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Attitudes, Knowledge, and Justifications Concerning Industrially Farmed Animal Welfare Between Residents of High and Low Animal Agriculture States

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Supplementary Materials: Data, Preregistration [see Index of Supplementary Materials]

Abstract

Do residents of states with high levels of animal agriculture have different views about animal welfare on industrialized farms compared to residents of states with low levels of animal agriculture? In a survey of residents of high and low farmed animal agriculture states in the USA (N = 1985), we found that views about farmed animal welfare were largely similar between residents of those two sets of states. Using an extreme groups analysis of the 5 highest animal agriculture (e.g., Oklahoma) and 5 lowest animal agriculture states (e.g., Massachusetts), there were no measurable differences on some key outcome variables (e.g., mental state attributions to farmed animals, knowledge of factory farming, killing practices on industrialized farms, state and farmers' responsibility for farmed animal welfare). Among the variables where we found measurable differences (e.g., those in high animal agriculture states, compared to those in low agriculture states, knew less about animals used as food and had lower estimates of the percent of farmed animals on industrial farms), the size of those differences was small (mean Cohen's d of variables with significant differences = |0.18|) and none involved a qualitative shift (e.g., from agree to disagree). Moreover, predictors of those views were significant and stable across residents of the two sets of states and consistent with previous research (e.g., knowledge significantly predicted magnitude of factory farming independent of state of residency). These results may help inform where, for what, and by how much differences among residences high and low animal agriculture states matter.

Keywords

factory farming, attitudes, USA, animal welfare, animal agriculture

Non-Technical Summary

Background

Anecdotal and some empirical evidence suggest that there may be some systematic differences among residents of high and low animal agricultures states (e.g., Oklahoma v. Massachusetts) with respect to farmed animal welfare. Those systematic differences may indicate that those residing in high agriculture states may be less receptive to changes in policies or activism efforts aimed at increasing farmed animal welfare.

Why was this study done?

Our overarching goal was to provide some systematic, empirical evidence to help document potential differences between residents of high and low agriculture states with respect to farmed animal welfare.

What did the researchers do and find?

We collected a large (N = 1985), purposive sample of residents of 5 high (Iowa, Oklahoma, Nebraska, Kansas, and Indiana) and 5 low agriculture (Rhode Island, Hawaii, Nevada, Maryland, and Massachusetts) states based on USDA animal production data. We then created two sets of data by randomly assigning half participants to a test set and the other half to a validation set. Participants responded to a host of items concerning farmed animal welfare including (but not limited to) the percent of farmed animals on factory farms, who has obligations towards farmed animal welfare, and acceptability of common practices on factory farms. We tested for mean differences between the residents of high and low agriculture states in both the test and validation set. Overall, there were very small overall mean differences between residents of high and low agriculture states (average *Cohen's d* = 0.13) and none of differences resulted in a qualitative difference (e.g., from agreeing with factory farming practices to disagreeing with practices on factory farms) in either the test or validation sets. Predictors of these views (what one knows about farmed animals and justifications for using animals for food) were related to those outcome variables, were consistent with previous research, and were independent (i.e., not moderated) by state of residency in both test and validation sets.

What do these findings mean?

These results suggest that, on average, there are no substantial or practically meaningful differences about views concerning farmed animal welfare between residents of high and low agriculture states. The general results were bolstered by supplemental analysis suggesting that political orientation (i.e., liberal versus conservative) and area of residency (i.e., rural, suburban, and urban) also did not generate large overall differences on views of farmed animals. As such, on average there is substantial agreement among residents in the USA

about farmed animal welfare and state of residency should not be taken as a substantial barrier to acceptance of protections for farmed animals.

Industrialized farms attempt to maximize profits in part by keeping a large number of animals indoors or in confined spaces. Most residents of the United States are concerned about farmed animal welfare, but farming practices that negatively impact farmed animal welfare persist on industrialized farms (e.g., debeaking chickens) (Lusk et al., 2007). Consequently, practices common on industrialized farms often do not match some of the values that most United States residents have, and reducing that gap may be ethically desirable for animal welfare, health, and human interests. Viable strategies include increasing consumption of alternative proteins (e.g., meat alternatives) and policy level changes (e.g., forbidding gestation crates). However, several potential barriers exist for reducing the difference between industrialized farming practices and people's values, including their lack of knowledge of industrialized farming, misperceptions of the magnitude of industrialized farming, geographic location, differences in values, beliefs about animals such as their ability to feel pain, justifications for consuming animals, and personal connections with animals (see, for an overview, Fonseca & Sanchez-Sabate, 2022).

