

CHOLERA UPDATES in Indonesia



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Cholera epidemiology update

History

7 cholera pandemics since 1817

The first 6 (from 1817-1923) - caused by *V. Cholerae*

Originated in Asia with subsequent spread to other continents

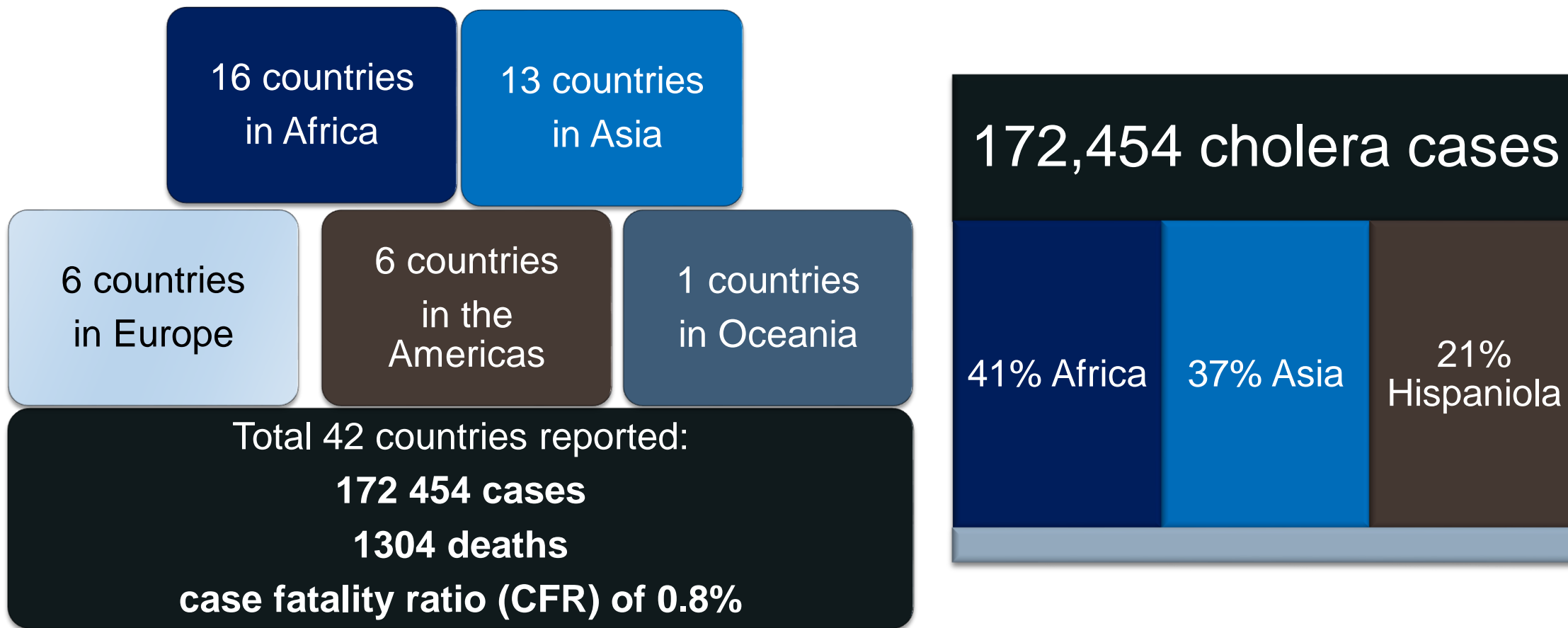
The 7th pandemic:

1961 began in Makasar Indonesia Caused by *V. cholerae* El Tor

Spread to Africa and Europe

1991, the pandemic strain spread to Peru

Global cholera epidemiology update - 2015



This represents a 9% decrease in the number of cases reported compared with 2014 (190 549 cases)

Global cholera epidemiology update - 2015

A high number of cases were reported in **Haiti, Mozambique, Somalia, and Democratic Republic of the Congo**

In 2015 has seen the occurrence of long, country wide outbreaks in **Tanzania and Kenya**

