Worker Health Issues in Pork Production

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Summary and Implications

Data from attendees of the annual World Pork Expo spanning the five-year period 1991-1995 were analyzed to determine the relationships between pork production and worker health. Self-reported or subjective health problems suggest that pork production is associated with nagging types of chronic problems for the producer and the family. Farmers were significantly more likely than non-farmers to report chronic health problems of cough/phlegm and flu-type symptoms. Pig farmers were significantly more likely than other farmers to report cough/phlegm, sinus problems, sore throat, and family being affected. Confinement farmers were more likely to report or observe effects and family member effects than were other pig farmers. Objective lung measurements did not show any significant differences in lung capacity. The lack of objective evidence is not compelling enough to conclude that the self-reported health effects do not exist, because the data's time frame may not be sufficient to reveal permanent respiratory damage.

Farmers were less likely to report hearing problems than were non-farmers. Pig farmers and confinement farmers were no different in this area than other farmers. However, hearing measurements showed that farmers had significantly impaired (reduced) hearing in both ears as compared to non-farmers. Hearing problems for confinement farmers and other pig farmers were not significantly different from other farmers. Farmers also had significantly lower hand strength than non-farmers, and pig farmers had less hand strength than other farmers. Pig farmers may be more susceptible to hand injury or repetitive motion disorders such as carpal tunnel syndrome.

Introduction

Pork production systems have been moving toward increased use of confinement technologies over time. At the same time, concerns have increased over environmental quality for workers.

Livestock production facilities can expose workers to dust, gas, and other elements that can impact both worker and animal health. Much has been written about these issues. However, there is limited information on relationships between livestock production systems and worker health. This project will begin an initial analysis of these issues. Productivity of the workers and the livestock in the facilities can be impacted by air quality. Little is known about worker health issues in pork production facilities. Information on health related measurements as well as self-reported measures were collected from participants at recent World Pork Expo meetings (from 1991-1995).

Establishing the relationship between swine production environments and animal or worker health improvements requires information on animal or worker health problems and production facilities. Donham has shown relationships between air quality (dust, ammonia, bacteria, and fungi) in confinement pig production systems and pig production response. Production information such as feed efficiency, days to market weight, etc., were measured. Boessen and Boessen et al. studied differences in lung lesions (respiratory) and turbinate damage in pigs by type of swine production facility. Hurley et al. evaluated the cost of respiratory disease in pigs.

Materials and Methods

The data for the analysis came from attendees of the World Pork Expo spanning the five-year period 1991-1995. Information such as age, gender, years in farming, years or time worked in confinement facilities, use of dust mask, and hearing measurements was collected each year. In 1995, more detailed objective information on items such as equipment design, source of information on safety and health, blood pressure, hand and lifting strength, lung capacity, and hearing was collected. This information was analyzed to determine the relationship between livestock production, amount of time worked in production or confinement facilities, and associated health measurements.

A health pavilion was set up in which various subjective and objective health assessments were conducted at the respective World Pork Expos. The collection effort by the National Pork Producers Council was in response to concerns regarding occupational health and safety in the pork industry. As such, these data represent a unique opportunity to examine the incidence of occupational injury and disease in the pork industry.

There are several advantages to this type of data. First, it offers a large number of observations on pork producers generally, and on confinement operators specifically. If more intensive pork production is associated with progressive deterioration in pulmonary function, for example, evidence may only be evident in large samples. On the other hand, poor health outcomes commonly associated with pork producers may be true of farmers more generally. The large number of farmers in the sample who are not engaged in pork production serves as a useful reference group for comparison with pork producers generally, or confinement operators specifically.

Attendees at the Pork Expo are broadly representative of pork producers, and so the health measures should be broadly representative of health outcomes for farmers currently engaged in pork production. However, there are some clear disadvantages with this sample which may impact the interpretation of the results. First, the sample is predicated upon sufficient interest in the pork industry to attend the

Pork Expo. While this is fine for the sample of pork producers, the non pork producers will not be representative of the population at large. More seriously, the sample only includes those who felt well enough to travel to the Expo, so those with serious illnesses or debilitating injuries will be excluded. Therefore, the study will concentrate on analysis of illnesses or injuries which may limit occupational pursuits, but not those which will require abandonment of occupational pursuits. Furthermore, the sample is best suited to compare confinement operators against pork producers more generally, and to compare pork producers against farmers more generally.

