



# **Risk Factors Associated with a Norovirus Outbreak in Baguio City, January 2024: An Epidemiological Study**

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doh.gov.ph

# Introduction

January 10, 2024:

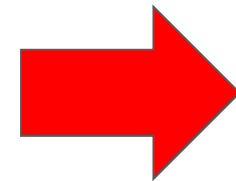
ESR Submitted by Center for  
Health Development -  
Cordillera Administrative  
Region (CAR)



# Outbreak Declaration!

January 10, 2024:

ESR Submitted by Center for Health Development - Cordillera Administrative Region (CAR)



## Baguio declares acute gastroenteritis outbreak

By Liza Agoot

January 10, 2024, 9:23 pm



**DRINK SAFE WATER.** Baguio City Mayor Benjamin Magalong urges the public to drink bottled or boiled water and avoid drinking directly from the tap whether at home or in establishments. The city government has declared an outbreak of gastrointestinal cases on Wednesday (Jan. 10, 2024) after cases rose to 1,609 at around 3 p.m. during the day. *(Photo from Baguio City PIO Facebook account)*

# Deployed for investigation

January 10, 2024:

ESR Submitted by Center for Health Development - Cordillera Administrative Region (CAR)



## Baguio declares acute gastroenteritis outbreak

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January 11, 2024:

A team from **EB, CHD CAR** and **Baguio City HSO** was deployed to investigate



# Objectives



Epidemiology  
of the outbreak



Associated risk  
factors



Guide public  
health actions

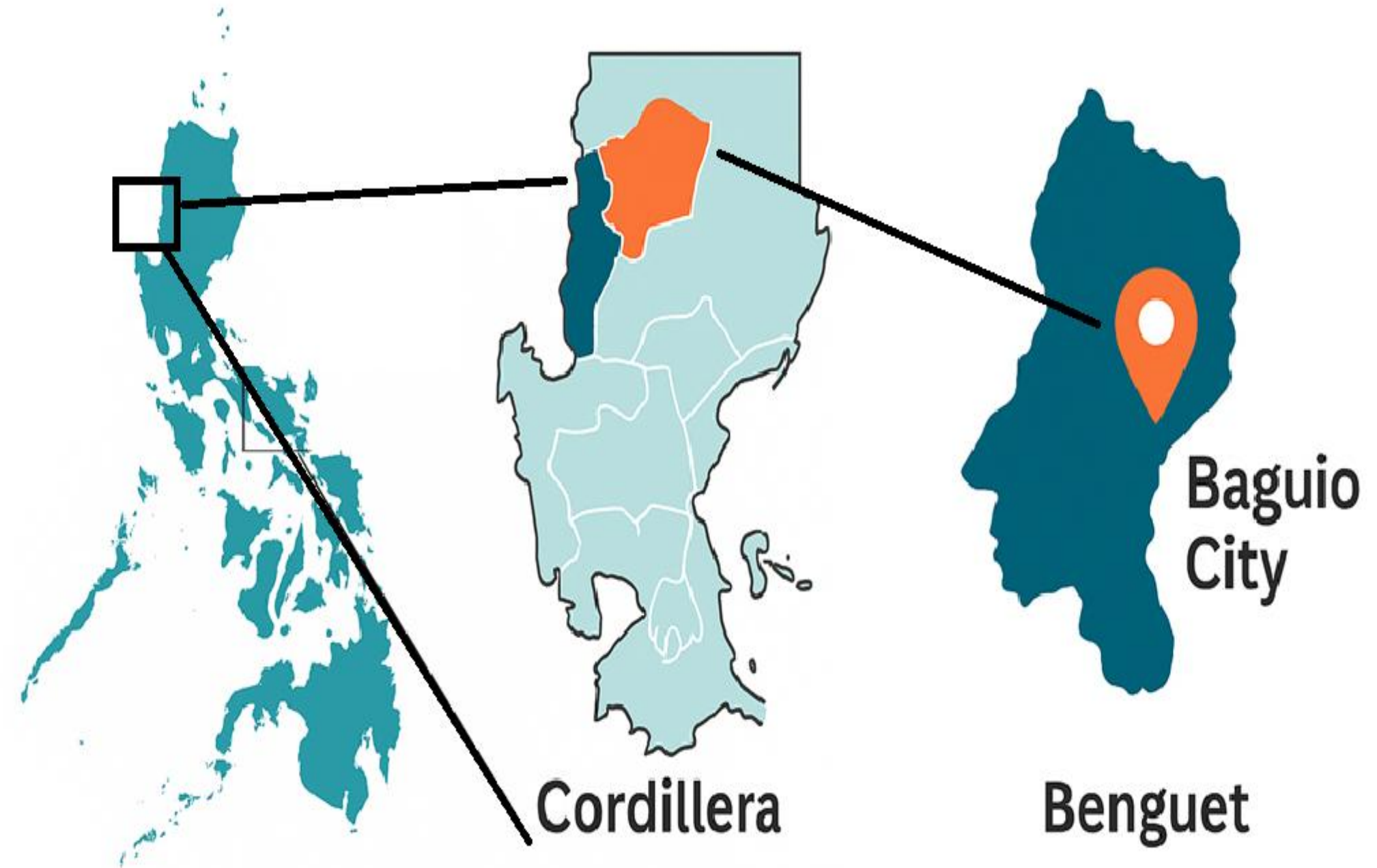
# Background

- **Diarrhea** is a leading cause of morbidity in the Philippines (38.08/100,000 cases, 2021).
- **Norovirus** detected in ~21% of childhood diarrhea cases (Philippines, 2016–2023).
- Highly contagious: **spreads via food, water, and contact.**



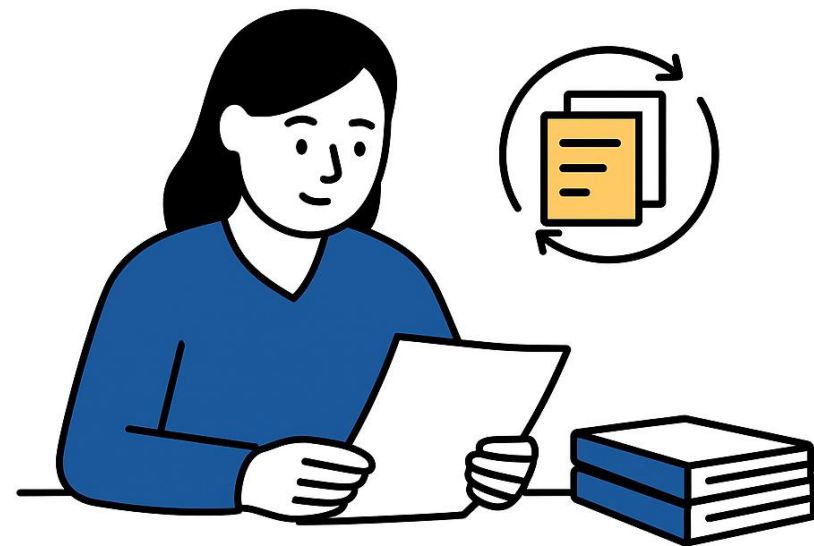
# City of Baguio

- **Population:** ~ **366,358** (128 villages)
- **Economy:** tourism
- **Health system:** 1 city health office, 16 health centers, 6 hospitals
- **Geographic challenges:** steep slopes, **uneven access to water**
  - Seasonal shortages, topographic constraints

