

**Investigating Predictors of Area-Level Implicit Transgender  
Attitudes**

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### **Abstract**

Using a newly developed measure of implicit transgender attitudes, this research investigates several potential outcomes associated with area-level estimates of implicit attitudes towards transgender people at both the state and county-level ( $N = 68,070$ ). Results showed greater anti-transgender implicit attitudes in an area were associated with lower self-reported contact with transgender people, a greater degree of votes for conservative politicians, and more discriminatory transgender policies. Implicit transgender attitudes did not reliably predict interest in or prevalence of transgender people. These findings represent an essential step in understanding how transgender implicit biases relate to regional characteristics, and expands prior studies looking at area-level indicators of intergroup bias into a new domain. This research also informs ongoing work concerning the role of policy-making and social norms on intergroup prejudice and discrimination.

### **Investigating Predictors of Area-Level Implicit Transgender Attitudes**

In recent years, the proportion of people publicly identifying as transgender has increased. Studies estimate that the percentage of people identifying as a different gender than the one assigned at birth has doubled in the last decade, reaching close to 0.4% of the United States population in 2015 (Meerwijk & Sevelius, 2017). Nonetheless, this increased presence of people publicly identifying as transgender has come with mixed legal and political responses across states. For instance, 2019 marked the end of a three-year judicial battle to remove North Carolina's "bathroom bill", which prevented transgender people from using restrooms matching their gender identity in public buildings (Drew, 2019). Around the same time, the state of Idaho attempted to enact a law banning transgender women from competing in women's sports (AP News, 2020). More broadly, it is clear that transgender people continue to face discrimination in many contexts, such as in health care (Winter et al., 2016), employment (James et al., 2016), and housing (Glick, Lopez, Pollock, & Theall, 2020).

#### **Attitudes towards transgender people**

The increased presence of transgender people and the rise of legislation concerning their treatment has motivated research on transgender biases. Most of the research on transgender attitudes has focused on explicit attitudes, which are comparatively conscious, deliberate and self-endorsed (Greenwald & Banaji, 1995). Multiple studies have shown that people self-report less warmth towards transgender people than lesbian or gay people, although these attitudes remain strongly related (Nagoshi et al., 2008; Norton & Herek, 2013). Negative self-reported transgender attitudes have also been found to be more common among conservatives (Norton & Herek, 2013) and more

religious people (Kanamori, Pegors, Hulgus, & Cornelius-White, 2017). Recently, Harrison and Michelson (2019) found that women tended to have more favourable transgender attitudes compared to men, though this finding was mostly driven among men following an experimental manipulation intended to threaten feelings of masculinity (e.g. being told one's traits are more feminine).

While explicit attitudes are certainly informative, these more controlled and endorsed responses may not reflect the full range of evaluations individuals hold towards an attitude object. Specifically, implicit attitudes refer to comparatively automatic associations that are less controllable and less aligned with conscious goals (Greenwald & Banaji, 1995). While explicit attitudes are measured using self-reports, implicit attitudes are assessed using indirect measures wherein attitudes are inferred based on behavioral responses. The most prominent method developed to measure such attitudes is the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998). The logic behind the IAT lies in the fact that concepts that are more frequently activated together will elicit stronger associations than concepts that are less frequently activated together. As such, the IAT measures implicit evaluations via a person's reaction time at completing a series of association tasks between a target label (e.g. Black-White, Transgender-Cisgender, etc.) and some positive or negative attributes (e.g. disgust, joy, rotten, etc.; Greenwald et al., 1998).

Several studies have shown that explicit and implicit attitudes exemplify distinct but related constructs (Nosek et al., 2007). However, while measures of implicit attitudes are common in many intergroup domains, such as race, religion, or sexual orientation (Greenwald & Lai, 2020), there is relatively little prior work on implicit attitudes towards

cisgender and transgender people. The first such study (Wang-Jones, Hauson, Ferdman, Hattrup, & Lowman, 2018) used a version of the IAT with labels of “transsexual men” and “transsexual women” in comparison to “biological men” and “biological women”, finding an overall preference for biological men and women among both gay and straight participants. However, considering that category labels have a significant influence on measures of implicit attitudes (Govan & Williams, 2004), the use of terms related to one’s genitals instead of one’s gender identity (e.g. “transgender women” vs “cisgender women”) might not be a representative measure of transgender implicit attitudes. Relatedly, past research has demonstrated that segregating groups into subgroups (in this case, gender) can yield results that are unrepresentative of the implicit attitudes towards the group as a whole (Fiske, Cuddy, Glick, & Xu, 2002; Sesko & Biernat, 2010).

