



Assessment of Hygienic Practices among Pig Slaughterhouses and Markets in Chiang Mai Province, Thailand

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Outline

- Introduction
 - Materials and Methods
 - Results
 - Discussion
 - Conclusion
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Introduction

Background and rationale

➤ Foodborne illness

- 2.2 million people worldwide die each year (WHO, 2000) caused by microbiological agents and chemical contaminants
- 3 major causes of diarrheal diseases in Thailand
 - Poor personal hygiene (Setiabundhi et al., 1997)
 - Contaminated food and drinking water (Al-Mutairi, 2011)
 - Poor consumption behaviors (Bhandare, 2007)

Background and rationale

➤ Consumption meat in Thailand in 2011

Table 1. Meat consumption per capita in Thailand, 2011

Meat	Unit (kg/person/year)
Broiler ¹	16.3
Pork ²	14.2
Beef ³	2.2
Duck ⁴	1.2

Sources:

¹ Thai broiler processing exporters association

² Swine producers and processors for exporting association

³ Department of Livestock Development (Bovine strategic plan 2012-2016)

⁴ Duck Breeders Association for Trading and Export

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Background and rationale



➤ Pig production chain in Thailand



Background and rationale

Knowledge, Attitudes, Practices (KAP) assessment

A representative study of a specific population to collect information on what is known, believed and acted on in relation to a particular topic (WHO, 2008) by using questionnaires.



Objectives

- To assess the level of KAP of selected stakeholders in slaughterhouses and markets
- To assess the level of microbiological findings that indicated the hygiene in slaughterhouses and markets

Materials and Methods

Research type

- **Cross-sectional study (November 2014 – April 2015)**

Sampling plan

Slaughterhouses

- Select all registered slaughterhouses of DLD lists in Chiang Mai and Lamphun provinces

