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**Re: Maximum Line Speed Under the New Swine Slaughter Inspection System (NSIS);
Proposed Rule**

The undersigned, Carisa Harris-Adamson, PhD, CPE, and Robert Harrison, MD, MPH, submit these comments on the proposed rule “Maximum Line Speed Under the New Swine Slaughter Inspection System (NSIS)” (“Proposed Rule”), published by the Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture (USDA).¹ The Proposed Rule relies, in part, on the results of the Swine Processing Line Speed Evaluation Study (“PULSE Study”), which we conducted with a team of fellow investigators.² We thank FSIS for the opportunity to comment on this important subject, and for the chance to explain why **the results of our study *do not* support the Proposed Rule.**

I. Interest of Commenters and Summary of Comments

We are co-principal investigators for the study. Dr. Harris-Adamson is a Professor in the Department of Medicine at UCSF, the Director of the Center for Occupational and Environmental Health at the University of California, Berkeley (UCB), and the Director of the UCSF/UCB Human Factors and Ergonomics Graduate Training Program. Her research focuses on understanding and preventing work-related injuries, and she has published extensively on topics relating to occupational health and ergonomics.

Dr. Harrison is a Clinical Professor in the School of Medicine at UCSF, and founded the UCSF Occupational Health Services, where he has treated thousands of patients with work-

¹ Maximum Line Speed Under the New Swine Slaughter Inspection System (NSIS), 91 Fed. Reg. 7905 (proposed Feb. 19, 2026) (to be codified at 9 C.F.R. pt. 310) [hereinafter Proposed Rule].

² Carisa Harris-Adamson et al., *Swine Processing Line Speed Evaluation Study* (PULSE) (Jan. 9, 2025) [hereinafter PULSE Study].

related injuries. Dr. Harrison has served on the California Occupational Safety and Health Administration (Cal/OSHA) Standards Board, and authored numerous publications in occupational medicine.

Our PULSE Study results provide further evidence of what has been studied and well understood for decades: that workers in American swine processing plants suffer from high rates of work-related pain and are at high risk of developing musculoskeletal disorders (MSDs). Both the current line speed and increased speeds tested at NSIS establishments are significantly associated with high MSD risk and high levels of moderate to severe work-related pain among workers. Until this epidemic of MSD risk and work-related pain is brought under control, **FSIS should not allow or facilitate increased line speeds in swine establishments.**

We are concerned that FSIS is about to make the problem even worse, because its **Proposed Rule fundamentally misunderstands and mischaracterizes the scope and results of the PULSE Study.** FSIS is ignoring the existing, unacceptable level of pain and MSD risk workers experience and mischaracterizes our central concern: when evisceration line speed increases, adjustments (like increasing staffing) must be made to avoid increased MSD risk. This is because “**piece rate**”—the number of repetitive, forceful motions each worker performs, or pieces each worker handles, per minute—**highly correlates to MSD risk.** The Proposed Rule acknowledges this association but does not propose requiring swine plants to maintain safe piece rates if evisceration line speeds increase. FSIS must do so. This is particularly important, **since one establishment showed a clear, statistically significant increase in hazard when its evisceration line speed increased.** The Proposed Rule ignores this and instead assumes that the increase in hazard at one establishment is “undone” or averaged out by the reduction in hazard at another establishment. This is illogical and inconsistent with how other workplace hazards are managed. It is analogous to saying that workers in one establishment can be overexposed with radiation as long as similar workers in another establishment are underexposed because their hazard “averages out.” Instead, FSIS should interpret the PULSE Study findings as clear evidence that establishments respond differently to increases in evisceration line speed, and the Proposed Rule that allows an increase in evisceration line speed will result in increased hazards for some workers.

Our PULSE Study findings do not support eliminating evisceration line speed limits. In contrast, our study findings clearly indicate that establishments respond to increases in evisceration line speed differently, leading to very different outcomes. Therefore, FSIS is misinterpreting the study findings and should not use them to eliminate evisceration line speed limits, as it attempts to do in its Proposed Rule. FSIS should require swine establishments to implement our study recommendations, which align with established industry best practices. Eliminating evisceration line speed limits without making these changes will place swine processing workers, already disproportionately suffering from work-related pain and injuries, at even greater risk.

II. FSIS has long disregarded the high risk of MSDs at swine processing establishments and the relationship between evisceration line speed, staffing levels, and MSD risk.

The Proposed Rule fails to acknowledge the relationships between evisceration line speed (which affects the number of swine processed per day), piece rate (a function of job-specific line speed and staffing), and MSD risk. Swine processing work—killing pigs and processing swine parts and products—is strenuous, repetitive, and fast. In crowded, noisy conditions, workers receive live pigs, shackle them on a line for evisceration and then process them largely by hand on the so-called “hot side.”³ Workers then process the animals on the co-called “cold side,” making many quick, repetitive, forceful hand movements with knives and other tools.⁴

In evaluating swine processing, there are two key measurements: evisceration line speed and piece rate. Evisceration line speed is the speed at which the shackled pigs are stuck and bled by workers. The evisceration line speed and its duration determine the throughput of swine processed on the hot side that day. Piece rate is the job-specific pace of work: the number of animal pieces each worker handles. **Piece rate and evisceration line speed are inextricably linked and interdependent, particularly for the hot side of the plant.** The reason is straightforward. As evisceration line speed increases, more pigs are slaughtered and processed per hour. So, without adding more workers on the line or making other adjustments (such as automation), increasing evisceration line speed will increase the piece rate. Across all establishments, piece rate was statistically significantly associated with MSD risk. Thus, piece rate is a measure of how effectively establishments manage increased evisceration line speeds, and it is essential for evaluating MSD risk. Since there are differences in how establishments process swine, a Proposed Regulation should include both evisceration line speed and piece rate requirements.