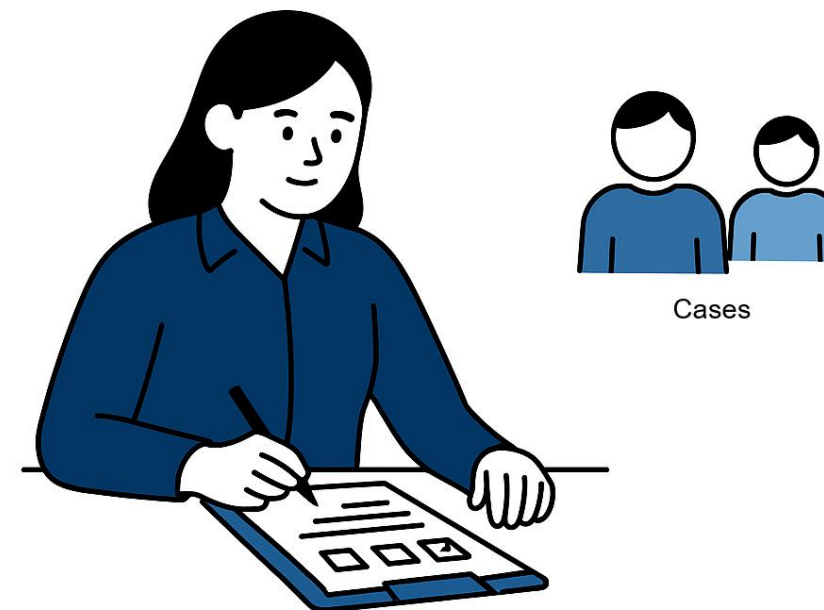


# Descriptive (Quantitative and Qualitative)

## Review of Records



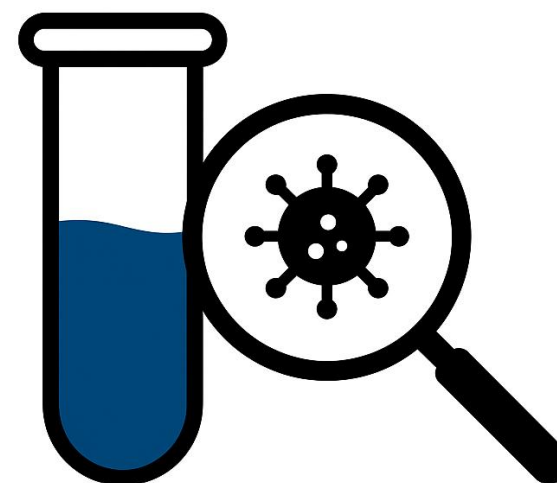
## Interview using a standardized questionnaire



## Key Informant Interview



## Laboratory Confirmation



## Environmental Survey



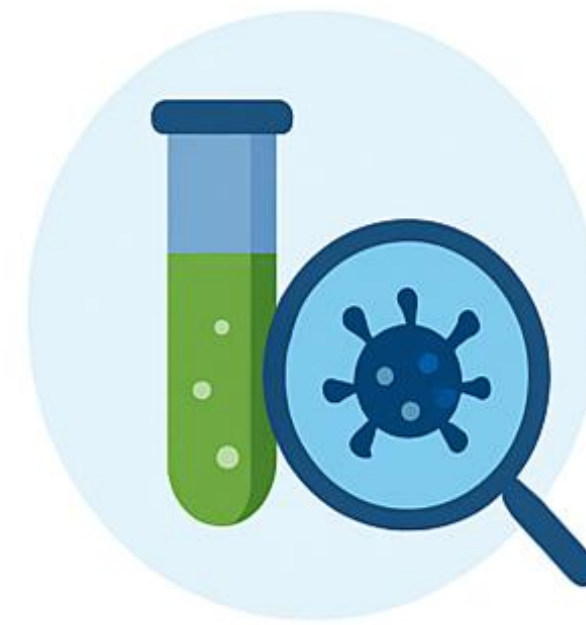
# Case definitions

A suspected case was defined as a previously well individual, residing in Baguio City, who developed acute watery diarrhea ( $\geq 3$  times per day) with onset between December 26, 2023 and January 15, 2024.



## SUSPECTED

Acute watery diarrhea  
( $\geq 3$  times per day)



## CONFIRMED

Positive bacteriologic/  
virologic test

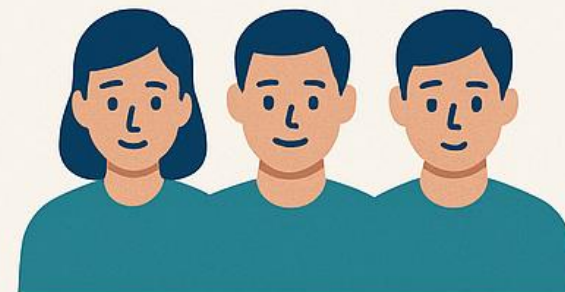
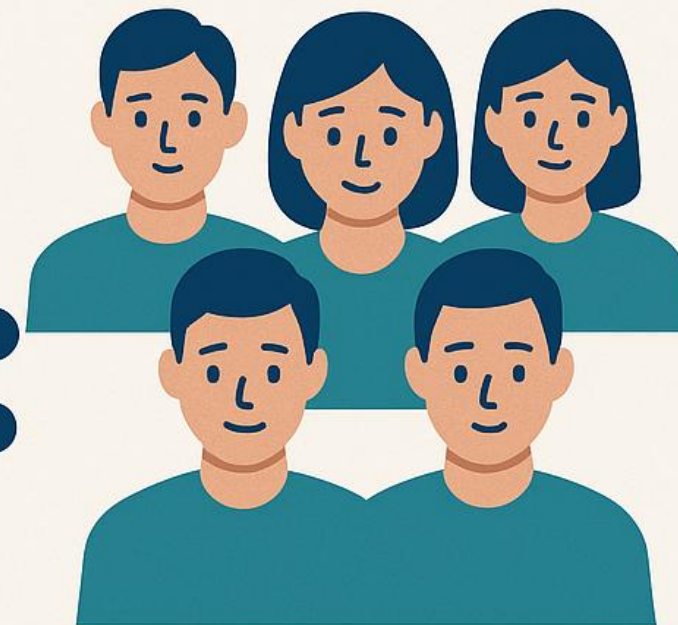
# Case-Control Study (Unmatched)