12

Sampling plan: Markets

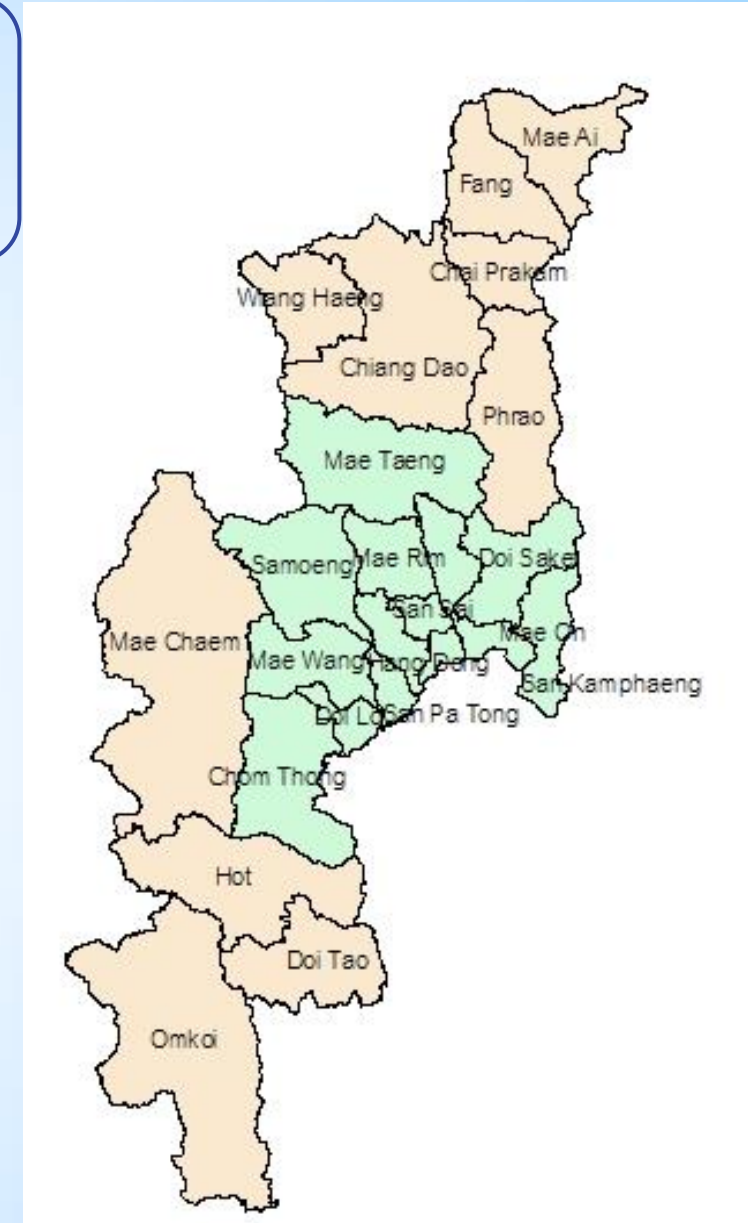
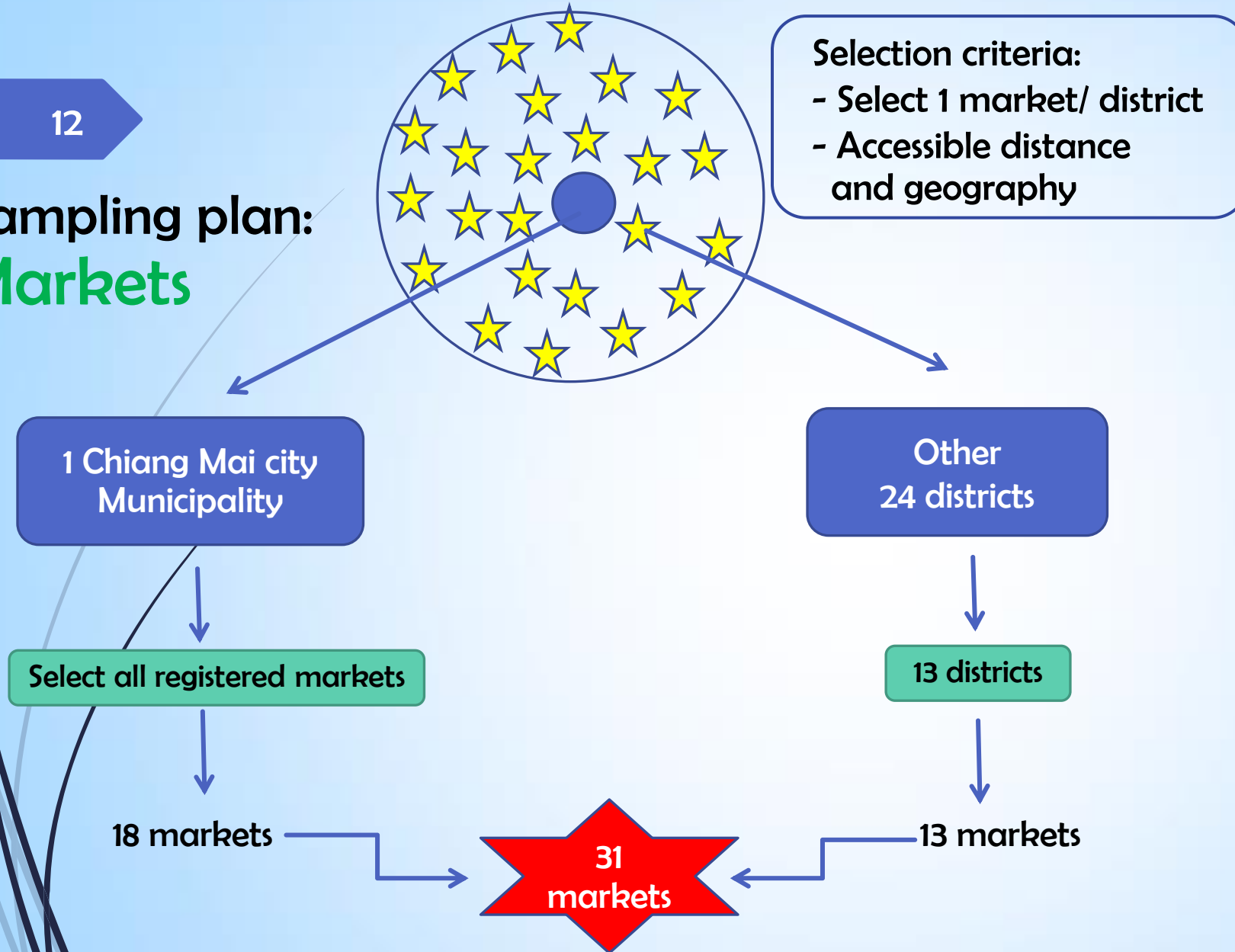


Figure 1. Sampling plan of markets in Chiang Mai province

Data collection from KAP study and microbiological examination

Microbiological Examination (n=132)

13

2 SH workers/SH
(n=32)

SH

- Carcass swab (n=40)
- Knife swab (n=8)
- Cutting board swab (n=4)
- Hand washing (n=16)

