Code

Model with Contrast Coded Pre_Post State Legalization
```
M1Im <-lmer(ImplicitBias ~ Year.Centered*Pre_Post.State.Legalization.Contrast
        + State.Population.Density.Centered +  State.SocioEconomicStatus.Centered
        + State.Education.Centered + State.Employment.Centered
        + Age.GroupMeanCentered + Racial.Majority.Centered + Sex.Centered
        +  (1 | State), data= Model1DatasetRevisedandResubmit)
summary(M1Im)
```

Model with Dummy Coded Pre_Post State Legalization (simple slope for pre-legalization)
```
M1ImPre <-lmer(ImplicitBias~ Year.Centered*Pre_Post.State.Legalization
          + State.Population.Density.Centered + State.SocioEconomicStatus.Centered
          + State.Education.Centered + State.Employment.Centered
          + Age.GroupMeanCentered + Racial.Majority.Centered + Sex.Centered
        +  (1 | State), data= Model1DatasetRevisedandResubmit)
summary(M1AImPre)
```

Model with Dummy Coded Post_Pre State Legalization (simple slope for post-legalization)
```
M1ImPost <-lmer(ImplicitBias~ Year.Centered*Post_Pre.State.Legalization.Dummy
          + State.Population.Density.Centered + State.SocioEconomicStatus.Centered
          + State.Education.Centered + State.Employment.Centered
          + Age.GroupMeanCentered + Racial.Majority.Centered + Sex.Centered
        +  (1 | State), data= Model1DatasetRevisedandResubmit)
summary(M1ImPost)
```

Tables
Table 1.A Implicit Bias (Heterosexual Participants)

Effect	B	SE	t-statistic	p-value
Intercept	.4252	.0059	72.42	< .001
Year	-.0086	.0003	-25.85	< .001
Pre_Post Legislation Contrast	-.0063	.0012	-5.26	< .001
Year and Pre_Post Legislation	-.0025	.0003	-7.91	< .001
State Population Density	.0001	.0001	-13.90	< .001
State Employment	-.0031	.0002	-15.61	< .001
State Education	-.0003	.0001	-18.33	< .001
State Socio Economic Status	.0001	.0001	7.36	< .001
Racial Majority	-.0395	.0007	-59.10	< .001
Gender	-.0656	.0006	-107.88	< .001
Age Centered	.0018	.0001	32.62	< .001
Pre State Legislation				
Year	-.0062	.0003	-19.99	< .001
Post State Legislation				
Year	-.0111	.0006	-19.57	< .001

R^2 = 4.29%

Table 1.B Explicit Bias (Heterosexual Participants)

Effect	B	SE	t-statistic	p-value
Intercept	2.3740	.0493	48.16	< .001
Year	-.0968	.0017	-57.43	< .001
Pre_Post Legislation Contrast	-.0198	.0061	-3.27	.001
Year and Pre_Post Legislation	-.0053	.0016	-3.40	< .001
State Population Density	.0000	.0001	-12.73	< .001
State Employment	-.0174	.0010	-17.10	< .001
State Education	-.0016	.0001	-22.27	< .001
State Socio Economic Status	.0001	.0001	16.49	< .001
Racial Majority	-.1535	.0034	-45.47	< .001
Gender	-.5045	.0031	-164.27	< .001
Age Centered	-.0112	.0003	-43.73	< .001
Pre State Legislation				
Year	-.0915	.0016	-58.76	< .001
Post State Legislation				
Year	-.1022	.0029	-35.69	< .001

R^2 = 8.79%

Table 2 Demography of Sexualities

Sexuality	Number of Participants	Percentage of Dataset
Heterosexuals	680,376	71.64
Bisexual	97,807	10.30
Gay or Lesbian	96,488	10.16
Asexual	9,002	0.95
Queer	2,215	0.23
Questioning	1,877	0.20
Other	1,666	0.18
NA	60,233	6.34
Total	949,664	

We note the percentage of respondents identifying as LGBTAQ is higher in this sample than that estimated in the North American population.