The largest study to date on implicit transgender attitudes involved the development and validation of an IAT measuring attitudes towards transgender versus cisgender people specifically (Axt, Conway, Westgate, & Buttrick, 2020). Here, the researchers tested two IATs: one using images of famous transgender people (e.g. Caitlyn Jenner, Laverne Cox) or cisgender people (e.g. Meryl Streep, Meagan Good) and another using text stimuli such as “transgender” and “cisgender”. While both IATs found reliable evidence of more positive associations with cisgender people than transgender people, the image IAT often showed greater internal reliability and stronger predictive validity on outcomes like explicit transgender attitudes, policy advocacy, and self-reported transphobia. Subsequent studies found that the image-based transgender IAT also predicted related outcomes like interest in romantic relationships with transgender individuals, prior contact with transgender people, and gender essentialism (Axt et al.,

2020). Finally, the measure demonstrated known groups validity in showing significant differences in performance between transgender and cisgender participants ( $d = .86$ ), which aligns with prior work using implicit measures in other intergroup contexts (e.g., Jost, Banaji, & Nosek, 2004; Westgate, Riskind, & Nosek, 2015). With the development of this new measure, implicit attitudes towards transgender people can be reliably assessed such that researchers can begin investigating related issues, including the broader context in which such biases may develop.

### **The use of regional measures of bias**

In the first two decades of research on implicit attitudes, an “individual-level perspective” approach was often the default interpretation of performance on implicit measures. From this perspective, performance on indirect measures like the IAT assess a construct that is specific to the individual (Greenwald & Banaji, 1995) and could thus be used as a measure of individual differences. Though it may ultimately be impossible to disentangle the degree to which individuals’ implicit associations are impacted by their own personal experiences or beliefs versus their cultural environment (Gawronski, Peters, & LeBel, 2008), performance on implicit measures was still mostly interpreted as reflecting consequential information about the individual participant (Kurdi & Banaji, 2017; Rae & Greenwald, 2017).

However, in recent years, this individual-level interpretation has been re-examined on both empirical and theoretical grounds. For example, measures of implicit attitudes suffer from low temporal stability at the individual level; for instance, in one study (Gawronski, Morrison, Phills, & Galdi, 2017) an IAT assessing implicit racial attitudes had only a moderate correlation when taken two months apart ( $r = .44$ ) while self-reports

of explicit racial preference demonstrated much stronger temporal stability ( $r = .88$ ). Nonetheless, despite instability at the individual level, the group-level performance on the IAT was surprisingly similar, as the test means fell within two percentage points over the two months period (Time 1:  $M = 0.42$ ; Time 2:  $M = 0.46$ ).

To explain this difference in stability among individuals versus groups over time, Payne, Vuletich, and Lundberg (2017) have proposed the “bias of crowds” model, which posits that measures of implicit biases reflect the accessibility of biases in a specific context and that this accessibility varies across situations, rather than across individual minds. As a result, the researchers propose that measures of implicit biases should be thought of as valid and reliable measures of *situations*, not persons. This position is consistent with the data in Gawronski et al. (2017), which showed low test-retest reliability of implicit racial attitudes at the individual level and greater stability at the group or sample level.

The “bias of crowds” model then argues that implicit biases should be investigated at the regional level as opposed to the individual level. According to Payne et al. (2017), in a given area, some situations will only be influential to certain individuals, while some others will equally affect all individuals in this area. Nevertheless, when aggregated into a sample, the average level of bias among participants in a shared area should reflect the most widely shared situation in this area, be it a city, state, or country. In support of this position, Hehman, Calanchini, Flake, and Leitner (2019) demonstrated that race IAT results aggregated for larger regions showed much greater retest reliability than for smaller areas, such that state-level ( $M_r = .693$ ) > CBSA-level ( $M_r = .275$ ) > county-level ( $M_r = .025$ ).