## 1:2 CASE-CONTROL STUDY

CASES



CONTROLS



# Case-Control Study (Unmatched)

## Case (30)

- A Suspected OR Confirmed Case
- Onset: **Dec 26, 2023 – Jan 5, 2024**

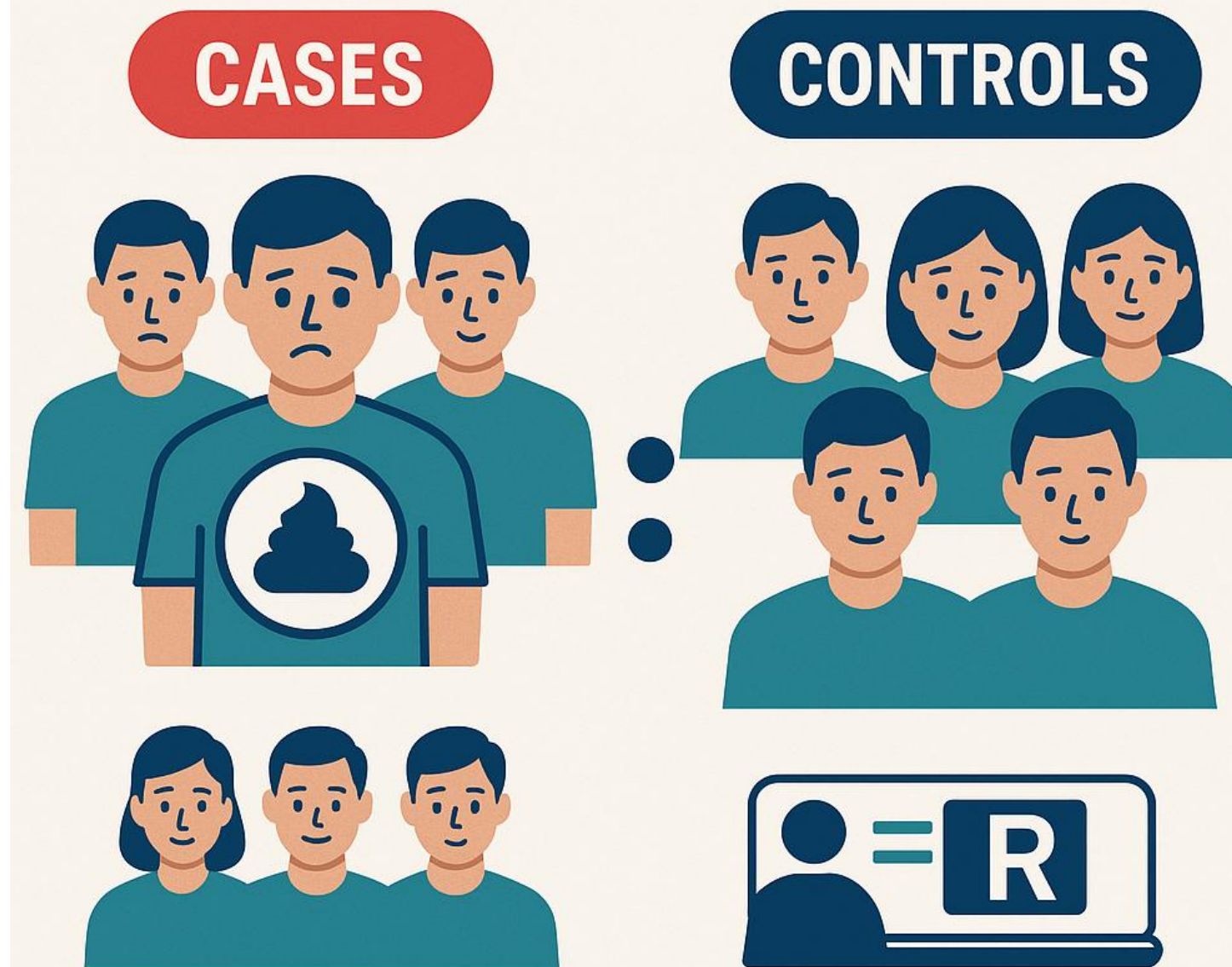


# Case-Control Study (Unmatched)

## Case (30)

- A Suspected OR Confirmed Case
- Onset: **Dec 26, 2023 – Jan 5, 2024**

## 1:2 CASE-CONTROL STUDY



## Control (60)

- Resident of Baguio City
- Neighbor of a case
- Did **not** develop diarrhea/symptoms
- Same period: **Dec 26, 2023 – Jan 5, 2024**

# Case Summary (N = 383)

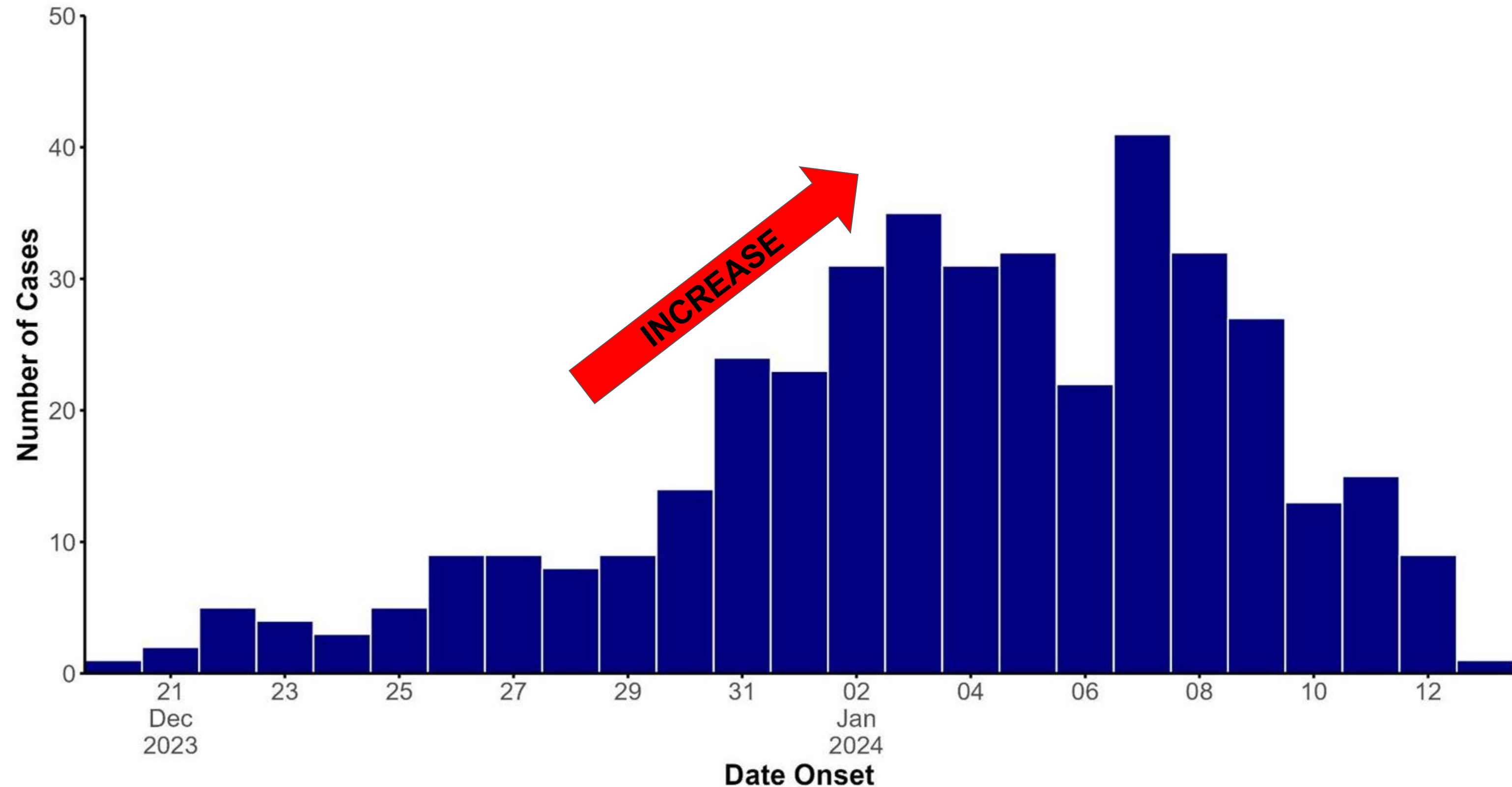
## City of Baguio, December 26, 2023 to January 15, 2024