Results and Discussion

Information presented in Table 1 provides a summary of descriptive statistics (means) of selected health survey results. As shown, the mean age of participant in the health survey was about 42 years (41.9) of age. They were 2/3 male (64%) and 1/3 female, with an average height of 5 feet 8 inches. They had an average 16.3 years of farming experience and 13.3 years in swine production, with 6.8 years in confinement production. On average they worked 3.6 days per week in confinement facilities, averaging 2.7 hours per day. In addition, they worked 5.9 hours per week in a dusty environment other than confinement buildings. Respondents indicated that they wore a dust mask 31% of the time they worked in confinement facilities and they used hearing protection 36% of the time. About 1/3 indicated they felt they worked in a noisy environment. Lung capacity tests suggested that about 15% of the participants should have follow-up tests with their regular doctor.

About 1/3 of the respondents indicated that they had headaches, while 59% indicated that they experience ear ringing or buzzing. While the hearing test showed some hearing loss, very few were encouraged to see a doctor immediately; 9% indicated they experienced temporary hearing loss. A large percentage were encouraged to visit with their local doctor (32%) and subscribe to annual hearing tests (36%). Blood pressure was reported to be normal for most participants (85%). From one fourth to one half of the producers reported hand strength problems.

Respiratory measures showed that from 12 to 40% of the participants indicated they experienced a dry cough, throat irritation, chest tightening, wheezing chest, sinus problems, and flu symptoms after working in confinement hog production facilities (Table 1). Information in Table 2 provides a comparison of respiratory problems by occupational category. For example, a higher percent of pig farmers (31%) and confinement farmers (28%) reported throat irritation than non-farmers (20%) or other farmers (20%). A higher percent of pig farmers also reported sinus problems, family members reacting to environmental conditions, chest tightness, and cough and phlegm.

Statistical tests revealed that farmers were more than twice as likely as non-farmers to report recurrent coughs and flu symptoms within two to six hours of a large dust exposure. Pig farmers were more likely than other farmers to [illegible] symptoms as other pork producers except for a greater level of family reaction and effects after an absence.

A close examination of the number of participants reported in Table 1 will show that it differs from that reported in Tables 2-4. For example, there were 853 participants for chest tightness in Table 2 as compared to 1,619 participants in Table 1. Tables 2-4 use only participants with a complete set of survey information. If any survey information was missing they were not retained for Tables 2-4 results. For example, information on if they were smokers was not collected on the 1995 survey. Thus, they were not included in Tables 2-4.

Of the respondents with complete information, 39% indicated they experienced some hearing difficulty in normal conversation, while 9% indicated they experienced temporary hearing loss. Hearing symptoms were experienced frequently or daily. Hearing tests indicated that 7% of the respondents had abnormal hearing at low frequencies in both the left and right ears (Table 3). At high frequencies, hearing abnormalities were evident in the right ear for 31% of the participants. In the left ear, abnormalities showed up for 32% of the respondents. A higher percent of farmers, in general, had abnormal hearing than did non-farmers.

It was interesting that in the self-reported hearing information farmers were significantly less likely to report hearing problems. However, the objective measures of hearing revealed significant occupational damage to hearing for farmers. Farmers were almost three times more likely to have hearing in the left ear diagnosed as abnormal at high frequencies. The probability of high frequency hearing loss in the right ear was even greater. Farmers were nearly four times more likely to be diagnosed as sufficiently hearing impaired to be referred to a hearing specialist, compare to non-farmers with the same human capital attributes. The loss of hearing was farming related and not to pork production specifically. In summary, farmers appear to be unaware of the effects of farming on their own hearing.

