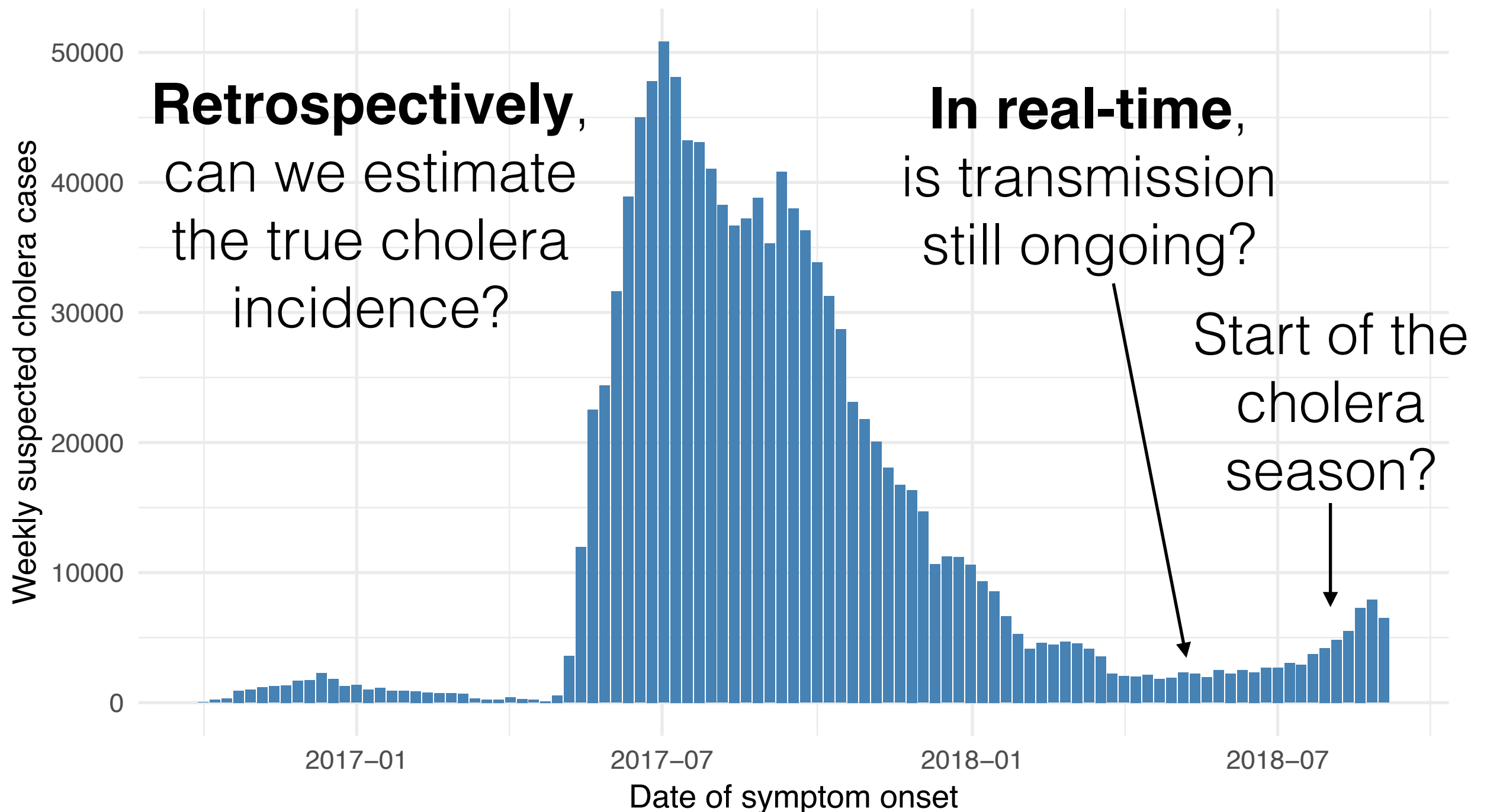# Using RDT & culture to refine our understanding of cholera outbreaks
The case of Yemen
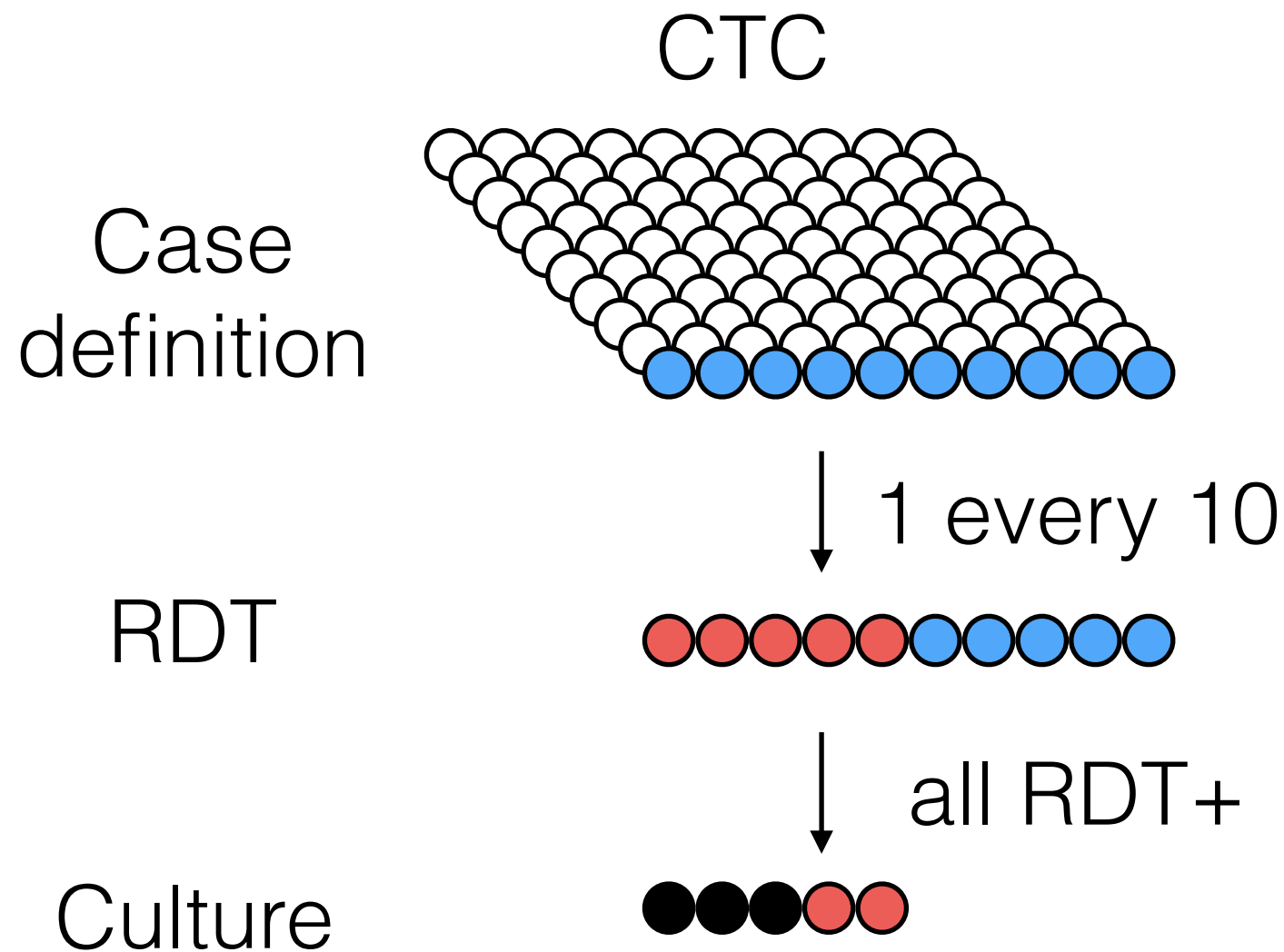
Anton Camacho, Francisco