Here, we attempt to estimate potential differences in some of those barriers as a function of residency in a high animal agriculture or low animal agriculture state in the U.S.. Some evidence indirectly suggests that those in high and low agriculture states might have different views about farmed animal welfare. For example, states with more farmed animals tend to have fewer farmed animal protections compared to states with fewer farmed animals (e.g., https://aldf.org/project/us-state-rankings/). We compared the 5 highest farmed animal agriculture states (e.g., Oklahoma) against the lowest 5 farmed animal agriculture states (e.g., Massachusetts) in the U.S. Overall, we found that residents of these states largely had the same views relevant to industrialized farmed animal welfare and health. Additionally, individual-level predictors (e.g., knowledge of factory farming) of views about farmed animal welfare and health (e.g., approval of body part removals) were significant, consistent with past research, and not dependent on state of residency.

Previous Work on Uses of Animals

Research on predictors of uses of animals has surged over the past twenty years (A. Feltz & Feltz, 2021; Ruby, 2012). For example, those who think eating meat is normal, necessary, nice, and natural (i.e., the 4Ns) are more likely to consume more animal products than those who do not (Piazza et al., 2015). Research also suggests that knowledge of animal related issues can predict animal related outcomes. For example, those who know more about animals used as food also consume fewer animal products (A. Feltz et al., 2024; S.

Feltz & Feltz, 2019). Concern for animal welfare is also commonly assessed. Those who care more about animal welfare are more supportive of animal protections (Rothgerber, 2015). Attitudes about uses of animals, such as acceptability of hunting animals for sport, predict some behavioral outcomes like consuming fewer animal products (Herzog et al., 2015).

Some evidence suggests that there might be important differences in views of farmed animal welfare between residents of high and low agriculture states. The Humane Society of the United States has listed which states have laws specifically protecting factory farmed animals[1]. Using data from the USDA[2], states that had higher total dollar revenue from cattle and hog production had fewer animal protections (Cattle, *Mann-Whitney* $U = 357$, $p = .04$ one-tailed; Hog total dollar revenue trended in the right direction *Mann-Whitney* $U = 326$, $p = .10$, one-tailed). A similar pattern was found with a recent ranking of state's animal protections laws performed by the Animal Legal Defense Fund (https://aldf.org/project/us-state-rankings/). The states that had higher cattle and hog total dollar revenue were ranked lower in terms of animal protection laws compared to the states that lower total dollar revenues from cattle and hog (cattle *rho* = -.20, $p = .08$, one-tailed; hog *rho* = -.25, $p = .04$, one-tailed). Other data suggest that the best economic predictor of animal protection laws in a state is the number of people who are employed in animal agriculture (Lutz & Lutz, 2011). Given the assumption that those residing in high animal agriculture states voted for elected officials making the laws, it is reasonable to think that the residents of those states are less supportive of protections for farmed animal welfare than residents of low animal agriculture states.

We aimed to provide direct evidence about potential differences concerning farmed animal health and welfare between residents of high animal agriculture and low animal agriculture states. We also provide evidence about what more proximal cognitive mechanisms might predict those differences (e.g., knowledge and one's values) and determine if those predictors were influenced by state of residency. The predictors selected were based on the Framework for Skilled Decisions (Cokely et al., 2018). While the Framework for Skilled Decisions includes several elements (environment, cognitive abilities, deliberation, and confidence), this Framework suggests that many outcome variables can be predicted by what one knows about an issue along with relevant values. This Framework has been successfully applied to related issues involving consumption of animals and animal products (A. Feltz et al., 2024; Feltz et al., 2022), consumer views of plant-based products (S. Feltz & Feltz, 2019), views about natural resource management (Tanner & Feltz, 2022), views about endangered species (Offer-Westort et al., 2020), among a host

1) https://www.humanesociety.org/blog/california-which-passed-worlds-strongest-farm-animal-protection-law-and-nations-first

2) https://data.ers.usda.gov/reports.aspx?ID=4052

of other outcomes. For example, those who know more about animals used as food and have weaker value-related justifications for consuming meat tend to consumer fewer animal products than those who know less or have stronger value-related justifications for consuming meat (A. Feltz et al., 2024).

