

## Do Consumers Really Know What Cage-Free Is and What It Entails?

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### Introduction

Over the past 18 months, record-setting avian flu outbreaks, supply chain disruptions, and general price inflation have significantly affected egg prices (U.S. Centers for Disease Control and Prevention, 2022; Muhammad, Martinez, and Lawani, 2023; U.S. Department of Agriculture Economic Research Service, 2023). The average price for a dozen eggs in the United States rose a remarkable 151% from January 2022 to January 2023 (U.S. Bureau of Labor Statistics (BLS), 2023), generating extensive coverage in the news media, policy arena, and academic community. While egg prices have declined in the past six months (February–July 2023) (BLS, 2023), a series of legal mandates and private sector commitments to cage-free egg production could drive prices back up.

Rooted in concern for animal welfare attributes in food systems, “cage-free” refers to a production process in which hens can roam in an open area or facility. Unlike conventional—also known as caged—facilities, the hens can more easily spread their wings, exhibit natural behavior, and wander through the facility. Through both ballot initiatives and state legislation, ten states are attempting to phase out conventional egg sales by 2026, requiring all eggs and egg products bought and sold in the state to come from hens raised in cage-free facilities (Ufer, 2022). Even in states without such legislation, the largest retailers—including Wal-Mart, Kroger, and Meijer—have voluntarily pledged to transition to 100% cage-free sales in their stores.

Imposing more restrictive on-farm practices often leads to higher prices across food and beverage supply chains (Saitone, Sexton, and Sumner, 2015; Sumner, 2017). Indeed, this claim is well-supported in the recent egg policy literature, where the shift toward more expensive cage-free facilities often leads to net welfare losses for consumers, retailers, and producers (Carter, Schaefer, and Scheitrum, 2021; Malone and Lusk, 2016; Mullally and Lusk, 2018; Oh and Vukina, 2021). Oh and Vukina

(2021) estimated that banning conventional eggs in California’s egg market would increase egg prices by as much as 65% and lead to a \$72 million reduction in annual household welfare.

If consumers prefer these specialty eggs and are willing to pay a premium, then the price increase across the system is perhaps justified. Indeed, at least part of the transition toward cage-free has been driven by consumer preference for animal welfare attributes in our food and agricultural systems (Clark et al., 2017; Van Loo et al., 2014; Lagerkvist and Hess, 2011). However, each consumer values animal welfare attributes differently, with some willing to pay large premiums and others unwilling to pay any (Cao et al., 2021; Lusk, 2019; Ochs et al., 2019). Evidence also suggests that consumers often say one thing, or vote one way, and behave differently when it comes time to purchase the product they said they wanted (Lusk and McCluskey, 2018). In our context, some consumers may state that they support cage-free pledges and even vote to ban conventional production, but when it comes time to purchase eggs, they want the cheaper (conventional) alternative (Norwood, Tonsor, and Lusk, 2019; Paul et al., 2019). The difference in stated versus actual behavior suggests that consumers could misperceive the meaning of the production systems and have limited awareness of the implications of such a transition.

Using survey data from a national sample of egg consumers, our study provides a descriptive overview of consumers’ perceived and objective knowledge, preferences, and awareness of conventional versus cage-free egg production systems. This included questions on which attributes are most and least important when purchasing eggs, word associations and Likert-scale questions on their perceptions of different egg production systems, and questions regarding retailer commitments to cage-free sales.

**Table 1. Sample Demographics and Characteristics Relative to U.S. Census Estimates (N = 961, % frequencies)**

<b>Characteristic</b>	<b>Sample</b>	<b>U.S. Census</b>
Male	45.8	48.6
Age		
18-34	27.7	30.5
35-44	20.4*	17.0
45-54	12.4*	18.4
55-74	28.9	26.1
75+	10.6*	8.0
Income		
Less than \$20K	9.1*	15.8
\$20K - \$79K	49.3	47.1
\$80K and above	41.7*	37.1
Education		
Less than high school	1.6*	9.6
High school diploma	18.3*	28.3
Some college, no degree	20.7*	17.1
College degree	38.2*	32.2
Advanced degree	21.2*	12.8
Region		
Midwest	20.6	21.1
Northeast	16.3	17.5
South	41.3*	37.7
West	21.7	23.7
Most frequent egg-purchasing location		
Supermarket	37.6	—
Supercenter	35.3	—
Warehouse Club	7.3	—
Natural or organic store	5.9	—
Low-price, no-frills grocery store	10.0	—
Other	4.0	—

Notes: Superscript \* denotes statistically significant differences between the sample and the U.S. population at the 5% level.