Luquero, Malika Bouhenia, Xavier de Radiguès, Kareem Almoalmi
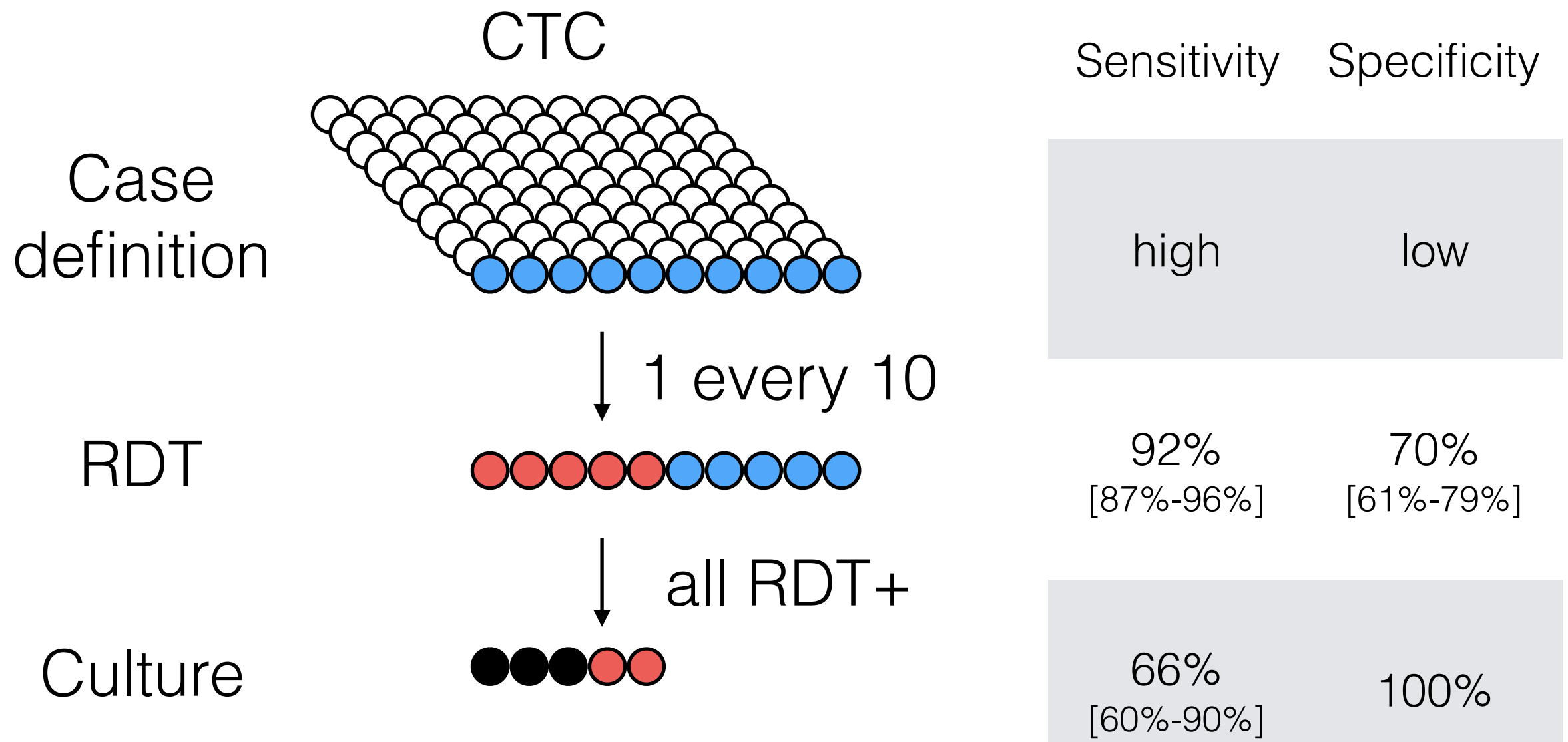
World Health Organization
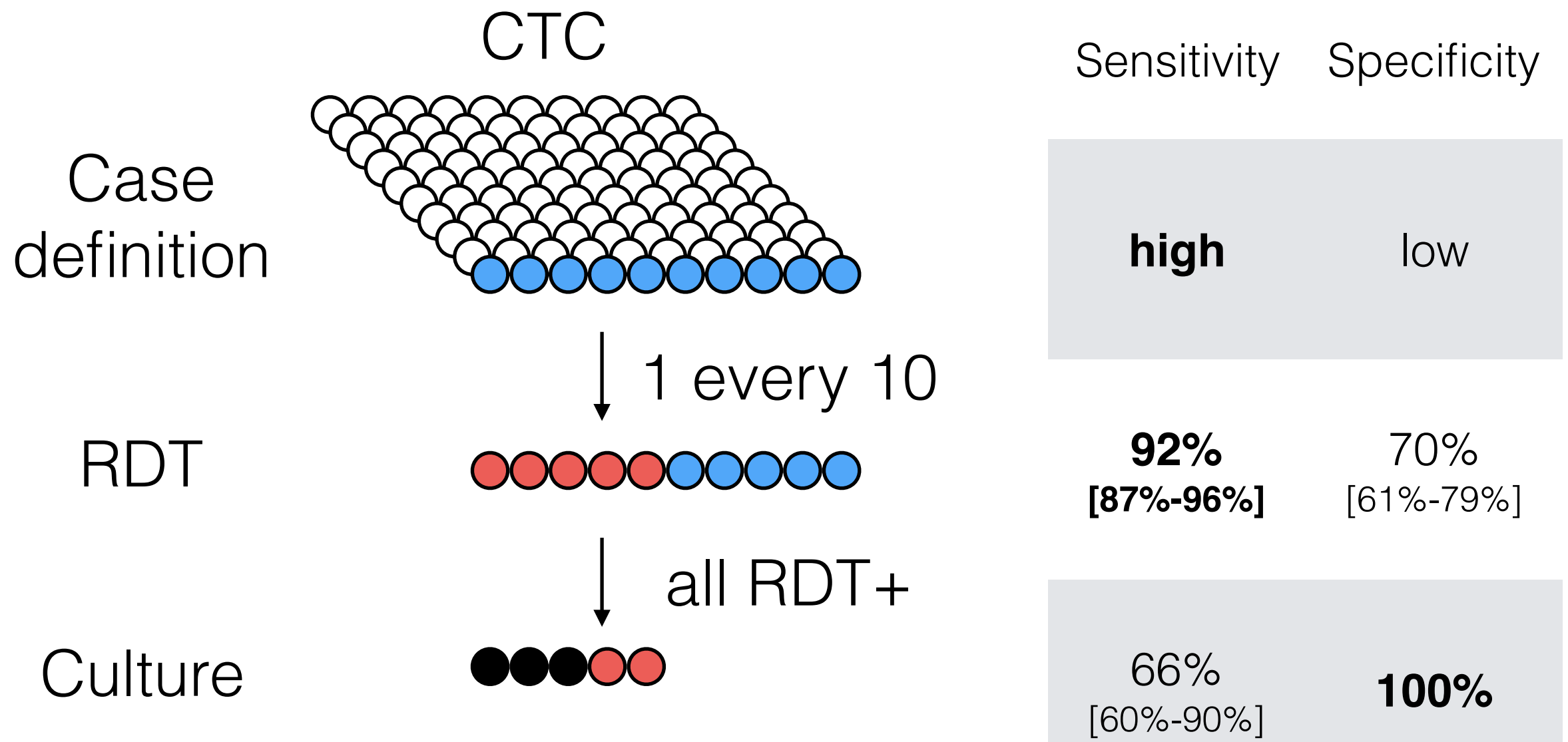
epicentre
ÉPIDÉMIOLOGIE · EPIDEMIOLOGY