- a. *High risk of MSDs and work-related pain are endemic in the swine processing industry and have been for decades, even at current line speeds.*

Swine processing workers face serious occupational hazards, including a high risk of MSDs and significant work-related pain. Workers in swine processing are at particular risk for developing disorders of the hand, wrist, and forearm, such as carpal tunnel syndrome (CTS), as their job roles often require them to engage in repeated high-force pinching and gripping, and to engage in such movements at high speeds for prolonged periods of time.⁵ These workplace

³ Michael P. Grant et al., Ctr. for Disease Control and Prevention, Nat’l Inst. for Occupational Safety and Health, *Evaluation of Ergonomic Risks, Musculoskeletal Disorders, and Peracetic Acid Exposure Among Employees at a Pork Processing Plant in Michigan*: HHE Report No. 2021-0117-3397, 1 (Apr. 2024) (“NIOSH 2024”).

⁴ *Id.*

⁵ PULSE Study, at 9.

hazards are severe and have existed for decades, as numerous studies have shown. Examples of these studies are summarized below:

MSD and Upper Extremity Risk

- A 1989 health hazard evaluation report by NIOSH⁶ illustrates the potential for extreme harm at some swine establishments that fail to take precautions. After evaluating employees at a swine processing plant in South Dakota, the study found that 31% of jobs were at high risk for cumulative trauma disorder, with 62% of workers at immediate risk. At the plant, 41.7% of workers were actively experiencing cumulative trauma disorders, compared to an average of 6.7% across the meatpacking industry. This was likely an underestimate because employees had a turnover rate of 200 to 400% in one year, strongly suggesting a healthy worker bias in the study, and because the study excluded back, chest wall, and lower extremity disorders.
- A 1994 study⁷ analyzed 32 jobs at a pork processing plant for hazards and risks for elbow, hand, and wrist disorders. The study found 104 disorders at the plant, including MSDs such as epicondylitis (tennis elbow), nonspecific hand/wrist pain, CTS, trigger finger, trigger thumb, and DeQuervain's tenosynovitis. Of the 32 jobs, 14 were determined to be hazardous for upper extremity injury, specifically cut floor and loading area jobs. These hazardous jobs had significantly elevated risks compared to the non-hazardous jobs, with 100 of the 104 observed injuries occurring in the hazardous jobs.
- A 1998 study⁸ found that workers in the deboning crew of a swine slaughter and processing establishment were 579% more likely to have CTS than non-kill floor staff at the same plant.
- In 2021 and 2022, NIOSH⁹ evaluated Michigan swine slaughter and processing workers for MSD risk and other ergonomic hazards. The plant was operating at an average of 1,100 hph. NIOSH found that 61% of jobs surpassed safe limits for upper extremity MSD risk and that 32% of cut and kill floor workers had "work-related symptoms pointing to upper body musculoskeletal disorders." As a result of its study, NIOSH recommended reducing the risk for MSDs by bringing jobs within safety limits and implementing ergonomic interventions, and improving monitoring of musculoskeletal symptoms, injuries, and illnesses.

Impact of Ergonomics Programs

⁶ Thomas Hales et al., Ctr. for Disease Control and Prevention, Nat'l Inst. for Occupational Safety and Health, *Health Hazard Evaluation of John Morrell & Co.: HETA 88-180-1958* (Apr. 1989) ("NIOSH 1989").

⁷ J. Steven Moore & Arun Garg, *Upper Extremity Disorders in a Pork Processing Plant: Relationships between Job Risk Factors and Morbidity*, 55 Am. Indus. Hygiene Ass'n J. 703 (1994).

⁸ Poul Frost et al., *Occurrence of carpal tunnel syndrome among slaughterhouse workers*, 24 Scandinavian J. Work, Env't, & Health 285 (1998).

⁹ NIOSH 2024, *supra* n.3.

- In 1994, NIOSH studied¹⁰ the implementation of ergonomics programs in three slaughter and processing establishments to offer suggestions for improvement. NIOSH found that successful ergonomic programs “require strong in-house direction, support, and ergonomic expertise.” Further, “[a]ccess to information, such as illness and injury data, is vital to proper team functioning.”
- A 1996 study¹¹ found that ergonomics training can reduce MSD hazards and increase satisfaction among workers and team leaders. In 1997,¹² the team continued to engage workers in designing more ergonomic solutions.
- Continuing their research in 1998,¹³ the team found that swine slaughter and processing establishments that implemented centralized ergonomic programs spent significantly less on workers compensation and lost work time. Between 1987 and 1993, workers compensation expenses at the test facility decreased by 84%. Similarly, between 1984 and 1993, lost time from injuries and illnesses decreased by 89%.

This list is not exhaustive. We understand other worker safety experts and advocates are submitting comments to the Proposed Rule that provide yet more evidence of the occupational hazards swine processing workers face, even at line speeds of 1,106 hph.

- b. Slaughter line speeds have historically focused on providing FSIS inspectors adequate time to examine carcasses for food safety standards, not on worker safety.*

The high rates of MSD and work-related pain we and others have observed are not surprising given that the speed of swine slaughter and processing has long been determined by efficiency and food safety aims, not by what is safe for workers. The Federal Meat Inspection Act (FMIA) charges USDA with protecting consumer health and welfare by ensuring that meat products are “wholesome, not adulterated, and properly marked, labeled, and packaged,”¹⁴ including by tasking FSIS inspectors with “post mortem examination and inspection of the carcasses and parts thereof of all [swine].”¹⁵ Traditionally, these inspections were conducted by federal inspectors at fixed points along the processing line, with line speed determined by the number of carcasses inspectors could inspect per minute.¹⁶

¹⁰ Ctr. for Disease Control and Prevention, Nat’l Inst. for Occupational Safety and Health, *Participatory Ergonomic Interventions in Meatpacking Plants* (Christopher C. Gjessing et al. eds., 1994) (“NIOSH 1994”).