The results suggest some consumer confusion and misperceptions over the different production systems, with many consumers perceiving cage-free as healthier and having a lower environmental impact than conventional production. Most respondents also perceive cage-free production to be superior with respect to animal mortality rates but acknowledge that conventional eggs are less expensive. Further, more than half of the consumers in our sample are unaware of the impending retailer pledges, though many state they would support such a pledge.

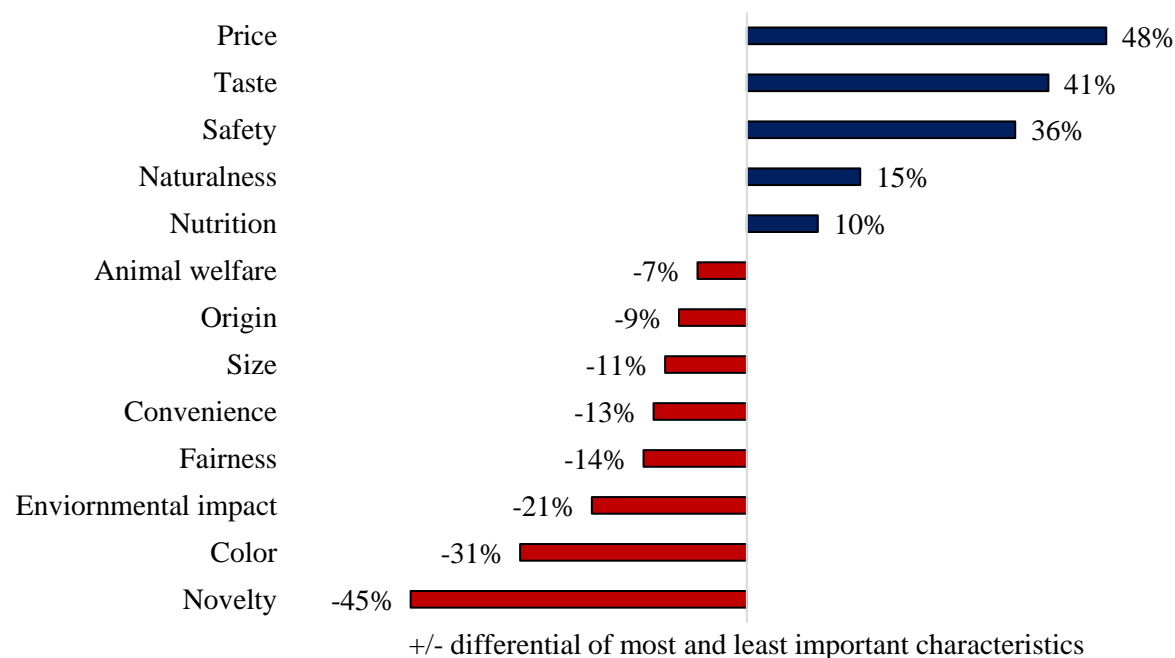
## Sample Characteristics and Egg Purchasing Patterns

A total of 961 U.S. consumers completed an online survey in November 2022. The survey was delivered to

an online consumer panel maintained by Qualtrics and took respondents approximately 15 minutes to complete. To be eligible, participants had to be 18 or older, have made egg purchases within the last three months, and have purchased at least half of their household's groceries. Table 1 presents a summary of the sample characteristics against the U.S. census.

The sample is older and over-educated with higher relative income compared to the U.S. population, but it can be common for online surveys to have differences in these demographic characteristics (Dillman, Smyth, and Christian, 2009). It should also be noted that, based on the screening criteria, we should not expect a sample that is necessarily representative of the U.S. population with respect to the five demographic characteristics listed in Table 1. Following Lusk (2019), the sample was

**Figure 1. Attributes that Are Most and Least Important to Consumers When Buying Eggs**



also weighted by the number of eggs each respondent purchased. Such weighting had relatively minor effects on sample characteristics, and therefore, we report the results of the responses from the respondents who purchase/consume eggs without any special weighting.