2016-2018 cholera epidemic in Yemen

Retrospectively, can we estimate the true cholera incidence?

In real-time, is transmission still ongoing?

Start of the cholera season?

Weekly suspected cholera cases

50000

40000

30000

20000

10000

0

2017–01   2017–07   2018–01   2018–07

Date of symptom onset

Recommended use of RDT and culture confirmation

CTC

Case definition

RDT

↓ 1 every 10

Culture

↓ all RDT+

Recommended use of RDT and culture confirmation

CTC

Case definition

Sensitivity   Specificity

high   low

1 every 10

RDT

92%
[87%-96%]

70%
[61%-79%]

all RDT+

Culture

66%
[60%-90%]

100%

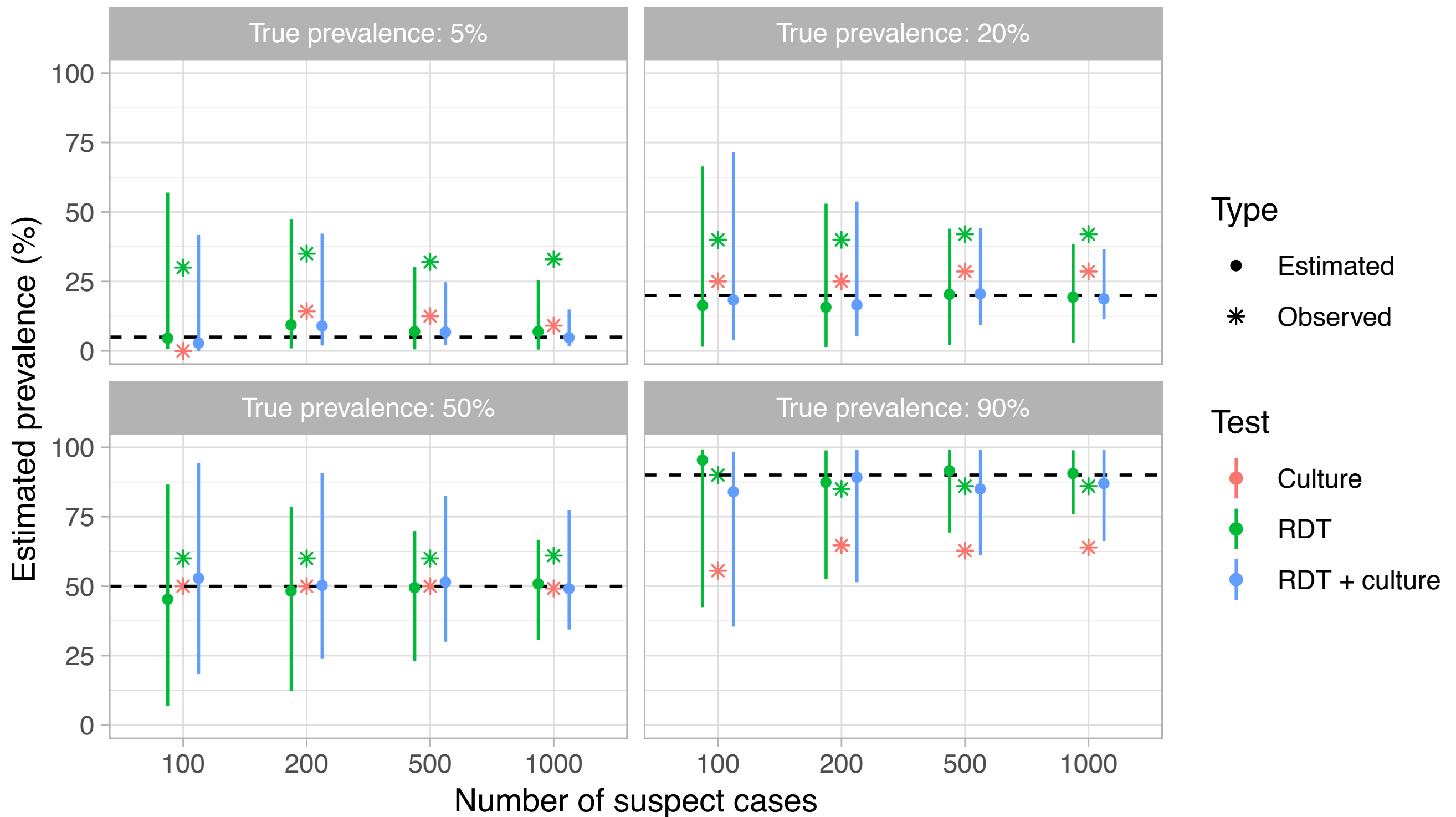Page 2012, *PLoS One*

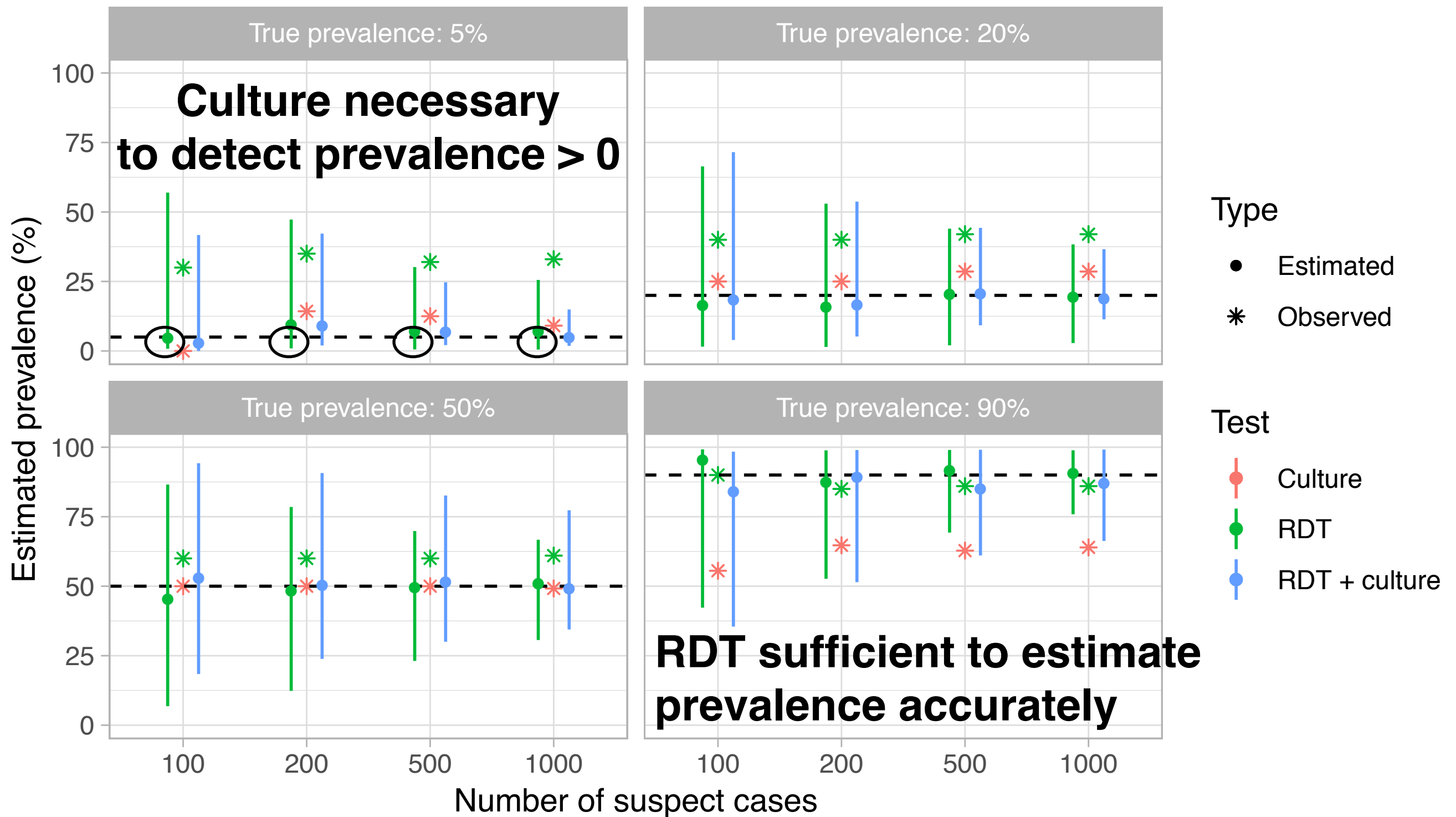# Recommended use of RDT and culture confirmation