KAP questionnaire
(n=94)

2 Pork sellers/
market (n=62)

MK

- Pork sample (n=16)
- Knife swab (n=16)
- Cutting board swab (n=16)
- Hand washing (n=16)

Collect all of
SH and MK

SH: Slaughterhouse
MK: Market

Collect 50% of
total number of
SH and MK

Data collection

☐ KAP

Key informant

- Personal hygiene
- Cross contamination
- Food borne illness
- Time & temperature control

Part 2

No	Knowledge	Yes	No	Do not know
A	Personal hygiene			
1	Personal hygiene is about general body cleanliness.			
2	Washing their hands regularly is a part of personal hygiene.			
3	Washing hands properly reduce risk of contamination.			
4	Workers should avoid touching their body after washing hands.			
5	Wearing apron is a part of personal hygiene.			
6	Wearing jewelry or accessory should be avoided.			
7	In case of have wound in their hand,it should be treated that wound and wear gloves.			
B	Cross-contamination			
1	Cross-contamination is transferred of microorganisms from a contaminated surface, equipments, other foods to food that is not contaminated.			
2	Use of gloves reduce the risk of microbial contaminationto the meat			
3	In case of gloves breakage, It is not necessary to change the new one.			
4	Clean knives with hot water reduce the risk of microbial contamination.			
5	Correct cleaning procedures of equipment increase risk of infection.			
6	It is necessary to separate zones between dirty and clean workspaces.			
C	Foodborne illness			
1	Foodborne disease is a diarrheal disease that transmit to people.			
2	Salmonellosis is one of foodborne illness.			
3	Foodborne disease caused by bacteria only			
4	Workers can only get sick if they have contact with animal blood during work activity			
5	<i>Streptococcus suis</i> relatedwith foodborne Illness			
D	Time and temperature control			
1	Time and temperature are important factors to control of bacterial growth			
2	Bacteria growth very rapidly at 4°C			
3	Chilling process can destroy bacteria in food			
4	High temperature has been recognised as a safe method to destroy bacteria			

Data collection

❑ Microbiological examination

At Slaughterhouse:

- Carcass swab (n=40)
- Knife swab (n=8)
- Cutting board swab (n=4)
- Hand washing (n=16)

At market:

- Pork sample (n=16)
- Knife swab (n=16)
- Cutting board swab (n=16)
- Hand washing (n=16)

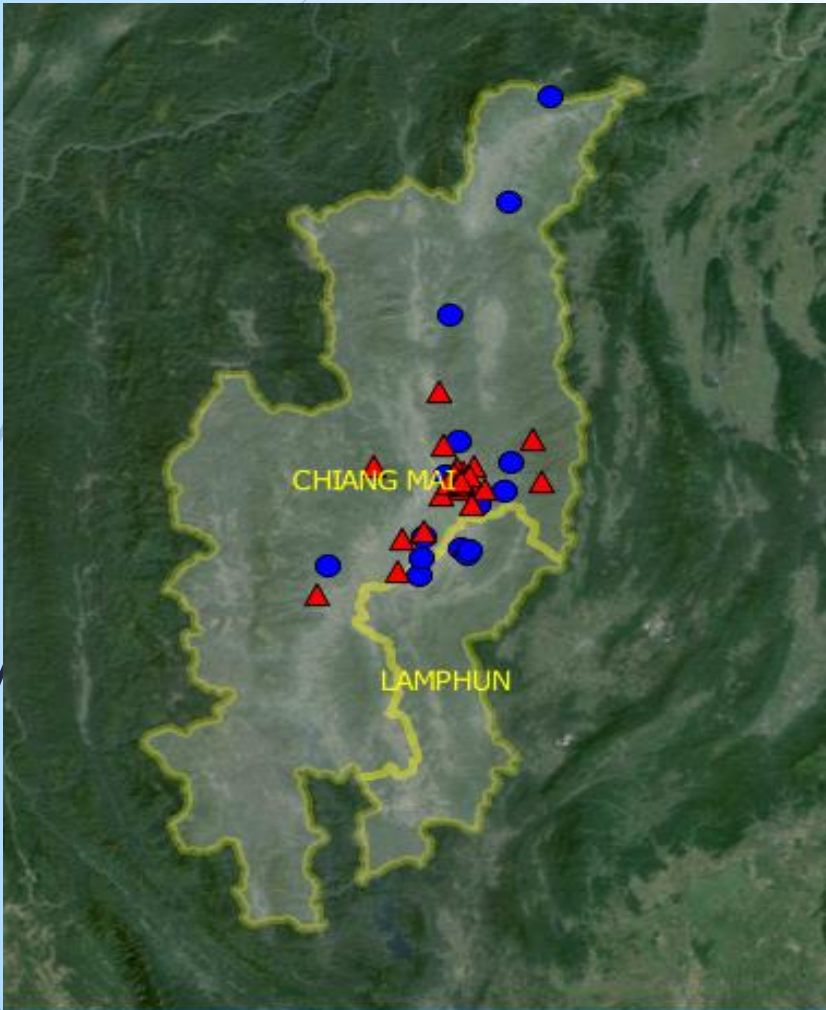
- Total viable count (ISO: 4833, 2003E)
- *Enterobacteriaceae* count (ISO: 21528-2, 2002)