- **383 cases** were identified
- **52% higher** compared to the annual AWD cases for the past 5 years

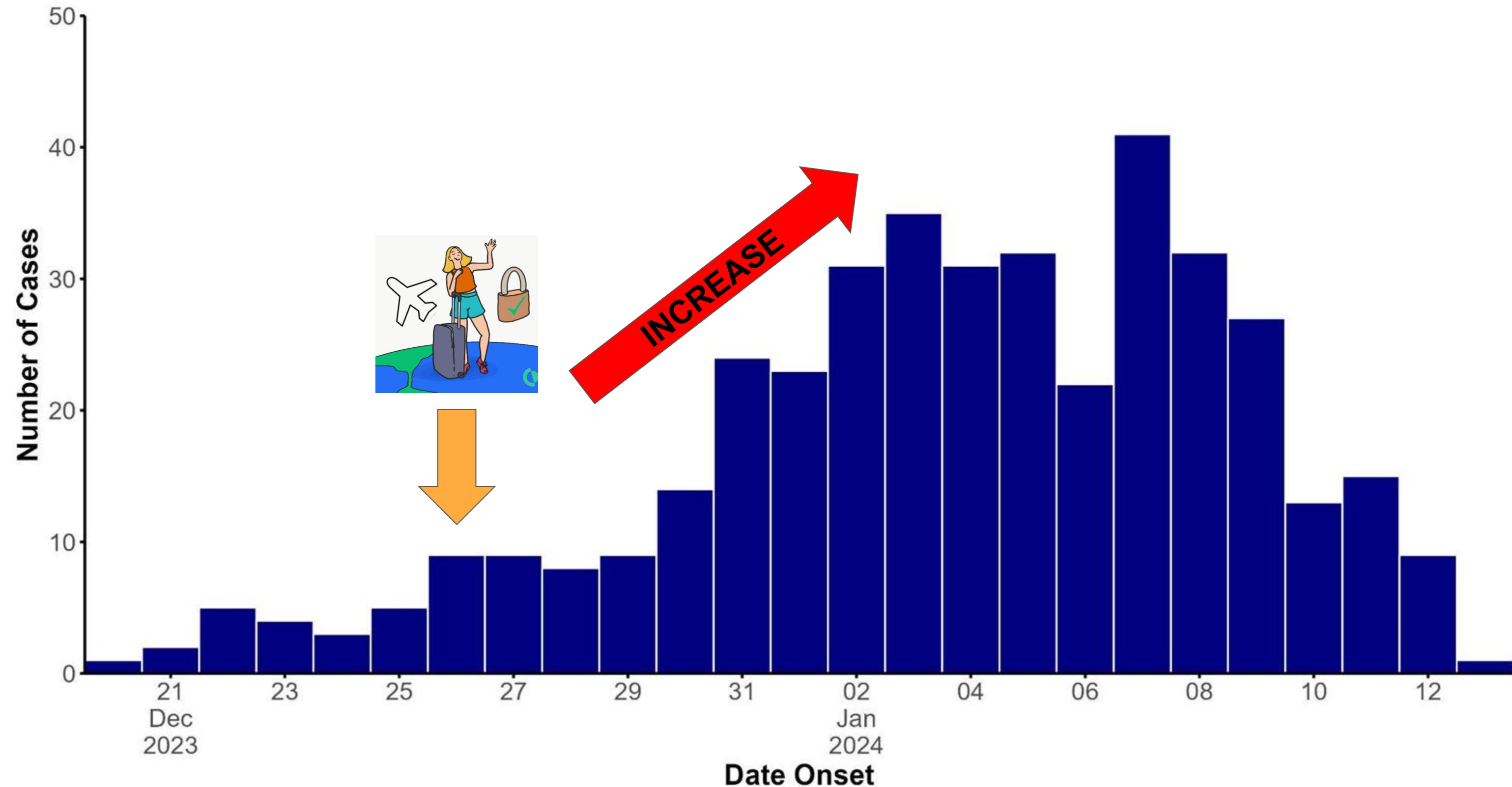
# Diarrhea Cases by Date of Onset (N = 383)