Nearly three-quarters of the respondents purchased eggs from supermarkets and supercenters. As these large retailers are the ones commonly implementing these voluntary pledges, this shows the scale and scope of the policies being considered and their potential implications.

### Most and Least Important Egg Attributes

During the survey, respondents were asked which characteristics were most and least important to them when purchasing eggs. They were presented with 13 attributes and selected three as most important and three as least important. Figure 1 reports how consumers perceive the importance of various product attributes and claims when purchasing eggs. Specifically, the figure shows the differential between the percentage of consumers that rate an attribute as most important versus least important. Attributes with a positive differential are more commonly selected as “most important,” while those with a negative differential are more commonly chosen as “least important.”<sup>1</sup>

<sup>1</sup> Respondents were asked to indicate the three egg attributes they would consider the most important and the three egg attributes they would consider the least important. The relative importance of each attribute was then derived by coding answers for most important as +1, answers for least important

The results indicate that price is the most important attribute to consumers, followed by taste and safety. Nearly 60% of respondents included price as one of the three most important attributes, whereas less than 10% selected it as one of the least important attributes. Important to this study, animal welfare ranks sixth, five spots below price. It also has a negative point differential, meaning it was more commonly selected as one of the three least important attributes than one of the three most important attributes. Thus, from a very general perspective, Figure 1 tells us that most consumers value price over animal welfare.

It is worth noting that environmental impact ranks as the third least important attribute overall in terms of point differential, five spots lower than animal welfare. While this could suggest that consumers place greater value on animal welfare over environmental impact, consumers may lump these two attributes into the same category (Boaitey, 2022). As shown later in this paper, consumers often think that cage-free is more environmentally friendly than conventional. While the scientific literature suggests that this is incorrect (Leinonen et al., 2012; Shepherd et al., 2015), it could be why animal welfare is above environmental impact in this ranking exercise. If consumers view animal welfare as an “all-encompassing” attribute, whereas environmental impact may not account for animal welfare, then it could explain the ranking order.

as -1, and all non-selected attributes as 0. Thus, the score ranges from a minimum of -1 (all respondents indicate the attribute to be among the least important ones) to +1 (all respondents indicate the egg attribute to be among the most important ones).



# Consumer Knowledge and Perceptions of Egg Production Systems

## Word Association

Respondents were also asked to complete a series of word associations to understand their perceptions of various egg production systems, including caged, conventional, and cage-free.<sup>2</sup> Each word association question was structured as follows: “What one word or phrase comes to mind when you hear \_\_\_\_\_ eggs?” Figure 2 presents word clouds for each system, where the size of the word corresponds to the frequency it was used.

There are a few interesting takeaways from these consumer reactions. First is the difference in perceptions between “conventional” and “caged.” Despite implying the same system (i.e., the conventional production system is the caged system), respondents attach more negative associations to caged production. Rather than use words like “normal,” “regular,” and “traditional,” respondents frequently resort to terms such as “inhumane,” “cruel,” and “sad.” This distinction signals the importance of framing, messaging, and marketing.