Data analysis

- **Descriptive analysis by using R program (version 3.1.3)**

Results

KAP questionnaires



- ❑ Collected 32 questionnaires from 16 slaughterhouses (2/SH)
- ❑ Collected 51 questionnaires from 29 markets (2/MK)

● SLAUGHTERHOUSE (16)
▲ MARKET (29)

Key of demographic characteristic in slaughterhouse workers and sellers

- ➡ **Gender** : 85% of SH workers are male
75% of sellers are female
- ➡ **Educational level** : 40% of both sellers and SH workers -> primary school or less
- ➡ **Working Experiences** : More than 60% → > 5 years
- ➡ **Race** : SH workers → 80% are Thai but for 20% are Myanmar and ethnic hill tribe
Pork sellers → all are Thai

Knowledge of respondents

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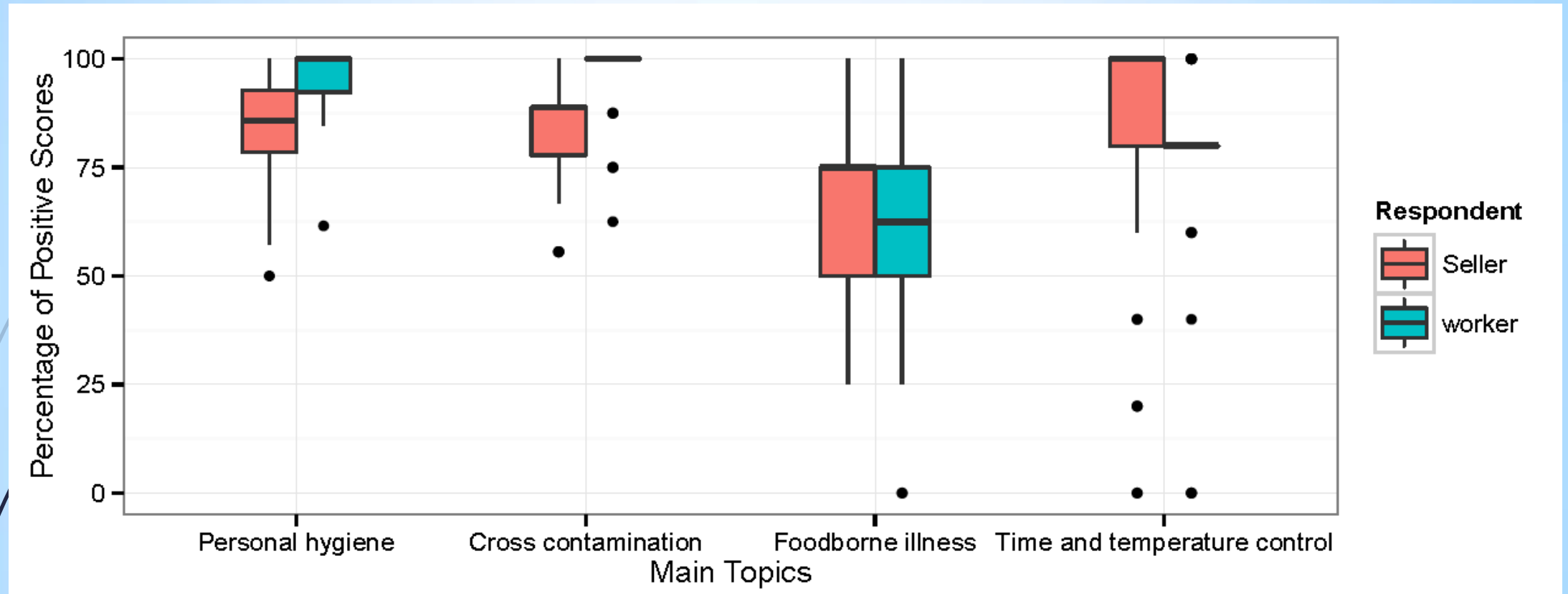


