

## **Economic Analysis of the FSIS Proposed Salmonella Control Measures**

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### **Abstract**

This report examines the economic implications of the FSIS's proposed rule and proposed determination – *Salmonella* Framework for Raw Poultry Products. Through an in-depth assessment of FSIS cost assumptions, an evaluation of overlooked components, and an exploration of long-term industry impacts, the report provides a comprehensive analysis aimed at fostering informed regulatory decision-making.

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## Executive Summary

The Food Safety and Inspection Service (FSIS) has issued a proposed rule and determination aimed at reducing *Salmonella* contamination in raw poultry products, specifically focusing on raw chicken and turkey carcasses, parts, and comminuted products. The proposal introduces enhanced testing requirements, stricter compliance protocols, and a zero-tolerance policy for or certain *Salmonella* serotypes when contamination levels reach or exceed 10 colony-forming units (CFU) per gram. While the proposal aims to improve public health outcomes by addressing a major source of foodborne illness, its economic ramifications for the poultry industry are extensive and complex, impacting producers, processors, and supply chains.

This report provides an in-depth examination of the FSIS cost assessment, identifying key areas where the analysis falls short. Specifically, it highlights:

- **Unrealistic Assumptions:** FSIS underestimates the costs of initial implementation and compliance, particularly for small and medium-sized processors, and assumes uniform capacity to implement, validate, and verify, advanced testing systems across all establishments.
- **Overlooked Cost Components:** The assessment fails to account for supply chain disruptions, long-term shifts in consumer demand, and potential losses in export markets.
- **Broad Economic Impacts:** Beyond individual processors, the regulation poses risks to rural economies, employment, and industry competitiveness.

Key findings include:

1. Compliance costs will disproportionately burden smaller processors, risking further consolidation in the poultry sector and reducing competition.
2. Increased testing, product disposition protocols, and potential product rejection will lead to higher retail prices, shifting consumer behavior, and potentially decreasing poultry demand.
3. Divergent domestic standards may create barriers for U.S. poultry exporters, undermining their competitive standing in global markets.

To mitigate these risks, this report recommends FSIS reevaluate its cost assessment to incorporate realistic assumptions and a more comprehensive understanding of the economic landscape. Collaboration with industry stakeholders is critical to balancing public health objectives with the economic sustainability of the poultry sector.

As such, this analysis aims to generate informed dialogue with policymakers and industry stakeholders toward developing an appropriate regulatory framework that achieves food safety goals without imposing undue burdens on producers, processors, consumers, rural communities, and the overall U.S. economy.

## Contents

<b>I. Introduction</b> .....	4
<b>II. Industry Background</b> .....	5
<b>III. The FSIS Cost Assessment Underestimates the Costs Associated with Its Identified Compliance Measures</b> .....	10
<b>A. Maintaining Control of Sampled Products</b> .....	11
<b>B. HACCP Plan Reassessments</b> .....	12
<b>C. Microbiological Sampling for SPC and Finished Product Standards</b> .....	13
<b>D. Electronic Data Submission</b> .....	14
<b>IV. The FSIS Assessment Ignores the Majority of Economic Costs Associated with the Proposed <i>Salmonella</i> Framework</b> .....	15
<b>E. Regulatorily-Induced Supply Chain Adjustments</b> .....	16
1. <i>Pre-Harvest Controls</i> .....	16
2. <i>Supplier Impacts</i> .....	<b>Error! Bookmark not defined.</b>
3. <i>Inventory Holding</i> .....	18
4. <i>Lot Rejections</i> .....	19
<b>F. Regulatorily-Induced Changes in Consumer Demand Due to Recalls and Price Increases</b> .....	20
1. <i>Increased Consumer Prices</i> .....	21
2. <i>Food Safety Recalls and Consumer Confidence</i> .....	21
<b>G. Potential Long-Term Implications of the Proposed <i>Salmonella</i> Framework</b> .....	21
1. <i>Small Establishment Viability</i> .....	22
2. <i>Export Market Risks</i> .....	23
3. <i>Rural Economic Impact</i> .....	24
<b>V. Conclusion</b> .....	24

## I. Introduction

The Food Safety and Inspection Service (FSIS) has issued a proposal to control *Salmonella* contamination in raw poultry products. These requirements detailed in the proposed “*Salmonella* Framework” would constitute a substantial shift in the regulatory landscape for the poultry industry. The proposed measures aim to reduce the prevalence of *Salmonella* infections, a leading cause of foodborne illnesses in the United States. While the overarching goal of enhancing public health is laudable, the proposed *Salmonella* Framework has raised substantial concerns among stakeholders within the poultry industry due to their potential economic implications.

Central to the FSIS proposal is the implementation of new testing and compliance protocols designed to identify and mitigate *Salmonella* contamination at multiple stages of production. Key elements of the proposed testing requirements include:

1. **Pre-Harvest Testing:** Producers would be encouraged, via agency guidance, to adopt pre-harvest interventions. While not mandatory, pre-harvest interventions, such as testing flocks for *Salmonella* before they enter the processing facility, could become an industry expectation to ensure downstream compliance.
2. **Post-Harvest Testing:**
  - a) Slaughter facilities will be required to conduct SPC sampling and monitoring for indicator organisms.
  - b) FSIS will routinely conduct final product standard sampling of carcasses, parts, and ground products at slaughter and processing facilities.
3. **Testing Frequency:** FSIS proposes routine testing at frequencies determined by product type, production volumes, and historical compliance records. Certain high-volume processors or those with a history of non-compliance may face more frequent testing requirements, potentially increasing costs and operational burdens.
4. **Lot-Specific Testing:** Establishments would be required hold production lots until test results confirm compliance, potentially delaying distribution and increasing storage costs.
5. **Enhanced Record-Keeping:** Facilities will be required to implement additional recording-keeping for document testing procedures, results, and corrective actions in detail. These documents will then be subject to FSIS review.

The proposal also includes proposed enforceable final product standards that deem raw chicken carcasses and parts, as well as ground chicken and turkey, adulterated if testing detects

(1) *Salmonella* at levels of 10 CFU/g; and (2) the presence of at least one *Salmonella* serotype of concern. This policy could result in increased lot rejections, necessitating redirection to fully cooked operations, rendering, or disposal.

This report was commissioned by industry stakeholders to evaluate, in detail, the FSIS's cost assessment and its implications for the poultry sector. It highlights significant deficiencies in the FSIS evaluation, including unrealistic assumptions, overlooked cost components, and failure to account for broader economic impacts. By incorporating industry insights and independent economic analysis, this report provides a comprehensive assessment of the regulation's potential effects on producers, processors, consumers, and rural communities.

