

HEALTH IMPACT ASSESSMENT: A CASE STUDY ON RENOVATION OF A SLAUGHTERHOUSE

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Abstract. The purpose of this study was to conduct a health impact assessment (HIA) in a community where an old slaughterhouse was to be renovated. The authors conducted a cross-sectional study in March, 2011. Questionnaires were used to collect data and focus group discussions were conducted to solicit the community concerns and recommendations regarding the project. The results reveal positive impacts in 4 aspects of health: physical, mental, social, and spiritual. The current substandard slaughterhouse was perceived negatively by the surrounding community. They were happy the slaughterhouse would be renovated, and some preferred it moved elsewhere. This HIA had 2 positive results: first, we tested our HIA tool in a real situation and found it practical on a small scale; second, the municipality obtained the community's opinions and concerns and the community knew their opinions reached the municipality, so they were more positive about the municipality.

Keywords: health impact assessment, slaughterhouse

INTRODUCTION

A slaughterhouse in one of the municipalities in Samut Prakan has been operated for more than 40 years with only minor renovations. During this period, the surrounding area has become more urbanized. People in the community were unhappy with the environment caused by the slaughterhouse and appealed to the Municipality to solve the problems of noise and smell caused by the slaughtering process and the obstructed drainage

system. This obstructed drainage sometimes contaminated household water putting the community at health risk.

The Municipality responded to each complaint one at a time. In 2010, the Municipality determined to renovate the slaughterhouse to meet standards set by the Department of Livestock Development, Ministry of Agriculture and Cooperatives. In order to solicit community opinion, the authors conducted a health impact assessment (HIA) regarding this renovation of the slaughterhouse.

The objectives of this HIA were to explore the positive and negative health impacts that could result from this renovation, as perceived by the community and their recommendations for mitigating the negative aspects.

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MATERIALS AND METHODS

Study area

The slaughterhouse is located in an area of about 1,600 m² on a small road less than 1 km from the main road. The land donor designated the area for slaughtering only. The area and surrounding area are swamp. There was a pond receiving waste water from the slaughterhouse, but it had been abandoned. There was no specific drainage system for the slaughterhouse. Houses had been built up around the slaughterhouse. The Municipality constructed a drainage system for the houses; the waste water from the slaughterhouse also drains into this system.

There were 3 communities adjacent to the slaughterhouse. The slaughterhouse was a simple building with one side open to an outdoor rest area for cows. The other side of the rest area was an entrance for cows via a small road.

This research was approved by the ethics committee of the Faculty of Medicine, Chulalongkorn University. This was a qualitative and quantitative study. We obtained informed consent from each participant prior to inclusion in the study. All the households on the small road leading to the slaughterhouse were asked to participate; 50% of the households farther than 1 km from the slaughterhouse on the small road and the main road were randomly selected and asked to participate.

For qualitative research, focus group discussions (FGDs) were carried out with 2 groups lasting 45 minutes each. The first group consisted of Municipality's officers: a veterinarian, an engineer, and a deputy permanent secretary of the Municipality office. The second group consisted of 3 community leaders. Their perceptions and concerns about the slaughterhouse and the plans for renovation were solicited.

The interviews were audio-recorded and transcribed to enhance reliability. Quantitative research was carried out using an interview questionnaire within the community.

RESULTS

Sixty-nine people agreed to participate in the study. The general characteristics of the participants are given in Table 1. Twenty-six participants (37.7%) lived close to the slaughterhouse and 68% were not satisfied with the environment.

Table 2 presents the environmental problems listed by participants about the slaughterhouse. Six cows and 1 bull were killed per week. The owners of the animals, who were Muslims, did the killing, cutting, and transporting the cut meat. The tools used were knives and ropes. The killing was done every day except national and religion holidays. On average, there were no killings 4 days a month. The cows were kept in a rest area and were not fed 1 day before being killed to reduce feces. There was no standard waste water treatment system and the only pond was obstructed and abandoned. The owners cleaned the slaughterhouse after killing each day with detergent and sometimes with iodine. Waste water including cow blood and excreta flowed untreated into the community drainage system passing the adjacent houses. If the drainage system became obstructed, the water and excreta would overflow and get into nearby houses.

The concerns mentioned include mosquitoes (58%) and flooding (29%) which was more obvious during the rainy season (18.8%) (Table 2). Most nuisance came from pests, such as rats (46.4%), cockroaches (42%), flies (40.6%), and fruit flies (17.4%). Some complained of garbage

Table 1
General characteristics of the participants (*n* = 69).