Figure 2. Comparison of boxplot distributions for respondents correct answer (%)

- ❑ Knowledge of respondent is vary between slaughterhouse workers and sellers
- ❑ Range of respondent' knowledge is wider for sellers

Attitude of slaughterhouse workers

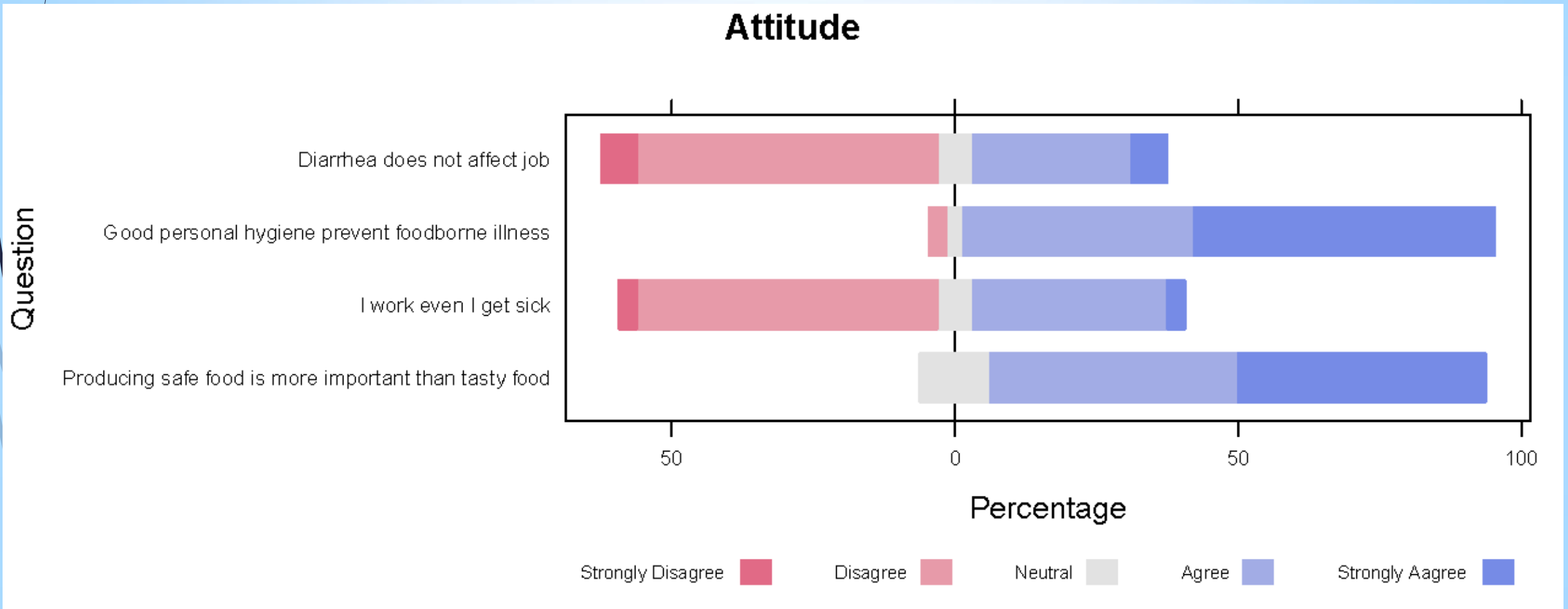


Figure 3. The response of slaughterhouse workers (percentage) to attitude statements related to food safety