## City of Baguio, December 26, 2023 to January 15, 2024



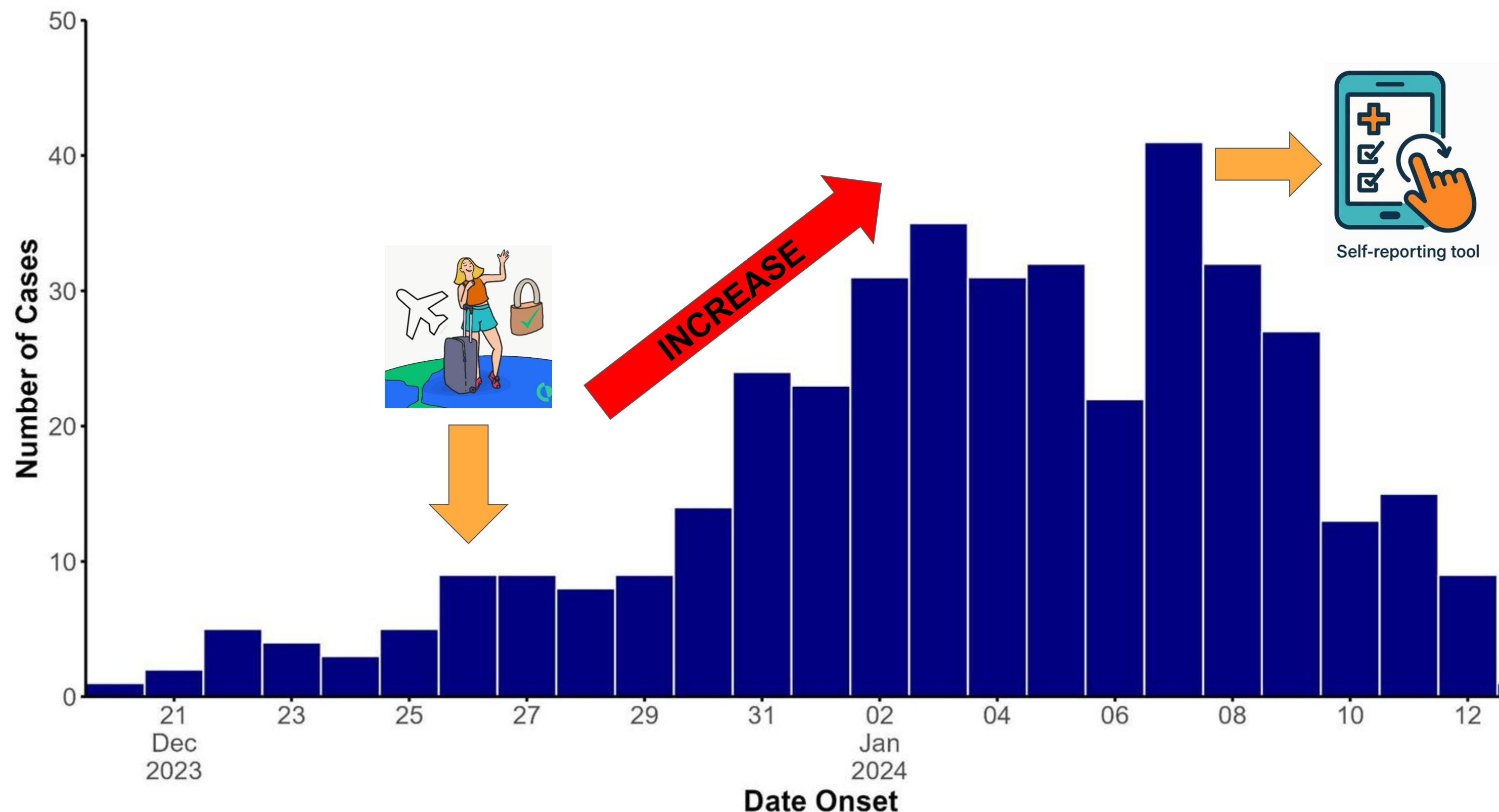
# Diarrhea Cases by Date of Onset (N = 383)

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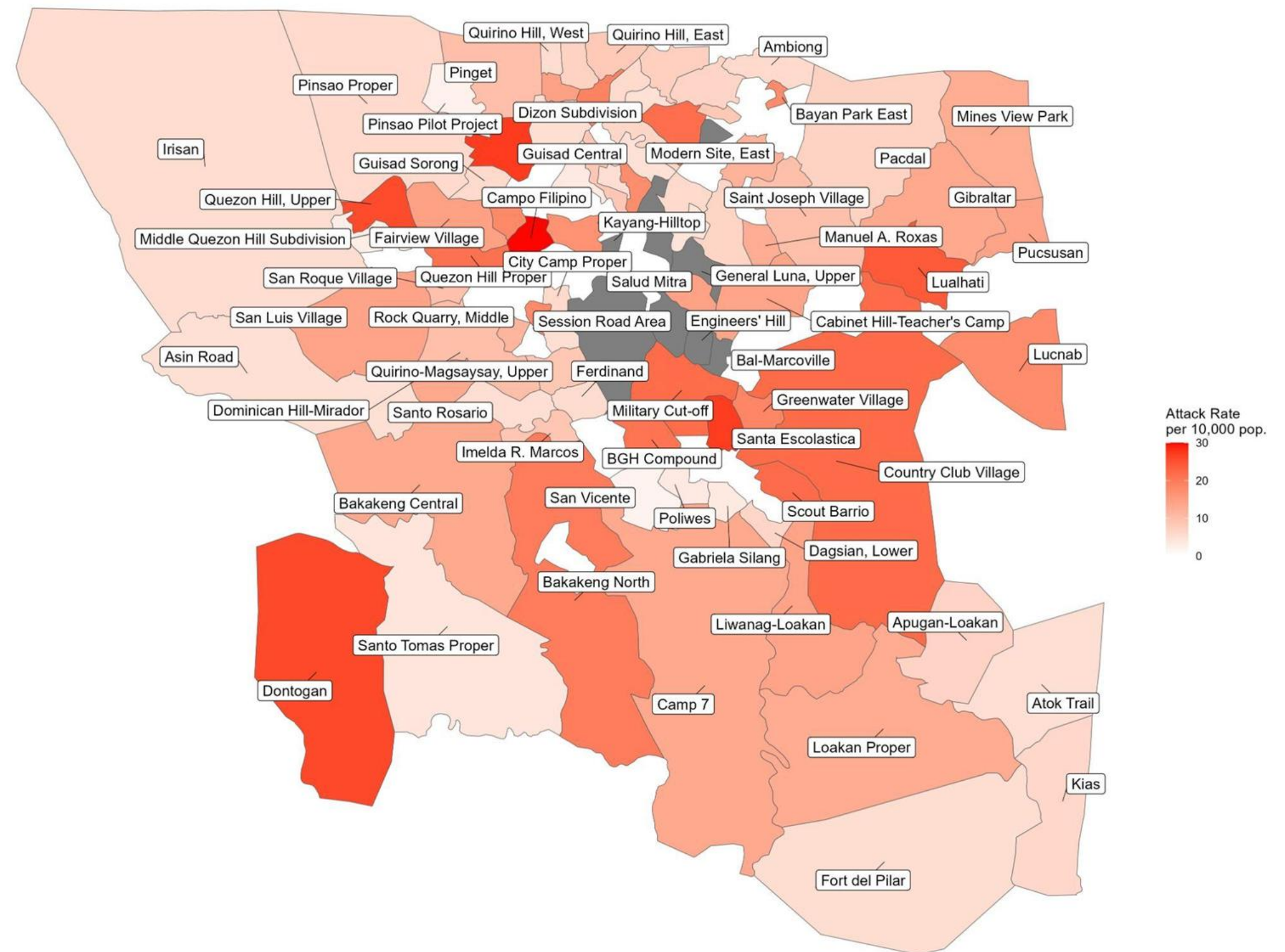
# Diarrhea Cases by Date of Onset (N = 383)

