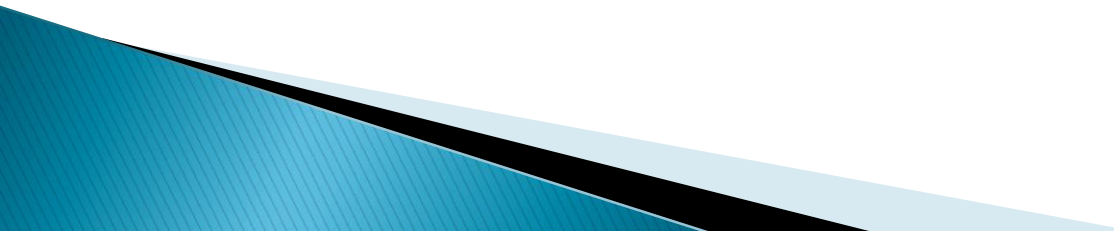
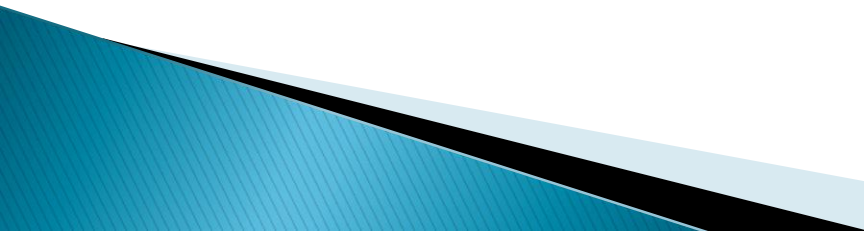


What is an outbreak?

- ▶ The coordinator of the MSF project has been receiving reports of an increase in cases of acute watery diarrhoea over the past 3 weeks (16 cases 3 weeks ago, 40 cases the following week and 40 cases so far this week). 20 deaths have so far occurred, all in adults.
 - ▶ **How would you prepare to support this potential outbreak?**
 - ▶ **How do you determine whether this is a true increase?**
- 

Outbreak investigation– Step 1


1. Prepare for investigation
 - Research the potential diseases
 - Research background/context
 - Supplies and equipment (no internet!)
 - Passport/visas/letter of invitation
 - Population numbers
 - Weather (rainy season)
 - Determine your role in the investigation and who your local contacts will be
- 

Outbreak investigation– Step 2

2. Establish the existence of an outbreak

- Observed no. cases $>$ Expected number
- Epidemic thresholds
- Compare with previous weeks/months/years
- Sources: MoH surveillance, hospital/clinic registers
- If no data available, use neighbouring states/national data, telephone survey of medics or community, doubling of cases over 3 consecutive weeks
- NB. Is the increase in cases real?
 - Changes in local reporting procedures
 - Changes in the case definition
 - Increased interest because of local or national awareness
 - Improvements in diagnostic procedures
 - Changes in population

Identifying the disease

- ▶ Your medical staff have reviewed the clinical symptoms of the first 15 cases
 - ▶ All patients described a sudden onset of profuse watery stools without pain, sometimes rice-water-like and often accompanied by vomiting
 - ▶ There was no fever. Dehydration appeared within 12 to 24 hours
 - ▶ Intense watery stools and vomiting was reported for 3 patients that died. Dehydration occurred rapidly (within 12 hours).
 - ▶ **What disease do you suspect?**
 - ▶ **How would you confirm the diagnosis?**
- 

Outbreak investigation– Step 3

3. Verify the diagnosis

- The clinical symptoms indicate cholera
- Laboratory confirmation is required
 - Confirmation on 5 to 10 stool or vomit samples
 - Filter paper, Cary Blair medium or rapid tests (NB sensitivity)
 - Rapid tests do not measure antibiotic sensitivity/biotyping
- The team wish to send stool samples for laboratory confirmation. However the Ministry of Health (MoH) refuses to allow samples to be sent for testing. What do you do?