The report is structured as follows:

- **Industry Background:** Section II presents a detailed overview of the poultry industry, including its economic importance and operational structure.
- **Critique of FSIS Cost Assumptions:** Section III highlights several unrealistic and arbitrary assumptions underlying the FSIS cost assessment.
- **Ignored Cost Components:** Section IV discusses additional economic costs omitted from FSIS's analysis, such as supply chain adjustments, shifts in consumer demand, and long-term implications for market dynamics.
- **Conclusion:** Section V concludes with some key takeaways and recommendations for policymakers to ensure a balanced approach that achieves public health goals without imposing disproportionate economic burdens.

Through this analysis, we aim to inform stakeholders and regulators of the true economic impact of the proposed framework, including a more balanced and comprehensive evaluation of their potential costs.

## II. Industry Background

The poultry industry is a highly integrated supply chain, operating in a hyper-efficient, just-in-time production model, where production occurs close to the time of sale.<sup>12</sup> Although products can be

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<sup>1</sup> MacDonald, J.M. Technology, Organization, and Financial Performance in U.S. Broiler Production, EIB-126, U.S. Department of Agriculture, Economic Research Service, June 2014.

<sup>2</sup> MacDonald, J. M. (2020). Tracking the consolidation of US agriculture. *Applied Economic Perspectives and Policy*, 42(3), 361-379.

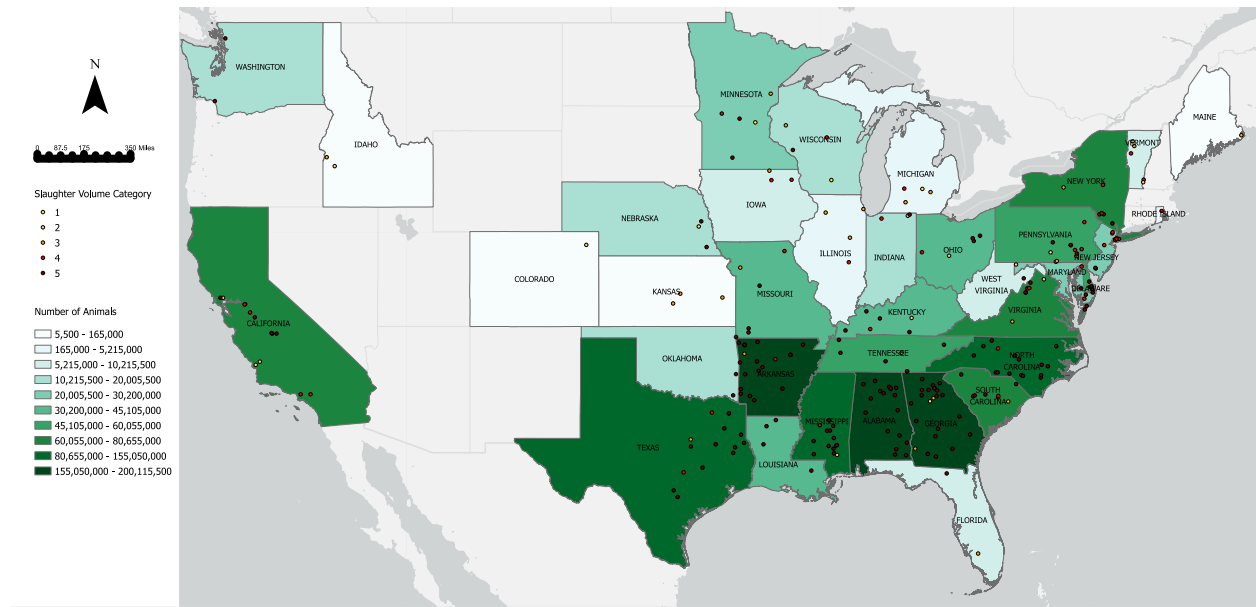
sold as fresh, frozen, or cooked forms, storage capacity remains constrained by physical space and associated costs. Changes to the supply chain process have multiplicative effects up- and downstream, increasing processing costs and ultimately increasing consumer prices. In terms of processing, however, there is spatial heterogeneity in where these impacts would occur.

The regionalization of production and processing would imply that the costs and burden of increased regulation would disproportionately affect certain parts of the United States more than others.<sup>3</sup> Poultry production typically occurs in rural areas best suited for farming, where land use requirements, availability of resources, and integration with other agricultural activities, such as using poultry litter for fertilizer, make these locations ideal for large-scale operations. As a result, the costs and burden of increased regulation would disproportionately affect these rural communities, where production and processing facilities are concentrated. While the distribution of the costs is beyond the scope of this analysis, it is a salient concern and worth noting. Consider Figure 1, which shows the distribution of USDA-FSIS inspected poultry slaughter facilities.<sup>4</sup> These facilities vary in processing size, whose categories range from small to very large. In summing the expected annual processing volume, a state level of production can be estimated and is presented in state level gradation. The darker the state, the higher the reported volume of poultry processed in that state. This map does not denote the type of poultry processed (i.e., turkey, broiler, or eggs), but generally, broilers have three large concentration regions: the southeast, Delmarva, and California. Turkey production is concentrated in the Midwest and North Carolina. Eggs are processed in hubs throughout the United States, but a large area for egg product production is in the Midwest, including Illinois. In addition to the regional effects, potential changes in processing and standard operating procedure may lead to increased water demand to account for sanitation related to the proposed more stringent measures. These water demands across the production region have varying impacts based on water availability, and in some instances, production and processing facilities are already at their maximum water usage threshold as determined by the local municipality.

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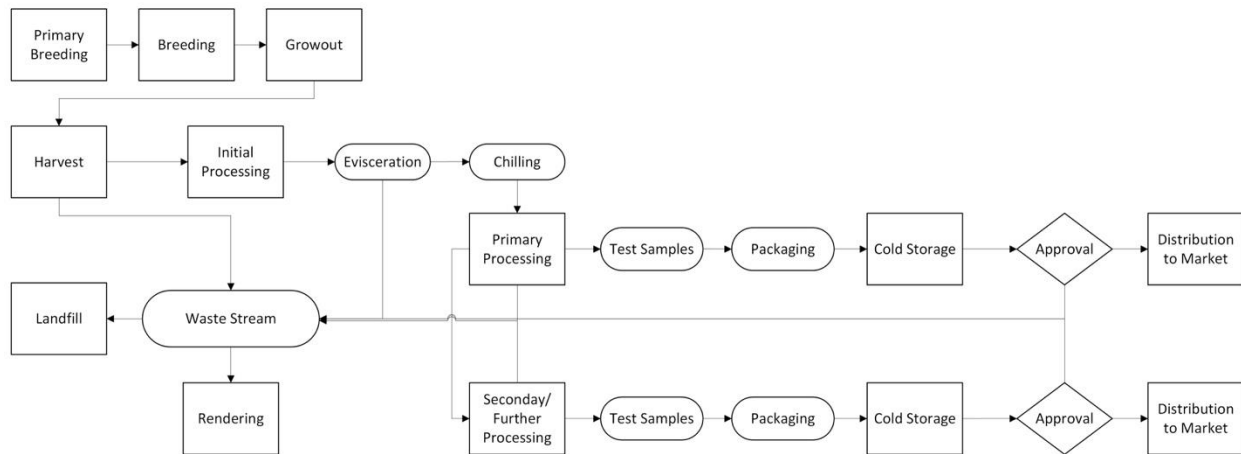
<sup>3</sup> Saitone, T. L., Schaefer, K. A., Scheitrum, D., Arita, S., Breneman, V., Nemec Boehm, R., & Maples, J. G. (2024). Consolidation and concentration in US meat processing: Updated measures using plant-level data. *Review of Industrial Organization*, 64(1), 35-56.