¹¹ J. Steven Moore & Arun Garg, *Use of Participatory Ergonomics Teams to Address Musculoskeletal Hazards in the Red Meat Packing Industry*, 29 Am. J. Indus. Med. 402 (1996).

¹² J. Steven Moore & Arun Garg, *Participatory Ergonomics in a Red Meat Packing Plant Part II: Case Studies*, 58 Am. Indus. Hygiene Ass’n J. 498 (1997).

¹³ J. Steven Moore & Arun Garg, *The effectiveness of participatory ergonomics in the red meat packing industry: Evaluation of a corporation*, 21 Int’l J. Indus. Ergonomics 47 (1998).

¹⁴ 21 U.S.C. § 602.

¹⁵ 21 U.S.C. § 604.

¹⁶ FSIS Directive 6410.4, *Verifying Swine Slaughter Establishments Maintain Adequate Procedures for Preventing Contamination of Carcasses and Parts by Enteric Pathogens* (U.S.D.A. 2019).

USDA first developed these speeds roughly 50 years ago, with no regard for worker safety. Instead, line speeds were determined by the number of food safety inspectors available at each establishment.¹⁷ In setting line speeds, USDA has never accounted for the disproportionately high levels of MSD risk and work-related pain among swine processing workers. The Proposed Rule continues that trend.

- c. OSHA's oversight does not relieve FSIS of the need to consider worker safety in swine processing plants, particularly when OSHA has failed to address widespread harms.*

In the Proposed Rule, FSIS points to the Occupational Safety and Health Administration (OSHA) as the agency “responsible for [swine] establishment worker safety issues.”¹⁸ The Occupational Safety and Health Act imposes a “general duty” on employers to provide workplaces “free from recognized hazards that are causing or are likely to cause death or serious physical harm” to employees.¹⁹ OSHA administers the Act. But that shouldn’t mean FSIS can take actions that could increase hazards to workers; based on the PULSE Study findings, the Proposed Rule would increase hazards for some workers. FSIS is the agency that regulates swine evisceration line speed limits, so it must bear responsibility for ensuring those speeds are safe for workers. The Proposed Rule’s reliance on OSHA is especially problematic given that agency’s track record on this issue and given FSIS’s and OSHA’s longstanding failure to work collaboratively to protect swine processing workers from chronically unsafe workplaces. In short, OSHA already lacks the capacity to monitor the swine industry, so the FSIS should not implement regulations that depend on it to do so.

Indeed, despite extensive evidence that workers in the swine processing industry are at high risk of MSDs, **OSHA has no specific ergonomic standards for swine processing.**²⁰ OSHA has published *guidance* on preventing musculoskeletal injuries in meat processing, but that isn’t legally binding on swine processing establishments.²¹ Based on our experience in the PULSE Study, most of the swine processing establishments are not implementing long-standing, published recommendations. A U.S. Government Accountability Office (GAO) report published nearly a decade ago concluded that “worker safety and health problems persist” at meat and poultry plants despite OSHA’s enforcement efforts, and that improvements are needed to protect

¹⁷ See 9 C.F.R. § 310.1(b)(3) (1982).

¹⁸ Proposed Rule.

¹⁹ 29 U.S.C. § 654.

²⁰ *Meatpacking Standards*, U.S. Dep’t Labor Occupational Safety Health Admin., <https://perma.cc/HCH5-TFZ8> (last visited Apr. 20, 2026).

²¹ OSHA Publ’n 3123, *Ergonomics Program Management Guideline for Meatpacking Plants* (U.S. Dep’t Labor 1993, *reprinted*), <https://perma.cc/6U83-K2XR>; see also NIOSH 1994, *supra* n.10.

worker safety in the industry.²² The report also noted that “[c]ollaboration between OSHA and FSIS is limited.”²³

OSHA has not even fully accounted for the scope of the problem, in part because recordkeeping for workplace injuries at swine processing establishments is often unreliable. We observed that firsthand when we visited establishments for the PULSE Study. Compounding the issue, OSHA does not regularly inspect swine slaughter establishments to assess ergonomic risks to workers. Instead, it responds to incident reports, which is problematic because swine establishments often do not log incidents correctly. One report analyzing information collected by OSHA during inspections at meat and poultry establishments found more than twice as many recordkeeping errors related to incidents resulting in days away from work, restricted work activity, and/or job transfer than for OSHA inspections in other sectors.²⁴

Moreover, as the 2017 GAO Report noted, some of the recordkeeping issues appear to be the result of intentional underreporting by establishments. At one establishment, GAO noted, “workers recalled incidents in which supervisors told injured workers they were not hurt and to go back to work rather than report their injury.”²⁵ Even apart from being dissuaded, workers “are reluctant to report injuries, illnesses, and hazards because they fear losing their jobs.”²⁶ Pervasive underreporting of workplace injuries²⁷ exacerbates the issues created by recordkeeping errors.

In sum, OSHA has demonstrably failed to ensure that swine slaughter establishments institute appropriate ergonomic standards to reduce MSD risk for workers. FSIS knows that. FSIS also knows, given the extremely high risk of MSDs observed throughout the industry, that swine establishments are not voluntarily following OSHA recommendations to reduce that risk. If establishments are not *required* to institute appropriate measures to reduce MSD risk to workers (such as controlling piece rate to reduce hazard), raising slaughter line speeds—as the Proposed Rule would allow—will increase MSD risk, as our PULSE Study demonstrated. FSIS’s statement “commend[ing]” OSHA guidance and our PULSE Study recommendations to swine

²² U.S. Gov’t Acct. Off., *Workplace Safety and Health: Better Outreach, Collaboration, and Information Needed to Help Protect Workers at Meat and Poultry Plants* 49 (2017).