Many recent studies have adopted this approach and have used regional aggregates of implicit bias to predict meaningful outcomes. For example, differences in scholastic disciplinary actions (e.g. suspension, expulsion, punishment, etc.) between Black and White students were significantly related to county-level measures of implicit racial bias (Riddle & Sinclair, 2019), meaning that counties where participants showed the greatest amount of negative associations towards Black versus White people on an IAT were also more likely to have greater racial disparities in suspensions of Black versus White students. In a related study, counties with higher levels of anti-Black implicit attitudes (again measured through the IAT) were also more likely to have disproportionately greater use of lethal force in police interactions with Black people (Hehman, Flake, & Calanchini, 2018).

Regional levels of implicit bias have been used to estimate the impact of new and existing policies. Since such policies may vary in implementation across different areas (counties, states, etc.), it can be informative to investigate how such policies are associated with changes in implicit biases among people living in those regions. One prominent example of this approach used a quasi-experimental design to examine how variability among states in the legalization of same-sex marriage was associated with subsequent changes in implicit and explicit anti-gay attitudes (Ofosu, Chambers, Chen, & Hehman, 2019). Results found that both implicit and explicit attitudes towards gay people became more negative before same-sex legalization, but did so at a much faster rate following the legislation's passing. This work demonstrates that while constituents' attitudes can influence policymaking, policy changes at the area-level may also influence the attitudes of an area's constituents (Tankard & Paluck, 2016).



## **The Present Work**

Given that people publicly identifying as transgender now occupy a growing proportion of the population, it has become an increasingly pressing issue to understand the causes and consequences of discrimination based on gender-identity. To further that effort, this research will be the first to apply the “bias of crowds” model using the novel transgender IAT developed by Axt et al. (2020). Specifically, we will use multiple area-level outcome measures to explore a variety of potential correlates of anti-transgender implicit attitudes. This work not only has the potential to further validate the Transgender IAT, but will also extend the bias of crowds perspective to a new area of intergroup research, as much of the prior work has focused on only a handful of domains, such as race or sexual orientation (e.g., Hehman, Oforu, & Calanchini, 2021; Johnson & Chopik, 2019). Below, we detail the specific outcomes that prior work suggests may be correlated with area-level estimates of anti-transgender implicit attitudes.

### ***Exploring potential predictors of transgender implicit bias***

**Interest for transgender people.** Past research has shown that increased awareness of a bias is associated with reduced biases in attitudes and behavior on that dimension (Pope, Price, & Wolfers, 2018; Uluğ & Tropp, 2020; Wolfers & Price, 2010), as awareness of an issue may translate into greater motivation to control prejudice. As such, we explore whether areas where residents have more interest in transgender causes, as measured by aggregated internet search behaviour, will also show less implicit bias against transgender people.

**Self-reported contact with transgender people.** There is consistent evidence that more contact with minorities is associated with lower explicit or implicit bias (Flores et

al., 2018; Tadlock et al., 2017). In the case of contact with transgender people, more self-reported contact has previously predicted more positive attitudes in most, but not all studies (King, Winter, & Webster, 2009; Tompkins, Shields, Hillman, & White, 2015; Willoughby et al., 2010). Here, we investigate whether there is a relationship between contact with transgender people and implicit transgender attitudes.

**Prevalence of transgender people.** Past research has found mixed evidence for the influence of population-level prevalence of a lower-status group on implicit biases. In one study about implicit racial attitudes, a greater proportion of Black residents was associated with a *higher* in-group bias for both Black and White respondents (Rae, Newheiser, & Olson, 2015). In another study, residents of the county with the highest obesity prevalence among adolescents also recorded lower anti-fat implicit attitudes relative to residences of a county with fewer obese adolescents (Cullin, 2020). Consistent with these findings, we will explore the relationship between transgender population prevalence on implicit transgender attitudes.

