

Review of the Analysis Prepared by the Food Safety and Inspection Service (USDA/FSIS) of Plant Employee-Injury Rates at Swine Slaughtering Operations

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On February 1, 2018, the Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture proposed a regulation called “Modernization of Swine Slaughter Inspection” (83 *Federal Register* 4780.) The preamble to the proposed rule described an analysis conducted by FSIS to compare in-establishment worker injury rates between HIMP and traditional establishments from 2002 to 2010. FSIS stated:

“The results showed HIMP plants had a lower mean number of injuries using three OSHA injury rate measures: Total Case Rate (TCR), Days Away Transferred Restricted (DART), and Days Away From Work (DAFW).” (83 *Federal Register* 4796)

The analysis conducted by FSIS was not included in the rulemaking docket posted at Regulations.gov (Docket No. FSIS–2016–0017.) We filed a Freedom of Information Act (FOIA) request on February 14, 2018 in which we requested copies of the data, spreadsheets, and reports used by FSIS to conduct its analysis. FSIS acknowledged receipt of the FOIA request on February 21, 2018 and responded with records it deemed responsive on September 21, 2018. Some records provided contained redacted information.

We reviewed the data provided by FSIS, as well as the agency’s description of the statistical analysis conducted using the data. There are significant limitations in the data used by FSIS to draw its conclusion that HIMP plants had a lower mean number of injuries than traditional plants. We describe the key limitations below.

Small Sample Size

In response to our FOIA request, FSIS provided a spreadsheet labeled “establishment profile.” The spreadsheet lists 612 swine processing plants in the U.S. Twenty eight (28) of them are classified by FSIS as “Large,” 105 are classified as “Small,” and 479 classified as “Very Small.”

The annual injury rate data used by FSIS for its analysis was assembled by OSHA for the agency’s Data Initiative (ODI). Briefly, between 1996 through 2011 OSHA collected data annually from a small portion of U.S. private sector establishments (i.e. workplaces.) Specifically, about 80,000 out of 7.5 million total establishments.

The ODI is not a random sample, as OSHA explains:

“...these data are not representative of all businesses and general conclusions pertaining to all US business should not be drawn.”¹

Between 2002 and 2010 (FSIS’s period of analysis,) 56 of the 612 swine processing plants were required to submit their annual injury rate to OSHA for its ODI. Some of the plants were only required to submit the injury rate for a single year, while other plants were required to do so for multiple years.

Of the 56 for which annual injury rate(s) were available, FSIS excluded 27 plants that had production volumes less than 100,000 head. **Table 1** is a list of the 24 plants used by FSIS for its analysis of injury rates in traditional plants. **Table 2** is a list of the 5 plants used by FSIS for its analysis of injury rates in HIMP plants.

TABLE 1: List of 24 Traditional Plants Used in FSIS Analysis

Traditional Plants (Annual production >1 million swine head (n=10))				
FSIS ID No.	Plant Name	City, State	Consecutive Years/#	OSHA Injury Data Year(s)
3363/ M5537	Sioux-Preme Packing Co.	Sioux Center, IA	Yes (6)	2002-2007
3235/ M244L	Tyson Fresh Meats, Inc.	Columbus Junction, IA	Yes (8)	2003-2011*
2484/ M244I	Tyson Fresh Meats, Inc.	Logansport, IN	No	2005-2007,2009-2011*
2679/ M17564	Indiana Packers Corp.	Delphi, IN	No	2002, 2007
3234/ M244	Tyson Fresh Meats, Inc.	Storm Lake, IA	No	2011*
2936/ M17D	John Morrell & Co.	Sioux Falls, SD	No	2002-2005, 2007-2009
3228/ M850	Cargill Meat Solutions Corp.	Ottumwa, IA	Yes (5)	2006-2010
3907/ M13597	Seaboard Foods	Guymon, OK	No	2002-2003, 2005-2006
9879/ M31965	Triumph Foods	St. Joseph, MO	Yes (4)	2006-2009
728/M18079	Smithfield Farmland Corp.	Tar Heel, NC	Yes (5)	2005-2009
Traditional Plants (Annual production >100,000 swine head but <1 million (n=14))				
FSIS ID No.	Plant Name	City, State	Consecutive Years?	OSHA Injury Data Year(s)
1891/ M818	J. H. Routh Packing Co.	Sandusky, OH	No	2002-2004, 2008
2586/ M2926	Pork King Packing, Inc.	Marengo, IL	No	2007, 2009
2606/ M6775	Calihan Pork Processors	Peoria, IL	Yes (4)	2006-2009
2713/ M19185	Spectrum Preferred Meats	Mount Morris, IL	No	2002-2004, 2006-2007, 2009
3259/ M363	Verschoor Meats, Inc.	Sioux City, IA	No	2002-2004, 2006-2007
4669/ M8314	Swaggerty Sausage Co. Inc.	Kodak, TN	No	2002-2003, 2005-2009
5138/ M548	Yosemite Meat & Locker	Modesto, CA	No	2003, 2006-2010
5932/ M226	Independent Meat Co.	Twin Falls, ID	No	2002-2004, 2006-2011*
6710/ M9520	Leidys, Inc.	Souderton, PA	Yes (7)	2002-2008
7009/ M1962	Johnsonville Sausage, LLC	Watertown, WI	No	2003
7239/ M15896	Abbyland Pork Pack, Inc.	Curtiss, WI	No	2004-2009
7669/ M21179	J& J Packing Co., Inc.	Brookshire, TX	No	2009
8103/M21069	Premium Iowa Pork, LLC	Hospers, IA	No	2004-2007, 2009-2010
8664/ M21898	Dakota Pack, Inc.	Estherville, IA	Yes (4)	2007-2011*

