Education Level	High School	51.28	47.07	48.73
	Less than High School	15.78	20.07	12.49
	College	23.84	25.02	27.51
	Post-Graduate	9.09	7.84	11.27
Political Ideology	Liberal	27.98	21.90	26.45
	Moderate	29.30	32.43	28.27
	Conservative	42.72	45.67	45.28
Observations		890	834	903

Changes in perceptions may also result from changes in demographic factors. If particularly innumerate categories have grown over time, the average size estimate may follow suit. Previous research indicates that women, young people, immigrants, racial minorities, the more socio-economically vulnerable, and the more politically conservative offer more inflated estimates on average (Nadeau et al 1993; Alba et al. 2005; Sigelman and Niemi 2001; Herda 2010). Table 1 presents the percentages and means for each of these variables across the three surveys. All are consistent across time, as none of the differences reaches statistical significance.

Methods

The analysis begins with a basic description of population innumeracy patterns over time and compared to actual size statistics. Subsequently, multivariate models predict variation in population innumeracy using pooled cross-sectional regression. This approach allows for a longitudinal analysis of multiple, separately collected random samples from the same population at different time points. This differs from panel data, which involves measurement within the same individual over time. Given that the three samples included here are independent (ie: no respondents provide data for more than one wave), serial correlation of residuals is not problematic, as is the case with panel data. The pooled cross-section models proceed similarly to typical cross-sectional regression model, but with a series of time indicators (δ), which will estimate the change in dependent variable over time:



$$\text{size estimates}_i = \delta_0 + \delta_{2009i} + \delta_{2013i} + \beta'x_i + \delta_{2009i}\beta'x_i + \delta_{2013i}\beta'x_i + \varepsilon_i$$

The demographic predictors from Table 1 (β) are included to explain variation in the time indicators, along with the random error term (ε). The regression tables begin with a model including only the time indicators. The second model adds the demographic predictors from Table 1 to determine their ability to mediate the time coefficients. The analysis concludes by considering how these demographic effects might vary over time through interacting each coefficient with the time indicators ($\delta\beta$).⁴ This allows the researcher to determine if misperceptions are changing within any particular independent variable categories (ie: have political conservatives' perceptions grown more incorrect over time?). While the current study analyzed interactions including all the predictors from Table 1, it limits discussion to only the statistically significant patterns.

Analysis

Growth of Size Estimates

The solid line in Figure 1 charts the mean level of immigrant population innumeracy for each of the three survey years. It is clear that the typical estimate has grown over the nine-year span, increasing with each subsequent survey. The differences in means across years are all statistically significant at conventional levels (2005 v. 2009: $z = -88.18$; 2005 v. 2013: $z = -269.83$; 2009 v. 2013: $z = -176.89$), suggesting that, unlike the independent variables in Table 1, the growth in population innumeracy is not due to chance error. Regardless, the increases over time would make sense if they occurred within a context of a similarly growing foreign-born population.

Following this, the broken line in Figure 1 indicates the actual size of the foreign-born population in the U.S. for the three survey years. These numbers are substantially lower than size estimates, demonstrating the tendency toward overestimation established in the literature. The actual sizes for each year sit well outside of the 95 percent confidence intervals for each of their corresponding survey estimates suggesting that the levels of over-estimation are statistically significant. The relatively flat trajectory of actual sizes, suggest only moderate increases over time (an increase of only .96 percentage points across the entire span of the data). Given this, the rapid increase in innumeracy appears to be largely unrelated to the reality. Thus, it is important to explore other factors that might account for the growing misperceptions in the U.S.