Overall, we expected that residents of high animal agriculture states would have views less supportive of factory farmed animal welfare compared to views of residents in low animal agriculture states (e.g., less favorable views of animal advocacy agencies, more approving of body part removal and killing practices on industrialized farms. See below for more specific predictions). Our approach would also allow us to see if residency in those states moderated the expected relations between the predicter variables (i.e., knowledge and values) and views concerning farmed animal welfare (e.g., body part removal practices).

Method

Participants

We identified five states high in farmed animal agriculture and five states low in farmed animal agricultural (see below). We sampled 200 participants from each state. Our decision to recruit 200 participants (2000 overall) enabled us to create "test" and "validation" set data (pre-registration of sampling plan is available, see Feltz & Dillard, 2023). Of note, an error in the preregistration indicated an initial sample of 10 low and 10 high agriculture states. We planned to sample 10 *overall,* 5 from each kind of state). This increased confidence in our results by replicating the potential effects in the validation set data. A sensitivity analysis using conventional parameters suggested that this method would allow us to detect a small mean difference between high and low agriculture states (*Cohen's d* = .18, N = 1000, *power* = .80, p = .05, two-tailed) and a small correlation between variables (r = .09, N = 1000, *power* = .80, p = .05, two-sided) for each of the test and validation sets (Cohen, 1988).

We selected states that were high in animal agriculture based on USDA total dollar revenue data on hog and cattle production[3]. The high animal agriculture states we identified were Iowa, Oklahoma, Nebraska, Kansas, and Indiana. We also used the same techniques to identify states low in animal agriculture. These states were Rhode Island, Hawaii, Nevada, Maryland, and Massachusetts. Of note, there was very little separating the total dollar revenues in the 20 states with the lowest hog and cattle production accounting for about 5% of the total dollar revenue between the 31st and 50th states. Because there was so little differentiating the bottom 20 states, we also partially selected states to balance overall human resident populations between high and low animal

3) https://data.ers.usda.gov/reports.aspx?ID=4052

agriculture states. Based on 2020 USA census data, the total population of the high animal agriculture states we selected was 18.9 million and the overall population of the low animal agriculture states we selected was 18.8 million[4].

Our approach to selection of states is similar to what would be used in "extreme groups" analyses (Preacher et al., 2005). Extreme groups analyses look at a distribution and find people who are at the extremes of that distribution (e.g., the top 25% versus bottom 25% in trait differences). There are well-known criticisms of this approach such as the tendency to overestimate effects and increase false positive rates (see, for example, Preacher et al., 2005). Here, one may take the shortcomings of extreme group analyses as a strength. If there are differences between high and low agriculture states about views concerning farmed animal welfare, they would likely be detected given our extreme group analysis. If there are no reliable differences between these two sets of states, then there are not likely to be differences in states that are less different in terms of farmed animals. In other words, the extreme groups approach should be highly sensitive to any differences that is likely to be found between states.

As a check on our selection of states, we evaluated the states in terms of how they rated on animal protection laws and political conservativism. Even given the small sample size (N = 10), the high animal agriculture states (rank mean = 31) trended to having weaker animal protection laws than low animal agriculture states (rank mean = 20) according to the Animal Legal Defense Fund (*Mann-Whitney test* = 6, p = .11, one-tailed). Additionally, according to the Human Society of the United States (https://www.humanesociety.org/blog/california-which-passed-worlds-strongest-farm-animal-protection-law-and-nations-first), four of our high agriculture states did not have laws specifically protecting farmed animals (all but Oklahoma) whereas 4 of our low animal agriculture states did (all but Nevada, $\chi^2(1) = 3.6$, p = .058, ϕ = .6). Those in high agriculture states were also more politically conservative according to a Pew survey (high agriculture state rank mean = 46.6, low agriculture state rank mean = 12.6, *Mann-Whitney test* = 0, $p < .01$, one tailed)[5].

We used Cint testing service to recruit participants (see https://www.cint.com/ for their methods for recruiting participants). Cint recruited 200 participants from each of the states we identified. Three extra participants were recruited because of state quota issues. Consistent with Cint's data quality reports, we excluded 15 participants for failing a basic comprehension question ("Which of the following is a fruit?" TV, Apple, Boat, Baseball). Three participants were excluded for reporting an age less than 18. This resulted in a total sample of 1985 participants.