²³ *Id.*

²⁴ Kathleen M. Fagan & Michael J. Hodgson, *Under-recording of work-related injuries and illness: An OSHA priority*, 60 J. Safety Rsch. 79, 80 (2017). OSHA investigations specifically identified onsite medical units “as a new obstacle to accurate recordkeeping,” noting that “the EMTs and LPNs staffing these onsite medical units had little to no nursing or medical supervision, functioned without appropriate, up-to-date protocols and provided care beyond their scopes of practice,” resulting in workers being prevented from accessing “higher level medical care” and their cases being “kept off the employer’s recordkeeping log.” *Id.* at 80-81.

²⁵ U.S. Gov’t Acct. Off., *supra* n.22, at n.66.

²⁶ *Id.* at 49.

²⁷ As described in Section III.c., our PULSE Study found that a third of study participants who reported moderate to severe work-related pain in the previous year did not report their pain to their supervisor or the establishment nurse.

establishments is thus toothless.²⁸ FSIS cannot justify lifting line speed limits by gesturing to another agency that it knows has, for decades, been ineffectual in reducing MSD risk.

III. From evaluating hundreds of workers from six swine slaughter and processing establishments, we found a high baseline level of pain and MSD risk and a statistically significant association between piece rate and MSD risk across all establishments. Further, we found a statistically significant increase between evisceration line speed and MSD risk in one establishment.

a. FSIS commissioned the PULSE Study for the New Swine Slaughter Inspection System.

Our study is the direct result of FSIS’s nearly identical attempt, seven years ago, to eliminate line speeds for swine processing. In 2019, FSIS published the “Modernization of Swine Slaughter Inspection” rule, which established the New Swine Slaughter Inspection System (NSIS) and eliminated the maximum line speeds for establishments meeting certain criteria.²⁹ In 2021, after the rule was challenged, a court invalidated the line speed portion of the rule, because FSIS failed to consider worker safety in eliminating maximum line speeds.³⁰ As a result of this decision, establishments under NSIS could no longer operate at speeds exceeding 1,106 hph.

However, in collaboration with OSHA, FSIS allowed six establishments to operate above 1,106 hph as part of a “time-limited trial” (TLT).³¹ FSIS required these establishments to submit worker safety and health data, and contracted with us and a research team at the University of California, San Francisco (UCSF) to design and conduct the PULSE Study to assess the impact of increased evisceration line speed in swine slaughter and processing establishments on work-related musculoskeletal disorders (MSDs) and respiratory symptoms.³²

b. The PULSE Study aimed to evaluate the impact of evisceration line speed and piece rate on MSD risk in swine slaughter and processing establishments. Additionally, we aimed to quantify the prevalence of worker pain and MSD risk in this population.

In designing, conducting, and analyzing the results of the PULSE Study, we relied upon our years of experience teaching, investigating, and publishing in the fields of ergonomics and occupational medicine. We visited six NSIS establishments and conducted surveys, medical interviews, and measurements on 574 workers, assessing the workers’ job duties, piece rates, and other factors.³³ We collected data from an average of 5 workers per job across the 78 jobs we

²⁸ Proposed Rule.

²⁹ Modernization of Swine Slaughter Inspection, 84 Fed. Reg. 52300 (proposed Oct. 1, 2019) (codified at 9 C.F.R. pts. 301, 309, 310).

³⁰ *United Food & Com. Workers Union, Loc. No. 663 v. United States Dep’t of Agric.*, 532 F. Supp. 3d 741, 749 (D. Minn. 2021).

³¹ Proposed Rule.

³² PULSE Study, at 9.

³³ *Id.* at 5.

observed in four processing areas (Front End, Main Chain, Offal, Cut Floor) of the establishments.³⁴

Our overall objective was to evaluate the impact of evisceration line speed on: (1) the risk of acute and chronic work-related MSDs, and (2) antimicrobial-related respiratory exposure at a range of line speeds, from a baseline of 1,106 heads per hour (hph) up to 1,450 hph.³⁵ We aimed to estimate the effect of evisceration line speed and piece rate on MSD risk scores and on the prevalence of moderate to severe upper extremity pain.³⁶

To estimate the effects of increased line speeds and piece rates on MSD risk, we analyzed workers' body movements and muscle activity (as a proxy for applied hand force) over a two week period.³⁷ Unlike for the poultry study, for this study, we were able to measure the same workers performing the same job while the establishment operated at two different evisceration line speeds—a “within establishment” and “within subject” study design.³⁸ Thus, during one week, we analyzed 498 workers at the establishments operating at non-TLT line speeds of 1,106 hph, and during the second week,³⁹ we analyzed 519 workers at establishments operating at TLT speeds over 1,106 hph.⁴⁰ During the TLT week, half of the establishments operated at line speeds above 1,300 hph, and the other half operated at line speeds at or below 1,300 hph (but higher than 1,106 hph).⁴¹ We created a paired data set of measurements from 472 workers, who we measured doing the same tasks at both TLT and non-TLT times.⁴² Some analyses used all workers evaluated, and other analyses used the paired data set.

We then used validated risk assessment tools to interpret workers' MSD risk exposure while performing various tasks within the establishments.⁴³ The American Conference of Governmental Industrial Hygiene (ACGIH) publishes threshold limit values of workplace exposures intended to protect nearly all workers from adverse health effects, including a workplace limit of repeated physical exertions to protect *most* workers from upper extremity MSD.⁴⁴ In accordance with standard research practice, we measured MSD risk by calculating a ratio of the worker's actual hand activity and force exertion to ACGIH's threshold.⁴⁵ This

³⁴ *Id.*

³⁵ *Id.*

³⁶ Severe work-related pain was defined as pain or discomfort experienced during the past 12 months that was worse at work, lasted for more than one day, and was assigned a pain severity rating of four or greater (on a ten-point scale). *Id.* at 19.