Explaining the Growth of Size Estimates

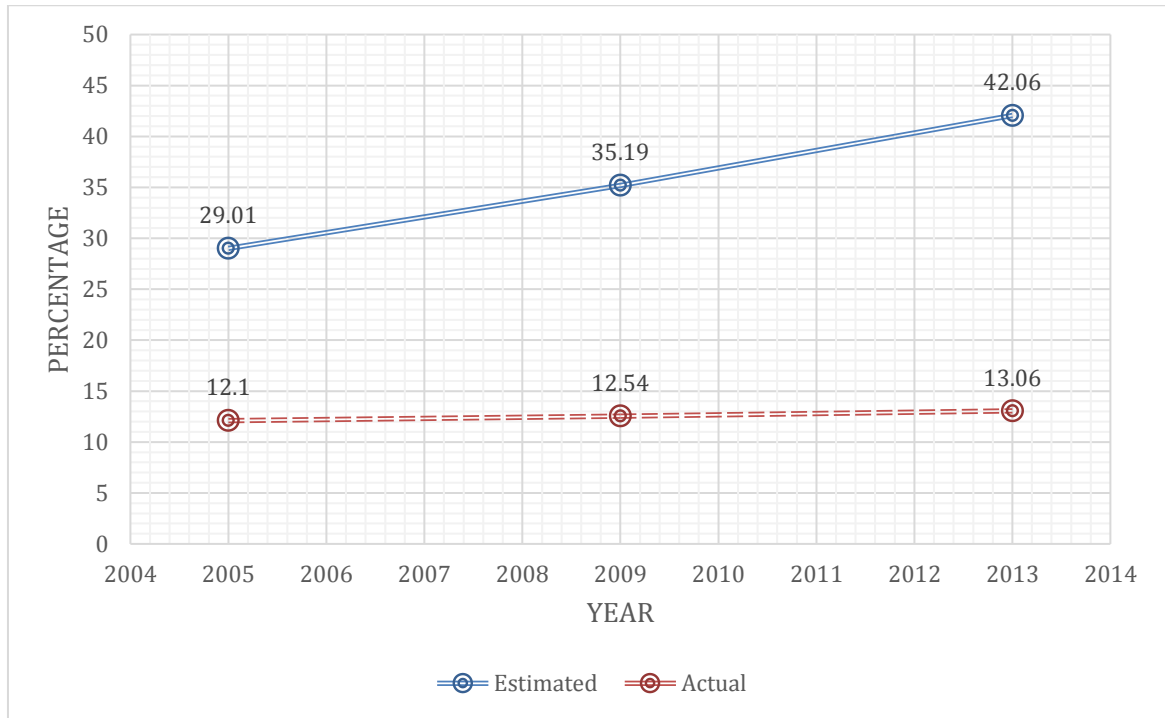
Table 2 predicts variation in size estimates using pooled-cross sectional regression models. The initial model includes only the year indicators. The 2005 survey acts as the reference category. The effects for 2009 and 2013 are both positive and significant, indicating that the mean estimates for both years are significantly larger than in 2005. The coefficients in the first model of Table 2 indicate that the mean estimate in 2009 was 6.176 percentage points larger than in 2005. In 2013, the mean estimate was 13.094 percentage points higher than in 2005. The fact that the coefficient for 2013 is larger than that for 2009 suggests that size estimates continued to grow over time. The 95 percent confidence intervals for the two slopes do not overlap, suggesting statistically significant growth in innumeracy between 2009 and 2013. Note that the constant term (δ_0), which represents the mean estimate for the year 2005 is equal to the value presented in Figure 1. Further, adding the

⁴ All models apply sample weights to ensure representativeness within each survey and replace missing observations through multiple imputation with 35 datasets.



slope coefficients to the intercept yield the corresponding sample means for 2009 and 2013 from Figure 1.

Figure 1: Changes in immigrant population size perceptions and actual immigrant population sizes from 2005 to 2013



With these baseline year effects established, one can add demographic controls to explain the over-time changes (see the second model of Table 2). Mediation would be indicated by reductions in the two year coefficients relative to Model 1. As with previous research, the demographic factors yield several significant associations with population innumeracy. Women tend to offer estimates about 4.16 points higher than men, net of controls. Racial minorities offer higher estimates with Blacks 3.43 points greater than whites ($p < .10$), Hispanics 9.71 points greater ($p < .001$), and Other race respondents 8.76 points higher ($p < .001$). The particularly high estimates of the latter two groups could have to do with greater interpersonal exposure to immigrants. Those with less than high school education offer significantly larger estimates than the high school graduate reference category ($p < .001$), while those with a post-graduate education perceive the immigrant population to be significantly smaller ($p < .01$). Finally, both political moderates ($p < .01$) and conservatives ($p < .05$) offer significantly higher estimates than liberals on average. Age and immigrant status are not significantly associated with the perceptions outcome.

Despite these significant associations, consideration of these demographic factors explains little of the longitudinal effects. Across the two regression models, the 2009 coefficient shrinks only by 6.7 percent, net of demographics, while the 2013 coefficient actually increases slightly. Neither of these changes are statistically significant. Thus, it is clear that the increase in immigrant population innumeracy results largely from factors other than these demographic variables.