*2011 data was included in dataset but was not included in the FSIS analysis

¹ OSHA Data Initiative. https://www.osha.gov/pls/odi/establishment_search.html

TABLE 2: List of 5 HIMP Plants Used in FSIS Analysis

HIMP Plants					
FSIS ID No.	Plant Name	City, State	Consecutive Years?	# of Years	OSHA Injury Data Year(s)
2478/M85B	Cargill Meat Solutions	Beardstown, IL	Yes	3	2007-2009
2979/M1620	Quality Pork Processors	Austin, MN	Yes	5	2002-2006
3247/M199N	Hormel Foods Corp.	Fremont, NE	No	5	2003-2005, 2007-2008
5118/M360	Clougherty Packing LLC	Vernon, CA	Yes	6	2002-2007
6408/ M791	Clemens Food Group, LLC	Hatfield, PA	No	5	2002-2006

We note that the dataset used by FSIS had consecutive years of data for only 8 of the 24 traditional plants. Moreover, none of the traditional plants had data available for the full 9-year period (2002 through 2010). Likewise, only three of the five HIMP plants had data for consecutive years, and none had data available for the full 9-year period of analysis.

Unsuitable Analysis of Annual Injury Data

An analysis of work-related injury data should, at the very least, treat each year at each plant as a separate observation and then statistically model any within-plant dependency of observations. By simply comparing an average injury rate for a 9-year period at HIMP and traditional plants, FSIS fails to consider the dependence of observations in the series of injury rates.

An appropriate way to assess the impact of HIMP operations on work-related injuries would be a time series analysis that examines the change in injury incidence from the pre-HIMP to the post-HIMP adoption periods. A necessary component of this analysis would be to consider alternative explanations for any marked changes between the two time periods through the inclusion of covariates in the model. These alternative explanations could be factors such as, changes in OSHA injury reporting requirements, changes in employee characteristics, experience with OSHA inspections, and/or changes in the ratio of monthly production to production employee work hours.

Instead, FSIS draws its conclusion that HIMP plants have a lower mean number of work-related injuries compared to traditional plants by the most rudimentary method. For each of the five HIMP plants, the agency simply averaged injury rates across available years. For the traditional plants, FSIS performed the same calculation. Then the agency simply compared average injury rates across the two types of plants to make its conclusion that HIMP plants have fewer work-related injuries.

Tables 1 and Table 2 (above) present the years in which an annual injury rate was available for each of the five HIMP plants. For one plant, an annual injury rate was available for only three of the nine year periods. For the other four plants, an annual injury rate was available for only five of the nine years. The average injury rate for the five HIMP plants is based on 24 observations over a nine year period (2002-2010.) The average injury rate for the 24 traditional plants is based on 119 observations over the nine year period.

In an attempt to characterize the comparison of the averages as statistically convincing, FSIS states:

“The independence of the means test was used to verify the statistical significance of the analysis.”

Statisticians are likely to scratch their heads to dissect the meaning of this sentence. It does not reflect the manner in which a statistician would describe a comparison of two averages.

Similarly, FSIS states:

“the equality of variances in the Levene’s test as well as the t-test were used to evaluate the HIMP and Traditional injury rate means.”

Statisticians would scratch their heads about this statement, too. Levene’s test is used to assess whether the variance of one of set of observations is equal to the variance of another set of observations. In the case of the injury rate data analyzed by FSIS, the Levene’s test indicates that the variances in the two data sets are not equal. Levene’s test does not provide a determination that there is a statistically significant difference between the two average injury rates. The statistical significance of Levene’s test in the present case in fact underscores the concern that qualitative differences unrelated to HIMP status may exist between the two groups of plants.

Not a Random Sample

The five plants chosen for the implementation of HIMP were not randomly selected from the larger group of plants. The five HIMP plants were self-nominated for the pilot program. Therefore, these five facilities may be significantly different in other respects from the traditional plants. These differences could include factors such the following: age of facility; maintenance practices; management personnel; experience with OSHA inspections; workers represented by a collective bargaining agreement; tenure of workforce; ratio of monthly production to production employee work hours; and worker training.

FSIS’s analysis inappropriately assumes that the plants are comparable in every way *except* for their HIMP status. This is an erroneous assumption that FSIS fails to explain and justify. Without having data on potentially confounding factors and controlling for them in the analysis, it is inappropriate for FSIS to conclude that there is statistically sound evidence that HIMP plants have a lower mean number of injuries than traditional plants.

Conclusion

In sum, the limitations described above make it impossible for FSIS to draw any statistically valid conclusion about worker injury rate differences in HIMP versus traditional plants.