³⁷ *Id.* at 17.

³⁸ *Id.* at 15.

³⁹ The order of time trial and non-time trial weeks for each establishment was randomized such that some establishments were first measured at TLT speeds while others were first measured at non-TLT speeds. *Id.* at 17.

⁴⁰ *Id.* at 30.

⁴¹ *Id.* at 29.

⁴² *Id.* at 30.

⁴³ *Id.* at 21.

⁴⁴ *Id.* at 10.

⁴⁵ *Id.*

number is the *Peak Force Index Threshold Limit Value* (PFI-TLV).⁴⁶ Jobs with a PFI-TLV score of 1.0 or less are categorized as acceptable risk jobs, and jobs with a score above 1.0 are categorized as hazardous jobs.⁴⁷

Additionally, to estimate the prevalence of moderate to severe upper extremity pain, we surveyed 574 workers about their workplace conditions and their experience of pain.⁴⁸ 36 workers also participated in medical interviews.⁴⁹

Although we wished to study more aspects of worker safety and MSD risk, our PULSE Study was limited by what the USDA and establishments allowed us to evaluate. For example, we were unable to account for knife sharpness. Because sharper knives require less force to cut through meat, this difference is an ergonomic improvement that may be reflected in PFI-TLV scores.⁵⁰ Further, our study likely produced an underestimation of reported work-related pain and MSD risk because of the “healthy worker survivor effect.”⁵¹ The establishments in our study had high turnover rates—49% average in 2023.⁵² That means that workers who left their jobs due to work-related pain or difficulty keeping up with work pace were underrepresented, resulting in a study sample that was likely healthier than the sample of all previously exposed workers.⁵³

c. Our study found high baseline levels of pain and MSD risk and significant increases in MSD risk with higher piece rates.

We found disturbingly high levels of MSD risk and work-related pain among the swine processing workers. At baseline non-TLT speeds, nearly half (44.7%) of evaluated workers had exposures that were hazardous and, therefore at high risk for MSDs (PFI-TLV scores above 1.0).⁵⁴ At TLT line speeds, this number increased to 46.1% of evaluated workers.⁵⁵ Moreover, 42% of workers reported moderate to severe upper extremity pain during the 12 months prior to the site visit.⁵⁶ One-third of all workers experiencing pain did not report their pain to their employer.⁵⁷

Our PULSE Study found that increasing piece rate, *i.e.*, the number of pig parts handled per minute by a worker, was statistically significantly associated with increased MSD risk. Specifically, we found that the odds of workers exceeding the acceptable PFI-TLV threshold

⁴⁶ *Id.*

⁴⁷ *Id.*

⁴⁸ *Id.* at 30.

⁴⁹ *Id.*

⁵⁰ *Id.* at 80.

⁵¹ *Id.* See also Daniel M. Brown et al., *The Healthy Worker Survivor Effect: Target Parameters and Target Populations*, 4 *Current Env't Health Rep.* 364, 367 (2017).

⁵² PULSE Study, at 79.

⁵³ *Id.*

⁵⁴ *Id.* at 32.

⁵⁵ *Id.*

⁵⁶ *Id.* at 77-78.

⁵⁷ *Id.* at 71-72.

(PFI-TLV above 1.0), and thus being at high risk for MSD, increased by 28% for each additional piece per minute increase.⁵⁸ For workers in establishments operating at or above 1,300 hph, each additional unit per minute increased the odds of exceeding the acceptable PFI-TLV threshold by 29%.⁵⁹

As explained above, piece rate is inextricably linked to evisceration line speed but is modifiable by differences in how an establishment handles increased throughput by the higher evisceration line speed. Changes in automation and increased staffing can keep piece rates lower, and, therefore, hazard and MSD risk lower. Moreover, because piece rate is the measure of the *impact* of how the company manages the increase in evisceration line speed on each worker, it is essential to understand our study results. Thus, as our study noted, **if establishments increase evisceration line speed without adjusting staffing levels, workers' MSD risk increases based on each additional unit per minute increase.**⁶⁰

We further found a statistically significant increase in the risk of MSDs for each increase of 100 hph in establishments that operated at or above 1,300 hph during TLT week.⁶¹ This increase was especially exaggerated on the cut floor, where workers are required to repeatedly perform nearly identical, precise cuts. There, 44.1% of cut floor workers exceeded the MSD risk threshold at both TLT and non-TLT speeds, and an additional 18.9% exceeded the threshold during the TLT week compared to the non-TLT week.⁶² Again, this was not uniform across *all* establishments since establishments can choose how fast the hogs exit the chiller.

IV. The Proposed Rule ignores and misrepresents our study results, which in fact show the dangers of increasing line speeds without controlling piece rate and/or monitoring risks.

- a. Our study results do not justify or support eliminating evisceration line speed limits for swine establishments, as the Proposed Rule incorrectly suggests.*

Contrary to FSIS's assertions, the results of our PULSE Study **do not** justify or support eliminating evisceration line speed limits for swine establishments. The Proposed Rule states that "in five of the six establishments studied, there was either decreased MSD risk, or no effect on MSD risk, because of increased line speeds," and that "[i]ncreased MSD risk was observed in only one of the participating establishments."⁶³ That mischaracterizes our study results in several ways.

⁵⁸ *Id.* at 55.

⁵⁹ *Id.*

⁶⁰ *Id.*

⁶¹ *Id.* at 35-36.

⁶² *Id.* at 51.

⁶³ Proposed Rule.