## City of Baguio, December 26, 2023 to January 15, 2024



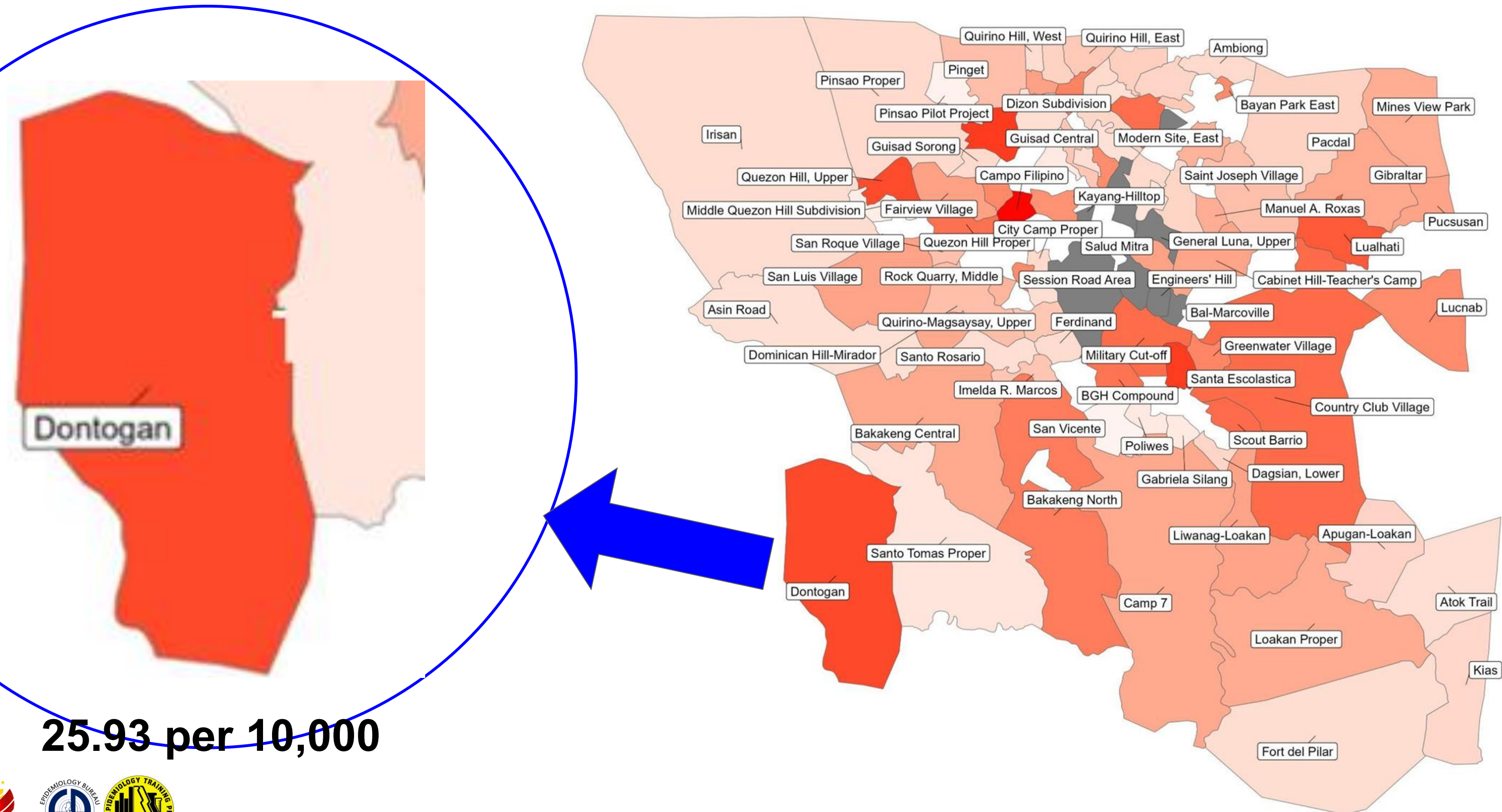
# Map by Attack Rate (N = 383)

## City of Baguio, December 26, 2023 to January 15, 2024



# Map by Attack Rate (N = 383)

## City of Baguio, December 26, 2023 to January 15, 2024



# Key Informant Interview Thematic Analysis



- Based on self-reported diarrhea cases
- Limited service coverage of Baguio Water District
- Unregistered bulk water delivery services
- Lack of local government authority to regulate deep wells

# Images During Environmental Survey

## City of Baguio, January 15 to 17, 2024



Water delivery truck getting water from a deep well



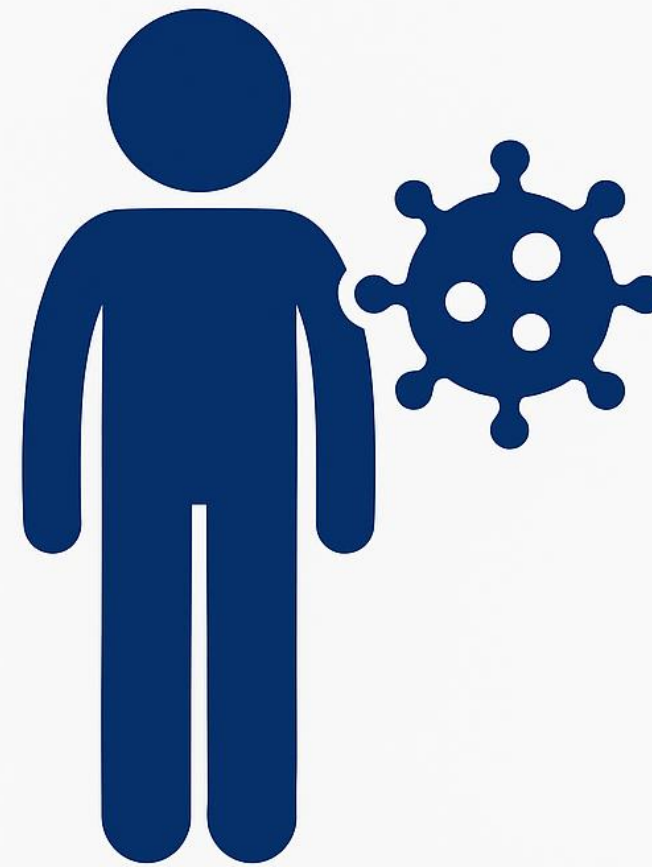
Uncovered water hoses going to cisterns



Tanks of bulk water delivery trucks

# Virology Test Results for Cases\* (n = 34)

## City of Baguio, January 12 to 15, 2024



**Norovirus 50%**

Sapovirus  
Astrovirus  
Rotavirus

*\*Note: Potentially multiple pathogens can be isolated per sample; 2 samples tested for multiple pathogens*