<sup>4</sup> <https://www.fsis.usda.gov/inspection/establishments/meat-poultry-and-egg-product-inspection-directory>



**Figure 1: USDA-FSIS Inspected Establishments 2024**

Poultry meat processing can be characterized as in Figure 2. This brief overview of poultry processing is described in the following sections. It includes generalizations for each stage in processing with a discussion of where additional costs and testing could occur.



**Figure 2: Poultry Processing Flowchart**

Poultry are moved to processing at an appropriate age based on desired weight and uniformity. Birds are transported to processing facilities, typically within a reasonable driving distance of the feed mill associated with the processor, as feed hauling costs are the primary

driver of farm location. While farms are often within 50–60 miles of the feed mill, processing facilities may be farther away depending on logistical and operational considerations.<sup>5</sup>

Birds are then moved through initial processing, where birds are humanely stunned and slaughtered following regulatory guidelines to minimize stress and pain to birds or follow specific religious guidelines (e.g., Kosher or Halal). Birds are then sent through a hot water bath for scalding before passing through a feather-picking machine.

After feather picking, birds go through the evisceration stage. Heads and feet are removed and either discarded or sent for further processing. Heads are typically disposed of in compliance with waste management regulations. Feet, or paws, can be marketed domestically but are often exported. Internal organs are removed, with some parts (e.g., liver, gizzards) saved for use as edible byproducts or sent to retail to be marketed on their own. After evisceration each bird is inspected by FSIS for any signs of disease or abnormalities, and the bird and viscera are maintained together during inspection if any portion of the internal organs are for human consumption. Once inspections are passed, birds will proceed into their respective processing stages. Non-compliant carcasses are condemned and moved into a waste stream to be disposed of under appropriate regulatory protocols.

Following evisceration, bird carcasses are rapidly chilled using water immersion or air chilling methods to further reduce potential bacterial contamination and meet temperature safety standards. The rapid chilling ensures the internal temperature falls below 4°C or 40°F within a particular timeframe. This intermediary step has limited capacity for extended storage, as the expectation is that birds will move on to their next processing step to make room for the next flock of birds. If there are delays in the downstream process, this could lead to slower movements of birds, requiring costly or unique solutions to ensure chilling protocols are met for the subsequent flocks. It should be noted that if there becomes a backlog in the processing chain, there would be costly ramifications on the whole chain if production is affected.

After birds reach the appropriate internal temperature, they move into secondary processing. This would include whole ready-to-cook birds for retail or food service, portioning these whole birds into ready-to-cook parts (e.g., breasts, wings, drumsticks, thighs, leg quarters), or completely deboning the bird. Some whole birds or parts would move to food-grade packaging,

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<sup>5</sup> Roesler, Kylie, Jada Thompson, Shelby Rider, and Ryan Loy. 2024. "Mapping the Risks for Arkansas Broiler Production." FSA85. University of Arkansas.  
<https://www.uaex.uada.edu/publications/PDF/FSA85.pdf>



typically tray-packed, with any remaining product going to further processing. Those packaged whole birds or parts would be randomly tested by FSIS for *Salmonella* immediately prior to packaging. Post packaging, the lots tested by FSIS would be required to be held in storage. The lot of packaged products will then move into a waste stream if they have unacceptable levels of *Salmonella* as it is cost prohibitive to remove product from packaging, it is not an acceptable food safety practice, and it has the potential to introduce foreign material into the product. Testing by FSIS at this stage requires appropriate storage to maintain the meat at the appropriate temperature to inhibit bacterial growth. The proposed requirement to hold the lot of product sampled by FSIS would require sufficient storage, either onsite in existing coolers or in refrigerated trucks, or off-site at a cold storage facility. The lot of product would be held until sample results indicate that the product is acceptable to enter commerce, which could take up to seven days, but in general, it would be two to three days. Current processing facilities typically only hold these fresh products for a few hours and, therefore, onsite cold storage is extremely limited.

Outside of these ready-to-cook whole birds and parts, the birds go into further processing. This covers a wide range of processing, including deboning, marination, processing, and cooking for ready-to-eat products. These products range from marinated ready-to-cook products for retail and food service to ready-to-eat nuggets and patties. After all further processing is completed, products are packed into their respective food-grade packaging. Random tests for *Salmonella* would be taken before packaging similar to the whole birds and parts discussed above. Additional storage time would incur costs to maintain the product at appropriate temperatures while waiting for the results from the FSIS laboratory.

Once a lot is approved for movement, it is shipped in temperature-controlled environments to wholesales, distributors, or retailers. Refrigeration units must maintain specific temperatures (e.g., below 4°C for fresh and -18°C for frozen products). These products are monitored to ensure the temperature is consistent and are compliant with storage and transportation requirements. Traceability records are maintained throughout storage and distribution.

If the lot of product sampled by FSIS does not meet the proposed *Salmonella* final product standard, it will move into an alternative stream including fully cooking, rendering, or landfills. These routes require transportation infrastructure, drivers, and loading/unloading labor. These additional costs and labor burdens may be cumbersome if the processor's needs are intermittent or require additional overtime. Many of these products cannot be fully cooked due to limited

capacity, extended transportation distances, and the potential for adulterants from foreign material during an added unpacking step.

Rendering processes carcasses and other non-human-edible parts into meal and fat products, primarily used in animal feed, fertilizers, and other industrial applications.<sup>6</sup> The rendering process involves heat treatment to kill potential bacteria and produce a stable, usable product. Limitations for rendering include processing capacity, market demand for rendered products, and the physical requirements of the process. Rendering facilities are designed to handle raw, unpackaged meat products, so tray-packed or packaged goods would require additional systems to unpack or increased labor to manage, driving up costs and reducing profit margins. These additional steps could also reduce the desirability of such products for rendering. Furthermore, rendering facilities may lack the capacity to process unexpected large lots, leading to logistical challenges and unprocessed supply when demand exceeds available capacity. This would increase the cost of rendering.