**Political conservatism.** Many studies have highlighted the relationship between political ideology and intergroup attitudes, where findings generally show that conservatives hold more favourable implicit attitudes towards higher-status groups (and less favourable attitudes towards lower-status groups) than liberals (Jost et al., 2004; Nosek et al., 2007). For LGBT people specifically, similar evidence points to a positive relationship between conservatism and implicit bias against sexual minorities, at least at the individual level (Jost et al., 2004). Given the close relationship between gay/lesbian attitudes and transgender attitudes, we investigate whether a similar relationship exists between area-level conservatism and anti-transgender bias.

**Valence of transgender laws.** Building on the above findings, attitudes towards transgender people should be associated not only the political ideology of states but also the characteristics of existing policies that dictate the treatment of transgender people. Results from several studies indicate that policy changes can favourably or unfavourably affect the perception of societal norms (Eisner, Turner-Zwinkels, & Spini, 2020; Ofosu et al., 2019). As a result, we explore whether the valence of laws, be it positive or negative, concerning the treatment of transgender people in an area is related to area-level estimates of implicit transgender biases.

**Explicit attitudes.** In their original paper, Axt et al. (2020) report a significant relationship between implicit and explicit transgender attitudes at the level of the individual participant. In other work using area-level implicit and explicit attitudes, significant correlations (county-level:  $r = [0.27, 0.79]$ ; state-level:  $r = 0.846$ ) have been reported in the domain of race (Hehman et al., 2018; Riddle & Sinclair, 2019). Here, we investigate if a similar relationship exists within the domain of gender identity at the state and county-level.

## Methods

### *Participants*

A total of 106,057 participants completed the transgender IAT at Project Implicit (<https://implicit.harvard.edu>) between April 2<sup>nd</sup> 2020 and December 31<sup>st</sup>, 2020. Since this study primarily focuses on regional comparisons, only participants living in the United States (71.7%,  $N = 76,091$ ) were retained for analysis. As in prior work, data from participants who had reaction times faster than 300ms on more than 10% of the trials were removed from analysis (Greenwald, Nosek, & Banaji, 2003; Nosek, 2007). Finally,

participants who reported a gender identity other than “cisgender” were excluded (8.7%), resulting in a sample of  $N = 68,070$  ( $M_{\text{Age}} = 32.78$ ,  $SD = 13.79$ , 71.4% White, 72.1% female).

This study uses states and counties as primary units of analysis. Thus, we established an internal criterion of  $N > 50$  per region in order to retain that state or county for analysis. All states were retained due to sufficient observations, but only 106 counties remained. These samples then allowed for 80% power to detect an effect as small as  $r = 0.37$  for state-level analyses and  $r = 0.27$  for county-level analyses.

### ***Measures***

*Implicit transgender attitudes.* Implicit attitudes were assessed using the Transgender IAT developed by Axt et al. (2020). During this seven-block IAT, participants were presented with either good words (e.g. “Nice”, “Pleasure”, etc.) or bad words (e.g. “Nasty”, “Hurt”, etc.) as attributes. The stimuli consisted of eight images of celebrities (four cisgender, four transgender). Pairs of cisgender and transgender celebrities were matched on race and were of approximately the same age and popularity (estimated using Google search returns). Participants were first shown short descriptions of each celebrity and performed a 24-trial training block where they had to correctly classify the transgender (or cisgender) celebrity image, and images were explicitly labeled as cisgender or transgender. These labels were removed for the IAT, which followed the initial training block.

The seven-block IAT was administered according to the design outlined in Nosek et al. (2007). Scores were calculated using the  $D$  algorithm (Greenwald et al., 2003), such

that more positive scores indicated more positive implicit associations towards cisgender versus transgender people.