*Source: RITM*



Republic of the Philippines  
**Department of Health**  
/doh.gov.ph

# Water Test Results for Total Coliforms and E.coli (N = 51)

| Classification                      | Total Tested | E. coli         | Total Coliforms |
|-------------------------------------|--------------|-----------------|-----------------|
| Storage – bulk water delivery truck | 23           | 7 (30%)         | 12 (52%)        |
| End-user – food establishment       | 15           | 2 (13%)         | 7 (47%)         |
| Other (specify in remarks)          | 5            | 0 (0%)          | 2 (40%)         |
| Source – deep well                  | 2            | 0 (0%)          | 2 (100%)        |
| End-user – residential              | 2            | 1 (50%)         | 1 (50%)         |
| Water refilling station             | 4            | 0 (0%)          | 0 (0%)          |
| <b>Total</b>                        | <b>51</b>    | <b>10 (20%)</b> | <b>24 (47%)</b> |



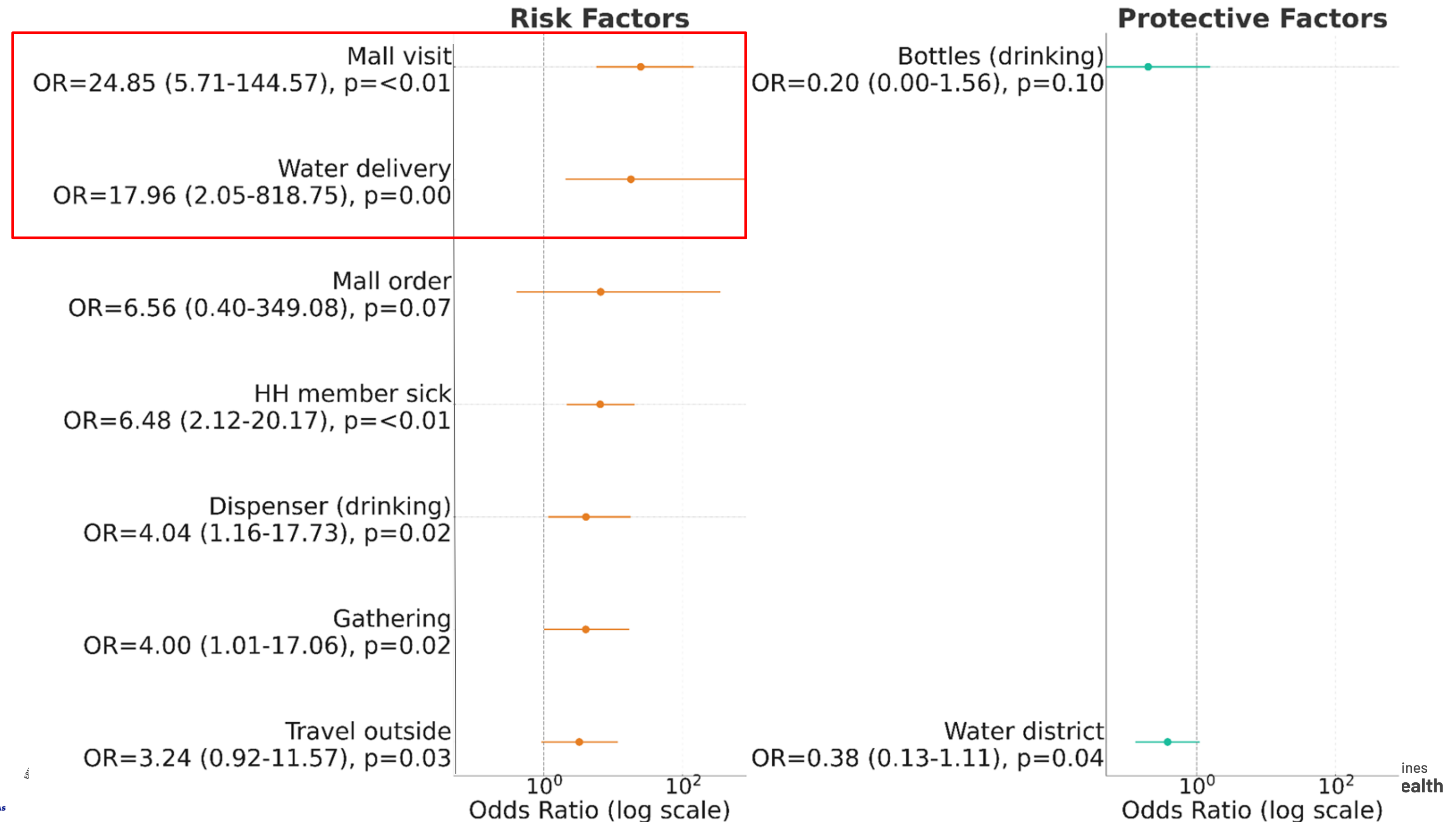
Source: Health Services Office - Laboratory



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# Risk Factors Associated with the Outbreak

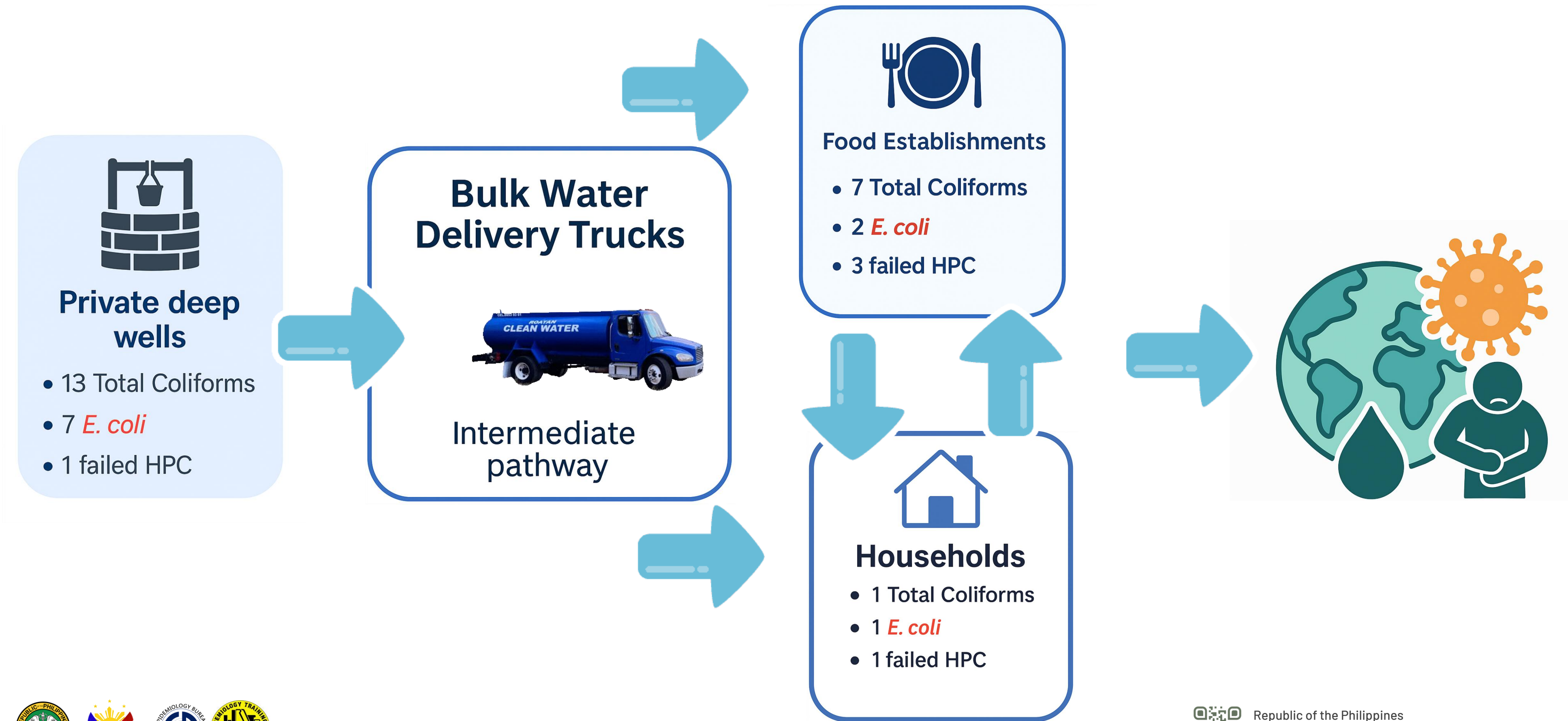
## City of Baguio, December 26, 2023 to January 5, 2024