4) https://www2.census.gov/programs-surveys/popest/tables/2020-2022/state/totals/NST-EST2022-POP.xlsx

5) https://www.pewresearch.org/religion/religious-landscape-study/compare/political-ideology/by/state/

Materials

Participants were given the following materials divided into three blocks. The first two blocks were counterbalanced for order. After responding to the first two blocks, all participants responded to the items in the third block (for full descriptions and materials, see supplemental materials).

In the block 1, participants received, in order, The Knowledge of Animals as Food Scale (S. Feltz & Feltz, 2019), The Knowledge of Factory Farming Scale (A. Feltz et al., 2024), a question about the percent of farmed animals on factory farms, familiarity with meat alternatives, government and corporate obligations to industrially farmed animals, responsibility for industrially farmed animals, perceptions of acceptable practices on industrial farms. In block 2, participants received, in order, a measure of mental state attributions to animals, the 4Ns (Piazza et al., 2015), a measure of personal connections to animals, a measure of attitudes towards animal advocacy, and a measure of personal activism. Block 3 contained the Brief Version of the Santa Clara Strength of Religious Faith scale (Plante et al., 2002), 3-Month Food Frequency Questionnaire (A. Feltz et al., 2023), One Item Berlin Numeracy Test (E. T. Cokely et al., 2012), and basic demographic questions.

Results

To help reduce the complexity and number of analyses, we first factor analyzed the items that we created for this study. Exploratory factor analyses suggested that a number of the sets of questions could be meaningfully captured by one or two factors (all the exploratory factor analyses are provided in the supplemental materials) and are summarized in Table 1. To determine if presentation order of the blocks of items influenced responses, we conducted a MANOVA with order of presentation as the fixed factor and all the variables listed above as the dependent variables. The MANOVA indicated a significant difference between the two orders, F (23, 1961) = 3.47, p < .01, η_p^2 = .04. A subsequent inspection of the ANOVA tables for each variable indicated small to trivial differences on the dependent variables (η_p^2s ≤ .01). Consequently, while order of presentation may have influenced responses, order was not a strong influence. For ease of analyses, we did not include order of presentation in any subsequent analyses.

While our hypotheses were theory driven, they were not preregistered, so we adopted a cautious analytic strategy. After conducting the exploratory factor analyses, we divided the full data set into two sets of data—a test set and a validation set. Participants were randomly assigned to only one of the test set (N = 992) or validation set (N = 993). For the test set, there were in 497 participants from low animal agriculture states and 495 from high animal agriculture states. For the validation set, there were 498 from low animal agriculture states and 495 from high animal agriculture states. See Table 2 for

means and standard deviations of the dependent variables in the test set (all analyses and results for the validation set are provided in the supplemental materials).

Table 1

Factors Identified in the Items Created for this Study and Scores Used in Analyses

Group	Factors	Items in Factor	Score Used
Familiarity with Meat Alternatives	Eating Meat Alternatives	3, 4	Sum
	Awareness of Meat Alternatives	1, 2, 5	Sum
Government/Corporate Obligations to Factory Farmed Animals	Animal Welfare	1, 2, 3, 4, 5, 7	Mean
	Human Welfare	8, 9, 6	Mean
Responsibility for Factory Farmed Animals	No systematic factors were detected.		Value for each question
Perceptions of Acceptable Factory Farming Practices	Removals	1, 2, 4, 5	Mean
	Killing and Confinement	3, 6, 7, 8, 9	Mean
Mental State Attributions		1–6	Mean
Attitudes toward Animal Advocacy	No systematic factors were detected		Value for each question
Personal Connection to Animals		1–6	Mean
Personal activism		1–2	Mean

Note. Full factor analyses are available in the supplemental materials.