Hand strength and blood pressure information is shown in Table 4. Self-reported information on hand strength was similar across the different groups. However, the hand strength tests showed different results. Eighteen percent were told to follow-up for further hand strength checks with their family physician. This was higher for farmers than non-farmers, 3% for the non-farmers and 16% for farmers. Hand strength was greater for non-farmers than farmers. The systolic blood pressure was 124 while the diastolic blood pressure was 75. Seven percent of the participants were recommended for a blood pressure follow up.

Farmers hand strength lagged behind non-farmers by 10.5%. They were 11 times more likely than non-farmers to be diagnosed as needing more tests. Confinement farmers were more likely than farmers in general to be referred for additional tests. Blood pressure for farmers was 2-4% below that of the non-farm participants of comparable age, gender, stature and smoking habits. While these differences are not large enough to draw any major conclusions, it appears that [illegible]

Objective lung capacity tests did not show any difference in lung capacity between farmers and non-farmers.

References

Boessen, C. "Analyzing the Economic Cost of Swine Disease," Masters Thesis, Iowa State University, 1988.

Boessen, C., J. Kliebenstein, R. Cowart, K. Moore, and C. Burbee. "Determination of Swine Pneumonia and Impacts on Production Costs Through Slaughter Checks," Department of Economics Staff Paper No. 190, Iowa State University, Ames, June 1988.

Donham, K.J. "The Effects of Environmental Conditions Inside Swine Housing on Workers and Pig Health," Australian Pig Swine Association, Canberra, Australia, Nov. 26-29, 1995.

Hurley, T., S. Chaudhary, J. Kliebenstein, and S. Westercamp. "Cost of Respiratory Disease," 1995 Swine Research Report, Iowa State University, Ames, 1995.

Table 1. Summary of descriptive information for pork producer health survey.

Item	Mean Value	Years for Information	Number Observations
Age (years)	41.9	1991-1995	3,445
Weight (pounds)	177.4	1991-1995	3,279
Height (inches)	68.1	1991-1995	3,285
Gender	1/3 female, 2/3 male	1991-1995	2,879
Years Farming	16.3	1991-1995	2,879
Years Swine	13.3	1991-1995	2,905
Years Confinement	6.8	1991-1995	2,757
Days per Week Work in Confinement Facilities	3.6	1991-1995	2,564
Hours per Day Work in Confinement Facilities	2.7	1991-1995	2,430
Hours per Week in Dust Beyond Confinement	5.9	1991-1995	2,357
Percent of Time Wear Dust Mask	31%	1991-1995	2,703
Number of Years Used Dust Mask	2.3	1991-1994	2,516
Percent of Time Wear Hearing Protection	36%	1991-1995	2,488
Experienced Headaches	32%	1991-1994	1,559
Experienced Ear Ring or Buzz	59%	1991-1994	1,631
Experienced Temporary hearing Loss	9%	1991-1994	1,282
Hearing Test: 2=loss in one ear; 3=loss in both ears	2.9	1991-1995	1,466
Blood Pressure Diagnosis (percent normal)	85%	1991-1995	2,430
Hand Strength Affects Daily Function	47%	1991-1994	1,371
Hands Fall Asleep	27%	1991-1994	1,369
Consistently Have Dry Cough	28%	1991-1994	1,730
Consistently Have Throat Irritation	29%	1991-1994	1,723
Consistently Have Chest Tightness	13%	1991-1994	1,619
Consistently Have Wheezing Chest	12%	1991-1994	1,617
Consistently Have Cough and Phlegm	28%	1991-1994	1,731
Consistently Have Sinus Problems	41%	1991-1994	1,316
Other Family Members Have Reaction	35%	1991-1994	1,976
Consistently Have Flu Symptoms After in Facility	27%	1991-1994	2,078

Table 2. Percent of respondents reporting respiratory problems by selected occupations.[a]