Have Any Categories Grown More Innumerate Over Time?

It is possible to test whether a particular variable is having a stronger or weaker effect on the outcome over time by interacting each covariate with the time indicators. In general, most effects are consistent across time (models not shown). Gender is an exception, as women seem offer estimates equivalent to men in 2005 ($b = .60$; $p = .688$). However, in 2009 females estimated about 5.21 percentage points higher ($b = 4.61$; $p = .108$), and then about 6.7 percentage points higher in 2013 ($b = 6.06$; $p = .024$).

Table 2: Pooled Cross-Sectional OLS Regression Models Predicting Immigrant Population Size Estimates

	Beta	SE	Beta	SE
2009	6.176***	1.585	5.764***	1.439
2013	13.049***	1.389	13.260***	1.381
Female			4.164***	1.214
Black			3.433+	1.845
Hispanic			9.708***	2.493
Other			8.758***	2.746
Age			-.048	.036
Immigrant			2.393	2.484
Less than High School			9.388***	2.205
College			-.361	1.349
Post-Graduate			-5.597**	1.880
Moderate			4.767**	1.603
Conservative			3.358*	1.502
Constant	29.011****	.788	23.261***	2.186
Observations	2627		2627	
F-Statistic	44.49***		14.22***	
R-Squared	.046		.113	

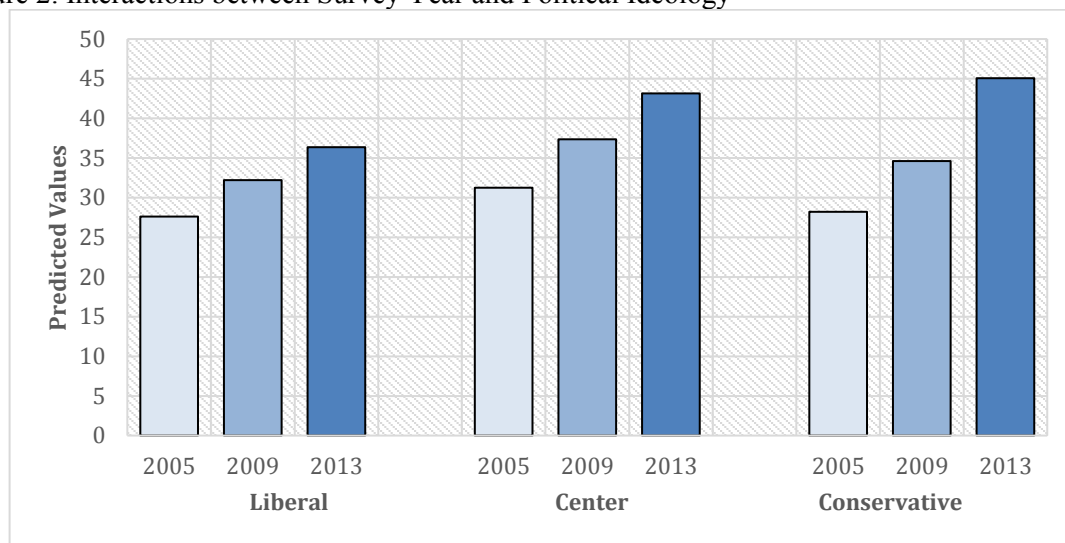
*** $p < .001$; ** $p < .01$; * $p < .05$; + $p < .10$

Another significant over-time interaction emerges for political ideology. Figure 2 displays the predicted values for each of the three ideology categories across the three survey years with all control variables set at their means. It is clear that within each category, size estimates have increased over time, but these increases have not been consistent across groups. Liberals and conservatives start comparable in their estimates in 2005, but centrists offer significantly higher estimates ($b = 3.68$; $p < .10$). In 2009, the differences between liberals and centrists and liberals and conservatives grew, but at non-significant levels (interaction slopes: $b = .433$ and $b = .803$ respectively). However, by 2013 the perceptions of conservatives grew significantly larger than



liberals (interaction slope: $b = 6.76$; $p < .05$). On average, conservatives viewed the immigrant population to be roughly 45 percent of the country in 2013, whereas the liberal's average estimate was about 10-percentage points lower. The liberal-centrists difference grew as well, but the change was not statistically significant. The pattern suggests that over this nine year span conservatives have become particularly more innumerate regarding the immigrant population.