*Explicit transgender attitudes.* Participants completed five items concerning explicit attitudes towards cisgender vs. transgender people: one relative preference item, two thermometer items, and two liking indicators. For the relative preference item, participants used a -3 (“I strongly prefer transgender people to cisgender people”) to +3 (“I strongly prefer cisgender people over transgender people”) response scale. For the thermometer items, participants rated how warm or cold they felt towards transgender people and then cisgender people (0 = Extremely cold, 10 = Extremely warm). A difference score was calculated such that positive scores indicated more warmth for cisgender people over transgender people. The two liking items used a slider response scale, where participants reported how negative or positive they felt towards cisgender or transgender people (1 = Strongly negative, 100 = Strongly positive). Another difference score was computed for the liking items, with higher values indicating a higher relative positivity towards cisgender people over transgender people. Values from the explicit preference scale, difference score of warmth, and difference score of liking were standardized and then averaged together to represent aggregate explicit transgender attitude scores (Axt et al., 2020).

*Self-reported contact with transgender people.* Based on the four-item contact scale presented in Axt et al. (2020), participants completed four yes-or-no questions asking about their prior contact with transgender people. The four items were: “Do you have a family member who is transgender?”, “Do you have a friend who is transgender?”, “Do you have friendly interactions with transgender people on a regular basis?”, and “Have

you ever met a transgender person?”. Responses to the four items were summed (1 = Yes, 0 = No) to create an index of contact with transgender people, such that higher scores indicate more contact. Among cisgender participants, these data were used to estimate state-level and county-level averages of contact with transgender people.

*Prevalence of transgender people.* Prevalence data came from an online report of The Williams Institute, which estimates state population counts of transgender people based on a large-scale survey (Flores, Herman, Gates, & Brown, 2016). In separate analyses, we used both the *overall* population of transgender people in a state and the *percentage* of transgender people in a state relative to the total population.

*Interest in transgender people.* Interest for transgender people and transgender-related issues was estimated using relative search volumes from Google trends (<https://trends.google.com>). This method has been used successfully in prior work as a means of gauging public interest for various social issues (Mellon, 2014; Moors, 2017; Nuti et al., 2014; Vargas, Schiffman, Lam, Kim, & Mittal, 2020). Trend scores can range from 0 to 100, with 100 being the location with the highest number of searches relative to its total number of searches in a given period. For the purpose of this research, the search term used was “transgender”, and the observed period was set from January 1<sup>st</sup>, 2015 to December 31<sup>st</sup>, 2020.

*Political conservatism.* At the county-level, percentages of the popular vote for the Republican party in the 2016 presidential election were used to estimate the county-level degree of conservatism. These data were obtained from Pettigrew (2016) on a publicly available library.

*Valence of transgender laws.* Positivity of state-level laws was operationalized as a “policy tally” of gender-identity-related laws, available through a 2020 online report from Movement Advancement Project. The gender identity policy tally is a count of laws and policies that contribute to equality for gender non-conforming individuals (Movement Advancement Project, 2020).

For instance, a state that passed a law explicitly prohibiting employment discrimination based on gender identity would gain 1 point. Meanwhile, another state that passed a religious exemption law allowing health care workers to refuse treatment to LGBTQ clients would be deducted 1 point (Movement Advancement Project, 2020). Some categories of laws included in the total count concern the treatment of LGBTQ youth and policies surrounding identification documents. For example, under the LGBTQ youth categories, states that have a law prohibiting bullying in schools based on gender identity are awarded 1 point, whereas having a "Don't Say Gay" regulation (explicitly restricting teachers and staff from talking about LGBTQ issues and people) are deducted 1 point. As for the identity document category, for instance, states are awarded 0, 0.5, or 1 point depending on the how easy the process of changing one’s gender identity on a driver’s licence is and whether or not the application requires a medical provider’s certification. At the time of data collection, Connecticut, Nevada, and Washington had the highest tally with a score of 19 out of 20, while Alabama occupied the last position of the chart with a negative score of -4.5.

### ***Procedures***

All participants completed the transgender IAT and explicit attitude scale in a random order. Participants also completed one of three other self-report scales, which

included the contact scale. The data for prevalence of transgender people, interest in transgender people, political conservatism, and valence of transgender laws was obtained from the various sources outlined in the previous section.

