A Gastroenteritis Outbreak of Rotavirus Genotype G3P[8] in a Secondary School in Pathum Thani Province, Thailand, 2022

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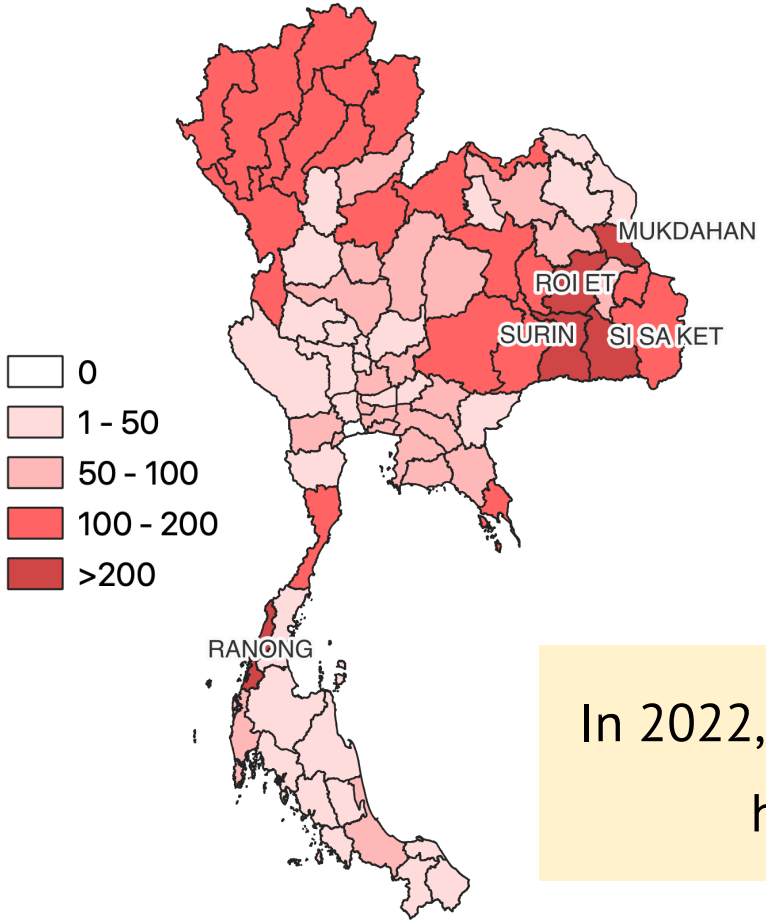
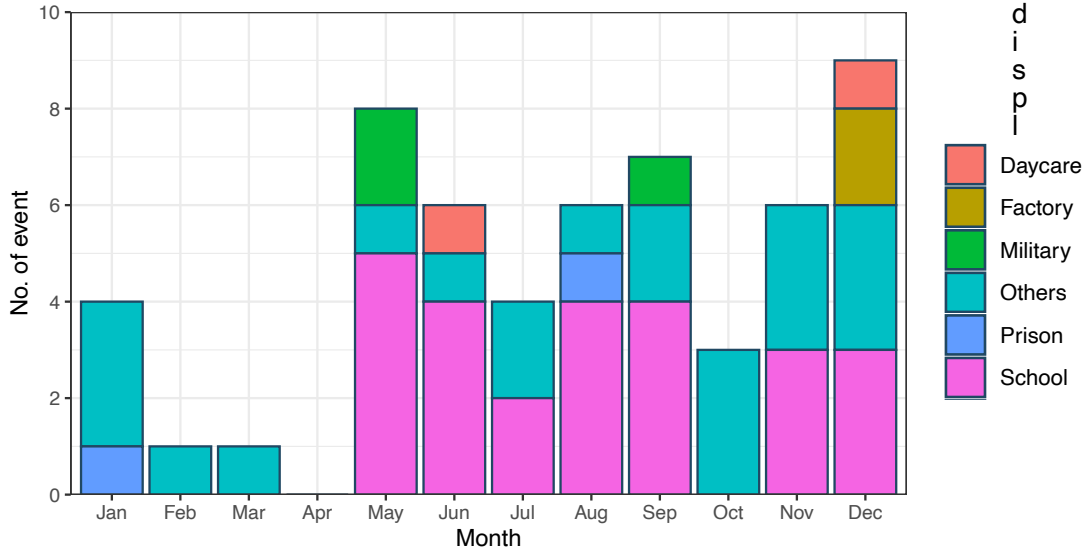
Food poisoning and gastroenteritis outbreaks in Thailand, 2022