Outside of rendering, waste products are moved to landfills following all federal, state, and local regulations for waste disposal. These waste sites may increase fees related to the excess burden of meat recalls or lot disposals. While a landfill is likely able to absorb excess waste, it is possible that landfills refuse products, and alternative arrangements with landfill or waste disposal at greater distances from the processor must be established.

### **III. The FSIS Cost Assessment Underestimates the Costs Associated with Its Identified Compliance Measures**

The FSIS estimates that the proposed *Salmonella* control measures will impose annualized costs on the poultry industry ranging from \$3.31 million to \$32.25 million, with a central estimate of \$16.43 million, as outlined in Table 33 (below) of the regulatory impact analysis. These costs are attributed to compliance activities, including maintaining control of sampled products, HACCP plan reassessments, microbiological sampling and Statistical Process Control (SPC), and electronic data submission. These estimates provide a baseline for understanding the proposal's economic impact. However, FSIS underestimates the actual costs associated with these measures. By underestimating the true financial and operational impacts—particularly for smaller facilities—the FSIS assessment provides an incomplete picture of the economic burden this proposal imposes.

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<sup>6</sup> Hamilton, C. R. (2006). An Overview of the Rendering Industry. *Essential Rendering*, 1-16.

TABLE 33—SUMMARY OF INDUSTRY COSTS

Cost descriptions	Cost (million \$)		
	Low	Medium	High
Costs associated with the proposed rule:			
Statistical process control .....	0.04	0.04	0.04
Electronic data submission .....	0.18	0.18	0.18
HACCP plan reassessment .....	0.09	0.18	0.26
Costs associated with the proposed determination:			
Maintaining control of sampled product .....	2.11	14.47	29.26
Lost value to the industry .....	0.87	1.52	2.43
Microbiological sampling plan reassessment .....	0.02	0.04	0.08
Total <sup>1</sup> .....	3.31	16.43	32.25

<sup>1</sup> Costs are annualized at a 7 percent discount rate over 10 years.  
**Note:** Numbers in table may not sum to totals due to rounding.

## A. Maintaining Control of Sampled Products

FSIS estimates the costs for holding sampled products at \$2.11 million to \$29.26 million annually, as outlined in Table 28 of the regulatory impact analysis. These costs reflect the need to segregate and hold products pending test results. However, FSIS significantly underestimates the financial and logistical burdens this requirement imposes.

TABLE 28—SUMMARY OF COSTS TO INDUSTRY FROM MAINTAINING CONTROL OF SAMPLED PRODUCT

Product	Number of establishments <sup>1</sup>	Cost (million \$) <sup>2</sup>		
		Low	Medium	High
Chicken carcasses .....	188	0.41	0.75	1.09
Chicken parts .....	490	1.40	11.88	24.93
Comminuted chicken .....	74	0.13	1.07	1.72
Subtotal for chicken products .....	752	1.94	13.71	27.74
Comminuted turkey .....	48	0.09	0.69	1.45
Import establishments .....	12	0.07	0.07	0.07
Total .....		2.11	14.47	29.26

<sup>1</sup> Establishments may produce more than one of the products subject to these final product standards.

<sup>2</sup> Costs are annualized at a 7 percent discount rate over 10 years.

**Note:** Numbers in table may not sum to totals due to rounding.

FSIS assumes facilities have sufficient existing capacity to hold products without substantial investment. However, most facilities, particularly smaller ones, may require expansions to refrigerated storage, which can cost \$150–\$170 per square foot only if the physical footprint of the facility could accommodate additional refrigerated storage. Alternatively, facilities may need to lease cold storage space, incurring monthly recurring costs of \$15–\$20 per pallet. Extended holding times disrupt just-in-time inventory systems, leading to additional labor, transportation, and logistical costs that FSIS does not adequately account for. These delays also increase spoilage risks for fresh poultry, directly impacting product value and marketability, and may negatively impact the safety of the product as well.

For highly perishable products such as chicken parts and comminuted poultry, even short delays during testing reduce shelf life and increase spoilage. These indirect costs, while

significant, are notably absent from FSIS’s analysis. In addition, products that fail to meet FSIS standards must often be downgraded, diverted to lower-grade uses such as rendering, or disposed of entirely, with associated costs for transportation or disposal ranging from \$50 to \$100 per ton. The full extent of these costs also includes environmental impacts, but that is beyond the scope of this analysis.<sup>7</sup>

FSIS’s cost methodology also fails to account for cost variability across establishment sizes and product types. Tables 21, 23, and 28 illustrate how high-volume establishments bear the bulk of total costs. However, low- and very low-volume establishments face a disproportionately higher financial burden relative to their production capacity and revenue. These smaller facilities, particularly those in rural or underserved regions, often lack access to affordable capital for infrastructure upgrades, amplifying the operational strain. These low- and very low-volume facilities may also lack access to alternative storage for extended time, further increasing the cost.

## B. HACCP Plan Reassessments

FSIS estimates annual costs for revising HACCP plans at \$0.09 million to \$0.26 million, as outlined in Table 19 of the regulatory impact analysis. These costs are assumed to be manageable for producers, with minimal impact on prices. However, this assumption underestimates the complexity and variability of HACCP updates across facilities, particularly for small and medium establishments with fewer resources.

TABLE 19—HACCP PLAN REASSESSMENT COSTS

Establishment volume category	Number of establishments	Cost (million \$)		
		Low	Mid	High
High .....	333	0.31	0.61	0.92
Medium .....	279	0.26	0.52	0.77
Low .....	193	0.09	0.18	0.27
Very Low .....	91	0.04	0.08	0.13
Total .....		0.70	1.39	2.09
Annualized <sup>1</sup> .....		0.09	0.18	0.26

<sup>1</sup> Costs are annualized at a 7 percent discount rate over 10 years.

Facilities with older or less automated processes may require significant modifications to meet updated HACCP requirements, with costs potentially reaching \$50,000 to \$200,000 for equipment upgrades. Smaller facilities often lack in-house expertise and rely on external

<sup>7</sup> For more information on livestock disposal see: Henry, Chris G, and Larry L Bitney. 2010. “Disposal Methods of Livestock and Poultry Mortality.” Extension Report EC727. University of Nebraska, Lincoln.

consultants to revise and validate their HACCP plans. Consultant fees alone can cost \$10,000 to \$20,000 per facility, representing a significant financial burden.

FSIS also overlooks regional and facility-specific variations in compliance costs. Facilities in rural or remote areas may face higher expenses due to limited access to specialized consultants or training resources. Additionally, the reliance on a uniform 7% discount rate over a 10-year period fails to account for the immediate financial pressures faced by smaller establishments. Many of these facilities operate with limited liquidity, making upfront compliance investments particularly challenging.