Page 2012, *PLoS One*

Simulation study with RDT sampling = 10%
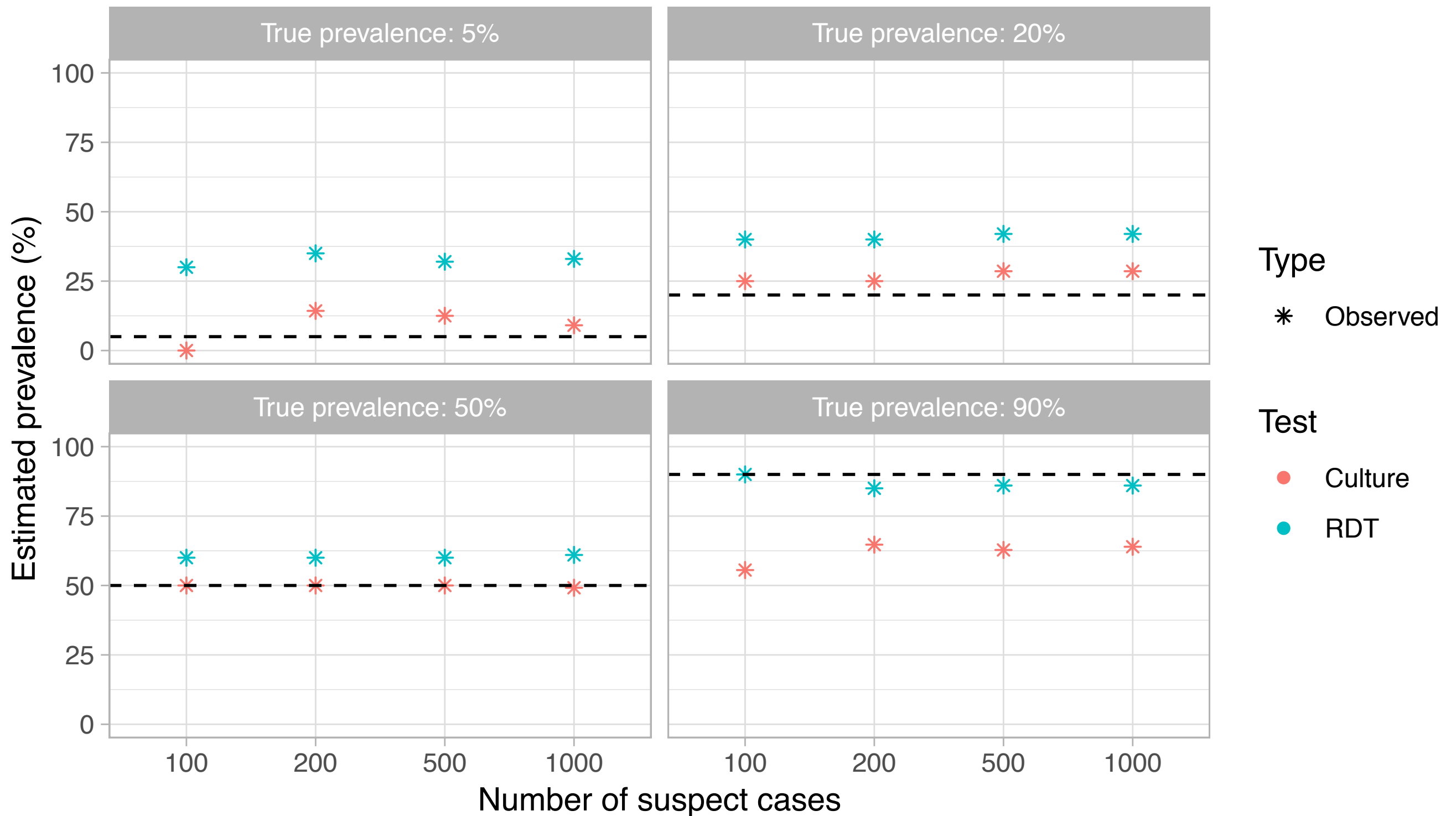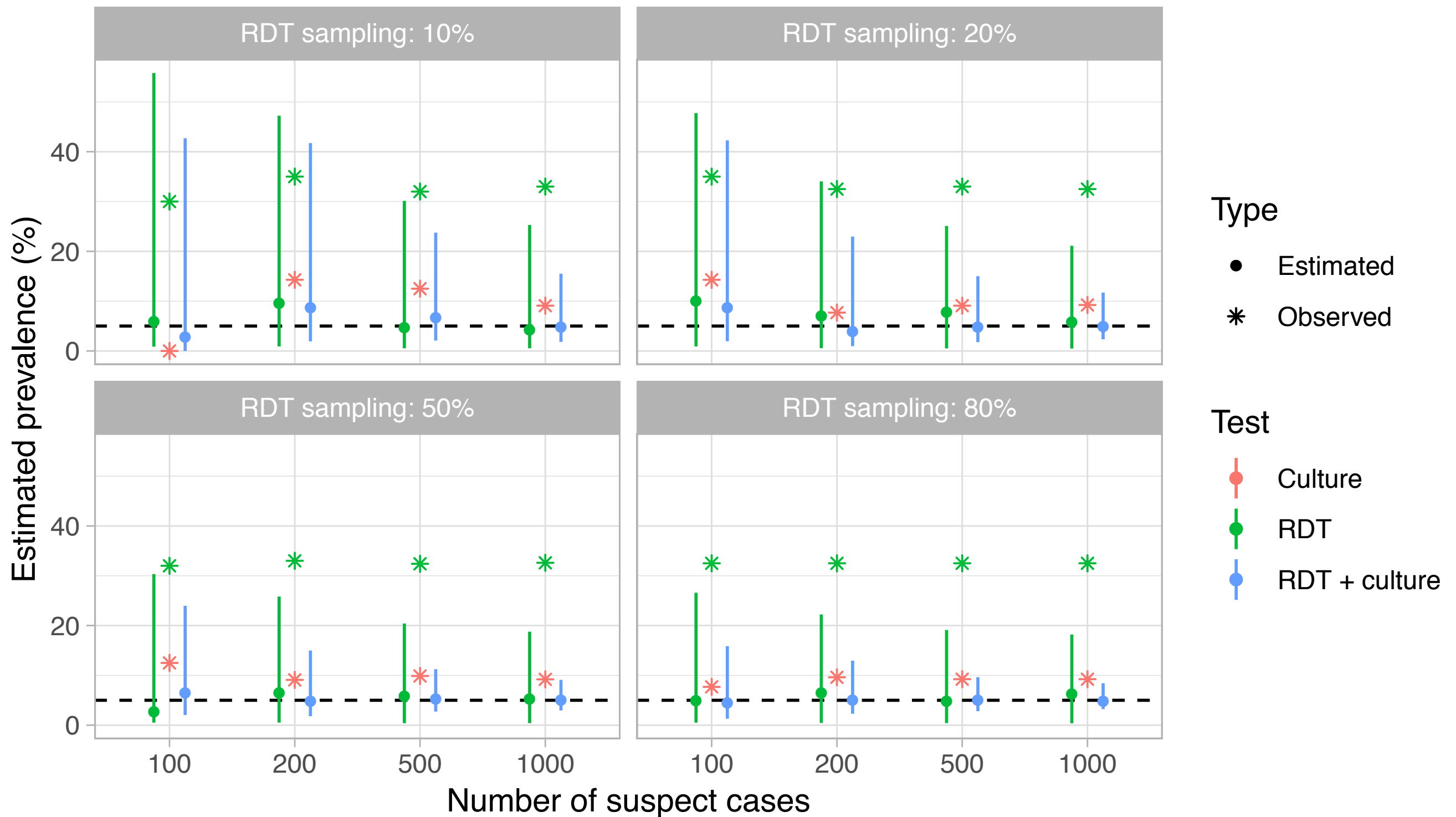