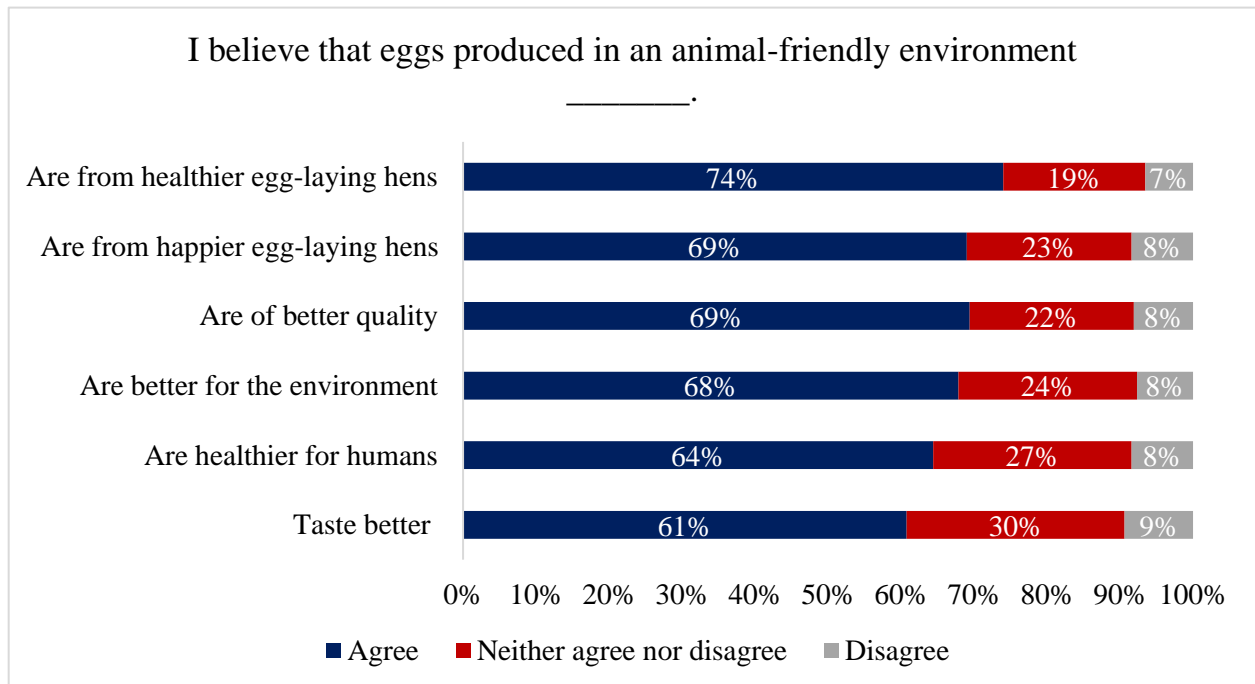
The second takeaway is that consumers attach an apparent halo to cage-free eggs, where “healthy” is commonly used to describe cage-free. The enhanced animal welfare label implies a change in the production practices that do not speak to the nutritional content of the egg itself, meaning cage-free and conventional eggs have nearly identical nutritional values. Yet consumers tend to associate these labels with healthier egg alternatives. Figure 3 supports this reasoning of a potential halo effect around the cage-free label.

Respondents were asked how much they agreed or disagreed with statements on the implications of more animal-friendly production facilities. While nearly three-quarters of respondents stated that the higher animal welfare production system resulted in healthier laying hens, 64% noted that the eggs would be healthier for humans. If most consumers believe that the “cage-free” label implies healthier eggs, this indicates a vital misperception that producers, policy makers, and other key stakeholders should consider during the impending transition to cage-free production systems.

## Ranking Which System Is Best

Respondents were specifically asked which egg production method ranked best across five broad

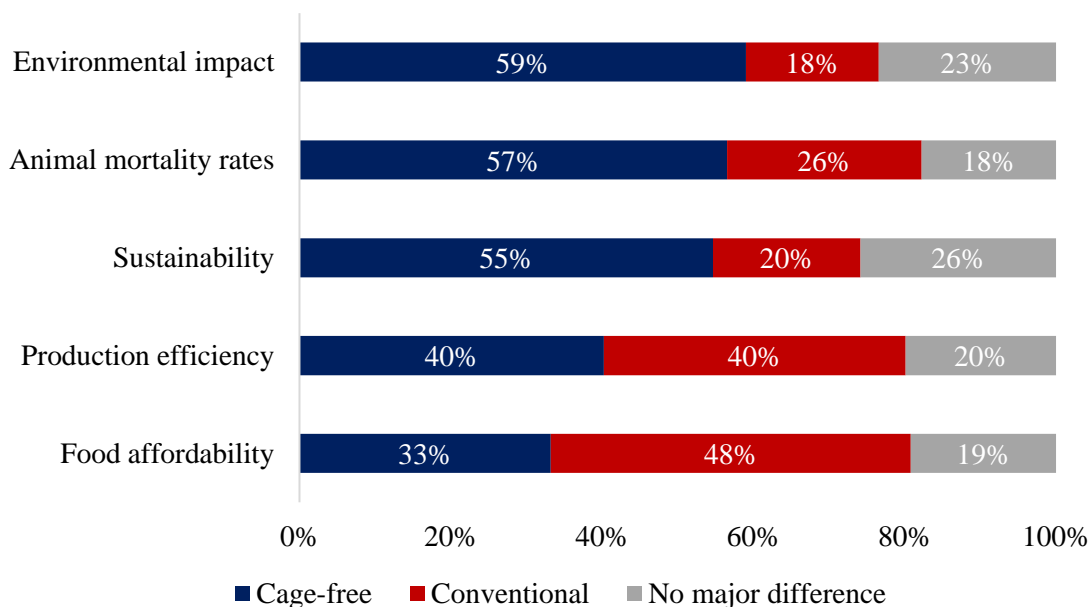
**Figure 3. Likert Responses to Statements on How More Animal-Friendly Production Systems Affect the Attributes of Eggs**