Table 2.A Implicit Bias (All Sexualities)

Effect	B	SE	t-statistic	p-value
Intercept	.3250	.0068	48.11	< .001
Year	-.0135	.0003	-43.28	< .001
Pre_Post Legislation Contrast	-.0086	.0011	-7.88	< .001
Year and Pre_Post Legislation	-.0046	.0003	-15.84	< .001
State Population Density	.0001	.0001	-25.01	< .001
State Employment	-.0043	.0002	-22.23	< .001
State Education	-.0003	.0001	-22.19	< .001
State Socio Economic Status	.0001	.0001	17.61	< .001
Racial Majority	-.0388	.0006	-61.16	< .001
Gender	-.0458	.0006	-79.90	< .001
Age Centered	.0010	.0001	20.00	< .001
Pre State Legislation				
Year	-.0089	.0003	-30.09	< .001
Post State Legislation				
Year	-.0181	.0005	-34.48	< .001

$R^2 = 3.54\%$

Table 2.B Explicit Bias (All Sexualities)

Effect	B	SE	t-statistic	p-value
Intercept	1.8270	.0482	37.81	< .001
Year	-.1149	.0015	-75.14	< .001
Pre_Post Legislation Contrast	-.0362	.0054	-6.75	< .001
Year and Pre_Post Legislation	-.0211	.0014	-14.81	< .001
State Population Density	.0001	.0001	-22.08	< .001
State Employment	-.0205	.0009	-21.81	< .001
State Education	-.0016	.0001	-23.51	< .001
State Socio Economic Status	.0001	.0001	24.39	< .001
Racial Majority	-.1487	.0031	-48.03	< .001
Gender	-.4415	.0028	-157.46	< .001
Age Centered	-.0114	.0003	-45.51	< .001
Pre State Legislation				
Year	-.0939	.0014	-64.76	< .001
Post State Legislation				
Year	-.1360	.0026	-52.83	< .001

$R^2 = 7.63\%$

Table 3 Explicit Bias (ANES)

Effect	B	SE	t-statistic	p-value
Intercept	58.7734	1.5404	38.15	< .001
Year	1.2608	.4722	2.67	.008
Pre_Post Legislation	-1.2984	.8611	-1.51	.132
Year x Pre_Post Legislation	1.1142	.3943	2.83	.005
State Population Density	-.0060	.0022	-2.73	.007
State Employment	-.2094	.6627	-.32	.752
State Education	.1611	.0664	2.43	.015
State Socioeconomic Status	.0002	.0003	.66	.512
Gender	-3.8187	.3066	-12.46	< .001
Age	-.2263	.0177	-12.76	< .001
Pre State Legislation				
Year	.1466	1.5062	.24	.813
Post State Legislation				
Year	2.3750	.6107	3.89	< .001

R^2 = 6.75%

Note. This analysis was weighted so variance explained was calculated by formulas in Raudenbush & Bryk (2002) rather than in Rights & Sterba (2018) as in all other models.

Table 4.A Implicit Bias (3-Way Interaction)

Effect	B	SE	t-statistic	p-value
Intercept	.3992	.0090	44.59	< .001
Year	-.0006	.0016	-.38	.707
Pre_Post Legislation Contrast	-.0409	.0069	-5.89	< .001
State_Federal Legislation Contrast	-.0149	.0089	-1.66	.098
Year and Pre_Post Legislation Contrast	.0058	.0016	3.51	< .001
Year and State_Federal Legislation Contrast	.0075	.0016	4.56	< .001
Pre_Post Legislation Contrast and State_Federal Legislation Contrast	-.0338	.0069	-4.86	< .001
Year and Pre_Post Legislation Contrast and State_Federal Contrast	.0088	.0016	5.36	< .001
State Population Density	.0001	.0001	-13.91	< .001
State Employment	-.0031	.0002	-15.27	< .001
State Education	-.0003	.0001	-18.41	< .001
State Socio Economic Status	.0001	.0001	7.20	< .001
Racial Majority	-.0395	.0007	-59.08	< .001
Gender	-.0656	.0006	-107.89	< .001
Age Centered	.0018	.0001	32.66	< .001
Pre Legislation for states with State Legislation Year	-.0051	.0006	-12.82	< .001
Pre Legislation for states without State Legislation Year	-.0077	.0005	-16.70	< .001
Post Legislation for states with State Legislation Year	-.0112	.0006	-19.36	< .001
Post Legislation for states without State Legislation Year	.0215	.0065	3.29	< .001