Item	Average All Individuals	Mean by Occupation			
		Non-Farm	Farmer	Pig Farmer	Confinement Hog Farmer
Dry Cough	27 (890)	22 (23)	19 (73)	26 (223)	28 (571)
Throat Irritation	28 (895)	20 (25)	20 (76)	31 (235)	28 (559)
Chest Tightness	12 (853)	5 (20)	11 (70)	13 (220)	13 (543)
Wheezing Chest	11 (862)	5 (21)	12 (73)	12 (218)	11 (550)
Cough and Phlegm	30 (901)	14 (22)	19 (73)	29 (234)	33 (572)
Sinus Problems	30 (810)	0 (17)	13 (64)	33 (209)	32 (520)
Family Reaction	34 (986)	3 (34)	19 (80)	30 (251)	40 (621)
Flu Symptoms	30 (1023)	14 (37)	22 (87)	27 (261)	33 (638)
Coughing, Etc., After Two Day Absence	17 (976)	16 (31)	16 (82)	12 (240)	19 (623)
Forced Expiratory Volume[b]	3.80 (1,104;0.88)	3.54 (100;0.77)	3.51 (105;0.96)	3.55 (268;0.93)	3.99 (631;0.82)
Forced Vital Capacity[c]	4.57 (1,116;1.05)	4.28 (100;0.95)	4.20 (105;1.12)	4.25 (271;1.07)	4.80 (640;0.98)

[a] The numbers in parentheses reflect the number in the respective samples and the standard deviation where two numbers are provided.
[b] Restricted to the range of 1.2 to 9.0 to eliminate extreme outliers.
[c] Restricted to the range of 7.5 to 1.0 to eliminate extreme outliers.

Table 3. Percent of respondents with hearing problems.[a]

Item	Average All Individuals	Mean by Occupation			
		Non-Farm	Farmer	Pig Farmer	Confinement Hog Farmer
Hearing	53 (784)	21 (95)	57 (84)	57 (188)	58 (417)
Left Ear Abnormal - Low	7 (1,075)	2 (99)	11 (100)	8 (262)	7 (614)
Left Ear Abnormal - High	32 (1,075)	18 (99)	40 (100)	34 (262)	33 (614)
Right Ear Abnormal - Low	7 (1,049)	4 (98)	11 (95)	8 (254)	6 (602)
Right Ear Abnormal - High	31 (1,049)	15 (98)	37 (95)	32 (254)	31 (602)

[a] The numbers in parentheses reflect the number in the sample.

Table 4. Percent of respondents by hand strength along with dynameter and blood pressure results.[a]

Item	Average All Individuals	Conditional Means			
		Non-Farm	Farmer	Pig Farmer	Confinement Hog Farmer
Hands Fall Asleep	30 (745)	25 (92)	23 (79)	29 (181)	34 (393)
Hand Strength Affects Daily Function	49 (746)	43 (91)	39 (79)	47 (181)	53 (395)
Hand Strength Change Last 6 Months	13 (749)	11 (92)	10 (78)	15 (183)	13 (396)
Recommended Follow-Up	18 (678)	3 (73)	16 (74)	19 (170)	20 (361)
Dynameter					
Dominant hand	1.83 (520;1.07)	2.47 (32;0.57)	1.96 (46;1.15)	1.78 (135;1.10)	1.77 (307;1.07)
Non-dominant hand	1.92 (515;1.06)	2.47 (32;0.67)	1.91 (46;1.11)	1.88 (132;1.15)	1.89 (305;1.02)
Blood Pressure					
Systolic[b]	124 (1,136;15.0)	126 (102;16.3)	123 (105;14.7)	124 (279;16.7)	125 (650;14.1)
Diastolic[c]	75 (1,132;10.4)	77 (102;11.6)	74 (104;9.9)	75 (278;10.4)	75 (648;10.2)
Diagnosis - Follow-up	0.07 (721)	0.02 (48)	0.07 (67)	0.09 (175)	0.08 (431)

[a] The numbers in parentheses reflect the number in the sample along with standard deviation of two numbers.
[b] Blood pressure systolic is restricted to the range of 60 to 185 to eliminate extreme outliers.
[c] Blood pressure diastolic is restricted to the range of 30 to 120 to eliminate extreme outliers.