No. of **food poisoning/gastroenteritis cases**



No. of **food poisoning/gastroenteritis events** by type of setting



In 2022, Thailand reported 56 outbreaks of food poisoning/gastroenteritis, half of the which (28/56) occurred in **schools and daycares.**

Background

On 14 Sep 2022, the Division of Epidemiology was notified of a cluster of around **400 students with acute gastroenteritis** in a secondary school in Khlong Si Subdistrict, Khlong Luang District, Pathum Thani Province. A joint investigation was conducted during 15–16 Sep 2022.

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Objectives

Confirm the outbreak and diagnosis

Describe its epidemiological characteristics

Identify possible sources and risk factors

Provide recommendations

Methods

1. Descriptive study

- Active case finding >> via interview & online questionnaire.
- Operation definitions were set as;
  - **Suspected cases** - Students/staff who had ≥1 symptoms during 27 Aug to 21 Sep 2022: diarrhea, mucus in stool, stomachache, nausea, and vomiting.
  - **Confirmed cases** - Suspected cases who tested positive for GI pathogens in stool or vomitus.

2. Laboratory study

- Specimens were tested for GI pathogens using **bacterial C/S and RT-PCR for rotavirus and norovirus.**
- Positive specimens were randomly selected and sent for Sanger sequencing.