Identifying cases

- ▶ You must establish a case definition. This a standard set of criteria to identify suspected cholera cases and to treat them as early as possible. A case definition usually includes four components:
 - Clinical information about the disease
 - Characteristics about the people who are affected
 - Information about the location or place
 - A specification of time during which the outbreak occurred.
- ▶ You also need to record information for every case identified. This register is commonly known as a 'line list'. This should contain identifying, demographic, clinical (and risk factor) information.
- ▶ **Suggest a case definition and information to be recorded on a line list**

Outbreak investigation– Step 4a

4. Define and identify cases (case definition)

- To identify and treat suspected cholera cases
- Also to standardise outbreak investigation and control
- Case definition is a balance between including non-real cholera cases (over-estimation/ low specificity of the definition) with excluding true cases (under-estimation/low sensitivity)
- Investigators often classify cases as:
 - “confirmed” = laboratory-confirmed
 - “probable” = typical clinical symptoms, not lab-confirmed
 - “possible” = some but not all of typical clinical symptoms
- MoH usually have pre-established case definitions, adapted from the WHO standard definition
- Definition should be simple, be agreed upon by all partners and remain the same throughout epidemic.
- But if agreed by all it can be looser initially and tightened later

Examples of case definitions for cholera

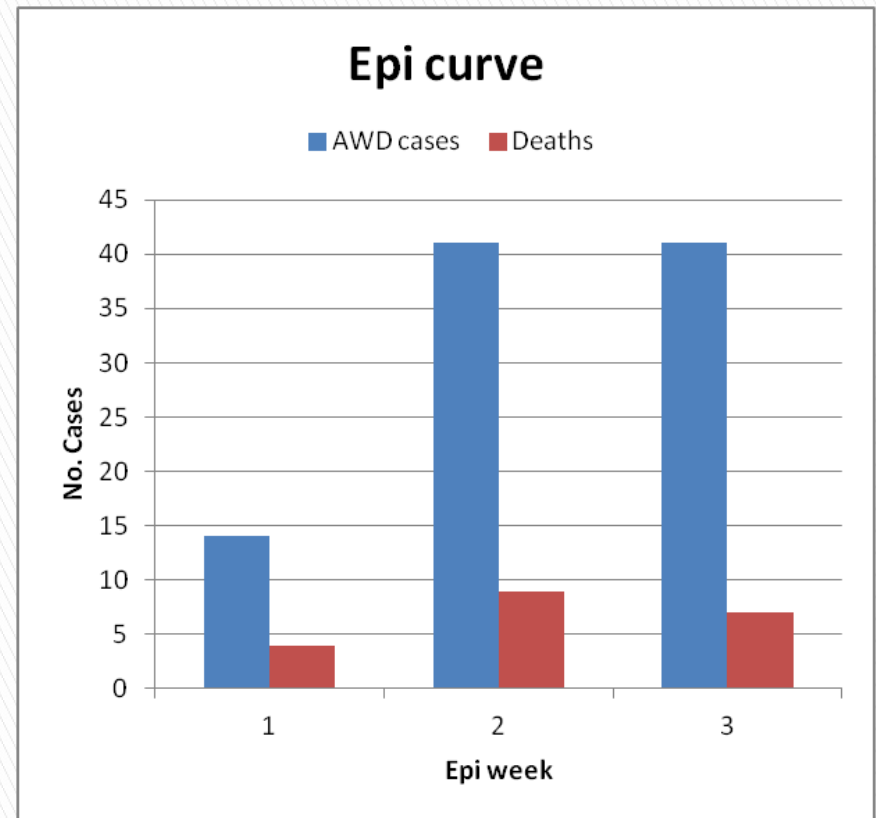
WHO Standard Case Definition	In an area where the disease is not known to be present	A patient aged 5 years or more develops severe dehydration or dies from acute, watery diarrhoea.
	In an area where there is a cholera epidemic	A patient aged 5 years or more develops acute watery diarrhoea, with or without vomiting
MSF case definition	In an area where there is a cholera epidemic	Any patient presenting 3 or more liquid stools and/or vomiting for the last 24 hours

Descriptive epidemiology

- ▶ You have gathered initial line–list data and must carry out some descriptive epidemiology
- ▶ Describe the data in terms of ‘time’, ‘person’ and ‘place’

Time (epidemic curve)

- ▶ Shows evolution & magnitude of epidemic over **time** with the number of cases and deaths per week
- ▶ Where you are in the course of the epidemic
- ▶ Pattern e.g. common source or propagated source (person-to-person) exposure