Figure 2: Interactions between Survey Year and Political Ideology



Discussion and Conclusions

It is clear, based on the current analysis, that not only do Americans express a high degree of ignorance regarding the size of the foreign-born population, but this ignorance has gotten worse. Respondents in the U.S. have gone from thinking that the immigrant population is 2.4 times greater than the reality to 3.2 times greater in the span of nine years. It does not seem that national-level demographic realities are driving the trend as the relative proportion of immigrants in the U.S. has increased by only about a single percentage point across the same span. Couple this with recent research on qualitative misperceptions about immigrants including their most likely origins (Herda 2015), their typical legal status (Herda 2018) and the reasons for their presence (Blinder 2015) and it is clear that immigrant-related misinformation is pervasive in the U.S. If size perceptions are indeed indicative of perceived group threat, then these feelings may have reached their highest point in nine years in 2013.

This upward trend in population innumeracy is interesting given Donald Trump's Presidential election victory in 2016. He famously opened his campaign in June of 2015 with a speech characterizing Mexican immigrants as "rapists" and bringing "crime" and "drugs" (Lee 2015). While data on immigrants in general refutes these overgeneralizations (Bersani 2013; Hagan and Palloni 1999), the statements clearly resonated with voters. Simultaneously, the American public that heard these statements was the most poorly informed regarding immigrants since we began measuring innumeracy in the early 2000s. According to the current data, this is particularly true among conservatives, the population from which Trump draws most of his support. While the current data do not tell us anything directly about the Trump era, they do paint a picture of a highly misinformed electorate a few years prior. Given their innumeracy and the potential feelings of threat often



associated with it, Trump may have been speaking to an audience that was particularly primed to accept the anti-immigrant rhetoric that helped him win the Presidency in 2016. It is important that social researchers continue to monitor levels of immigrant population misperceptions. They may prove useful for predicting when and where anti-immigrant politicians will find the most success.

The next logical question is why did Americans' misperceptions increase so dramatically relative to the truth across this time span? One possible explanation is that of cognitive availability heuristics and how individuals use them to formulate their estimates of the truth. Tversky and Kahnemann (1973) contend that individuals answer questions of fact by drawing on similar examples that exist in their memory (ie: their cognitive availability). The more instances and examples of immigrants that one can remember as "evidence", the larger their size estimate will be. Such examples may come from intergroup contact with immigrants in the forms of friends, neighbors, and coworkers. These have predicted greater innumeracy in the past (Herda 2013b). If the increases in the actual foreign-born population size have increased levels of intergroup contact, it may explain the growth in innumeracy. Unfortunately, there are no direct question about intergroup contact measured consistently across the three surveys, precluding further analysis here.

Further, media exposure and highly publicized news events about immigrants may also populate one's cognitive availability and inform population size perceptions. In particular, between the years 2009 and 2013, where innumeracy increased most rapidly in the current sample, the state of Arizona passed its controversial SB1070 anti-immigration law, which required law enforcement officers to determine the immigration status of individuals with which they came into contact if they suspected that they were undocumented. Nationwide protests and calls to boycott the state followed, making national news. Additionally, the states of Indiana, Georgia, South Carolina, and Alabama passed similar laws. Such events and a greater focus on foreigners in the news media could make the immigrant presence appear much larger in the minds of respondents. Unfortunately again, a lack of consistent media exposure questions across the three surveys precludes further analysis. However, detailed consideration of both sources of cognitive availability (contact and media exposure) would be an important subject for future research.

An additional next-step for future studies is to consider over-time trends in countries other than the U.S. It remains unknown if the increase in misperceptions is a uniquely American phenomenon, or if it is happening in Europe as well. Given the recent influx of asylum seekers to the continent, we may see similar increases, especially in places that have received large numbers of refugees. Identifying and explaining potential variation in innumeracy levels over time may prove useful for predicting contexts where native- and foreign-born relations may become increasingly volatile or where far-right political figures may generate the most appeal.

Regardless, this more dynamic look at misperceptions has elucidated our understanding of the innumeracy phenomenon and should raise concerns about the worsening state of ignorance in the U.S. It is important now to continue monitoring ignorance about immigration as well as other topics into and beyond the Trump-era, especially given the emergence of alternative facts and post-truth politics in the American lexicon (Norman 2016; Economist 2016). However, in order to do so, it is crucial that survey administrators continue to include consistently worded questions about respondents' perceptions.

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