Attitude of sellers

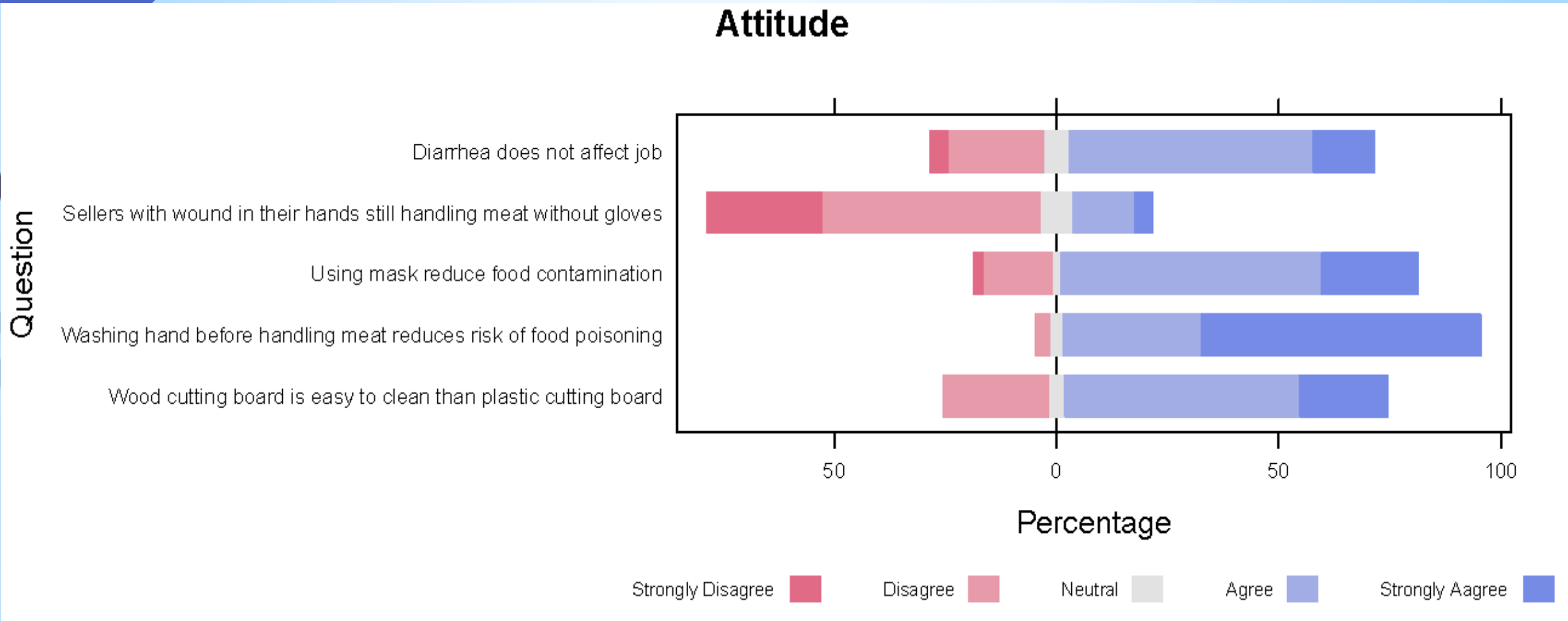


Figure 4. The response of pork sellers (percentage) to attitude statements related to food safety