# Conclusion

- Norovirus outbreak in Baguio City (Dec 26, 2023 – Jan 15, 2024)
- Contaminated water sources (unregulated deep wells, bulk delivery services) identified as sources
- Regulatory gap: lack of consistent oversight and safety standards in water supply
- Urgent need for a policy ensuring access to safe drinking water

# Discussion



# Recommendations

## Stronger Surveillance & Response

- Enhance syndromic surveillance and outbreak management especially in hospitals
- Conduct emergency water testing with quick-response teams.

## Safe Water & Sanitation

- Enforce sanitation protocols in food and water establishments.
- Regular inspection and certification of water sources.
- Upgrade local water infrastructure and purification systems.

# Recommendations

## Health Promotion & Community Engagement

- Integrate water safety and hygiene education in schools and communities.
- Sustain public awareness campaigns on safe water and hygiene.

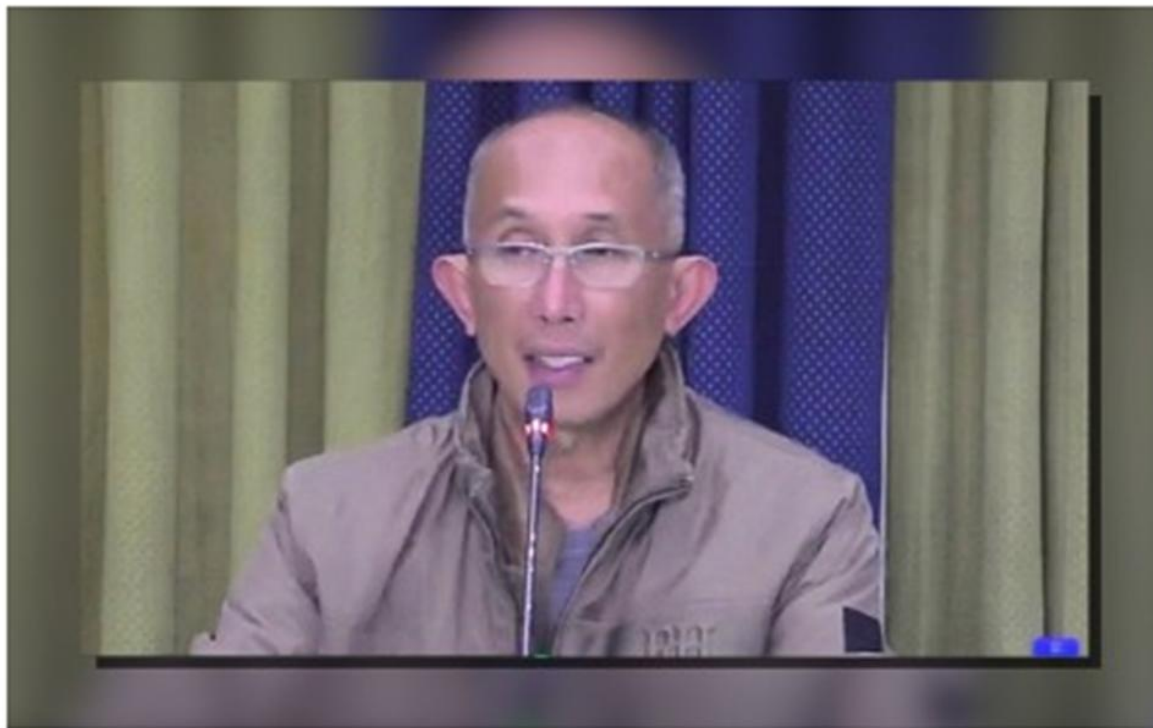
## Coordination & Governance

- Strengthen collaboration between HSO, Baguio Water District, and NWRB.
- CDRRMO to coordinate swift response to water safety gaps.

# On Follow-up

## No More Outbreak!!!

- January 18, 2024 - Officially declared, “No More Outbreak”



**NO MORE OUTBREAK.** Baguio City Mayor Benjamin Magalong, in a late afternoon press conference on Thursday (Jan. 18, 2024), announces the lifting of the gastroenteritis outbreak declaration in the city. He traced the outbreak to contaminated deep wells, which are the source of water delivery services supplying households and establishments. (PNA photo by Liza T. Agoot)

## Magalong declares end of gastroenteritis outbreak in Baguio

JAN 19, 2024 11:27 AM PHT

MIA MAGDALENA FOKNO

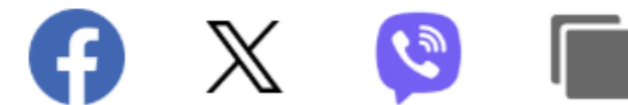
# Public Health Implication

News

## Baguio tightens safety rules on water delivery services after outbreak

ABS-CBN News

Published Jan 22, 2024 03:15 PM PHT | Updated Jan 22, 2024 04:35 PM PHT



BAGUIO CITY, Benguet, Philippines — The city council here is drawing up a “safe water” ordinance to better manage the production and distribution of drinking water in light of the gastroenteritis outbreak that is still plaguing the summer capital.

## Creation of a Safe Drinking Water Task Force



# Limitations of the Study

- Not all cases were interviewed, and swabs were limited to recent patients.
- Some water samples were collected after treatment, possibly missing the viral period.
- Not all controls were tested, which may affect accuracy.
- Reliance on record reviews limited understanding of disease dynamics and incubation period.

*Clean water saves  
lives—regulation  
makes it possible.*





# TERIMA KASIH

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