Updated HACCP plans also require comprehensive staff training to ensure compliance with new procedures. Training costs, including materials and instructor fees, can range from \$5,000 to \$10,000 per facility. The time spent on training diverts employees from production activities, further compounding operational disruptions that FSIS's estimates fail to address.

### C. Microbiological Sampling for SPC and Final Product Standards

FSIS underestimates annual costs for microbiological sampling and Statistical Process Control (SPC) implementation, as outlined in Table 17 of the regulatory impact analysis. These estimates assume that testing and monitoring requirements will add only marginal costs to production, with minimal effects on retail prices. However, testing for microbiological sampling and SPC monitoring introduces both recurring and fixed investment costs that FSIS significantly underestimates.

TABLE 17—STATISTICAL PROCESS CONTROL COSTS

Establishments type	Number of establishments (2021)	Testing cost (\$)
Very low-volume under Traditional Inspection .....	90	44,460
Very small under Traditional Inspection .....	2	3,952
Total .....	92	48,412
Annualized <sup>1</sup> .....		35,950

<sup>1</sup> Costs annualized at a discount rate of 7% over 10 years.

\* Note: Numbers in table may not sum to totals due to rounding.

Recurring costs for microbial testing reagents and consumables alone can range from \$2 to \$5 per test for in-house testing and can range from \$13 to \$20 per test for external testing, quickly accumulating to monthly expenses exceeding \$10,000 to \$40,000 for high-throughput facilities. Many facilities will require new or upgraded microbial monitoring equipment, with purchase and installation costs ranging from \$50,000 to \$100,000 per facility. Maintenance and calibration introduce additional recurring costs. Further, establishments with in-house testing

capabilities are at a competitive advantage to those establishments that must send samples to an outside laboratory. In-house sampling capabilities will reduce the time in which sample results are obtained allowing those facilities to make more real-time decisions compared with those that must ship samples offsite for analysis.

Labor costs associated with sampling and SPC monitoring are also underestimated. FSIS assumes that existing staff can integrate these measures without significant changes. In reality, facilities will require additional personnel or retraining to effectively conduct sampling, analyze test results, and manage SPC protocols. These labor-related costs can add \$5,000 to \$10,000 per month, depending on facility size and throughput.

To minimize the impact of the proposed finished product standards, establishments will need to demonstrate microbial independence between processing lines, *i.e.* thighs vs. wings. Establishing line independence will require the installation of new microbial interventions which also introduces significant costs for poultry processing establishments. Each production line will require a specialized approach, such as antimicrobial spray cabinets, steam pasteurization units, or other targeted control technologies, to ensure compliance with regulatory standards. These interventions necessitate substantial initial investment in equipment and facility modifications, including installation labor and integration with existing systems. Beyond installation, resources must also be allocated to validate the effectiveness of the interventions during initial implementation; requiring microbial testing and quality assurance processes. Ongoing verification adds to operational costs, as establishments must routinely test and monitor the interventions to confirm consistent performance and compliance. These activities demand additional labor, training, and supplies and potential downtime for equipment calibration and maintenance.

#### **D. Electronic Data Submission**

FSIS estimates annual industry-wide costs for electronic data submission at \$180,000, as outlined in Table 18 of the regulatory impact analysis. These costs are intended to cover the digital reporting of microbial testing results and related compliance information. FSIS assumes that facilities already possess the necessary infrastructure to meet these requirements and that any additional costs will be marginal. However, this assumption fails to account for the significant variability in technological capacity across facilities, particularly for smaller operations.

TABLE 18—ELECTRONIC DATA SUBMISSION COSTS

Establishment volume category	Cost (\$)			
	Chicken	Turkey	All other classes	Total
High .....	97,839	19,024	2,038	118,902
Medium .....	8,153	679	1,359	10,192
Low .....	7,474	679	1,359	9,512
Very Low .....	55,714	7,474	679	63,867
Total .....	169,181	27,857	5,436	202,473
Annualized <sup>1</sup> .....				182,228

<sup>1</sup> Costs annualized at a discount rate of 7% over 10 years.  
**Note:** Numbers in table may not sum to totals due to rounding.

Smaller facilities, which often lack advanced IT systems, may need to invest between \$10,000 and \$50,000 to upgrade hardware, software, and network infrastructure. Ongoing costs, such as licensing fees, maintenance, and cybersecurity measures, can add \$2,000 to \$5,000 annually per facility. FSIS also assumes that existing personnel can manage electronic reporting without additional training. Many facilities will need to hire and train employees on new systems, incurring additional costs of \$1,000 to \$3,000 per facility.

Moreover, FSIS's cost estimates fail to address the operational inefficiencies during the transition to electronic reporting systems, including potential delays in data submission and reporting. These challenges disproportionately affect smaller facilities, which often have limited technical expertise and financial resources. Tables 18 and 27 highlight how FSIS's assumptions about uniform compliance costs fail to capture the nuances of implementing advanced reporting systems across diverse facility types.

#### **IV. The FSIS Assessment Ignores the Majority of Economic Costs Associated with the Proposed *Salmonella* Framework**

The FSIS cost assessment significantly underestimates the economic burden of its proposed *Salmonella* control framework. This section explores several overlooked cost components that substantially impact the poultry industry. First, the analysis neglects critical supply chain adjustments, including pre-harvest controls, contractual renegotiations, and logistical challenges like inventory holding and lot rejections.

Second, the proposal is likely to increase the number of recalls, as seen previously with *E. coli* being named an adulterant. These recalls could stem from product not properly held pending lab results, or from product tested downstream or by other parties outside of FSIS oversight. The economic assessment fails to account for the ripple effects of increased recalls, including shifts in consumer demand, potential price increases, and erosion of market confidence, which could amplify financial pressures on producers. Finally, the assessment overlooks long-

term implications, such as risks to export competitiveness, threats to small establishment viability, and adverse effects on rural economies heavily reliant on poultry production. These omissions highlight the need for a more comprehensive and realistic economic evaluation.

## A. Regulatorily-Induced Supply Chain Adjustments

The proposed regulation will require significant modifications throughout the poultry industry's supply chain, from farm-level operations to processing and distribution. These adjustments will impose new financial and logistical burdens on a protein supply chain already subject to significant regulatory oversight.<sup>8</sup> The added costs are particularly large for smaller establishments, who often operate with tighter margins and fewer resources. Below, we examine the key areas where these supply chain changes will have the most profound impact.

### 1. Pre-Harvest Controls

Pre-harvest interventions are critical for reducing *Salmonella* loads in poultry, but their implementation carries substantial costs that FSIS's assessment has largely overlooked. These measures include, but are not limited to, vaccination programs, feed additives, litter management, and enhanced biosecurity protocols. Each of these interventions requires significant financial investments and ongoing management, especially for small and medium-sized operations.