First, as stated above, the Proposed Rule essentially “averages” hazard and MSD risk across workers rather than accounting for the increased hazard and risk for each worker. The Proposed Rule assumes that the increase in hazard at one establishment is “undone” or averaged out by the reduction in hazard at another establishment. Again, this is illogical and inconsistent with how other workplace hazards are managed. Workers at one establishment with high exposures to toxic chemicals are still exposed even if workers at another establishment have no exposure to the toxic chemicals at all. In occupational health, the adverse impact of exposure to hazards is evaluated individually. Instead, FSIS should interpret the PULSE Study findings as clear evidence that many workers will face higher exposures and a higher risk of MSDs when their establishment increases its evisceration line speed.

Second, by relying primarily on one section of our study, in which we stratified MSD risk results by establishment, FSIS places undue emphasis on our findings for one establishment, Establishment C, without giving equal weight to the other establishment (Establishment B), which showed a clear increase in hazards. At Establishment C, we observed and reported a significant decrease in MSD risk at the TLT line speed. However, as we noted, several underlying factors likely explain that result. Establishment C was among the lowest TLT and non-TLT line speeds and piece rates of all establishments.⁶⁴ And notably, unlike all the other establishments we studied, Establishment C had also developed a “comprehensive ergonomic program and had carried out many high-quality ergonomic evaluations and interventions completed or overseen by trained ergonomists.”⁶⁵ Likely because of this ergonomic program, Establishment C workers’ average hand activity and force exertion were lower than workers performing equivalent jobs at other establishments.⁶⁶ **Establishment C’s extensive efforts to operate at lower speeds and work with trained ergonomists illustrate that while it is possible to have lower MSD risk at higher speeds, it will require substantial effort and guardrails, none of which FSIS acknowledges—let alone proposes requiring.**

Likewise, although FSIS highlighted Establishment C’s success, the Proposed Rule does not equally emphasize the *increase* in hazard at **one establishment, Establishment B, where we observed a four-fold increase in MSD risk when operating at TLT line speeds.**⁶⁷ Indeed, at that speed, only *two workers* decreased from an unacceptable MSD risk to an acceptable risk score, while **18 workers** (26.9%) moved from an acceptable PFI-TLV score to an unacceptable, hazardous risk score.⁶⁸ In contrast to Establishment C, Establishment B’s “piece rates were among the highest of all piece rates across all processing areas.”⁶⁹ Again, this illustrates that management operational choices and staffing levels (which impact piece rate) significantly affect

⁶⁴ *Id.* at 56.

⁶⁵ *Id.* at 76

⁶⁶ *See id.*

⁶⁷ *Id.*

⁶⁸ *Id.* at 44.

⁶⁹ *Id.* at 56.

MSD risk. This should be interpreted by FSIS as a clear indication that any increase in permissible line speeds *must* include guardrails by requiring establishments to demonstrate that their workers are at acceptable exposure levels (PFI-TLV less than or equal to 1.0), through management operational choices and staffing, as observed in Establishment C.

Next, FSIS incorrectly states that there was “no effect on MSD risk” in four establishments. In truth, our study found a null association, *i.e.*, no *statistically significant* increase or decrease in MSD risk, at these establishments.⁷⁰ This is a distinction with a difference. We cannot with any certainty state that increased line speeds had “no effect” on MSD risk. Rather, we can only state that our sample lacked adequate power to detect an effect. For this reason, relying on only this stratified test is once again misleading. Stratifying samples reduces the number of observations, thereby decreasing the power to detect a statistical difference. Although we can learn from this test stratified by establishment about the importance of how establishments manage line speed increases, we did not and cannot conclude, as FSIS asserts, that increasing line speeds has “no effect” on MSD risk in these four establishments.

Finally, the Proposed Rule fails to consider the high baseline prevalence of MSD pain and MSD risk across all workers. A baseline of 42% of workers experiencing *moderate to severe* upper extremity pain and 44.7% exceeding the acceptable MSD threshold limit value (PFI-TLV) is simply unacceptable. Even if piece rates are maintained as line speeds increase (as our study showed is highly variable across establishments), nearly half of swine processing workers would *still* face unacceptably high levels of MSD risk. If swine establishments will have to hire more people or decrease job-specific speed to prevent MSD risk from getting *even worse*, FSIS can’t credibly claim the Proposed Rule won’t negatively affect workers, particularly when there are no requirements in the Proposed Rule for establishments to monitor exposure and reduce it to below hazardous thresholds (PFI-TLV less than 1.0).

This is especially true given that increasing staffing may become more, not less, challenging for swine processing establishments. As our PULSE Study documented, the industry heavily relies on immigrant labor.⁷¹ Among the workers participating in the study, 80.7% were born outside the United States, and 91.8% reported using a language other than English as their primary language.⁷² The current administration’s immigration enforcement policies could make hiring and retaining workers more difficult in an industry where labor supply is already tight, and turnover is high.⁷³ In other words, if evisceration line speeds increase but swine establishments

⁷⁰ *Id.* at 43.

⁷¹ Surveys administered by the U.S. Census Bureau indicate that 37.5% of animal slaughtering and processing workers in the U.S. were born outside the United States (and this figure is likely an underestimate, as it excludes the percentage of the workforce that is undocumented). Angela Stuesse & Nathan T. Dollar, *Who are America’s meat and poultry workers?*, Working Econ. Blog (Sept. 24, 2020), <https://perma.cc/E7NL-E9GH>.

⁷² PULSE Study, at 31.

⁷³ Matt Reynolds, *US Meat, Milk Prices Should Spike if Donald Trump Carries Out Mass Deportation Schemes*, Wired (Dec. 11, 2024), <https://perma.cc/VSH9-X6GE>.

cannot hire and retain enough workers, they may be unable to properly control piece rates, and more workers will be exposed to hazardous levels of work.