## **Results**

The regional values of implicit and explicit bias were obtained by averaging the IAT scores for each state or county. At the state-level, we found a positive and significant relationship between implicit and explicit attitudes,  $r = .66$ , 95% CI [.47, .79],  $p < .001$ . Previous research on area-level racial implicit-explicit correlations has found slightly stronger correlations at the state-level, ranging from  $r = 0.80$  for a White sample and  $r = 0.85$  for a Black sample (Hehman et al., 2019). At the county-level, another positive correlation between implicit and explicit attitudes was found,  $r = .54$ , 95% CI [.39, .67],  $t(103)=6.59$ ,  $p < .001$ . These county-level results appear to be similar to previous ones reporting correlations between  $r = 0.21$  (race IAT, Black participants; Hehman et al., 2019) and  $r = 0.79$  (race IAT; Riddle & Sinclair, 2019).

### ***State-level analyses***

Correlation coefficients were computed to predict our different outcomes from area-level Transgender IAT  $D$  scores. For interest in transgender people and prevalence of transgender people (total and proportional), there was no significant relationship with implicit transgender attitudes (see Table 1). However, higher implicit bias against transgender people predicted lower self-reported contact with transgender people,  $r = -0.69$ , 95% CI [-0.81, -0.50],  $p < .001$ . State-level biases in implicit transgender attitudes were also positively related to political conservatism,  $r = 0.32$ , 95% CI [0.04, 0.55],  $p = .025$ . Finally, state-level Transgender IAT scores were negatively related to valence of



transgender laws, such that higher levels of implicit biases predicted lower equality policy tallies,  $r = -0.43$ , 95% CI [-0.63, -0.17],  $p = .002$ .

### *County-level analyses*

We regressed Transgender IAT scores on political conservatism, which yielded a significant and positive relationship,  $r = 0.23$ , 95% CI [0.03, 0.40],  $t(103)=2.32$ ,  $p = .020$ . Following the same procedure, greater implicit bias against transgender people significantly predicted lower self-reported contact with transgender people,  $r = -0.64$ , 95% CI [-0.75, -0.49],  $t(80)=-7.47$ ,  $p < .001$  (see Table 2).

## **Discussion**

Using multiple outcome measures to explore several potential correlates of anti-transgender implicit attitudes, results found that area-level estimates of implicit transgender attitudes were reliably associated with area-level estimates of explicit transgender attitudes, self-reported contact with transgender people, greater political conservatism and more discriminatory transgender policies. At the same time, other area-level outcomes of interest (interest in transgender people, prevalence of transgender people), were not reliably with implicit transgender attitudes.

These findings demonstrate an intriguing link between contact with minority group members, policy-making, and intergroup biases at the regional level. Moreover, our results add to the existing literature using area-level implicit attitudes as predictors of important outcomes (e.g., Hehman et al., 2019; Hehman et al., 2018; Riddle & Sinclair, 2019), and extend this work into the domain of gender identity.

Our research also provides some support to the “bias of crowds” model for implicit attitudes proposed by Payne et al. (2017), though these data cannot resolve ongoing

discussions about whether area-level estimates of implicit biases are useful because such measures are *best* conceived of as assessing an individual's environment versus area-level estimates merely being a productive means of estimating the degree to which individuals in that area hold certain biases (Connor & Evers, 2020). Regardless, adopting either a "bias of crowds" or "individuals in crowds" perspective does not detract from the findings reported here, which suggest that regional analyses of transgender implicit attitudes are a productive avenue for exploring many important outcomes.

When looking at transgender attitudes specifically, this research adds to existing work looking at the relationship between policy beliefs and attitudes about gender identity. For instance, Axt et al. (2020) found that a relative preference for cisgender over transgender people in implicit attitudes was associated with transphobia and weaker support for more inclusive policies concerning the treatment of transgender people. In the present study, we extend this individual-level finding by showing that states with more anti-transgender policies also have higher aggregated levels of implicit bias. Our use of a regional-level of analysis is especially pertinent because policies and laws that are passed impact entire areas (counties, states, countries, etc.).