Methods

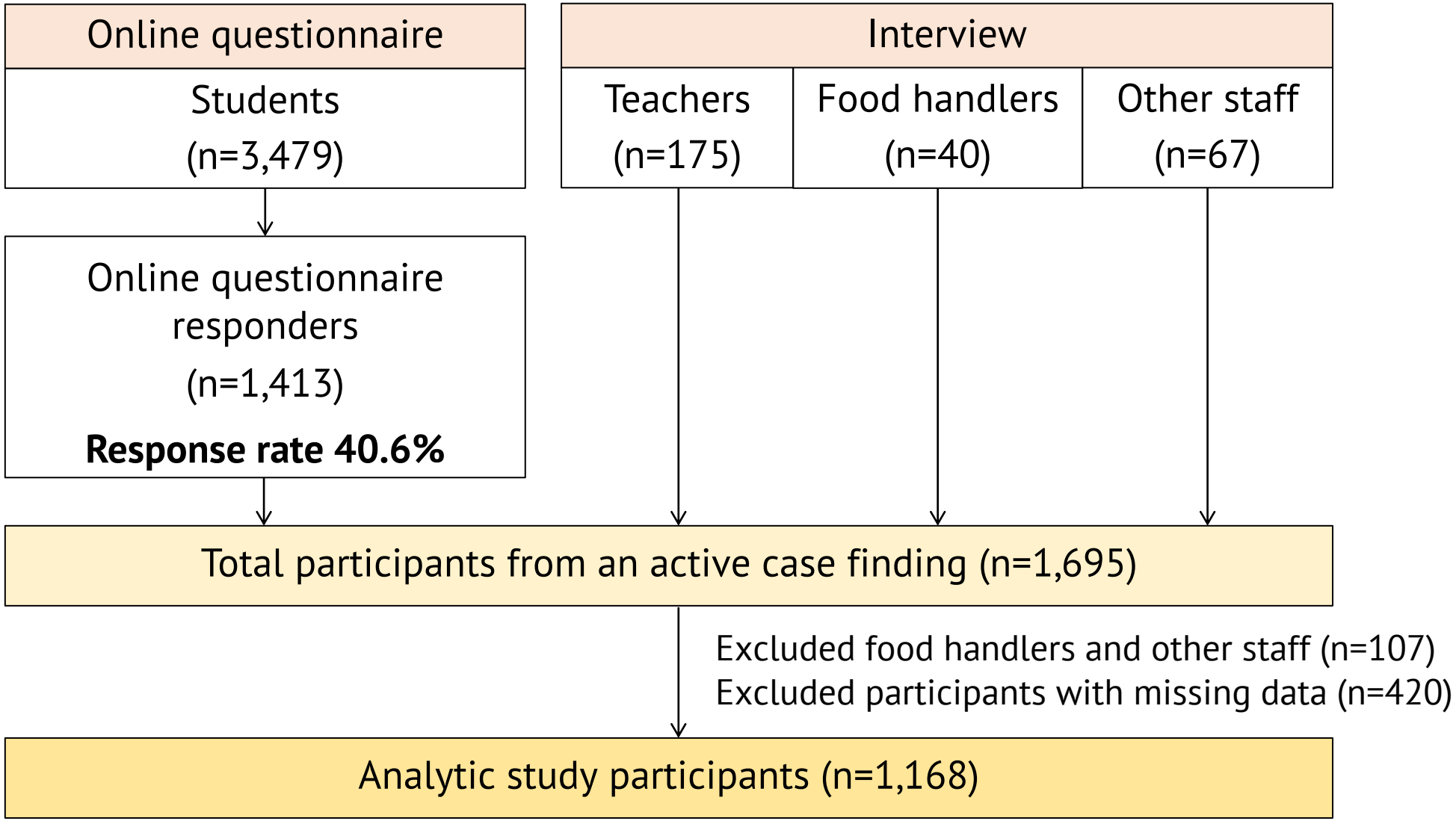
3. Environmental study

- A **walkthrough survey** was conducted. >> school canteen, water supply system, toilets
  - Free residual chlorine was tested using a digital colorimeter.
- In-depth interviews of food handlers, canteen manager, and canteen janitors were done.

4. Analytic study

Study design	**Retrospective cohort study**
Study participants	Students and teachers who responded to online questionnaire or were interviewed
Dependent variables	**Being either a suspected or a confirmed case**
Independent variables	**History of food or beverage consumption in the canteen,** gender, age, occupation, sanitation behaviors
Analysis	Univariable and multivariable logistic regression models

Participant recruitment process



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Demographic data of cases

Total 684 cases

M : F 1 : 1.32

Median age 15 years (Q_1-Q_3 14-17 years)

97% of cases **dined in the school canteen** in the past 2 days

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Position	n	Suspected	Confirmed	Attack rate (%)
Student	**1,413**	**636**	**20**	**46.4**
Teacher	175	14	7	12.0
Food handler	40	0	2	5.0
Other staff	67	1	4	7.5
Total	1,695	651	33	**40.4**

Grade	Case no./total no.	Attack rate (%)
7	94/197	47.7
8	93/206	45.1
9	102/273	37.4
10	116/221	52.5
11	86/163	52.8
12	145/333	43.5

Demographic data of cases

Top five most common **presentations**

Diarrhea (85%)

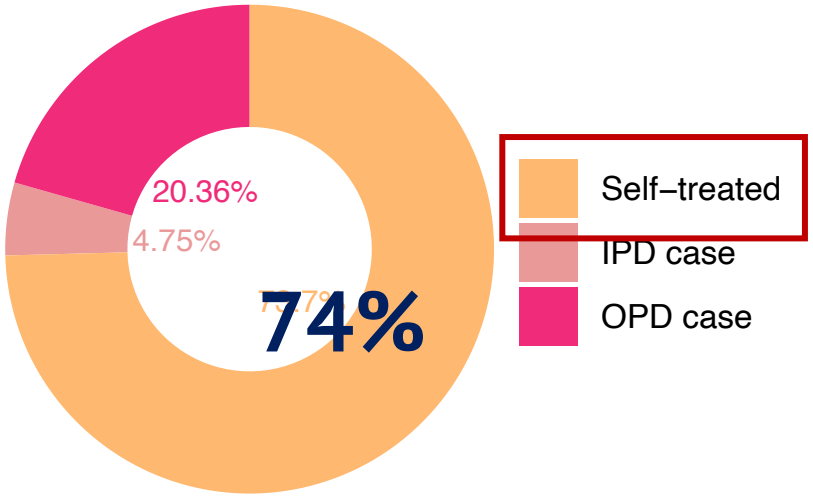
Stomachache (79%)