<sup>2</sup> Importantly, the order of these questions was randomized to prevent ordering effects. Respondents were also asked about USDA-certified organic, free-range, and pasture-raised systems. These word clouds are not included in this manuscript given the exclusive focus on conventional (caged)

and cage-free systems. The word clouds for these other production systems are available upon request and closely resemble the word cloud for cage-free.

**Figure 4. Consumer Perceptions of Which Production System Ranks Best in Various Characteristics**



categories: environmental impact, animal mortality rates, sustainability, production efficiency, and food affordability. Potential responses included conventional, cage-free, or no major difference. Figure 4 presents the results of these questions.

More than half of respondents rated cage-free as superior to conventional in terms of environmental impact, animal mortality rates, and sustainability. The results for environmental impact and sustainability categories could again signal that consumers associate animal welfare characteristics with environmental metrics, indicating a potential halo effect. Figure 3 also supports this environmental halo effect attached to animal welfare, as 68% of respondents state that higher animal welfare production systems produce eggs that are better for the environment. This (mis)perception is critical, as Leinonen et al. (2012) and Shepherd et al. (2015) show that conventional production systems have lower environmental impacts due to lower land and resource requirements.

The sample is evenly split on production efficiency, while the scientific literature suggests that conventional production has higher production rates than production systems with higher animal welfare (Golden, Arbona, and Anderson, 2012). Finally, a larger share of respondents state that conventional is superior to cage-free with respect to food affordability. This gives some indication that consumers acknowledge the price gap that exists between conventional and cage-free.

### *Knowledge of Retailer Pledges and Their Implications*

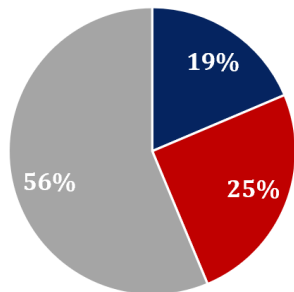
To assess their awareness of retailer cage-free egg pledges, respondents were asked whether the retail outlet they most commonly purchase eggs from has pledged to discontinue selling conventional (caged) eggs in the near future. Potential responses include “yes,” “no,” and “I don’t know.”

When asked whether their preferred retail outlet has pledged to remove conventional eggs, most respondents did not know (56%), and only 19% said they had (Figure 5). As roughly three-quarters of respondents primarily purchase eggs from supermarkets (e.g., Kroger, Meijer) or supercenters (e.g., Walmart), most of the respondents’ primary egg retailers have likely made a cage-free pledge. It is also possible that respondents who stated that their retail outlet had not pledged to go cage-free incorrectly assumed this response since they could still purchase conventional eggs; many retailers made an initial pledge deadline of January 2026. Thus, as much as 81% of consumers may be unaware of these deadlines.

While awareness of these initiatives is low, 79% of respondents said they would support their retailer in making this pledge. While this is encouraging for those retailers that have made these pledges, consumers often vote one way and act another in food policy settings (Lusk and McCluskey, 2018; Norwood, Tonsor, and Lusk, 2019; Paul et al., 2019). Thus, policy makers and

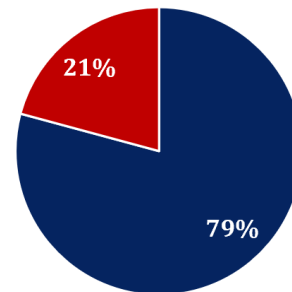
**Figure 5. Consumer Awareness and Support of Retailer Cage-Free Pledges**

Has the retail outlet where you typically buy eggs from made a cage-free pledge?



■ Yes ■ No ■ I don't know

Would you support or oppose your retail outlet making a cage-free egg pledge?



■ Support ■ Oppose

retailers must consider how consumers deviate from their stated preferences (and even their voting behavior), particularly when they may not be fully informed of the consequences of such a transition.