$R^2 = 4.22\%$

Table 4.B Explicit Bias (3-Way Interaction)

Effect	B	SE	*t*-statistic	*p*-value
Intercept	2.2790	.0562	40.56	< .001
Year	-.0545	.0082	-6.62	< .001
Pre_Post Legislation Contrast	-.2085	.0347	-6.01	< .001
State_Federal Legislation Contrast	.0269	.0561	.48	.632
Year and Pre_Post Legislation Contrast	.0387	.0082	4.71	< .001
Year and State_Federal Legislation Contrast	.0384	.0082	4.67	< .001
Pre_Post Legislation Contrast and State_Federal Legislation Contrast	-.1830	.0347	-5.28	< .001
Year and Pre_Post Legislation Contrast and State_Federal Contrast	.0476	.0082	5.79	< .001
State Population Density	.0000	.0000	-12.75	< .001
State Employment	-.0169	.0010	-16.59	< .001
State Education	-.0016	.0001	-22.42	< .001
State Socio Economic Status	.0001	.0001	16.24	< .001
Racial Majority	-.1534	.0034	-45.44	< .001
Gender	-.5045	.0031	-164.29	< .001
Age Centered	-.0119	.0003	-43.69	< .001
Pre Legislation for states with State Legislation Year	-.0841	.0020	-41.81	< .001
Pre Legislation for states without State Legislation Year	-.1024	.0023	-43.99	< .001
Post Legislation for states with State Legislation Year	-.1017	.0029	-34.86	< .001
Post Legislation for states without State Legislation Year	.0702	.0326	2.15	.031

R^2 = 8.60%

Table 5 Comparison of Demographics

| Estimate	Project Implicit Sample	National Sample (ANES Sample)
Age (Median)	21 years	38.1 years
Female	60%	49.80%

Supplementary Analyses in California

California uniquely had four different phases of same-sex legalization status. There were periods of time 1) prior to any sort of legalization, 2) following the California Supreme Court decision functionally legalizing same-sex marriage, 3) following the passing of Proposition 8, again making same-sex marriage illegal, and 4) following federal legalization, again legalizing same-sex marriage in California.

In the present research, we've hypothesized that government legislation, being signaled as a norm, shapes the attitudes of the local populace. California provides a unique opportunity to test this possibility. It would be consistent with our hypotheses that, following the passing of Proposition 8, citizens should express more anti-gay implicit and explicit biases relative to after the California Supreme Court decision legalized same-sex marriage, and also relative to follow federal legalization.

In a linear regression model, we tested this possibility by comparing the slopes of anti-gay implicit and explicit bias over time to the next sequential time period at each of the four time periods described above using a series of contrast codes, and controlling for all individual-level covariates included in the primary analyses reported in the primary text. Project Implicit data had 101, 313 observations within California across these four different time periods.