Vomiting (65%)

Fever (57%)

Nausea (50%)

Treatment status of gastroenteritis cases

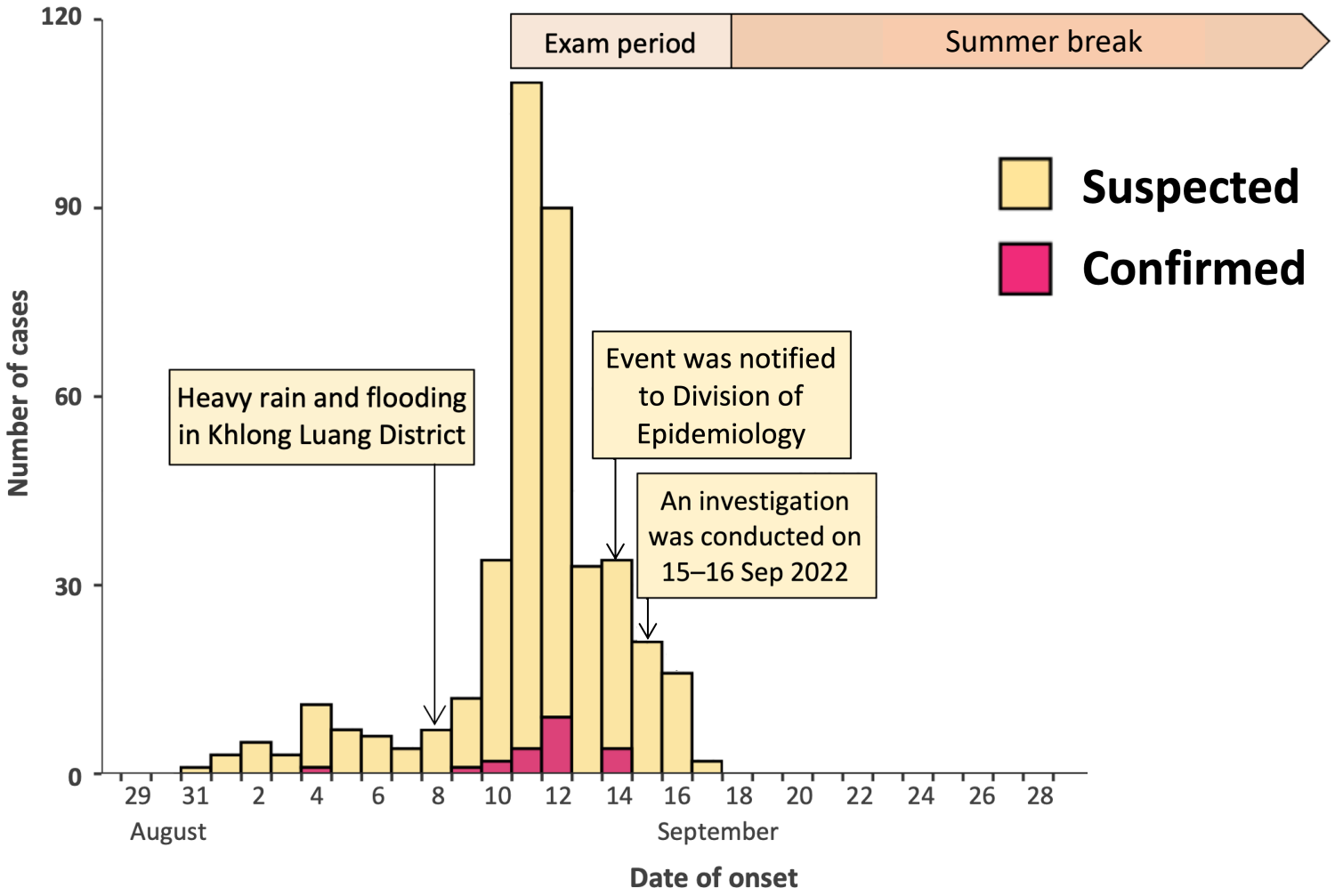


25 cases were hospitalized.