Practice of slaughterhouse workers

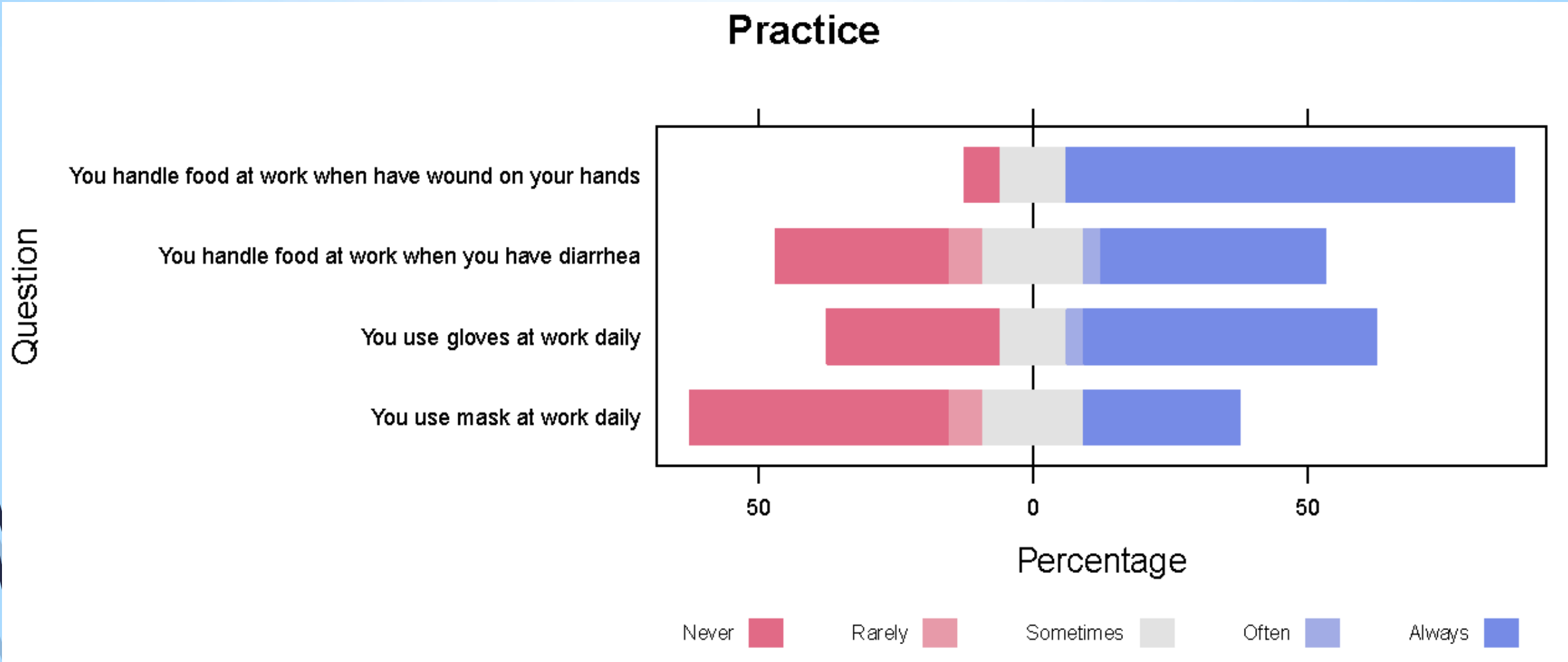


Figure 5. The response of slaughterhouse workers (percentage) to practice statements related to food safety

Practice of sellers

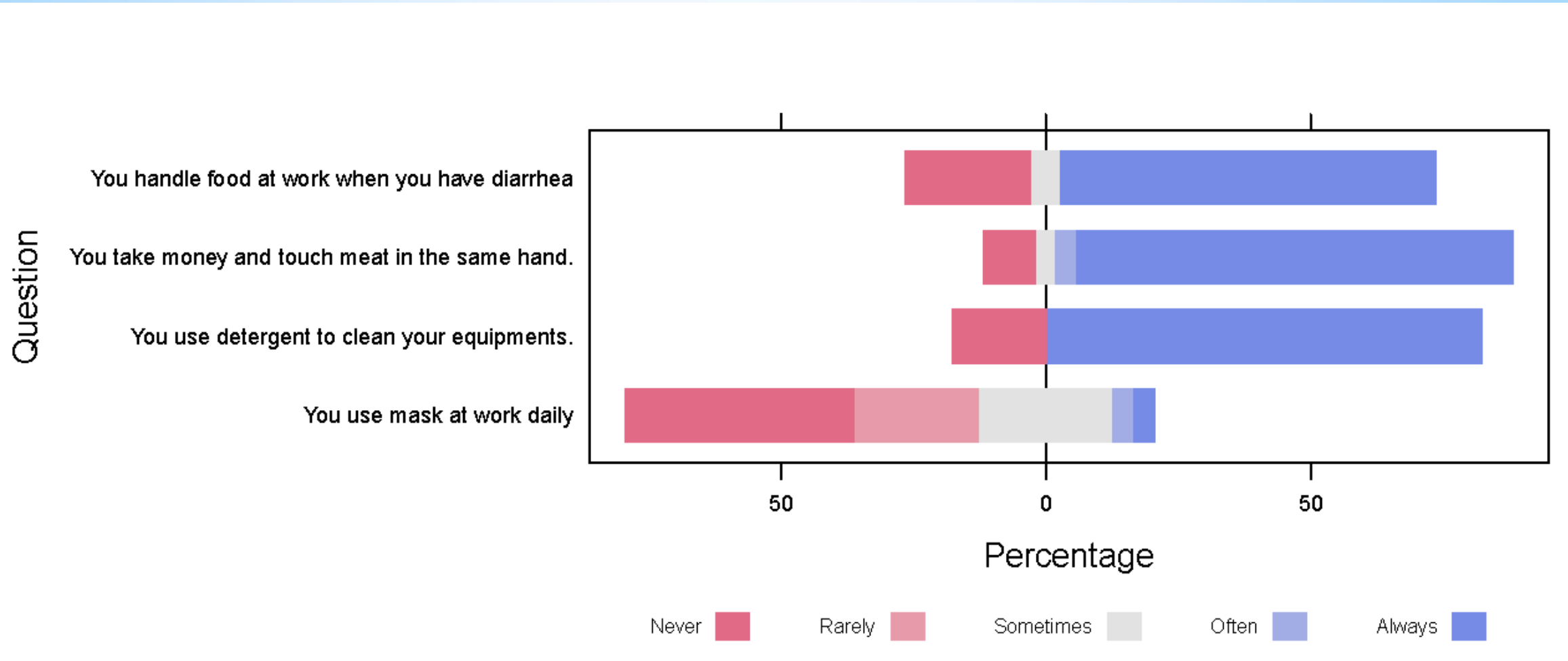


Figure 6. The response of pork sellers (percentage) to attitude statements related to food safety