To gauge consumer understanding of the implications of a potential transition to cage-free, respondents were presented with statements describing the potential consequences and asked how much they agreed or disagreed with the statements (Figure 6). Their responses suggest a general awareness that egg prices will increase if conventional eggs are removed from retail outlets. In fact, 83% of respondents agree that the price they pay for eggs will be higher if the conventional option is removed. Should the average price of eggs increase if the conventional option is removed from the market, there could be a reduction in the equilibrium quantity of eggs bought and sold in the market.<sup>3</sup> In asking the consumer how profits would change after removing conventional eggs from retail outlets, a slight majority (55%) agreed that retailer profitability would increase. In comparison, less than half (43%) agreed that farm profitability would increase. This could indicate some awareness among consumers of the increased fixed and variable costs associated with cage-free production relative to conventional facilities.

## Final Remarks

Average egg prices have fallen from their record highs in January 2023 (BLS, 2023), yet they could again rise if cage-free egg mandates and pledges are implemented

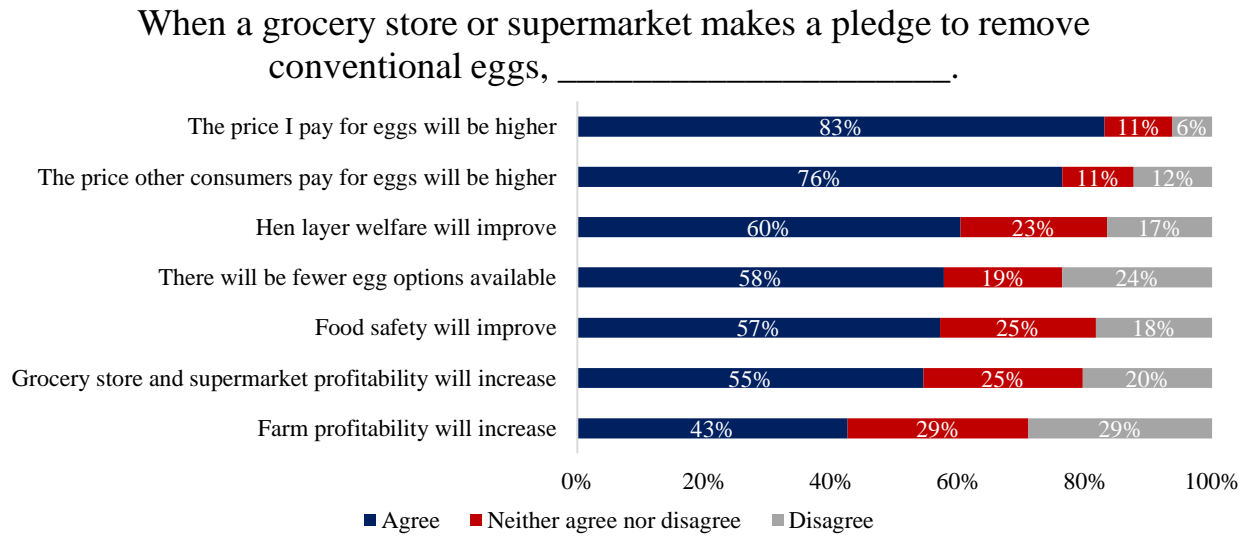
<sup>3</sup> Another potential change in consumer purchasing behavior from cage-free mandates and pledges could be increased interest in backyard hens. The idea gained popularity in 2022 as egg prices reached record highs because of avian influenza outbreaks (Smialek and Swanson, 2023). However, the

(O'Keefe, 2022). As stakeholders and policy makers adapt and respond to these industry shifts, it is important to understand consumer knowledge and awareness of the impending transition.

This study addresses consumer knowledge of different production systems and discusses general awareness of cage-free pledges and their implications. Responses to word association questions suggest a few important insights. First, there is a noticeable overlap between the specialty labels, including cage-free, USDA organic, free-range, and pasture-raised, indicating a degree of substitutability among these claims. This could suggest a lack of knowledge about what the labels imply and a need to include multiple labels when appropriate (USDA-certified organic implies cage-free and could bear both labels). Second, there is an apparent halo effect surrounding specialty animal welfare labels, where consumers commonly use the word "healthy" to describe cage-free. Future studies could consider the extent to which animal welfare labels impose a health halo effect on certain products. This is also true regarding environmental perceptions, where consumers frequently associate cage-free production with better environmental outcomes. Another noticeable misperception is that most respondents rate cage-free as superior to conventional production with respect to environmental impact and sustainability. However, the literature suggests that the opposite is true, as cage-free systems have lower stocking densities and higher resource requirements (Leinonen et al., 2012; Shepherd et al., 2015).

economic feasibility of backyard chickens is also in question (Pokorny, 2023), and future studies could explore the percentage of consumers that expect to make this change in response to cage-free shifts. We thank an anonymous reviewer for raising this point.