First examining implicit bias, the trend in bias over time was different before and after the California Supreme Court decision functionally legalized same-sex marriage ($B = -.0001$, $SE = .0001$, $t = -9.82$, $p < .001$). Prior to legalization, anti-gay implicit bias was actually increasing, but anti-gay implicit bias decreased over time following legalization (Supplementary Figure 1; Panel A). Next, trends in bias over time were significantly different following this legalization relative to the passing of Proposition 8, functionally making same-sex marriage illegal again ($B = .0001$, $SE = .0001$, $t = 3.21$, $p = .001$). The slope following the passing of Prop 8, while still negative overall, became less negative, indicating that anti-gay attitudes were no longer decreasing at the same rate as following initial same-sex marriage legalization (Supplementary Figure 1; Panel B). Finally, the trend in decreasing anti-gay implicit bias again became more sharp following federal legalization ($B = -.0001$, $SE = .0001$, $t = -4.18$, $p < .001$) (Supplementary Figure 1; Panel C). All simple slopes were significantly different from zero. For purposes of better comparing the trends across different periods of time, we have visualized these trends in the same panels, but of course these trends occurred at different periods of time and for different lengths of time.
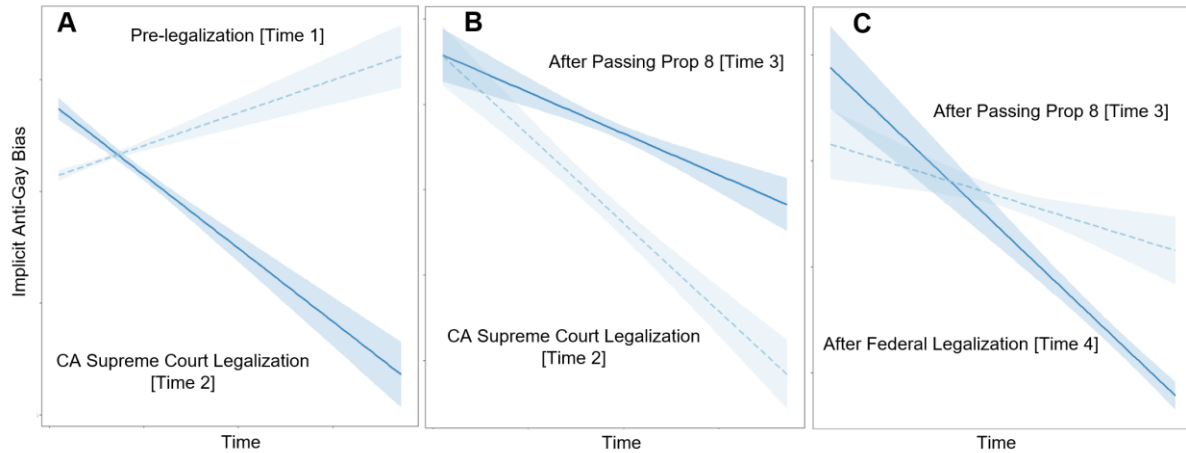
Supplementary Figure 1. Trends of anti-gay implicit bias over time compared across the four periods of California's legalization stages. Shaded areas represent 95% confidence bands. All slopes are significantly different from zero.

An identical pattern of effects was observed with explicit anti-gay bias. The trend in bias over time was different before and after initial same-sex marriage legalization ($B = -.0004$, $SE = .0001$, $t = -7.24$, $p < .001$). Prior to legalization, anti-gay explicit bias was increasing, but anti-gay bias decreased over time following legalization (Supplementary Figure 2; Panel A). Next, trends in bias over time were also different after legalization relative to after the passing of Proposition 8, though this effect was only marginal ($B = .0001$, $SE = .0001$, $t = 1.84$, $p = .066$). The slope following the passing of Prop 8, while still negative overall, became less negative, indicating that anti-gay attitudes were no longer decreasing at the same rate (Supplementary Figure 2; Panel B). Finally, the trend in decreasing anti-gay implicit bias again became more sharp following federal legalization, though this effect was also marginal ($B = -.0001$, $SE = .0001$, $t = -1.92$, $p = .054$) (Supplementary Figure 2; Panel C). All simple slopes were significantly different than zero.
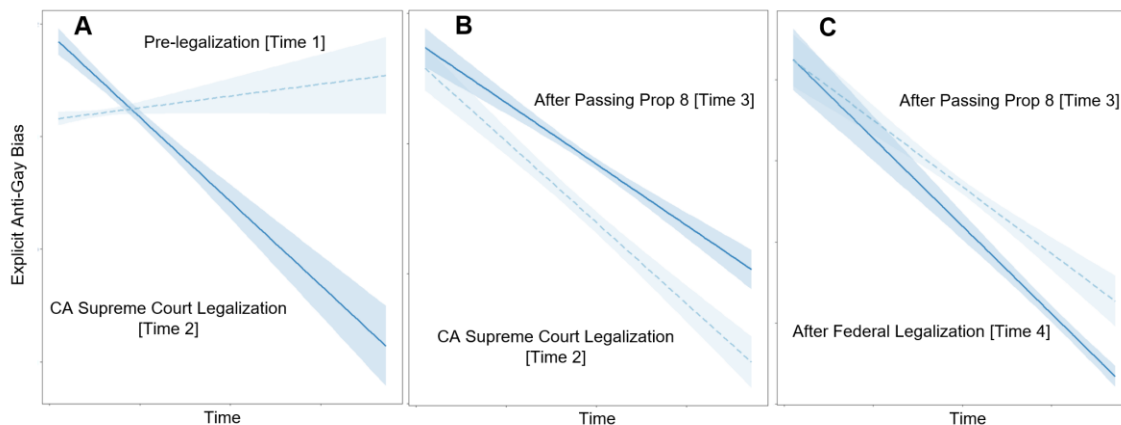
Supplementary Figure 2. Trends of anti-gay explicit bias over time compared across the four periods of California's legalization stages. Shaded areas represent 95% confidence bands. All slopes are significantly different from zero.