Simulation study with RDT sampling = 10%
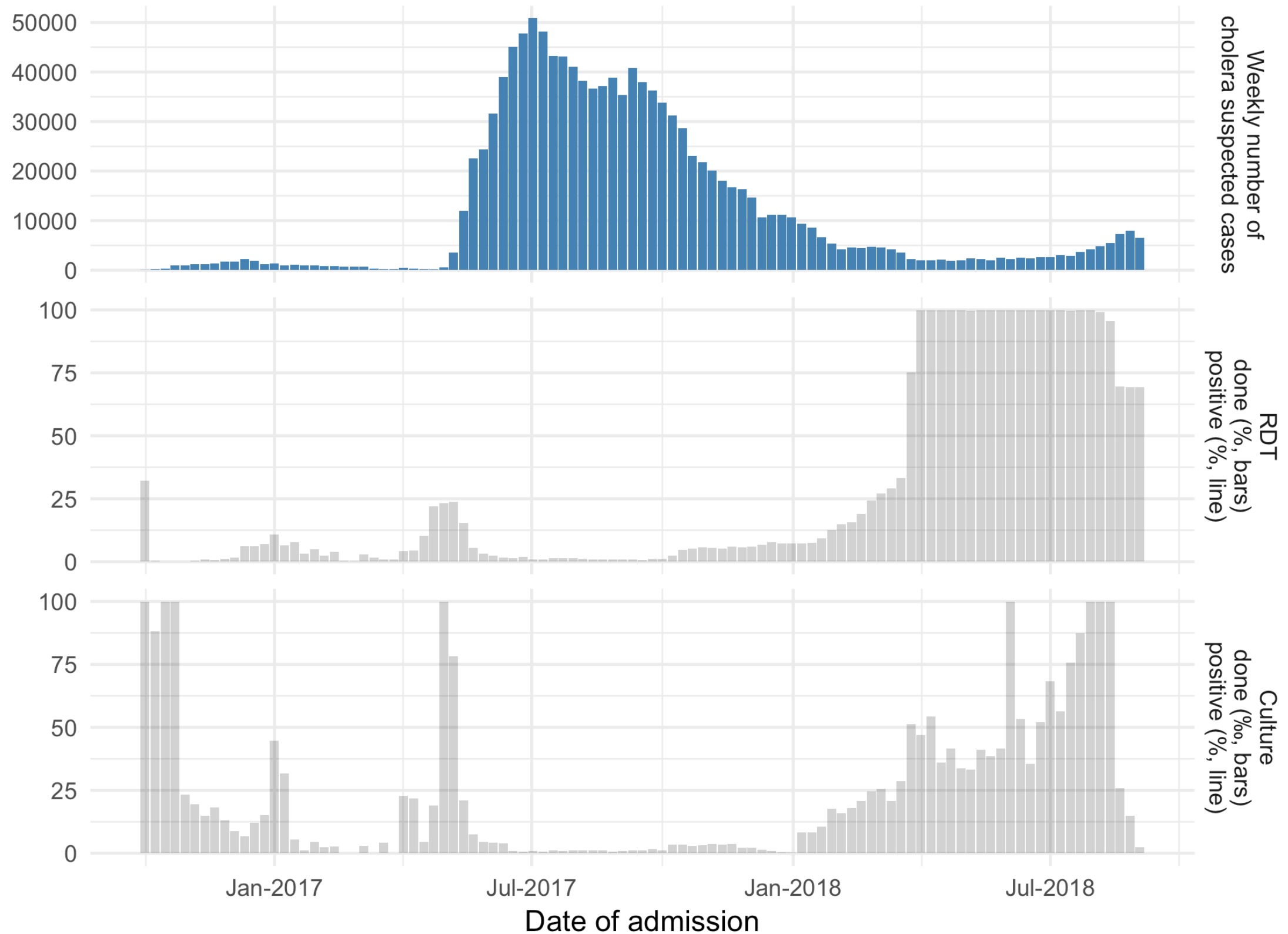
Simulation study with RDT sampling = 10%