One of the most significant contributions to this research is that it speaks to the role of policy-making in changing attitudes and reducing prejudice. Generally, people infer that policies are prescriptive of the normative behaviour encouraged or not in a given area (Tankard & Paluck, 2016). For instance, one prior study found that after a university issued a ban on outdoor smoking, students reported that smoking was less tolerated by others on campus (Procter-Scherdtel & Collins, 2013). Changes in perceived social norms are believed to create substantial behavioural change because people strive to

make accurate social judgements and avoid social rejection (Cialdini & Goldstein, 2004). As a result, new social norms can be signalled via policy-making institutions like the administration boards or the senate (Tankard & Paluck, 2016). For example, prior work found that participants perceived gay marriage as more socially acceptable following the U.S. Supreme Court ruling in favour of gay marriage legalization (Tankard & Paluck, 2017). Interestingly, this change in social norm perception happened independently of a change in personal attitudes (i.e., even people whose attitudes did not change following the court ruling still reported that societal norms had changed). This work has since been extended to show that implicit attitudes about gay people improved faster following the (Ofosu et al., 2019).

Our findings on the relationship between the valence of transgender laws and implicit transgender attitudes are in line with this prior work, though the correlational nature of our data limit our ability to make a causal argument. That is, while individuals may use their state's treatment of transgender people as a factor in forming their own attitudes, it is also possible that states that have a greater number of residents with anti-transgender attitudes choose to enact more discriminatory laws. To gain some traction on this issue, we conducted an additional analysis predicting state-level IAT scores from both our conservatism and policy measures. Here, results found that even after controlling for area-level conservatism, the policy measure of discrimination remained a reliable predictor of area-level transgender attitudes,  $b = -0.002$ , 95% CI [-0.005, -0.0003],  $t(47) = -2.31$ ,  $p = .026$ . These data suggest that policies concerning the treatment of transgender people are not redundant with conservatism, though future analyses will

have to rely on different data sources or designs to better identify causality between a state's levels of anti-transgender attitudes and its' legal treatment of transgender people.

Finally, another significant contribution of this research is the finding that a higher rate of regional self-reported contact with transgender people is related to lower aggregate implicit transgender biases. These results are consistent with previous work on contact theory (Tadlock et al., 2017), and add to existing knowledge that contact with or exposure transgender individuals reduces anti-transgender attitudes (Flores et al., 2018; King et al., 2009; Tompkins et al., 2015), though again conclusions about causality are limited given our correlational data.

### *Limitations*

The conclusions outlined above should be considered in light of certain limitations. First, the correlational nature of the study does not give information regarding the causality in the relationship. As mentioned above, having higher state-level negative transgender implicit bias could be either the cause or the consequence of having zero to few policies protecting transgender rights.

Second, this research's scope is constrained because of our limited data. While we were able to obtain data on all U.S. states (excluding D.C.), we only analyzed data from 106 counties out of the 3006 counties in the United States. As such, our conclusions regarding the county-level analyses might be non-generalizable to other counties. There could be factors biasing our interpretation of the results that are specific to the context of counties that enlisted enough participants to meet our threshold, which may be a particular concern given that Project Implicit participants tend to be disproportionately liberal and educated relative to the US population (Xu, Nosek, & Greenwald, 2014).

Similarly, data from the self-reported contact variable is limited because the related questions were presented to only one-third of the transgender IAT participants.

Finally, the data collection period for transgender implicit attitudes, explicit attitudes, and self-reported contact with transgender people variables was less than one year. In this relatively short interval of time, a few historical events occurred that could have influenced our results. Notably, 2020 was marked by the COVID-19 global pandemic, which created a rather unusual social context that introduced physical distancing measures, limits on social gatherings, and closings of public institutions. While it is too soon to know the effects of the pandemic on intergroup attitudes, it is possible that such large-scale shifts in social contact and heightened uncertainty over political and economic futures may have impacted certain aspects of intergroup attitudes (e.g. Krosch, Tyler, & Amodio, 2017). In addition, given that many of our outcomes are related to politics, changes in the US government following the 2020 special election may themselves have signalled new norms regarding issues related to stereotypes and prejudices. As a result, future analyses will benefit from a longer range of data that may cumulatively be less impacted by the highly tumultuous timeframe of 2020.