In summary, the results of this smaller, targeted analysis supported that of our primary analysis reported in the text, as well as tentatively supporting our broader hypothesis. Just as government legislation signaling support for marginalized communities should decrease anti-group biases, government legislation signaling rejection of marginalized communities (e.g., the repeal of Proposition 8) should increase anti-group biases. However, because this was only a one specific case in a limited geographic area (i.e., California), we consider this a limited amount of evidence for this possibility. Future research might target this possibility more thoroughly.

Contextualization of Effect Sizes

The percentage of variance explained by the effects of interest in the primary manuscript are modest. Although explaining between 1- 4.44% of variance in an outcome intuitively seems small, others have noted that variance explained as a metric of effect size is considered to be at odds with intuition. This was the main point of Abelson's 1985 *Psychological Bulletin*[1] paper, "A variance explanation paradox: When a little is a lot." In this paper, Abelson finds that a baseball player's batting skill explains one-third of 1% (or 0.33%) variance in whether they get a hit or not (page 131), an outcome that was at odds with intuition and estimates of the statisticians and baseball enthusiasts with whom he consults.

Further, our results must be situated among effects based on real-world interventions as opposed to being compared with effect sizes obtained in highly controlled laboratory studies. In general, variance explained in real-world settings tends to be smaller than that in highly controlled experimental work. Sue Dynarski, a leading educational economist, argues that in real-world settings, explaining 4% of the variance (what we observe for explicit bias in Model 4 of the present paper) is "a large effect" (https://www.brookings.edu/research/for-better-learning-in-college-lectures-lay-down-the-laptop-and-pick-up-a-pen/)[2]. Her observations are consistent with numerous examples of real-world effect sizes in the published literature.

For example, "A 61-million-person experiment in social influence and political mobilization" finds an effect size at fractions of a percent, as people receiving their manipulation were 0.39% more likely to vote than a control group (Bond et al., 2012, *Nature*[3]). More similar to the present research, and in a similar domain, a meta-analysis focusing on racism and health (Paradies et al., 2015, *Plos One*[4]) of 293 studies found that racism explained 5.3% of the variance in negative mental health, 1.7% of positive mental health, 1.7% of general health, and 0.8% of physical health. Other areas of research that have received a huge amount of attention show similarly small effects. Intergroup contact explains between 1-2% of the variance in attitudes toward immigration policy (Pettigrew, 1997, *Personality and Social Psychology Bulletin*[5]). Growth-mindset explains 1% of the variance in overall academic achievement (Sisk et al., 2018, *Psychological Science*[6]). Daily use of aspirin explains 0.011% of the variance in reduced heart attacks (Rosnow & Rosenthal, 2003[7]), though overwhelmingly endorsed by physicians. These examples provide a context in which to situate the current findings, and they demonstrate that our

effects are slightly larger than normal in the realm of explanation social attitudes and behavior.

These examples provide a context in which to situate the current findings, and they demonstrate that our effects are slightly larger than normal in the realm of explanation social attitudes and behavior. Given the combined importance of the conclusion that government legislation might impact citizens' attitudes, the evidence of the effects of anti-gay bias on the health of the LGBTQ+ community, the effect sizes throughout the present work, and the extent of the evidence for causality, we believe this result important and meaningful.

Reference

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