- Median admission duration = 3 days (Q_1-Q_3 2-4 days)
- All cases had mild-moderate dehydration.
- There was no report of shock/death.

Timeline of the outbreak

Epidemic curve of the gastroenteritis outbreak in the secondary school in Khlong Luang District, September 2022 (n=396)



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Laboratory results

Source	Viral PCR		Bacterial culture	
	No. of isolates (samples)	Pathogen (n)	No. of isolates (samples)	Pathogen (n)
Students/teachers **(stool samples)**	13/26	**Rotavirus G3P[8] (1)** **Rotavirus, untyped (10)** Norovirus (2)	6/26	*S. aureus* (3) *B. cereus* (2) *V. cholera* non-O1 (1) *P. shigelloides* (1) *Aeromonas hydrophila* (1) *Aeromonas veroii* (1)
[illegible]	[illegible]	**Rotavirus G3P[8] (1)**	[illegible]	*P. shigelloides* (1)
[illegible]	[illegible]	[illegible]	[illegible]	*Aeromonas spp.* (1)

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Additional 14 samples from students who visited hospitals were positive for **rotavirus.**

Environmental samples (e.g., water from various sources, ice specimens, and surface swabs) were positive for mixed enteropathogenic bacteria, however, **rotavirus could not be detected.**

Environmental survey

- The school had one canteen for every school members.
- There were 12 food stores, 5 snack stores and 2 beverage stores in the canteen.
  - Each store had a separate cooking area.
  - Food handlers prepared their own cooking ingredients.
- **Unfiltered water from a faucet in the canteen was used for cooking and preparing beverages.**
- Food handlers with GI symptoms still came to work. Some of them used their bare hands to prepare and serve food.

Canteen

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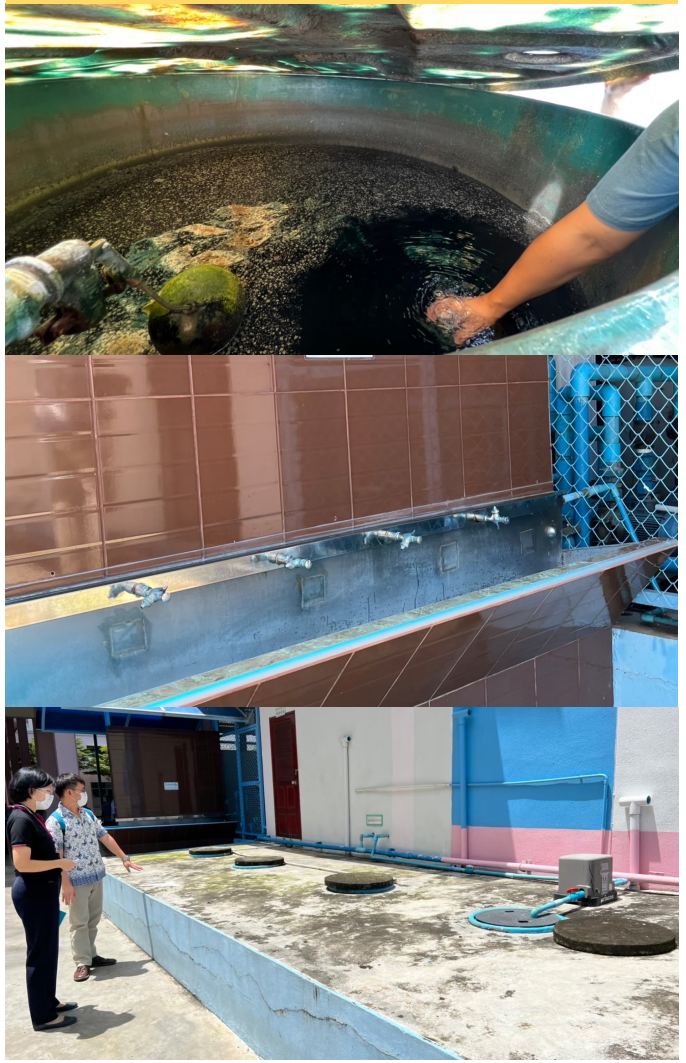
Environmental survey