**Vaccination Programs:** Administering a *Salmonella* vaccine to poultry flocks is one method to reduce, but not eliminate, the prevalence of specific *Salmonella* serotypes. The cost of vaccination varies depending on the vaccine type and scale of operation. For instance, the [Megan Vac1 Salmonella vaccine](#) is administered at a rate of 5,000 doses per 5,000 chickens, with specific administration protocols. While the exact cost per dose is not specified in the provided source, industry estimates suggest that vaccination costs can range from \$0.05 to \$0.15 per bird. For a large broiler integrator processing ten million birds per week, this translates to an added expense of \$26 million to \$78 million per year. Smaller producers may face higher per-unit costs due to limited economies of scale. FSIS's cost assessment does not account for these recurring expenses or the compounded financial burden over time.<sup>9</sup>

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<sup>8</sup> Staples, A. J., Chambers, D., Melstrom, R. T., & Malone, T. (2022). Regulatory restrictions across US protein supply chains. *Journal of Agricultural and Applied Economics*, 54(1), 1-27.

<sup>9</sup> While the rule acknowledges the importance of pre-harvest interventions—like vaccination programs, selective breeding, and enhanced biosecurity protocols—it does not mandate these measures, nor does it provide detailed cost analyses for their implementation. Consequently, the economic burden associated



**Production Changes:** Feed additives, litter amendments, and water treatments create costly changes for improving disease resistance and microbial control in poultry operations. Implementing feed additives such as probiotics or organic acids can add up significantly for high-volume operations. Litter amendments, including the application of acidifiers or drying agents to control bacterial growth, can vary in cost depending on the facility's size and environmental conditions. Water treatments, such as chlorination or acidification, involve ongoing equipment and chemical supplies expenses. While these interventions are actionable and provide quicker returns, they require regular monitoring and recalibration to ensure efficacy, creating recurring operational costs. FSIS's analysis underestimates these measurable upstream costs, focusing instead on downstream interventions and risks, overlooking the cumulative financial burden of these necessary preventative measures. Furthermore, the adoption process may delay production cycles, affecting contract growers who rely on consistent flows and adding to the economic burden.

**Biosecurity Protocols:** Strengthening biosecurity measures, such as installing secure perimeters, improving ventilation systems, and upgrading sanitation protocols, entails significant one-time and ongoing expenses.<sup>10,11</sup> Infrastructure improvements can cost between \$10,000 and \$30,000 per facility, while training and maintenance programs may add an additional \$5,000 to \$10,000 annually. FSIS's analysis does not incorporate the financial impact of these essential pre-harvest measures. There are approximately 25,000 broiler farms across the United States.

**Comparison to FSIS Estimates:** FSIS's cost assessment predominantly emphasizes post-harvest testing and enforcement, neglecting the substantial expenses incurred at the farm level. A comprehensive review of pre-harvest measures indicates that cumulative annual costs across the industry could exceed \$1 billion, particularly when accounting for operation size and regional cost variations. For example, vaccination and biosecurity measures alone are estimated to cost large integrators upwards of \$200 million annually.

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with pre-harvest controls is not comprehensively addressed in the FSIS's cost assessment. <https://www.meatpoultry.com/articles/30830-keeping-up-with-proposed-em-salmonella-em-rule>

<sup>10</sup> Siekkinen, Kirsi-Maarit, et al. "Measuring the costs of biosecurity on poultry farms: a case study in broiler production in Finland." *Acta Veterinaria Scandinavica* 54 (2012): 1-8.

<sup>11</sup> Patyk, Kelly A., Victoria L. Fields, Andrea L. Beam, Matthew A. Branan, Rachel E. McGuigan, Alice Green, Mia K. Torchetti, et al.. "Investigation of Risk Factors for Introduction of Highly Pathogenic Avian Influenza H5N1 Infection among Commercial Turkey Operations in the United States, 2022: A Case-Control Study." *Frontiers in Veterinary Science* 10 (2023).

## 2. *Inventory Holding*

Implementing FSIS's proposed *Salmonella* framework would require establishments to hold products pending test results, leading to increased inventory holding costs. These costs stem from the need for additional storage capacity, extended holding times, and potential disruptions to the supply chain. Below is an expanded discussion of these impacts, including estimated costs and supporting references:

**Additional Storage Capacity:** To comply with the requirement to hold products until test results confirm the product is not adulterated as defined in the proposal, establishments may need to invest in additional storage facilities or expand existing ones. The cost of cold storage construction varies, but estimates suggest that building a refrigerated warehouse can range from \$150 to \$170 per square foot. For a facility requiring an additional 10,000 square feet, this translates to an investment of approximately \$1.5 to \$1.7 million. Alternatively, leasing refrigerated storage space can cost between \$15 and \$20 per pallet per month, leading to substantial recurring expenses.<sup>12</sup> Further, beyond the rental cost for refrigerated trucks or space would be the cost to maintain these storage spaces. Idling a refrigerated truck uses between 0.4 and 1.1 gallons of diesel an hour to maintain the optimal temperatures which translates to daily costs between \$33.50 and \$92.14 for one day at \$3.49 per gallon of diesel. These additional costs are not insubstantial when factoring the scale needed to store held products.

**Extended Holding Times:** Holding products pending test results extends the time products remain in storage, increasing energy and labor costs. Energy expenses for refrigeration can amount to \$0.10 per cubic foot per month, and additional labor for monitoring and managing held inventory can add \$2,000 to \$5,000 monthly, depending on the facility's size and volume.<sup>13</sup>

**Supply Chain Realignment:** The adjustments required by the proposed rule may disrupt existing supply chain dynamics and significantly challenge integrators in sourcing new growers to meet enhanced standards. Contrary to the assumption of a readily available pool of unused capacity, finding new growers may require incentivizing individuals outside the industry. This process could involve substantial costs for securing financing, acquiring land, constructing poultry housing, and navigating regulatory requirements. Additionally, integrators would need to invest heavily in training and verification programs to ensure compliance, with costs likely exceeding the

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<sup>12</sup> <https://www.conger.com/cold-storage-warehouse/>

<sup>13</sup> <https://lracking.com/cold-storage-warehouse-cost/>

previously estimated \$1,000 to \$3,000 per grower. These underestimated figures fail to capture the broader economic and logistical challenges of onboarding growers who may need to establish entirely new operations, potentially straining already tight supply chains.

**Supply Chain Disruptions:** Delays in product release can disrupt just-in-time inventory systems, leading to inefficiencies and potential contractual penalties. While specific cost estimates for these disruptions are not readily available, the cumulative impact can be significant, especially for perishable products like poultry, where timely distribution is critical to maintaining quality and safety.