Variables	Number (percent)
Gender	
Male : Female	24 (34.8) : 45 (65.2)
Age (years)	
≤ 30	10 (14.5)
31-40	18 (26.1)
41- 50	14 (20.3)
51-60	17 (24.6)
> 60	10 (14.5)
Education	
Less than bachelor degree	37 (53.6)
Marital status	
Married	47 (68.1)
Occupation	
Laborer	16 (23.2)
Trader	10 (14.5)
Unemployed	8 (11.6)
House characteristics	
Single, self-owned	55 (79.7)
Time dwelling in this house	
> 10 years	34 (49.3)
The house was close to the slaughterhouse	
Yes	26 (37.7)
Smoke	
No	58 (84.1)
Drinks alcohol	
No	50 (72.5)
Annual physical examination	
Yes	55 (79.7)
Never	12 (17.4)
Disease	
No	44 (63.8)
Yes	25 (36.2)

aggregation (13%) and cow hair deposition (10.1%). There were no reports of tap water being contaminated. The majority of respondents (88.4%) did not know how the garbage was managed or how the waste water was managed (89.9%).

Thirty-seven respondents (53.6%) complained of odor especially at the

Table 2
Number (percent) of community environmental problems.

Community environmental problems	Number (percent)
Mosquitoes	40 (58.0)
Flood	20 (29.0)
Nuisance from pests	
Rats	32 (46.4)
Cockroaches	29 (42.0)
Flies	28 (40.6)
Fruit flies	12 (17.4)
Garbage aggregation	9 (13.0)
Cow hair deposition	7 (10.1)

ground level, experienced daily (20.3%), 2-3 days per week (13%) or once a week (13%). The times the odor was felt to be the strongest were morning (11.6%), evening (10.1%) and all the time (8.7%). In response to the odor, 18.8% closed their windows, 4.3% put something in their noses, and 25% did nothing.

Twenty participants (29%) heard cow noise from the slaughterhouse 2-3 times per week (11.6%) and every day (10.1%). The time they most frequently heard noise was in the morning (11.6%). Most did nothing when they heard noise (23.2%); 4.3% closed their windows. Those who heard the noise felt sorrowful (37.7%) or sad (13%).

Thirty-four participants (49.3%) saw trucks transporting the cows passing their houses 2-3 times per week (24.6%) or daily (15.9%). Forty-three point five percent did nothing when they saw the trucks, while 5.8% closed their windows. Thirty-seven point seven percent felt sorrow and 27.5% felt sad.

Perceived health impacts

Table 3 shows the extent to which participants living in the surrounding

Table 3
Number (percent) with symptoms during the previous 7 days.

Symptoms in the past 7 days	Participants having the symptom (<i>n</i> = 69)	Participants living near the slaughterhouse having the symptom (<i>n</i> = 26)
Headache/ dizzy	27 (39.1)	11 (42.3)
Cough/ sore throat	23 (33.3)	10 (38.5)
Nose irritation	22 (31.9)	11 (42.3)
Itchy nose	20 (29.0)	11 (42.3)
Difficulty breathing	19 (27.5)	10 (38.5)
Itchy eyes	14 (20.3)	7 (26.9)
Nausea/vomiting	13 (18.8)	6 (23.1)
Chest tightness	12 (17.4)	6 (23.1)
Anosmia	11 (15.9)	7 (26.9)
Frequent defecation	11 (15.9)	5 (19.2)
Conjunctivitis/tearing eyes/eye redness	8 (11.6)	4 (15.4)
Severe diarrhea	4 (5.8)	3 (11.5)

community had symptoms they attributed to the slaughterhouse during the previous 7 days. Fifty-five percent of respondents experienced no symptoms. Of those with symptoms, the most frequently reported symptoms were headache/dizziness (39.1%), cough/sore throat (33.3%), nose irritation (31.9%) and itchy nose (29%). Twenty point three percent of respondents stated these symptoms disturbed their daily living/work, 11.6% had to stop their activities and one had to be hospitalized. The response to symptoms were to do nothing (26.1%), buy medicine from the pharmacy or go see a doctor (20.3%) and get rest/sleep (10.1%).

Of the 26 respondents living near the slaughterhouse, the most frequently reported symptoms were itchy nose or nose irritation and headache/dizziness (42.3%), and cough/sore throat and difficulty breathing (38.5%). Of the respondents living near the slaughterhouse 30.8% had symptoms that disturbed their daily

lives or work and 15.4% had to stop doing activities and one respondent needed hospitalization. Responses of participants living near the slaughterhouse to their symptoms were to do nothing (50%), go see a doctor (19.2%) or go buy medicine (11.5%). Living nearer the slaughterhouse was not related to symptoms ($p > 0.05$).

Of the total 69 respondents, 29 did not receive any community information about the renovation project. Those who did, obtained their information from public speakers, neighbors or community leaders. The frequency they received this information was 2-3 times per week. More than half of participants never attended community meetings. Only 7 attended meetings 2-3 times per week.

Twenty participants knew there would be a renovation project; most obtained this information from public speakers (telling about the authors of this study carrying out this study in the community), neighbors or community leaders. Only 3

Table 4

Number (percent) of people who might be positively or negatively impacted by the construction/renovation and operation of the slaughterhouse ($n = 69$).