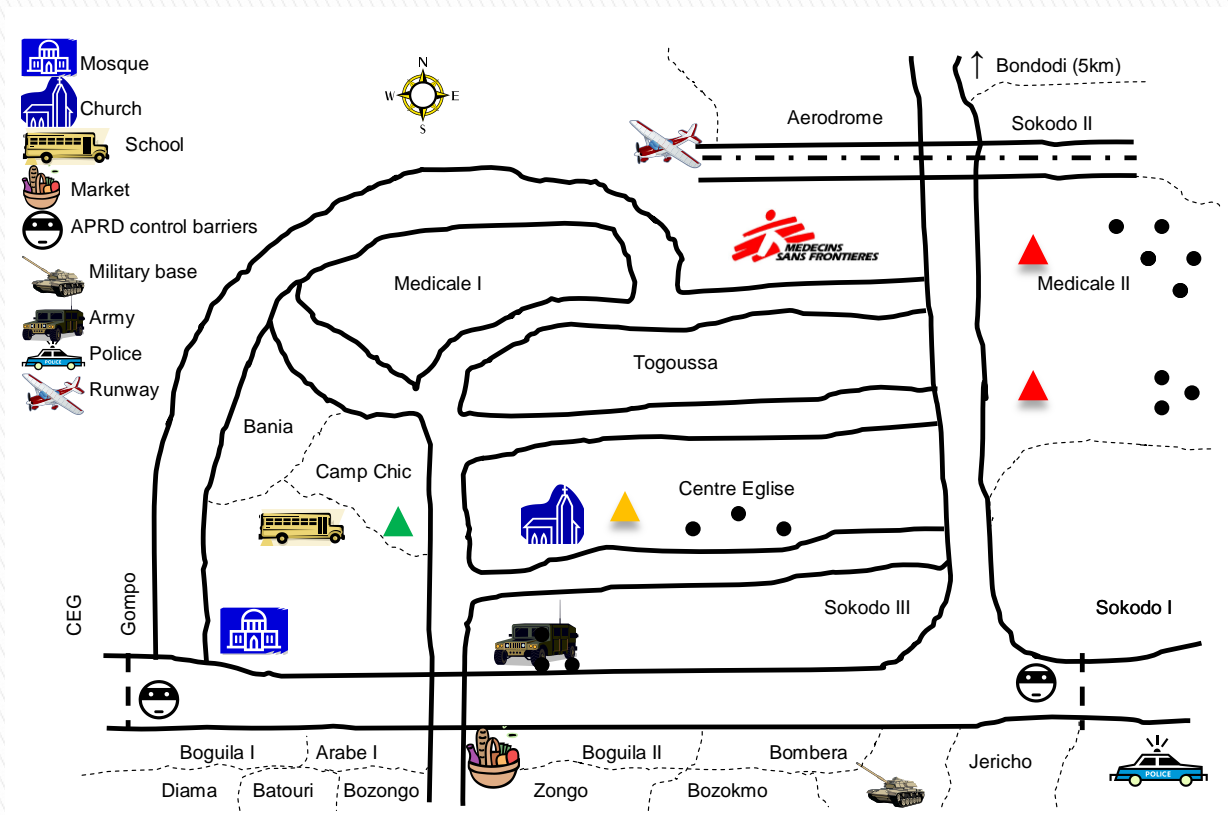
Person

- ▶ The number of cases and deaths per age group (e.g. $<5y$, $\geq 5y$)
- ▶ Differences in males/females?
- ▶ Relationship with ethnicity