Table 2

Means, Standard Deviations, t-Tests, and Cohen's d for the Test Set Data

Variable	Low/High Ag	*M*	*SD*	*t*	*p*	*d*
KAFs	Low	6.94	1.50	2.50	.01	0.16
	High	6.69	1.59			
KFF	Low	4.72	2.50	1.07	.29	.07
	High	4.55	2.54			
Magnitude	Low	59.30	20.50	2.44	.02	.16
	High	56.04	21.58			
Animal Substitutes Eating	Low	0.78	0.83	3.10	.002	.20
	High	0.61	0.8			
Animal Substitutes Awareness	Low	2.32	0.90	2.14	.03	.14
	High	2.19	0.99			
Government Obligation Animal	Low	5.73	1.24	1.45	.15	.09
	High	5.62	1.22			

Variable	Low/High Ag	*M*	*SD*	*t*	*p*	*d*
Government Obligation Human	Low	4.22	1.48	3.08	.002	.20
	High	3.94	1.33			
Welfare Federal	Low	4.46	1.35	3.54	< .001	.23
	High	4.15	1.37			
Welfare State	Low	4.47	1.32	1.4	.16	.09
	High	4.36	1.29			
Welfare Farmers	Low	5.21	0.99	0.69	.49	.04
	High	5.16	1.11			
Welfare Distributors	Low	4.57	1.32	0.51	.61	.03
	High	4.52	1.41			
Welfare Consumers	Low	3.75	1.59	0.63	.53	.04
	High	3.89	1.52			
Practices Removals	Low	1.87	1.20	5.79	< .01	0.27
	High	2.35	1.35			
Practices Killings	Low	1.74	1.21	2.03	.04	0.13
	High	1.90	1.24			
Mental Attributions	Low	5.88	1.28	0.05	.62	0.03
	High	5.92	1.17			
Animal Protection Advocates Favorability	Low	5.24	1.66	2.39	.02	.15
	High	4.98	1.73			
Plant Based Advocates Favorability	Low	4.49	1.59	2.79	.004	.18
	High	4.21	1.65			
Plant Based School Advocates Favorability	Low	3.16	1.69	0.16	.87	.01
	High	3.15	1.63			
Personal Connection	Low	3.46	1.74	0.92	.36	0.06
	High	3.36	1.62			
Personal Activism	Low	4.41	1.76	1.78	.08	0.11
	High	4.2	1.90			
4Ns	Low	4.42	1.26	2.94	< .01	0.19
	High	4.65	1.20			
3 Month FFQ	Low	2.51	0.72	2.89	< .01	0.18
	High	2.64	0.7			
Religiosity	Low	2.47	0.94	3.23	< .01	.21
	High	2.66	0.95			

Note. KAFS = Knowledge of Animals as Food; KFF = Knowledge of Factory Farming; Low/High Ag = Low Animal Agriculture State/High Animal Agriculture State.

The means for the test set, *t*-tests using state of residency as the independent variable, and effect sizes are reported in Table 2. We found no measurable differences between the two sets of states with respect to knowledge of factory farming, government obligations to farmed animals, state responsibility for animal welfare, farmer responsibility for animal welfare, distributors' responsibility for farmed animal welfare, consumers'

responsibility for farmed animal welfare, killing practices, mental state attributions, plant-based school advocate favorability, personal connection to animals, or personal activism.

Compared to residents of low animal agriculture states, those in high agriculture states had lower scores on the Knowledge of Animals Used as Food scale, lower estimates of percent of farmed animals on industrialized farms, lower frequency of eating meat substitutes, lower ratings for government obligations to human welfare, lower ratings for federal responsibility for farmed animal welfare, lower favorability of animal protection advocates, and lower favorability of plant based advocates. Compared to those in low animal agriculture states, residents in high animal agriculture states had higher ratings for removal practices on industrialized farms, had higher 4Ns scores, and consumed more animal products. Each of these effects was replicated in the validation set suggesting that the small differences were robust (for similar analyses and pattern of results using residence in urban, suburban, or rural settings as the independent variable instead of state of residency, see the supplemental materials).

Our second set of analyses was aimed at modeling these data along the lines of the Framework for Skilled Decisions (Cokely et al., 2018). This model gives central, non-redundant roles to knowledge and values in predicting outcome variable (for overall correlations, see Table 3). Previous research suggested that the Knowledge of Animals as Food scale tends to predict outcomes related to consuming animals and animal products while the Knowledge of Factory Farming scale tends to predict animal welfare and protection type outcome variables (A. Feltz et al., 2024). We used those two measures as the knowledge measures for the relevant outcome variables. For the values predictor variable, we used the 4Ns since this follows previous research (A. Feltz et al., 2024; Piazza et al., 2015).