So, while it is true that we “conclude[d] establishments can maintain or even reduce piece rate and associated MSD risk by adding staff or redistributing tasks, even as line speed increases,” as the Proposed Rule notes, FSIS must include *requirements* for hazard assessment and mitigation with any increase in evisceration line speed. If establishments are permitted to indiscriminately raise evisceration line speeds as FSIS proposes, our study suggests that many workers will be exposed to higher levels of hazard. FSIS is blindly assuming that establishments will implement higher evisceration line speeds like Establishment C, thereby reducing hazards for many workers. **But if the agency doesn’t make such guardrails mandatory, there will be no incentive for establishments to implement higher evisceration line speeds safely.** Further, omitting guardrails in the Proposed Rule disincentivizes companies from safely implementing higher evisceration line speeds, as it will require hiring additional workers. Therefore, the **Proposed Rule would unfairly penalize establishments** that choose to hire more staff to reduce hazards when operating at higher evisceration line speeds. As we noted in our study, “evisceration line speed”—on its own—“is a poor metric of MSD risk.”⁷⁴ FSIS must consider our piece rate findings and their implications, and not indiscriminately allow increased line speeds without ensuring worker safety through guardrails, such as requiring exposure assessments (and PFI-TLV values less than 1.0) to demonstrate that piece rates are set at levels that do not increase worker hazard.

b. The Proposed Rule fails to consider important factors beyond what we were permitted to study.

The Proposed Rule’s failure to consider important factors outside the scope of our PULSE Study also undermines FSIS’s confident pronouncement that “line speeds do not meaningfully impact worker safety.”⁷⁵ In promulgating a rule about line speeds, FSIS must consider the limitations of the data on which it bases its conclusions. The Proposed Rule suggests FSIS isn’t doing that.

First, the Proposed Rule appears to ignore the healthy worker survivor effect in our study, which affects how the results should be interpreted. As noted above, the establishments in our study had very high turnover rates. Establishments running TLT speeds <1,300 hph had a mean turnover rate of 47.1%, while those running ≥1,300 hph had a mean turnover rate of 54.6%.⁷⁶ Workers who left their jobs due to work-related pain or difficulty keeping up with the work pace were thus underrepresented, resulting in a study sample that was likely healthier than the sample of all previously exposed workers. This is particularly true at establishments with the highest

⁷⁴ PULSE Study, at 76.

⁷⁵ Proposed Rule.

⁷⁶ PULSE Study, at 29.

turnover rates. Consequently, our study likely underestimated the prevalence of work-related pain.

Similarly, the Proposed Rule is over-interpreting our study results from Establishment C and under-interpreting those from Establishment B. The stratified results from these Establishments provide two key insights: 1) with proper management of exposure, including a lower piece rate, an establishment could reduce hazard for workers while operating at a higher evisceration line speed, and 2) without proper management of exposure, including piece rate, an establishment could increase hazard for workers when operating at a higher line speed. By failing to consider both findings, the Proposed Rule erroneously reduces any limitations on evisceration line speed while simultaneously failing to require exposure assessments that would ensure establishments adjust staffing and operations to keep piece rates below hazardous levels. The Proposed Rule appears to select one finding to base its ruling on while ignoring the other.

The FSIS should pause to understand how Establishment C is managing exposure levels while increasing line speed and then require other establishments to do the same. As we noted, factors such as comparing knife sharpness across establishments were outside the scope of our study. Establishment C may well have had a robust knife-sharpening program, which would also support our observation that many of the job-specific force measurements were lower at that establishment than at the same jobs at other establishments.⁷⁷ That counsels caution. We could not study—and thus, FSIS does not know—exactly what led to Establishment C’s anomalous results in controlling MSD risk. Other factors, such as differences in piece rate and ergonomic training, could also account for the differences in exposure levels at both Non-TLT and TLT evisceration line speeds.

Finally, FSIS should also consider potential worker injuries resulting from increased line speeds beyond MSDs. Our study was constrained to measuring MSD risk and antimicrobial hazards and did not measure workers’ risks for other injuries, such as lacerations. The Proposed Rule does not discuss these other risks, and to our knowledge, FSIS has not examined them. However, research has shown that workers experience increased lacerations at higher speeds.⁷⁸ FSIS must consider these additional safety hazards before lifting line speed limits.

c. FSIS failed to consider current and increased healthcare cost consequences from this Proposed Rule.

In the Proposed Rule, FSIS has quite literally failed to account for the MSD risk and work-related pain our study (and many others) documented among swine processing workers.

⁷⁷ See *id.* at 76.

⁷⁸ Emmanuel Kyeremateng-Amoah et al., *Laceration Injuries and Infections Among Workers in the Poultry Processing and Pork Meatpacking Industries*, 57 Am. J. Indus. Med. 669 (2014).

The Proposed Rule's evaluation of costs and benefits ignores costs for swine processing workers.⁷⁹

These costs are not theoretical. Studies have documented that the costs of additional workplace injuries at slaughter and processing establishments fall upon the workers who have to live with debilitating disabilities (and may not be able to rejoin the workforce), on our healthcare system, and on meat companies themselves, in the form of higher workers' compensation payments. For example, in a chapter co-authored by Dr. Harris-Adamson, the estimated cost per CTS case in Washington state between 2002 and 2010 averaged \$17,536, based on workers' compensation data.⁸⁰ Adjusted for inflation, that is roughly \$26,065 per CTS case today.

As discussed in Section III.c., the PULSE Study found that 42% of swine processing workers were experiencing *severe* upper extremity pain, and 44.7% of evaluated workers were at high risk for MSDs when their establishments were operating at or below 1,106 hph. Thus, even at current line speeds, MSDs already cost workers and society greatly. If FSIS finalizes the Proposed Rule without necessary guardrails, (e.g., requiring jobs with a PFI-TLV less than 1.0), more workers may experience MSDs, thereby increasing these costs. FSIS must consider those costs in any accounting of the Proposed Rule's costs and benefits.