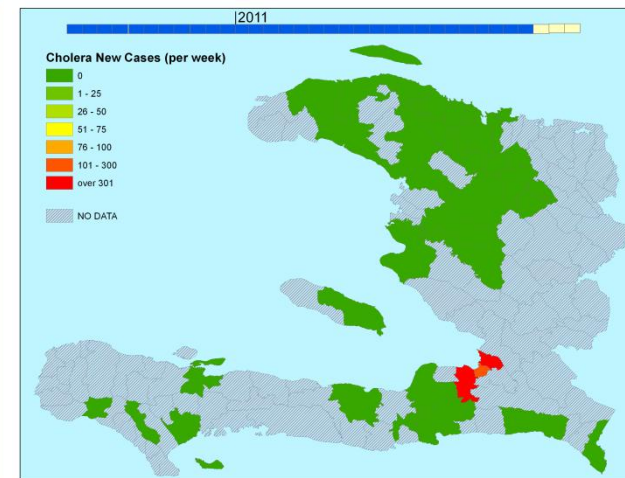
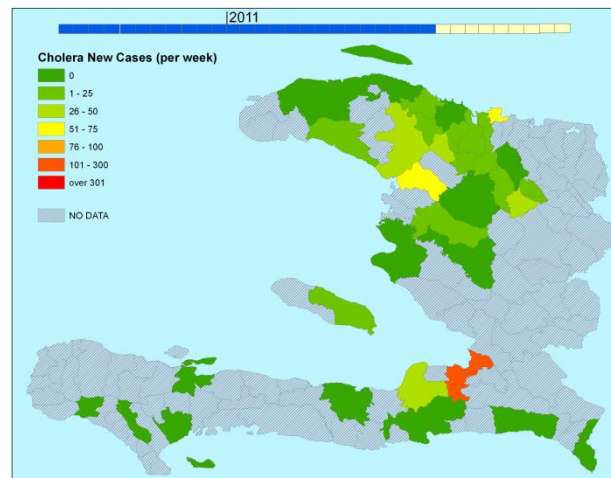
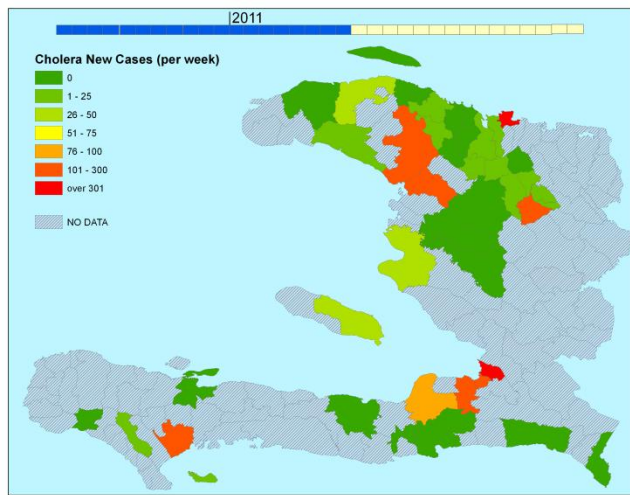
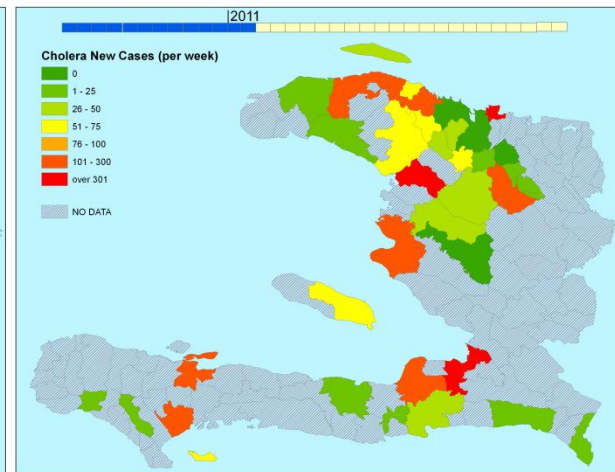
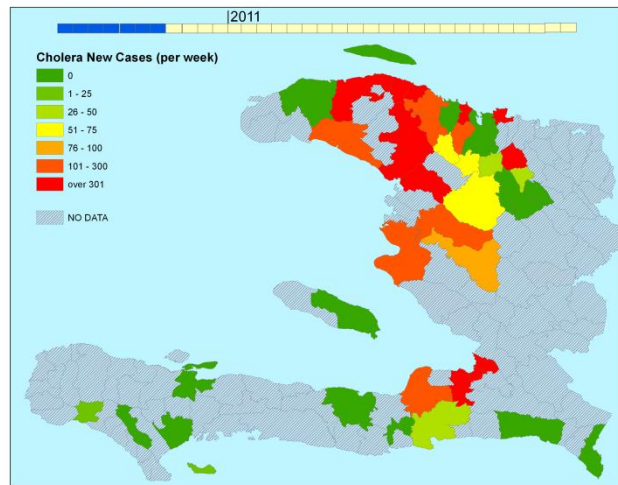
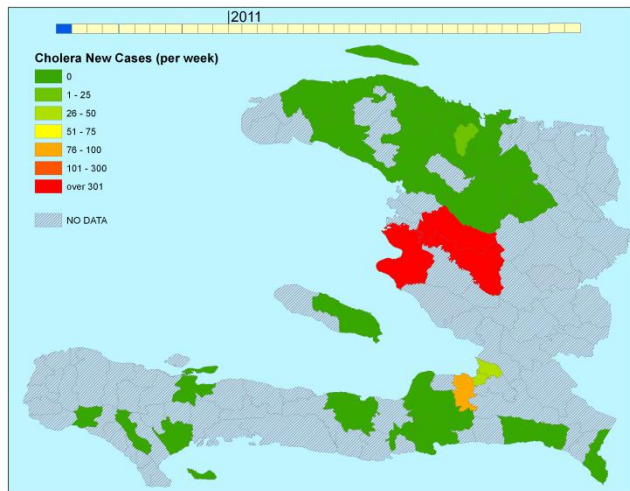
Sex	<5 years	≥ 5 years	Total
Male	14	52	66 (68.7%)
Female	2	28	30 (31.3%)
Total	16 (16.7%)	80 (83.3%)	96 (100%)