Group of people	Positive	Negative
Unemployed	28 (40.6)	11 (15.5)
Young adults (17-25 years)	24 (34.8)	15 (21.7)
Elderly (>60 years)	24 (34.8)	32 (46.4)
Teenagers (13-16 years)	23 (33.3)	15 (21.1)
Diseased/disabled	23 (33.3)	22 (31.9)
New mothers	23 (33.3)	18 (26.1)
Pregnant women	22 (31.9)	22 (31.9)
Drug addicts	22 (31.9)	19 (27.5)
Small children (0-4 years)	21 (30.4)	32 (46.4)
Alcohol drinkers	21 (30.4)	18 (26.1)
Mental disorder	21 (30.4)	19 (27.5)
Young children (5-12 years)	20 (29.0)	30 (43.5)

There were some missing data

heard about the project from the Municipality officers. Thirty-eight participants thought the public speakers were the best way to convey information to the community, followed by community leaders and flyers/leaflets. Six respondents (14%) knew about the HIA project.

Community concerns about construction/renovation and operation of the slaughterhouse

Most participants felt the construction/renovation project and operation of the slaughterhouse were positive. More than 15% raised concerns about the construction/renovation, specifically about the dust, noise, garbage, engine exhaust and theft/crime. More than 20% raised concerns about the operation of the slaughterhouse. Most had to do with cattle noise (43.5%), pests, dust and engine exhaust, garbage and waste disposal. Twenty-three point two percent were concerned about community conflict.

Those most affected were unem-

ployed (40.6%), young adults and the elderly. Those most negatively affected would be small children and the elderly (46.4%), children aged 5-12 years, diseased/disabled people and pregnant women (Table 4).

Health determinants

Nearly half the participants felt there would be positive changes, resulting from the renovation of the slaughterhouse, for themselves, the community, the environment (84.1%), community sanitation (81.2%), mental health (78.3%), religious beliefs (52.2%) and community participation (50.7%). The participants felt the least affected would be jobs and income (49.3%) (Table 5).

Two focus group discussions were conducted. The participants stated the negative aspects of the slaughterhouse included obstruction of the drainage system by waste water and excreta with it sometimes overflowing into the houses, odor especially on windy days, and the

Table 5
Number (percent) of health determinants affected positively or negatively by the renovation of the slaughterhouse.

Health determinant	Positive	Negative
Mental status	54 (78.3)	3 (4.3)
Community sanitation	56 (81.2)	5 (7.2)
Community environment	58 (84.1)	3 (4.3)
Jobs and income	34 (49.3)	4 (5.8)
Community participation	35 (50.7)	3 (4.3)
Religious beliefs	36 (52.2)	5 (7.2)

There were some missing data

road to the slaughterhouse is the same road used by the community for daily travel. They also complained the killing area could be easily seen by children outside the slaughterhouse and the killing process could be disturbing to children.

The participants felt the negative impact of the slaughterhouse could be significantly mitigated if the municipality installed a treatment pond and improved the community drainage system, reconstructed the slaughterhouse to meet adequate standards, built a fence around the slaughterhouse, provided a garbage collection point, made the killing room sound-proof, took care of theft/crime or moved the slaughterhouse elsewhere.

These findings show the residents of the community feel renovation of the slaughterhouse would result in a positive health impact on the community. The participants made a number of suggestions. The Municipality should communicate more effectively with the community via loud speakers, community leaders and flyers/leaflets. The Municipality should meet with the community to solicit their opinions about these types of issues. The renovation project should try to reduce dust

using wet techniques, manage garbage to reduce pests, limit the times in which construction materials are transported to the site during the day time while most people are at work and provide community security. Once operational, the slaughterhouse should have the drainage system inspected monthly. A fence should be built around the slaughterhouse to prevent children from getting in, noise control measures should be put into place to reduce noise from the cattle and the killing process, debris from the slaughtering process should be disposed of daily and the number of cows in the rest area should be limited to no more than 8 at a time.

DISCUSSION

Slaughterhouses pose potential risks to the environment; the most obvious being biological risks (Gomaa *et al*, 2003). Salmonella, Campylobacter, Enterococcus, Enterobacteriaceae and bovine spongiform encephalopathy (BSE), are of concern (Lücker *et al*, 2002). Some serotypes of Salmonella have become established in sewage systems of slaughterhouses and in sewer rats (Søgaard and Nielsen, 1979). This poses a health risk to the sur-

rounding community and contaminated carcasses and meat pose a health risk to consumers (Hurd *et al*, 2008). Some countries continuously monitor microbial hazards on farms, in slaughterhouses and processing lines for food safety (Rho *et al*, 2001).

The authors conducted a HIA using a tool developed as previously described (Hengpraprom and Sithisarankul, 2011). The slaughterhouse was perceived negatively by the surrounding community. The respondents realized the slaughterhouse had been there long before they came to live there. They were happy to hear the slaughterhouse would be renovated; some stated they preferred the slaughterhouse moved elsewhere. Our HIA had 2 positive aspects; first, we tried out a newly developed HIA tool and found it practical in a small scale project; second, the Municipality heard the community's opinions and concerns and the community knew their opinions were heard by the Municipality, so they felt more positive about the Municipality. We hope this HIA tool can help solve other conflicts in Thailand.

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