Microbiological examination in slaughterhouses

Table 2. Total viable counts and *Enterobacteriaceae* counts in different types of samples at slaughterhouses

	Samples	Unit	n	Mean±SD	Median
Slaughterhouse Total viable count	Carcass	log cfu/cm ²	40	3.09±1.34	3.45
	Knife	log cfu/cm ²	8	2.69±0.90	2.74
	Cutting board	log cfu/cm ²	4	3.13±1.59	2.53
	Hand washing	log cfu/100 ml	16	6.79±0.70	6.80
Slaughterhouse <i>Enterobacteriaceae</i> count	Carcass	log cfu/cm ²	40	0.03±1.08	0.04
	Knife	logcfu/cm ²	8	-0.06±0.02	-0.09
	Cutting board	log cfu/cm ²	4	0.61±1.02	0.83
	Hand washing	log cfu/100 ml	16	2.90±0.80	2.68

Microbiological examination in markets

Table 3.Total viable counts and *Enterobacteriaceae* counts in different types of samples at markets

	Samples	Unit	n	Mean±SD	Median
Market Total viable count	Pork	log cfu/g	16	5.50±0.39	5.43
	Knife	log cfu/cm ²	16	3.88±0.98	4.00
	Cutting board	log cfu/cm ²	16	5.26±0.77	5.24
	Hand washing	log cfu/100 ml	16	8.02±0.95	7.92
Market <i>Enterobacteriaceae</i> count	Pork	log cfu/g	16	2.55±1.43	2.95
	Knife	log cfu/cm ²	16	1.71±1.33	1.66
	Cutting board	log cfu/cm ²	16	2.31±1.15	2.21
	Hand washing	log cfu/100 ml	16	4.82±1.72	5.55

Discussion

Discussion

- ❑ Slaughterhouse workers and pork sellers got the lowest scores about food borne illness.
- ❑ Need to enhance food borne knowledge and training programs

Attitude versus practice of sellers

Table 3. Attitude versus practice of sellers

Attitude versus practice	Topics	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Attitude	Using mask is important in reducing risk of food contamination.	11 (21.6%)	30 (58.8%)	1 (2.0%)	8 (15.7%)	1 (2.0%)
	Topics	Always	Often	Sometimes	Rarely	Never
Practice	You use mask at work daily.	2 (3.9%)	2 (3.9%)	13 (25.5%)	12 (23.5%)	22 (43.1%)

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Criteria:

Lab carcass (TVC)

≤5 log Accept
>5 log Poor

Lab pork (TVC):

≤5x10⁵ cfu/g Accept
>5x10⁵ cfu/g Poor

Lab knife, cutting board (TVC)

≤10/cm² Accept
>10/cm² Poor

Lab hand washing
(TVC): log cfu/100ml
Do not have standard

Microbiological examination in markets

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>5x10⁵ cfu/g Poor

Lab knife, cutting board (TVC)

≤10/cm² Accept

>10/cm² Poor

Lab hand washing

(TVC): log cfu/100ml

Do not have standard

Microbiological examination

Samples	Mean of Total viable count	Mean of <i>Enterobacteriaceae</i> count
Carcass (log ₁₀ cfu/cm ²)	3.09 ± 1.34	0.03 ± 1.08
Pork (log ₁₀ cfu/g)	5.50 ± 0.39 Poor standard	2.55 ± 1.43

Criteria:

Lab carcass (TVC)

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Lab pork (TVC):

≤5x10⁵ cfu/g Accept

>5x10⁵ cfu/g Poor

Lab knife, cutting board (TVC)

≤10/cm² Accept

>10/cm² Poor

Lab hand washing
(TVC): log cfu/100ml
Do not have standard

Conclusion

Conclusion

- ❑ Slaughterhouse workers and sellers got the lowest scores about food borne illness.
- ❑ Some attitudes are not in accordance with their practices.
- ❑ Apart from training programs, there is a need to better understanding about cross contamination problem in pork production chain and government should realize the real problem and cooperate with stakeholders to find the techniques or solve problems together.

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THANK YOU