Place

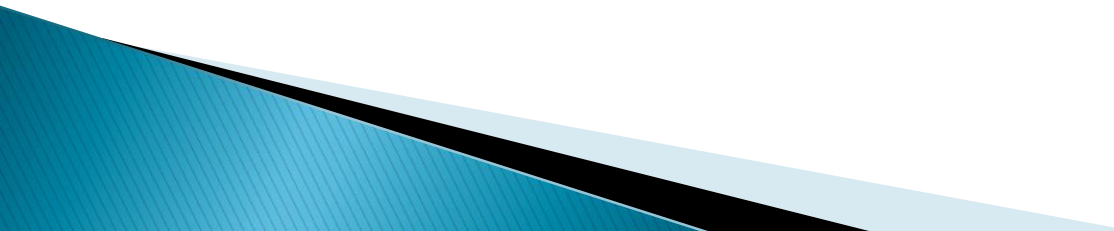
- ▶ Geographic distribution of cases per village/district can be used to identify areas at higher risk and to monitor outbreak spread by using chronological maps



Evolution of cholera in Haiti



Outbreak investigation– Step 5

5. Describe the data in Terms of Time, Person and Place
 - Familiarises you with the data
 - Shows trend over **time**, the populations (**people**) affected and its geographic extent (**place**)
 - Begins to show patterns to develop causal hypotheses
- 

Developing the hypotheses

- ▶ What does the evidence tell you so far about
 - The source of the agent
 - The mode (vehicle or vector) of transmission
 - The exposures that caused the disease
- ▶ Describe your hypothesis

Outbreak investigation– Step 6

6. Develop hypotheses

- In reality, start to develop hypothesis immediately
- **Time:** Point source epi curve
- **Person:** Adults mainly affected
- **Place:** Clustering in Medecale I

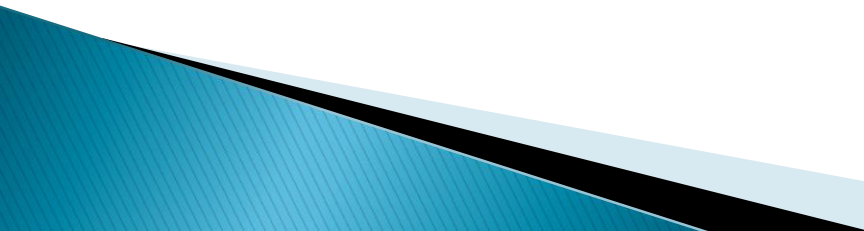
- **Hypothesis: Agent** = cholera (*Vibrio cholerae*)
- **Hypothesis: Mode of transmission** = infected water source (some person–person transmission)
- **Hypothesis: Exposures** = Medecale I in Region Y

Evaluate hypothesis

Epi week	AWD cases	Deaths	Population	WIR	CFR	AR
1	14	4	35000	4.00	28.57%	0.04%
2	41	9	35000	11.71	21.95%	0.12%
3	41	7	35000	11.71	17.07%	0.12%
4	37	7	35000	10.57	18.92%	0.11%
5	13	2	35000	3.71	15.38%	0.04%
6	13	1	35000	3.71	7.69%	0.04%
7	31	6	35000	8.86	19.35%	0.09%
8	25	5	35000	7.14	20.00%	0.07%
9	34	7	35000	9.71	20.59%	0.10%
10	76	10	35000	21.71	13.16%	0.22%

- ▶ In week 4 in a population of approximately 35,000; 37 new cases of cholera were recorded.
 $WIR = 37 / 35000 \times 10000 = 11 / 10.000$
- ▶ Among the 37 cases, 7 persons died during the same reporting week
 $CFR = 7 / 37 \times 100 = 19\%$
- ▶ At the end of the epidemic there were a total of 1321 cholera cases and 74 deaths.
 $AR = 1321 / 35000 \times 100 = 3.77\%$
 $CFR = 74 / 1321 \times 100 = 5.6\%$

Outbreak investigation– Step 7–10

7. Evaluate hypotheses
 8. Refine hypotheses and carry out additional studies
 9. Implement control and prevention measures
 - Case management: CTC, ORP
 - Active case–finding
 - Reduction of spread (hygiene, water purification)
 10. Communicate findings
 - Comprehensive description of epidemiology
 - Recommendations for control
- 

Outbreak investigation– 10 steps

1. Prepare for outbreak investigation
 2. Establish the existence of an outbreak
 3. Verify the diagnosis (lab confirmation)
 4. Define and identify cases (case definition)
 5. Describe and orient the data in terms of **time** (epi curve), **person** and **place**
 6. Develop hypotheses
 7. Evaluate hypotheses
 8. Refine hypotheses and carry out additional studies
 9. Implement control and prevention measures
 10. Communicate findings
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