Simulation: True prevalence = 5%
Increase RDT sampling from 10% to 80%

In Yemen: sampling & reporting varied over time

Weekly number of cholera suspected cases

RDT done (%, bars) positive (%, line)

Culture done (‰, bars) positive (%, line)

Date of admission

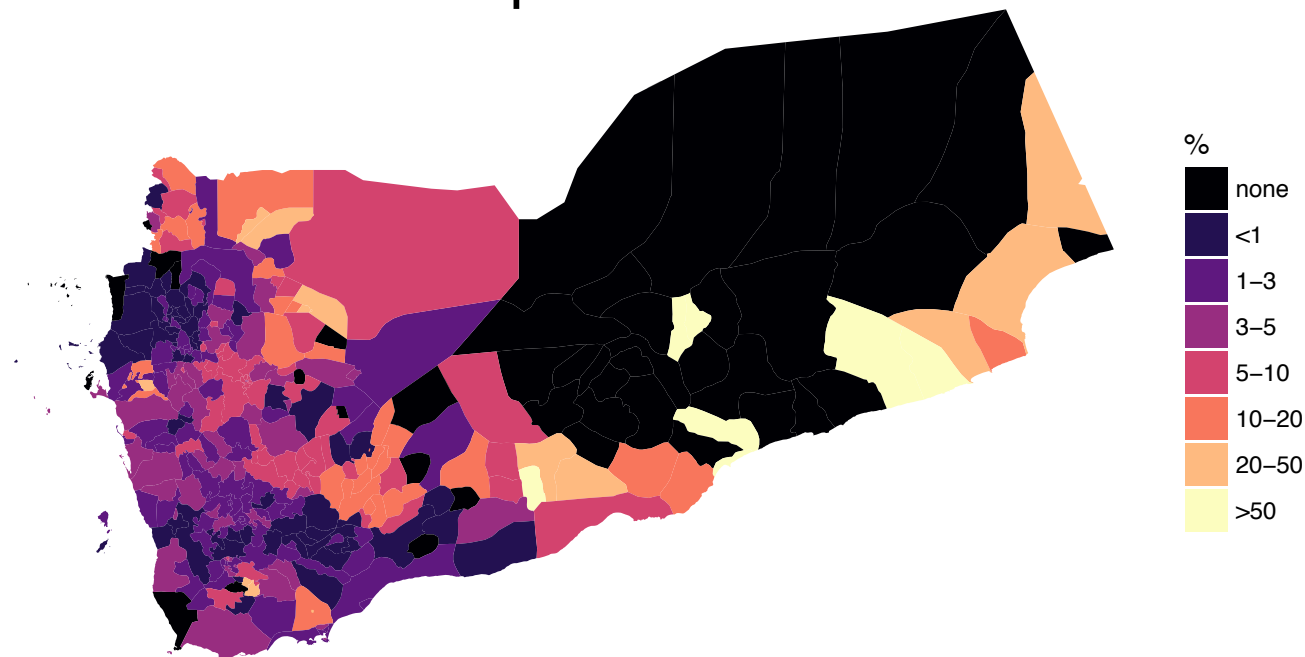In Yemen: sampling, reporting & positivity varied over time
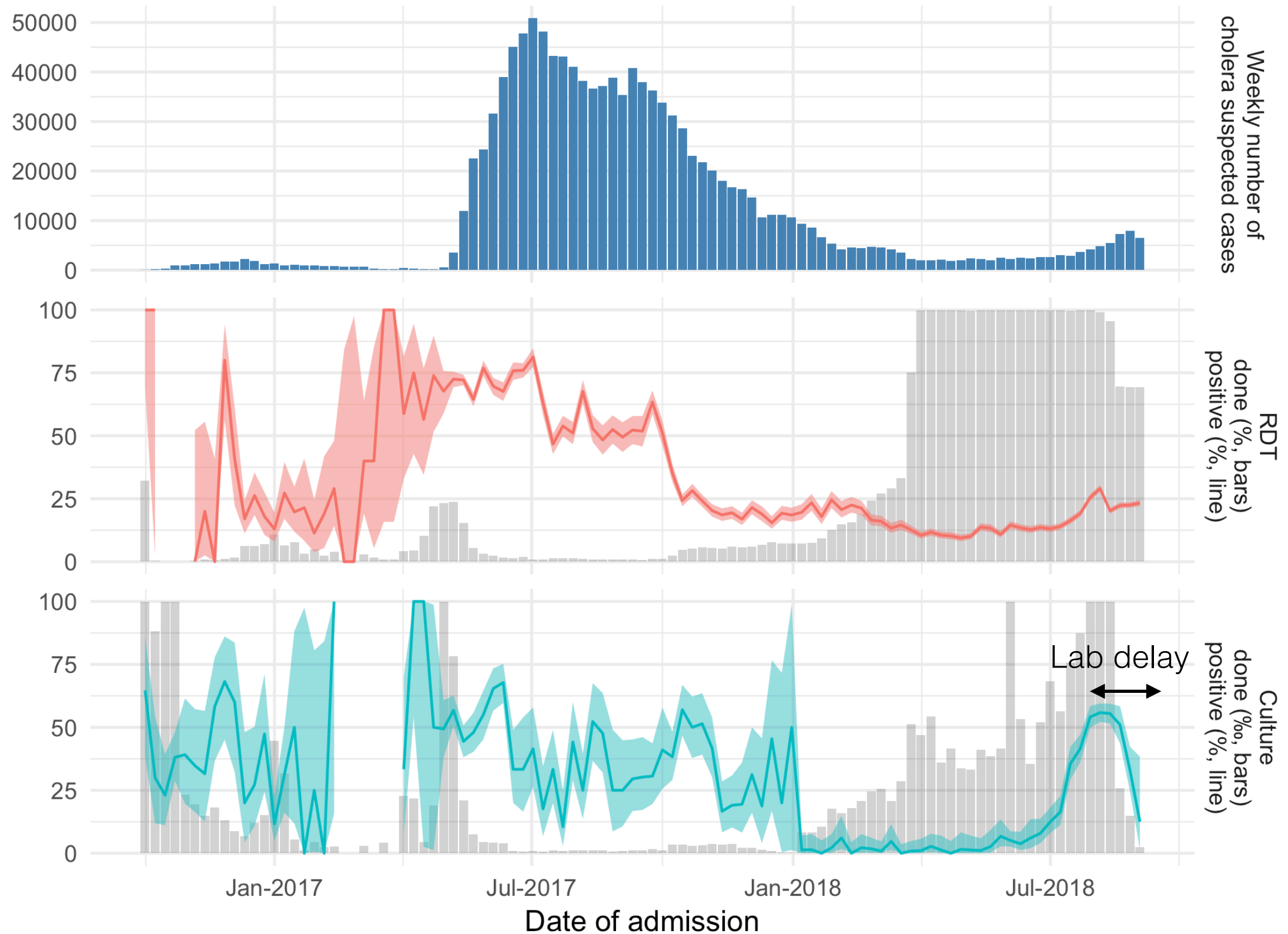
True cholera incidence (preliminary estimate)
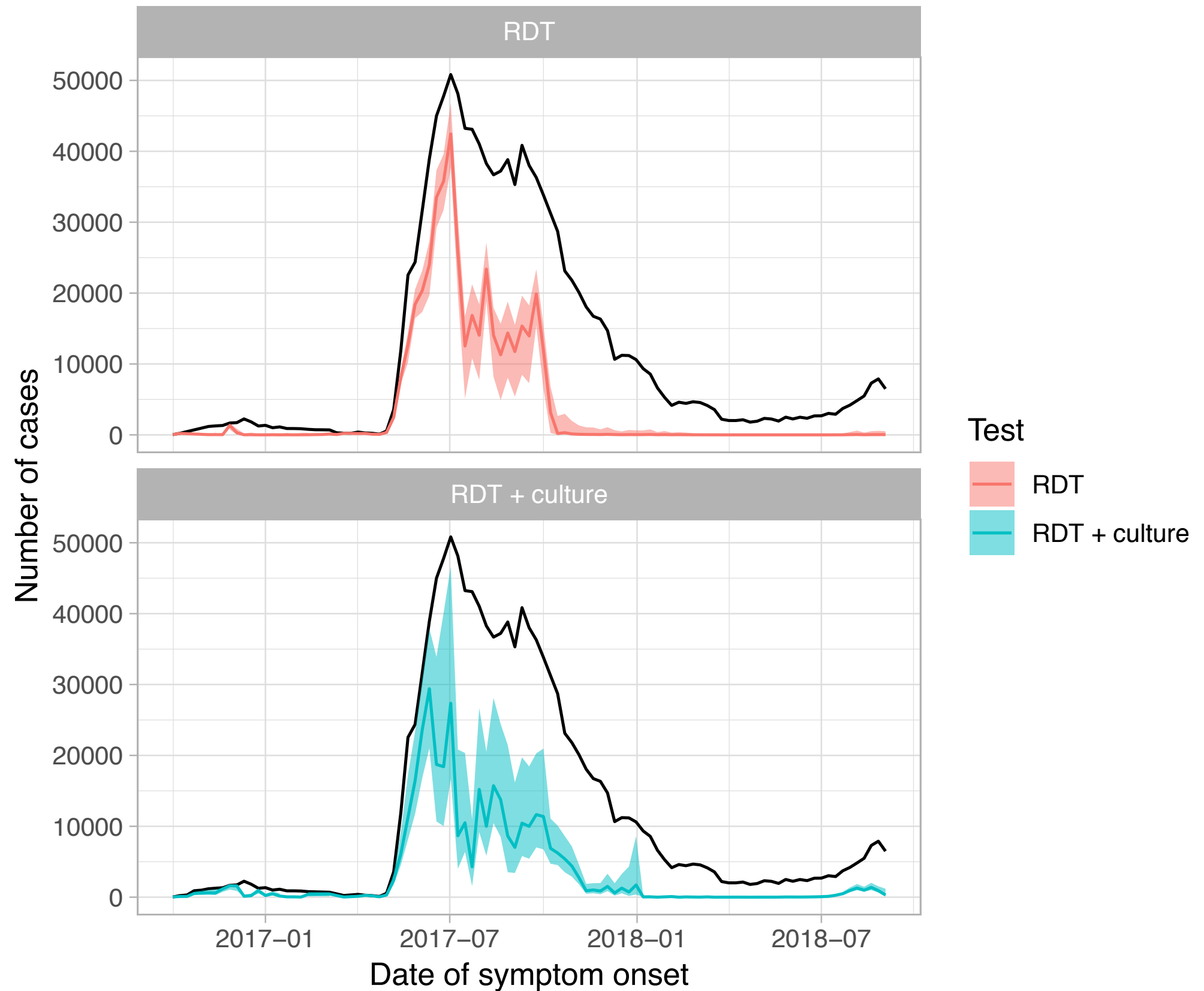
Sampling varied across space & patient characteristics