**Figure 6. Likert Responses to Statements on the Proposed Effects of Retail Cage-Free Pledges (N = 961)**



Last, almost 60% of consumers were unaware of whether their primary retailer had committed to cage-free, but 79% claimed they would support such a pledge. However, these results should be taken with a grain of salt, as consumers may state support but behave differently if they see a price increase. Retailers who shift toward 100% cage-free sales may see a decline in egg sales as consumers opt out of the market or shop at a retail outlet that still sells the cheaper conventional eggs (Lusk, 2019). This emphasizes the main limitation of this study, which is its reliance on stated consumer preferences. Some results could be subject to social desirability bias. However, other portions of the study, such as the word association section or ranking of production systems, may not be subject to this limitation as we assess attitudes and objective knowledge of the production systems.

Consumer preferences and purchasing behaviors have ramifications that stretch back to the farm. If consumers state that they want cage-free eggs, retailers will adjust their purchasing behavior, ultimately shifting the producers' laying-hen housing and investment decisions. Significant costs are associated with this transition—costs that will ultimately be passed down the supply chain—and consumers must understand the long-term ramifications of this decision. With evidence of consumer misperceptions and limited knowledge, increasing consumer awareness through educational campaigns or other measures should be considered before implementing unfunded mandates and pledges.



## For More Information

- Boaitey, A. 2022. "Subjective Beliefs about Farm Animal Welfare Labels and Milk Anticonsumption." *Food Ethics* 7(2): 17.
- Cao, Y.J., J. Cranfield, C. Chen, and T. Widowski, T. 2021. "Heterogeneous Informational and Attitudinal Impacts on Consumer Preferences for Eggs from Welfare Enhanced Cage Systems." *Food Policy* 99: 101979.
- Carter, C.A., K.A. Schaefer, and D. Scheitrum. 2021. "Piecemeal Farm Regulation and the US Commerce Clause." *American Journal of Agricultural Economics* 103(3):1141–1163.
- Clark, B., G.B. Stewart, L.A. Panzone, I. Kyriazakis, L.J. Frewer. 2017. "Citizens, Consumers and Farm Animal Welfare: A Meta-Analysis of Willingness-to-Pay Studies." *Food Policy* 68:112–127.
- Dillman, D.A., J.D. Smyth, and L.M. Christian. 2009. "Coverage and Sampling." In *Internet, Mail, and Mixed-Mode Surveys: The Tailored Design Model*, 3rd ed. Hoboken, NJ: Wiley, pp. 41–64.
- Golden, J.B., D.V. Arbona, and K.E. Anderson. 2012. "A Comparative Examination of Rearing Parameters and Layer Production Performance for Brown Egg-Type Pullets Grown for Either Free-Range or Cage Production." *Journal of Applied Poultry Research* 21(1):95–102.
- Lagerkvist, C.J., and S. Hess. 2011. "A Meta-Analysis of Consumer Willingness to Pay for Farm Animal Welfare." *European Review of Agricultural Economics* 38(1):55–78.
- Leinonen, I., A.G. Williams, J. Wiseman, J. Guy, and I. Kyriazakis. 2012. "Predicting the Environmental Impacts of Chicken Systems in the United Kingdom through a Life Cycle Assessment: Egg Production Systems." *Poultry Science* 91(1):26–40.
- Lusk, J.L. 2019. "Consumer Preferences for Cage-Free Eggs and Impacts of Retailer Pledges." *Agribusiness* 35(2):129–148.
- Lusk, J.L., J. McCluskey. 2018. "Understanding the Impacts of Food Consumer Choice and Food Policy Outcomes." *Applied Economic Perspectives and Policy* 40(1):5–21.
- Malone, T., and J.L. Lusk. 2016. "Putting the Chicken Before the Egg Price: An "Ex Post" Analysis of California's Battery Cage Ban." *Journal of Agricultural and Resource Economics* 41(3):518–532.
- Muhammad, A., C. Martinez, and A. Lawani. 2023. "Why Are Eggs So Expensive? Understanding the Recent Spike in Egg Prices." *Choices*, 38(2), 1-7.
- Mullally, C., and J.L. Lusk. 2018. "The Impact of Farm Animal Housing Restrictions on Egg Prices, Consumer Welfare, and Production in California." *American Journal of Agricultural Economics* 100(3):649–669.
- O'Keefe, T. 2022, January. *US Egg Producers Predict Eggs Not 100% Cage Free in 2040*. Watt Poultry Egg Industry Special Report. Available online: [https://www.eggindustry-digital.com/eggindustry/january\\_2022/](https://www.eggindustry-digital.com/eggindustry/january_2022/) [Accessed July 28, 2023]
- Ochs, D., C.A. Wolf, N.O. Widmar, C. Bir, and J. Lai. 2019. "Hen Housing System Information Effects on US Egg Demand." *Food Policy* 87: 101743.
- Norwood, F.B., G. Tonsor, and J.L. Lusk. 2019. "I Will Give You My Vote but Not My Money: Preferences for Public Versus Private Action in Addressing Social Issues." *Applied Economic Perspectives and Policy* 41(1):96–132.