### 3. *Lot Rejections*

Implementing the FSIS's proposed *Salmonella* framework may result in increased lot rejections, creating significant financial and operational challenges for poultry processors. While the FSIS assessment assumes that rejected lots can be redirected to cooked processing or rendering facilities, this assumption overlooks several logistical and economic constraints that complicate such redirection. Below is an expanded discussion of these issues, including estimated costs.

**Direct Financial Losses:** The immediate financial loss from a rejected lot includes the product's diminished value when diverted to alternative processing streams like cooking or rendering. Cooked product typically commands a lower market price compared to raw poultry, resulting in reduced margins. Rendering, which primarily produces meal and fat for non-human use, further diminishes the product's value. Companies face additional financial strain from processing costs, yield loss, and transportation expenses incurred when diverting product to these streams. For example, rendering facilities often operate near capacity, and transporting products to distant facilities not only increases costs but also risks further quality degradation. These factors significantly erode profitability compared to the margins achievable with raw poultry sales. If neither cooked nor rendering facilities can accommodate the rejected lots, the product must be disposed of, adding further expenses, with disposal costs typically ranging from \$50 to \$100 per ton, depending on the method (e.g., rendering, composting, or landfilling).

**Costs of Redirection:** Even when redirection to cooked or rendering processing is possible, it entails additional costs. For packaged lots, unpackaging the product for further processing adds significant labor and handling expenses. These costs can range from \$0.10 to \$0.20 per pound for unpackaging, with larger facilities incurring higher aggregate costs due to greater volumes. Furthermore, cooking rejected lots require additional energy, labor, and

materials, further increasing expenses and additional monitoring to ensure no foreign materials adulterants enter the supply when unpacking.

**Waste Management and Disposal Costs:** In cases where redirection is not feasible, rejected lots must be disposed of through landfilling, composting, or rendering. While rendering unusable product may recover some value by converting it into meal or fat for non-human use, this option still incurs transportation, processing, and compliance costs. In contrast, landfilling or composting requires companies to pay for disposal services, with no opportunity to recoup value, and can involve significant logistical expenses. Smaller establishments often face higher disposal costs due to limited access to economies of scale or nearby disposal infrastructure, further exacerbating the financial burden.

**Operational Disruptions:** Lot rejections disrupt processing schedules, divert resources to manage rejected products and execute corrective actions. This leads to inefficiencies, increased labor costs, and delayed production timelines. For smaller processors, such disruptions may pose existential challenges, particularly if repeated rejections occur.

**Supply Chain Implications:** Frequent rejections can strain relationships with suppliers and customers, leading to potential contract penalties or loss of business. Delays caused by lot rejections may also result in supply shortages, particularly for time-sensitive orders, further exacerbating financial impacts.

**Comparison to FSIS Estimates:** The FSIS cost assessment assumes a best-case scenario in which rejected lots are seamlessly redirected to alternative processing. However, this overlooks the practical challenges of facility availability, capacity constraints, and the added costs of unpackaging and transportation. When redirection is not feasible, the FSIS analysis fails to adequately account for the financial burden of disposal. These gaps result in an underestimation of the economic burden of the proposed rule, particularly for small and medium-sized establishments, which are more vulnerable to the costs and logistical challenges of lot rejections.

## **B. Agency-Induced Changes in Consumer Demand Due to Potential Increased Recalls and Subsequent Price Increases**

The proposed *Salmonella* framework is likely to impact consumer demand through increased recalls and price adjustments. These changes could significantly alter market dynamics, affecting both consumer behavior and the economic viability of poultry producers.

### 1. *Increased Consumer Prices*

The compliance costs associated with the proposed *Salmonella* framework, such as enhanced testing, monitoring, and facility upgrades, are likely to be passed on to consumers. Retail prices for poultry may increase by an estimated 5–10% to offset these added costs. Such price increases could disproportionately affect low-income households, where poultry is a primary source of affordable protein. Higher prices may also shift consumer preferences away from poultry and toward relatively less expensive proteins. This substitution effect could exacerbate the decline in poultry demand, further reducing revenue across the supply chain.

### 2. *Food Safety Recalls and Consumer Confidence*

Recalls stemming from false positives caused by the updated *Salmonella* testing protocol could erode consumer trust in poultry products. Media coverage of recalls tends to amplify perceived risks, even if the actual threat to public health is minimal. Studies indicate that recalls can lead to a 20–30% reduction in consumer purchasing for affected brands or products within weeks of the announcement.<sup>14</sup> Moreover, repeated recalls across the industry may tarnish the image of poultry as a whole – particularly those companies with well-known, public-facing brands.

The economic implications of diminished market confidence extend beyond immediate sales declines.<sup>15</sup> Retailers may adjust purchasing patterns, reducing order volumes to mitigate the risk of unsold inventory. This cautious behavior can ripple through the supply chain, ultimately reducing production levels and profitability for producers, reduce income to growers, and increase prices to consumers.

## **E. Potential Long-Term Implications of the Proposed *Salmonella* Framework**

FSIS's proposal also carries significant long-term implications for the poultry industry, particularly regarding market structure, international trade, and rural economies. These potential impacts must be considered to ensure the regulation achieves its public health goals without unintended economic consequences.

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<sup>14</sup> Lusk, Jayson L., and Susan Murray. "New tool (FooDS) identifies consumers' views on food safety." *Choices* 29.3 (2014): 1-7.

<sup>15</sup> Zhou, P., & Liu, Y. (2023). Recall information heterogeneity and perceived health risk: The impact of food recall on fresh meat market in the US. *Food Policy*, 114, 102398.

### 1. *Smaller Establishment Viability*

Smaller processors face distinct challenges in complying with the proposed *Salmonella* framework due to limited financial resources and economies of scale. Compliance costs for enhanced microbial testing, monitoring, and facility upgrades are disproportionately burdensome for small-scale operations. A [USDA Economic Research Service \(ERS\) study](#) found that small meat and poultry plants spend up to 20% more per unit of production on regulatory compliance compared to larger facilities (ERS, 2021).<sup>16</sup> In this instance, small establishments would face unique challenges in maintaining viability under the new regulatory requirements, particularly with the installation, validation, and ongoing verification of new interventions. Each intervention, such as antimicrobial spray systems, water treatment upgrades, or additional pathogen control mechanisms, demands significant upfront investment in equipment and installation labor. Validation of these interventions requires rigorous testing and quality assurance processes to demonstrate their effectiveness, often necessitating specialized expertise and additional resources. Moreover, these interventions require ongoing verification to ensure consistent performance, involving regular microbial testing, equipment calibration, and maintenance—all of which add to recurring operational costs. Compounding these challenges, any subsequent changes to the processing system, whether driven by regulatory updates or shifts in production methods, would require the entire process of installation, validation, and verification to be repeated. For small establishments operating with limited budgets and staff, these cyclical demands represent a substantial financial and logistical burden, potentially threatening their long-term viability.