% of RDT performed

%	
■	none
■	<1
■	1–3
■	3–5
■	5–10
■	10–20
■	20–50
■	>50

% of RDT+ tested by culture

%	
■	none
■	<10
■	10–20
■	20–30
■	30–40
■	40–50
■	50–75
■	>75
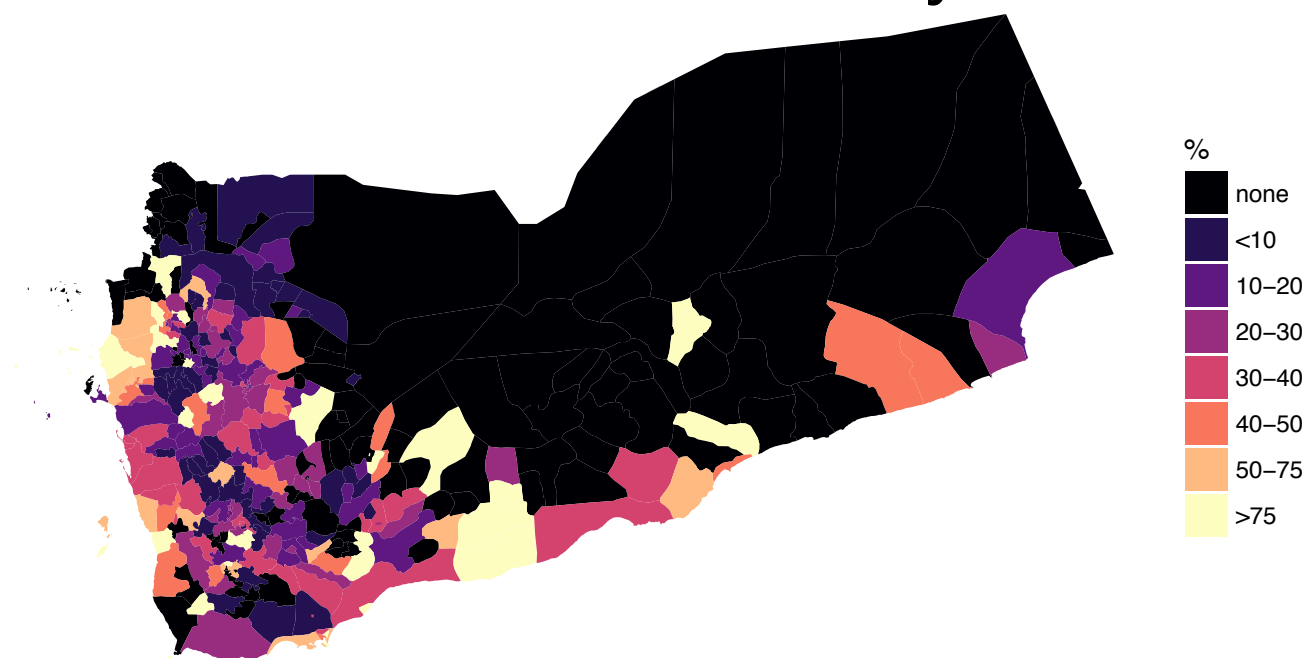
value	RDT not done		RDT done	
	N	%	N	%
Age-group				
1) 0-4	300773	27.4%	5741	19.1%
2) 5-14	258011	23.5%	6112	20.4%
3) 15+	527364	48.0%	17819	59.4%
Missing	11822	1.1%	331	1.1%
Sex				
female	544327	49.6%	15484	51.6%
male	553642	50.4%	14519	48.4%
Missing	1	0.0%	NA	NA
Dehydration				
a	343353	31.3%	6974	23.2%
b	418118	38.1%	9173	30.6%
c	170818	15.6%	11776	39.2%
Missing	43928	4.0%	961	3.2%
none	121753	11.1%	1119	3.7%