- Oh, S.E., and T. Vukina. 2021. "The Price of Cage-Free Eggs: Social Cost of Proposition 12 in California." *American Journal of Agricultural Economics* 104(4):1293–1326.
- Paul, A.S., J.L. Lusk, F.B. Norwood, and G.T. Tonsor. 2019. "An Experiment on the Vote-Buy Gap with Application to Cage-Free Eggs." *Journal of Behavioral and Experimental Economics* 79:102–109.
- Pokorny, K. 2023, February 3. "Are You Thinking of Raising Chickens because of Record-Breaking Egg Prices? Do Your Research." *Oregon State University Extension Service*. Available online: <https://today.oregonstate.edu/news/are-you-thinking-raising-chickens-because-record-breaking-egg-prices-do-your-research> [Accessed July 28, 2023]
- Saitone, T.L., R.J. Sexton, and D.A. Sumner. 2015. "What Happens When Food Marketers Require Restrictive Farming Practices?" *American Journal of Agricultural Economics* 97(4):1021–1043.
- Shepherd, T.A., Y. Zhao, H. Li, J.P. Stinn, M.D. Hayes, and H. Xin. 2015. "Environmental Assessment of Three Egg Production Systems—Part II. Ammonia, Greenhouse Gas, and Particulate Matter Emissions." *Poultry Science* 94(3):534–543.
- Smialek, J., and A. Swanson. 2023, February 2. "Forget Pandemic Puppies. Meet the Inflation Chicken." *New York Times*. Available online: <https://www.nytimes.com/2023/02/02/business/economy/inflation-chickens-egg-prices.html> [Accessed July 28, 2023]
- Sumner, D.A. 2017. "Economics of US State and Local Regulation of Farm Practices, with Emphasis on Restrictions of Interstate Trade." *Annual Review of Resource Economics* 9:13–31.
- Ufer, D. 2022. "State Policies for Farm Animal Welfare in Production Practices of US Livestock and Poultry Industries: An Overview." *Amber Waves* (USDA ERS Economic Information Bulletin 245).
- Van Loo E., V. Caputo, R.M. Nayga, and W. Verbeke. "Consumers' Valuation of Sustainability Labels on Meat." *Food Policy* 9(1):137–150.
- U.S. Bureau of Labor Statistics (BLS). 2023. "Eggs, Grade A, Large, per Doz. in U.S. City Average, Average Price, Not Seasonally Adjusted." *BLS Databases, Tables & Calculators by Subject*. Available online: <https://data.bls.gov/timeseries/APU0000708111> [Accessed July 28, 2023]
- U.S. Centers for Disease Control and Prevention. 2022, November 3. "U.S. Approaches Record Number of Avian Influenza Outbreaks in Wild Birds and Poultry." Available online: <https://www.cdc.gov/flu/avianflu/spotlights/2022-2023/nearing-record-number-avian-influenza.htm> [Accessed July 28, 2023]
- U.S. Department of Agriculture Economic Research Service. 2023. "Avian Influenza Outbreaks Reduced Egg Production, Driving Prices to Record Highs in 2022." *Poultry & Eggs*. Available online: <https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail?chartId=105576> [Accessed July 28, 2023]

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