### ***Future Directions***

As mentioned above, future research on transgender implicit attitudes should focus on long-term change or stability. With the Transgender IAT being among the most recently developed implicit attitude measures on Project Implicit, it is yet unknown what trend these attitudes are following. For instance, in a ten-year review of data collected on several IATs, Charlesworth and Banaji (2019) found that implicit attitudes have been moving towards neutrality in some domains (e.g. sexual orientation, race, skin tone)

while others have remained stable (e.g. age, disability). Regarding gender stereotypes, implicit and explicit attitudes have moved toward neutrality in as much as 19% over the last decade (Charlesworth & Banaji, 2021). In light of this evidence, we could expect to see transgender attitudes moving towards neutrality in the coming years because people usually report similar attitudes with sexual minorities (Norton & Herek, 2013).

Additionally, the shift towards less defined gender roles should help reduce prejudice against gender non-conforming groups.

Finally, future studies could adopt a longitudinal or quasi-experimental approach to better understand how changes in policy impact transgender implicit attitudes. For instance, future research on transgender implicit attitudes and policing could proceed similarly to Ofosu et al. (2019) and conduct a time series analysis based on state-by-state policy change regarding the treatment of transgender people. Many state legislatures are currently evaluating important transgender-related policies, such as the banning of transgender youth from participating in sports according to their gender identity (AP News, 2020). Different states will surely remove discriminatory policies and adopt policies protecting transgender rights at different rates. Therefore, future studies could look into the pre versus post-policy effect that such changes have on implicit transgender attitudes. Such analyses could better clarify the causal relationship between policy-making and transgender attitudes, though the present study accomplishes the important first step of identifying a clear relationship between area-level estimates of implicit transgender attitudes and the enactment of policies that combat discrimination against transgender people.

**Table 1.** Descriptive Statistics and Correlations for State-level Analyses.

Measure	Mean	SD	Correlation with 1 ( <i>r</i> )	95% CI
1. Transgender IAT <i>D</i> score	0.13	0.03	—	—
2. Interest in transgender people	76.5	5.64	<sup>ns</sup> -0.17	[-0.43, 0.11]
3. Self-reported contact with transgender people	0.06	0.13	<b>-0.69</b>	[-0.81, -0.50]
4. Prevalence of transgender people (total)	27654	36854.02	<sup>ns</sup> -0.05	[-0.32, 0.23]
5. Prevalence of transgender people (proportional)	0.01	0	<sup>ns</sup> -0.08	[-0.35, 0.21]
6. Political conservatism	0.49	0.1	<b>0.32</b>	[0.04, 0.55]
7. Valence of transgender laws	6.7	8.45	<b>-0.43</b>	[-0.63, -0.17]
8. Explicit attitudes	0.13	0.11	<b>0.66</b>	[0.47, 0.79]

Note. <sup>ns</sup> indicates  $p > .05$ . Bold indicates significance at  $p < 0.05$ .

**Table 2.** Descriptive Statistics and Correlations for County-level Analyses.

Measure	Mean	SD	Correlation with 1 ( <i>r</i> )	95% CI
1. Transgender IAT <i>D</i> score	0.14	0.04	—	—
2. Self-reported contact with transgender people	0.05	0.12	<b>-0.64</b>	[-0.75, -0.49]
3. Political conservatism	0.47	0.18	<b>0.23</b>	[0.03, 0.40]
4. Explicit attitudes	0.13	0.11	<b>0.54</b>	[0.39, 0.67]

Note. <sup>ns</sup> indicates  $p > .05$ . Bold indicates significance at  $p < 0.05$ .



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## **Appendix**

### **Statement of contribution**

As the primary researcher for this project, E.R. took the lead on the research project's conception, online gathering of data, data analysis, and writing of this final paper. J.A. (faculty supervisor) provided parts of the data to be analyzed and supervised the student in every step of the project. Finally, J.A. made editorial contributions throughout the writing of the manuscript by E.R. This project was done independently of the other projects in the laboratory.