A simpler, more robust estimate
Cholera circulation in districts (RDT+culture)
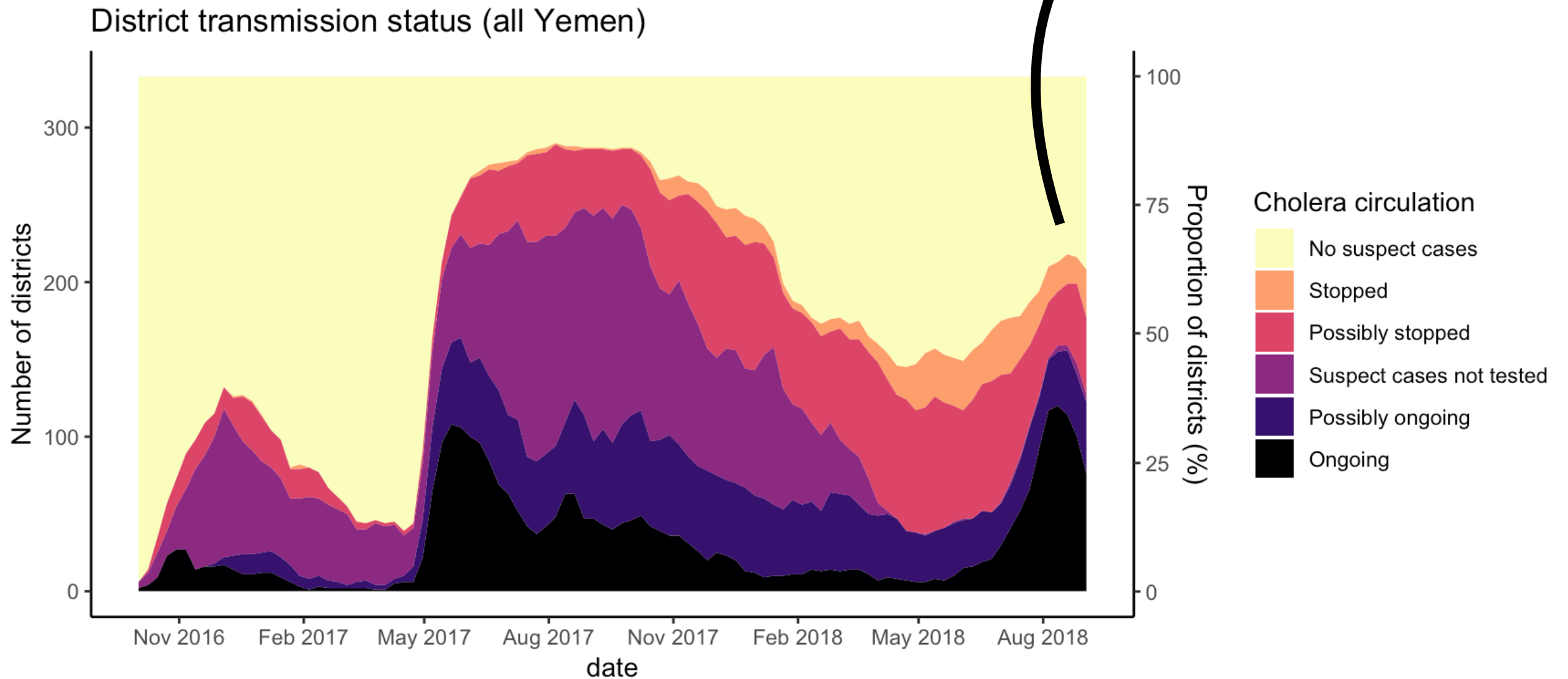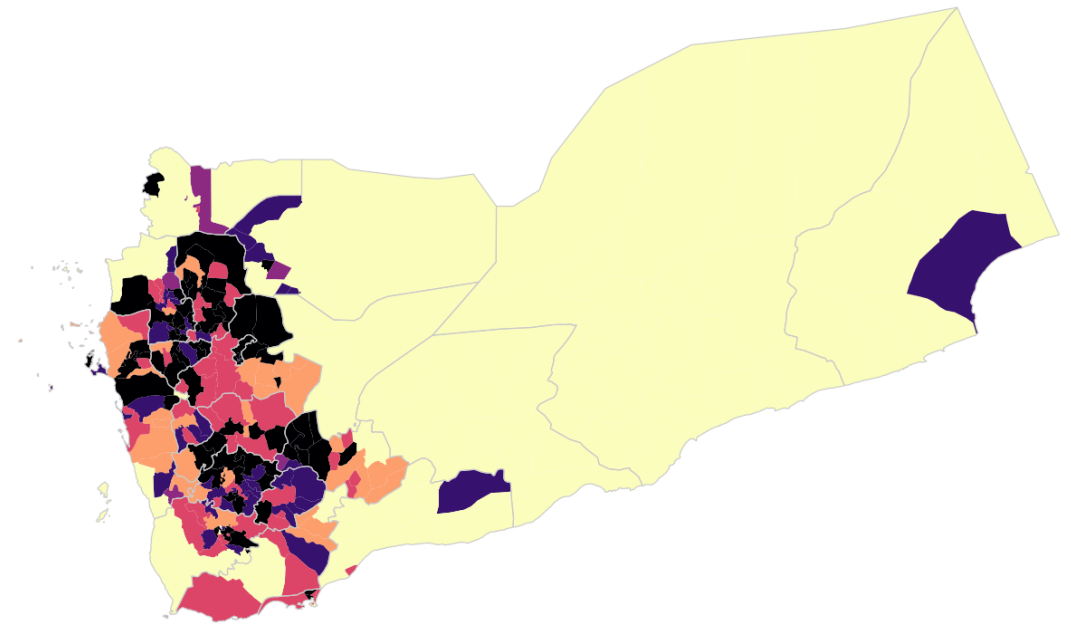
Discussion

- **RDT & culture testing algorithm:** Detect cholera transmission and estimate true cholera incidence

- **Practical constraints:** Non-random sampling for RDT, limited lab capacity for RDT+ confirmation

- **Sampling protocol:** Provide guidance given number of suspect cases, lab capacity & epidemic phase (growing, declining)

- **True cholera incidence in Yemen:** Future work will (try to) account for all biases in RDT & culture sampling

- **Mozambique:** algorithm in place to monitor the true number of cholera cases (RDT 1/10, Culture 50/week max)

Yemen 2019 (MSF data)