- Groundwater was the main water supply in the school.
  - Utility water and water supplying the canteen came from groundwater wells.
  - **Routine water quality testing was disrupted** due to COVID-19 pandemic.
  - **There was no groundwater treatment system.**
  - The groundwater well is located near a **cesspool and sewer pipes.**

Water supply system



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Analytic study

Variable	Crude RR (95% CI)	Adjusted OR[a] (95% CI)	% PAF (95% CI)
Male (vs. female)	0.97 (0.82-1.13)	0.99 (0.76-1.29)	
Student (vs. teacher)	0.98 (0.61-1.59)	1.02 (0.47-2.20)	
Exposure to any foods/drinks from the canteen	**2.54 (1.52-4.22)**	**2.35 (1.22-4.51)**	**55.48 (17.51–76.46)**
Washing hands before eating	0.88 (0.75-1.05)	0.92 (0.71-1.20)	
Bringing one's own lunch	0.37 (0.20-0.68)	0.55 (0.23-1.32)	
Bringing one's own drink	**0.74 (0.62-0.87)**	**0.66 (0.50-0.88)**	
Bringing one's own utensils	0.58 (0.44-0.77)	0.67 (0.42-1.06)	

[a]Adjusted for all variables shown in the table.

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Interpretation of data

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- This event was a **gastroenteritis outbreak in a secondary school** with an attack rate of 40%.
  - This event was one of the largest food poisoning outbreaks in Thai educational institutions.
- **Rotavirus G3P[8]** was the most likely pathogen responsible for the outbreak.
  - Almost half of the specimens (11/26) from cases were positive for rotavirus.
  - Other pathogens were detected but in small number and without epidemiological linkages.

Interpretation of data

- **Contaminated canteen water supply** was the most likely source of the outbreak with the following reasons;
  - The cases were evenly distributed across student grades and classes, suggesting a common source of exposure.
  - Every stores in the canteen used groundwater for cooking, which resulted in cross-contamination.
  - The proximity of the groundwater well to a cesspool and the lack of a water treatment system were noted.
- **The flooding** may have contributed to the contamination of the water.
  - This outbreak was preceded by a period of heavy rain which resulted in flooding in Khlong Luang District.

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Actions taken

- **The groundwater wells were shut down.**
- Groundwater treatment system installation was planned.
- Water from drinking water factory is being used for cooking in the meantime.

- Food handlers were not permitted to work until **their stool examinations were negative.**

- Cases were monitored for about a week after school re-opening.
- **Active surveillance of gastroenteritis outbreaks were conducted in high-risk spots** (e.g., kindergartens, daycare centers).

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Follow-up

✓No gastroenteritis cases were detected within 1 week after school re-opening.

✓No other gastroenteritis outbreaks were detected in Khlong Si Sub-district by active surveillance.

Limitations

- **Non-response bias** - The response rate to our survey was 40%. Cases were more likely to respond to the survey, leading to an overestimate of the attack rate.
- **Lack of laboratory confirmation for rotavirus in the water samples** - This was probably due to the higher detection limit of the conventional PCR method and the delay in specimen collection.
- **Uncooperativeness of food handlers** - Some food handlers were unwilling to provide information about their history of illness within the past month and refused to consent to specimen collection.

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Public health implications

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Contaminated drinking water is a key public health risk. To ensure the safety of the water supply, **routine water quality testing** and the **installation of a water treatment system** are recommended.

Organizations esp. schools should **ensure food and water safety** and require food handlers to follow good hygiene practices and refrain from work when sick.

- **Routine sanitation protocols should be re-established** after COVID-19 disruptions.

Gastroenteritis outbreaks should be closely monitored esp. **during and after floods**.

Acknowledgements

- The joint investigation team from the Division of Epidemiology, Department of Disease Control
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- Pathum Thani Provincial Public Health Office
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- Khlong Luang District Public Health Office
- Khlong Luang Hospital
- Khlong Si Health Promotion Hospital

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Q & A

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