Table 3

Correlations for the Key Predictors in the Test Set (KAFS, KFF, 4Ns, and BNT)

Predictor	KAFS	KFF	4Ns	BNT	Mean	*SD*	Cronbach's alpha
1. KAFS	1				6.81	1.55	IRT
2. KFF	.30**	1			4.63	2.52	IRT
3. 4Ns	.03	.20**	1		4.54	1.28	.93
4. BNT	.07*	.06*	-.02	1	0.15	0.36	1 Item
5. Magnitude	.24**	.26**	-.14**	.03	57.66	21.13	1 Item
6. Animals Subs Eating	.20**	.23**	-.38**	-.02	0.62	0.82	.67
7. Animal Subs Aware	.30**	.30**	-.20**	.05	2.25	0.95	.58
8. Obligation Animal	.24**	.27**	-.19**	.01	5.67	1.23	.92
9. Obligation Human	.30**	.17**	-.44**	.00	4.08	1.41	.68
10. Welfare Fed	.14**	.19**	-.14**	.00	4.31	1.37	1 Item
11. Welfare State	.13**	.18**	-.13**	-.03	4.41	1.3	1 Item

Predictor	KAFS	KFF	4Ns	BNT	Mean	*SD*	Cronbach's alpha
12. Welfare Farmer	.15**	.14**	.01	.03	5.18	1.05	1 Item
13. Welfare Distributor	.10**	.11**	-.05	-.07*	1.54	1.36	1 Item
14. Welfare Consumer	.08*	.10**	-.11**	-.07*	3.72	1.55	1 Item
15. Practices Killing	-.23**	-.14**	.21**	.01	1.82	1.22	.95
16. Practices Removals	-.25**	-.11**	.24**	.00	2.11	1.30	.93
17. Mental	.15**	.17**	-.01	-.02	5.90	1.22	.92
18. Animal Advocates Favorability	.14**	.21**	-.19**	-.03	5.11	1.70	1 Item
19. PB Advocates Favorability	.11**	.18**	-.24**	.00	4.35	1.62	1 Item
20. PB School Advocates	.11**	.00	-.14**	.06*	4.20	1.17	1 Item
21. Personal Connection	.05	.15**	-.16**	-.05	3.40	1.68	.93
22. Activism	.16**	.24**	-.29**	-.03	4.31	1.83	.72
23. 3 Month FFQ	-.30**	-.07*	.43**	-.01	2.57	0.72	IRT
24. Age	.04	-.05	.00	-.04	46.67	16.93	1 Item
25. Politics	-.15**	-.16**	.26**	-.07*	3.95	1.62	1 Item
26. Religion	-.11**	-.08**	-.15**	-.10**	2.57	0.95	.94

Note. Means, standard deviations, and scale reliabilities are reported for multi-item, non-Item Response Theory based items (i.e., BNT, KAFS, KFF, 3-Month FFQ). KAFS = Knowledge of Animals as Food; KFF = Knowledge of Factory Farming; BNT = Berlin Numeracy Test; IRT = Item Response Theory based measure.
*$p < .05$. **$p < .01$.

Additionally, we were interested in determining if residency in a high or low animal agriculture state would moderate some of the relations between relevant knowledge and the 4Ns with the outcome variables. So, for each of the outcome variables, we constructed a hierarchical linear regression. In the first step, we included only the relevant knowledge scale and the 4Ns. In the second step, we included state of residency, the 4Ns, the relevant knowledge scale, and the interaction terms of both the state of residency by 4Ns and the state of residency by the relevant knowledge scale. The model in the first step would allow us to determine the non-redundant predictive power of knowledge and the 4Ns along the lines of the Framework for Skilled Decisions. The model in the second step would allow us to determine if those relations were moderated by state of residency. For most of the outcome variables in the test set, the 4Ns and relevant knowledge were significant, non-redundant predictors and state of residency did not moderate those relations. Most of these results were replicated in the validation set data (see the Supplemental Materials for full analyses). In general, those who were more knowledgeable had views more supportive of factory farmed animal welfare compared to those who were less knowledgeable. Endorsement of the 4Ns were negatively related to views supportive of factory farmed animal welfare (for similar analyses and pattern of results that use political orientation as a potential moderator, see the supplemental materials).