V. FSIS should require that any increase in line speeds be conditioned on swine establishments implementing established best practices to reduce the currently unacceptable levels of MSD risk among their workers.

- a. Swine processing establishments should be required to implement established best practices to reduce PFI-TLV scores to 1.0 or lower, thereby reducing MSD risk among workers.*

Before increasing line speeds, establishments should be required to implement best practices to reduce pain and MSD risk to acceptable levels. Our study clearly illustrated that current line speeds and management practices do not provide workers adequate protection. Our chief recommendation is simple: swine establishments should reduce the PFI-TLV score to 1.0 or lower for all swine processing jobs.

This recommendation is straightforward to implement and aligns with prior NIOSH recommendations and long-standing meat industry best practices. Five years ago, after completing a health hazard evaluation of MSDs in a pork processing plant,⁸¹ NIOSH's first recommendation was to design job tasks to be below the ACGIH threshold (PFI-TLV at or below 1.0) for hand activity to minimize the risk of developing CTS.⁸² Likewise, as our PULSE Study

⁷⁹ Proposed Rule.

⁸⁰ Carisa Harris-Adamson, Stephen S. Bao & Bradley Evanoff, *Musculoskeletal Disorders, in Occupational and Environmental Health: Recognizing and Preventing Disease and Injury* (B. S. Levy et al. eds., 7th ed. 2018).

⁸¹ NIOSH 2024, *supra* n.3.

⁸² *Id.* at 4.

noted, establishments can reduce the PFI-TLV scores by reducing the piece rate in jobs with high levels of MSD risk and reducing hand force. Yet, by and large, most swine establishments have not implemented the NIOSH recommendations, evidenced by the high number of workers with PFI-TLV scores above 1.0. We suggested slowing line speeds, increasing staffing levels, sharpening knives, establishing comprehensive ergonomic training, or a mix of these strategies.⁸³

The Proposed Rule rightly commends our study recommendations to swine establishments. But FSIS must go further and *require* establishments to lower PFI-TLV scores to acceptable levels at all speeds by implementing these recommendations. In the Proposed Rule, FSIS claims it lacks the authority to consider worker safety.⁸⁴ The Proposed Rule also claims that FSIS has no obligation to consider the impacts on swine slaughter establishment workers. This position is inconsistent with FSIS's funding of the PULSE Study and partial reliance on the PULSE Study's conclusions. It is illogical for the FSIS to use the PULSE Study to support its rulemaking while also denying any responsibility or ability to consider worker safety.

We are aware of comments on the Proposed Rule by worker advocates who contend that FSIS is wrong, and argue that FSIS has the authority and the obligation to consider worker safety in determining whether and how to set evisceration line speed limits. We commend those comments to the agency and specifically suggest that **FSIS should only consider allowing line speeds to increase *after* an establishment shows that MSD risk is controlled (i.e., each job has a PFI-TLV at or below 1.0).** Including this requirement in the Proposed Rule will **benefit workers and companies that reduce hazards** for their workers.

b. FSIS should not remove the annual attestation requirement for swine processing establishments and should instead expand it.

Finally, FSIS should not remove the annual “attestation” requirement, as the Proposed Rule suggests. Currently, NSIS establishments must annually attest to FSIS that they “maintain[] a program to monitor and document any work-related conditions of establishment workers,” which must include “[p]olicies to encourage early reporting of symptoms of injuries and illnesses,” “[n]otification to employees of the nature and early symptoms of occupational illness and injuries, in a manner and language that workers can understand,” and “[m]onitoring, on a regular and routine basis, injury and illness logs.”⁸⁵

Establishments don't have to submit proof or details of such a program or policies to FSIS—only attest that they exist. Given the observed problems with inadequate recordkeeping and underreporting of workplace injuries in the swine processing industry, this requirement has clearly been insufficient to ensure that worker safety is adequately documented. To remove even this limited requirement, when underreporting remains pervasive and grave workplace hazards

⁸³ PULSE Study, at 80-83.

⁸⁴ Proposed Rule.

⁸⁵ 9 C.F.R. § 310.27.

persist, is unjustified and would further frustrate efforts to obtain reliable information about worker safety in the industry.

FSIS should instead expand the attestation and require facilities to provide additional information about worker safety, such as including the number of first-aid reports, the duration of first-aid, the number of first-aid cases that received medical treatment, the number of first-aid cases resolved, and the number of first-aid recurrences. Ergonomic risk evaluations and risk mitigation plans, including any policies to educate workers about MSD symptoms and prevention should also be included.

VI. Conclusion

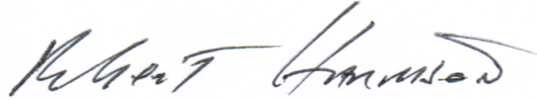
The Proposed Rule takes our PULSE Study as a green light to lift the limit on swine processing line speeds nationwide, when in fact our study results are a flashing red light that should alarm FSIS, OSHA, and the swine processing industry. Our results contribute to the large body of evidence from decades of research indicating that swine processing workers are exposed to unacceptable levels of ergonomic hazards and face unconscionably high MSD risk. Instead, FSIS could propose a rule requiring establishments to implement best practices to control ergonomic hazards before allowing them to increase evisceration line speed. Doing so would reward companies that choose to prioritize worker safety, rather than put them at a disadvantage, and would ensure that FSIS actions do not cause undue harm to workers. The Proposed Rule ignores important findings from the PULSE Study—which it commissioned—which clearly show that some workers will be harmed if their establishment is allowed to increase its evisceration line speed. Therefore, any Proposed Rule must require establishments to demonstrate that ergonomic exposures are not hazardous before allowing increases in evisceration line speed.

Sincerely,



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