The inability to absorb these costs may force smaller processors to exit the market, leading to increased industry consolidation.<sup>17</sup> This shift reduces competition and diversity among producers, potentially driving up prices and limiting innovation. Consolidation also strengthens the market power of larger integrators, which could further disrupt the supply chain.

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<sup>16</sup> The study analyzed the financial impact of the Pathogen Reduction/Hazard Analysis and Critical Control Point (PR/HACCP) regulation on meat and poultry plants. The study found that compliance costs varied significantly between small and large establishments. Specifically, small plants, which often produce specialized products, incurred higher average costs per unit of production compared to larger plants focusing on commodity products.

<sup>17</sup> Saitone, Tina L., et al. "Consolidation and concentration in US meat processing: Updated measures using plant-level data." *Review of Industrial Organization* 64.1 (2024): 35-56.

## 2. *Export Market Risks*

Enhanced domestic standards that diverge from international norms could create compliance challenges for U.S. exporters. Many importing countries rely on [Codex Alimentarius](#) guidelines for food safety, which differ from FSIS's proposed standards. For example, the Codex thresholds for acceptable *Salmonella* levels in poultry are less stringent than the FSIS's proposed enforceable final product standards, which target *Salmonella* concentration and specific serotypes.

These discrepancies may limit market access for U.S. poultry exporters, particularly in price-sensitive regions like Southeast Asia and Africa. A recent peer-reviewed journal article in the *Review of World Economics* highlighted that non-tariff barriers, including divergent food safety standards, reduce trade volumes by 10–15% for agricultural products.<sup>18</sup> As a major poultry exporter, the U.S. risks losing its competitive edge in these critical markets if compliance costs increase and standards diverge.

This loss of a competitive edge in producing globally affordable chicken is particularly important, as the proposed regulatory changes carry significant export market risks, particularly for lower-income countries that rely heavily on affordable U.S. poultry imports to meet food security needs. Many of these nations depend on consistent supplies of cost-effective chicken to feed their populations, with U.S. exports forming a critical component of their dietary protein sources. However, the additional costs associated with new interventions, validation, and ongoing verification may increase production expenses, leading to higher export prices.

Indeed, this would likely affect low-income importing countries, where even slight price increases can restrict food access for vulnerable populations. As a result, hungry families in these nations may face reduced availability of affordable U.S. chicken, potentially exacerbating food insecurity and malnutrition. Policymakers must consider these downstream impacts when evaluating the broader implications of regulatory changes on global food systems and ensure that measures are taken to mitigate harm to these critical export markets.

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<sup>18</sup> Kinzius, Luisa, Alexander Sandkamp, and Erdal Yalcin. "Trade protection and the role of non-tariff barriers." *Review of World Economics* 155.4 (2019): 603-643.

### 3. Rural Economic Impact

Finally, the poultry industry is a cornerstone of many rural economies, providing employment and economic activity in regions where alternative job opportunities are limited.<sup>19</sup> Closing even small-scale processing facilities or reduced production levels due to compliance costs would have ripple effects across these communities.<sup>20</sup>

According to a National Chicken Council report (2024), each poultry processing job supports an additional 2.5 jobs in related sectors, including transportation, feed production, and retail.<sup>21</sup> The loss of even one small processing facility could result in significant job losses and reduced income for local businesses that rely on the industry.

Additionally, reduced production levels would impact contract growers, many of whom are located in rural areas. Growers depend on the consistent income that comes with contracts with an integrator. Any disruptions could lead to financial hardship and exacerbate existing economic challenges in these regions.<sup>22</sup>

## V. Conclusion

The proposed FSIS *Salmonella* framework seeks to improve public health.<sup>23</sup> However, the economic implications of these measures must be thoroughly understood to ensure that the benefits of enhanced food safety do not come at an unsustainable cost to the poultry industry and the broader economy. Our analysis indicates that the proposed Salmonella Framework represents a costly policy shift with financial implications for producers, processors, customers, consumers, and rural America.

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<sup>19</sup> Saitone, Tina L., K. Aleks Schaefer, and Daniel P. Scheitrum. "Leveraging meatpacking ownership concentration and community centrality to improve disease resiliency." *Frontiers in Sustainable Food Systems* 6 (2022): 989876.

<sup>20</sup> Dudensing, R., Guerrero, B., & Amosson, S. (2019). Evaluating the accuracy of regional economic impact estimates: considering a 2013 beef plant closure in Texas. *Journal of Regional Analysis and Policy*, 49(1), 92-107.

<sup>21</sup> <https://www.nationalchickencouncil.org/broiler-industry-provides-1-4-million-jobs-and-450-billion-in-economic-impact-new-study/>

<sup>22</sup> Maples, J. G., Thompson, J. M., Anderson, J. D., & Anderson, D. P. (2021). Estimating COVID-19 Impacts on the Broiler Industry. *Applied Economic Perspectives and Policy*, 43(1), 315–328. <https://doi.org/10.1002/aep.13089>

<sup>23</sup> McEntire, J., Acheson, D., Siemens, A., Eilert, S., & Robach, M. (2014). The Public Health Value of Reducing Salmonella Levels in Raw Meat and Poultry. *Food Protection Trends*, 34(6), 386–392.



This report highlights critical shortcomings in the FSIS cost assessment, including unrealistic assumptions, omitted cost components, and insufficient consideration of long-term impacts. From supply chain adjustments to consumer demand shifts and rural economic vulnerabilities, the proposed framework pose complex challenges that extend far beyond the initial compliance costs. These challenges are particularly acute for small processors, rural communities, and international exporters, all facing unique and disproportionate risks under the proposed framework. The proposal significantly underestimates the cost to the industry and market.

To address these issues, FSIS should:

1. Engage with industry stakeholders to gather comprehensive data on the economic and operational realities of implementing the proposed measures.
2. Reassess cost estimates to include overlooked components such as expanded testing requirements, lot rejection costs, and rural economic impacts.
3. Develop a balanced regulatory approach that maintains high food safety standards while supporting the viability of the poultry industry.

Striking this balance is essential not only for achieving public health objectives but also for preserving the economic sustainability of an industry that plays a critical role in the food system both domestically and internationally. Policymakers must carefully weigh the benefits of all proposed regulations against their potential economic and social costs, ensuring that any final rule is implementable, effective, and equitable.

Through this analysis, we hope to contribute to a more informed dialogue between regulators, industry stakeholders, and policymakers, ultimately fostering a regulatory framework supporting public health and economic resilience.