Discussion

This study examined whether residents in high and low animal agriculture states differed in their views on farmed animal welfare. In a large-scale study that included a direct replication, we found no measurable differences between residents of high and low animal agriculture states in the U.S. regarding knowledge of factory farming, responsibility for farmed animal welfare attributed to the state, farmers, distributors and consumers, killing practices, mental state attributions, plant-based school advocate favorability, personal connection to animals, or personal activism. Compared to residents of low animal agriculture states, those in high agriculture states knew less about animals used as food, had lower estimates of percent of farmed animals on industrialized farms, ate meat substitutes less frequently, had lower ratings for government obligations to human welfare, lower ratings for federal responsibility for farmed animal welfare, lower favorability of animal protection advocates, and lower favorability of plant-based advocates. Compared to those in low animal agriculture states, residents in high animal agriculture states were more accepting of body part removal practices on industrialized farms, had higher scores on the 4Ns, and consumed more animal products. In addition, knowledge of animals used as food/factory farmed animals or the 4Ns were significant predictors of all the other outcome variables we gathered regardless of state of residency.

The results of our study were largely in line with the existence of real, but small, differences between residents of high and low animal agriculture states. For example, previous research suggests that Southerners tend to be slightly more speciesist (i.e., view the interests of non-human animals differently than the identical interests of humans) than Westerners in the U.S. (Wulderk & Anderson, 2023). For some of the outcome variables in our study, residents of high animal agriculture states were slightly more supportive of factory farming activities than those in low animal agriculture states. However, the magnitude of the differences between residents of those states was relatively small. The average effect size for the significant differences was equal to a *Cohen's d* of 0.18 (the average *Cohen's d* for all variables was 0.13), which is typically thought to be small (Cohen, 1988). There were also no qualitative differences in the dependent variables we gathered. For example, residents of high animal agriculture states were slightly more supportive of body part removal practices on industrialized farms compared to residents of low animal agriculture states. However, the overall means were fairly strongly not supportive of those body part removal practices for residents in both high and low animal agriculture states. So, while there was a measurable quantitative shift in views between residents of high and low animal agricultures states, residents of both states were on average strongly opposed to body part removal practices. Even if there may be some small quantitative shifts in some views about animals based on state of residency, the predictor variables of those views remained invariant and consistent with previous research and theory.

Whether the significant differences we found between residents of high and low animal agriculture states are practically important depends largely on one's goals. To illustrate, if one is interested in having the most accurate descriptive or predictive models of views related farmed animal welfare between residents of high and low farmed animal agriculture states, then these differences may be important for those kinds of models. However, if one is interested in intervening to affect change in individuals, then the differences observed in our studies may not be of practical importance. As such, if an intervention works in one state, there is reason to think that intervention will work in all states and animal advocates may be able to ignore the small differences related to state of residency. Of course, there are other goals that researchers may have that may factor in determining the importance of those small effects.

There are several limitations of this study. First, we only sampled 5 low and 5 high animal agriculture states in one country. While this was by design to approximate an extreme groups analysis, there may be something idiosyncratic about those groups of states that could account for the overall differences, or lack of differences, we observed. This worry may be mitigated to some extent because while there were some mean differences between residents of those two sets of states, the predictor variables were invariant with respect to states. The invariance of predictor variables suggests that the mean differences were not something idiosyncratic about states but rather about differences in more proximal causes such as knowledge and values that are likely to be similar across states. We also only measured a handful of uses of animals. There are many other uses of animals that could, potentially, display larger differences across state of residency (e.g., animals used for entertainment; medical research; hunting). While we have no evidence to suggest that those other uses would have larger difference, those potential difference could also be explored. Additionally, we gathered a rich data set with many possible relations that we did not test. For those who are interested in those kinds of analyses, the entire data set is available (see Feltz & Dillard, 2024). Finally, other potential theoretical models could be applied to these data. While we modeled the data in accordance with the Framework for Skilled Decisions, subsequent work could evaluate whether there are other useful models to help understand the effects reported here.

In conclusion, we think the message this study is clear. Residents of high and low animal agriculture states are more similar than they are different with respect to views about factory farmed animal welfare. While there may be some other important individual differences to document (see, for example, one's readiness to change behaviors involving animals, Hoang et al., 2023), state of residency seems to have relatively small impacts on views about farmed animal welfare.

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Competing Interests: The authors have declared that no competing interests exist.

Ethics Statement: All studies followed rules for the protection of human subjects.

Data Availability: For this article, data is freely available (see Feltz & Dillard, 2024).

Supplementary Materials

For this article, the following Supplementary Materials are available:

- Pre-registration (see Feltz & Dillard, 2023)
- Full dataset (see Feltz & Dillard, 2024)

Index of Supplementary Materials

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