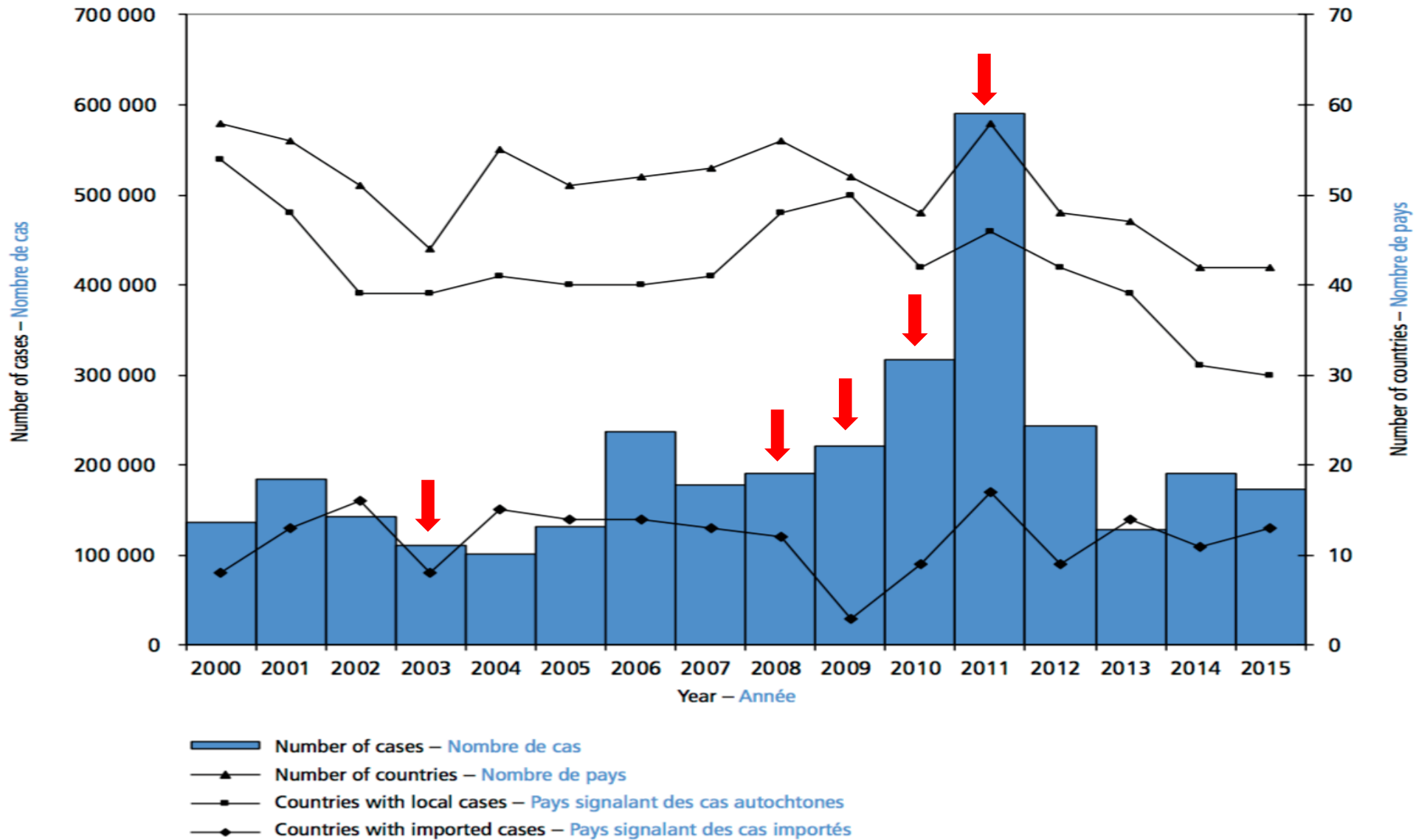
Under-reporting remains significant in **South Asia**

No reported from Indonesia ?

Thus, the quality of disease burden data still needs to be improved

Figure 1 **Countries/areas reporting cholera and cases reported by year, 2000–2015**

Figure 1 **Pays/territoires ayant déclarés des cas de choléra et nombre de cas déclarés par année, 2000-2015**



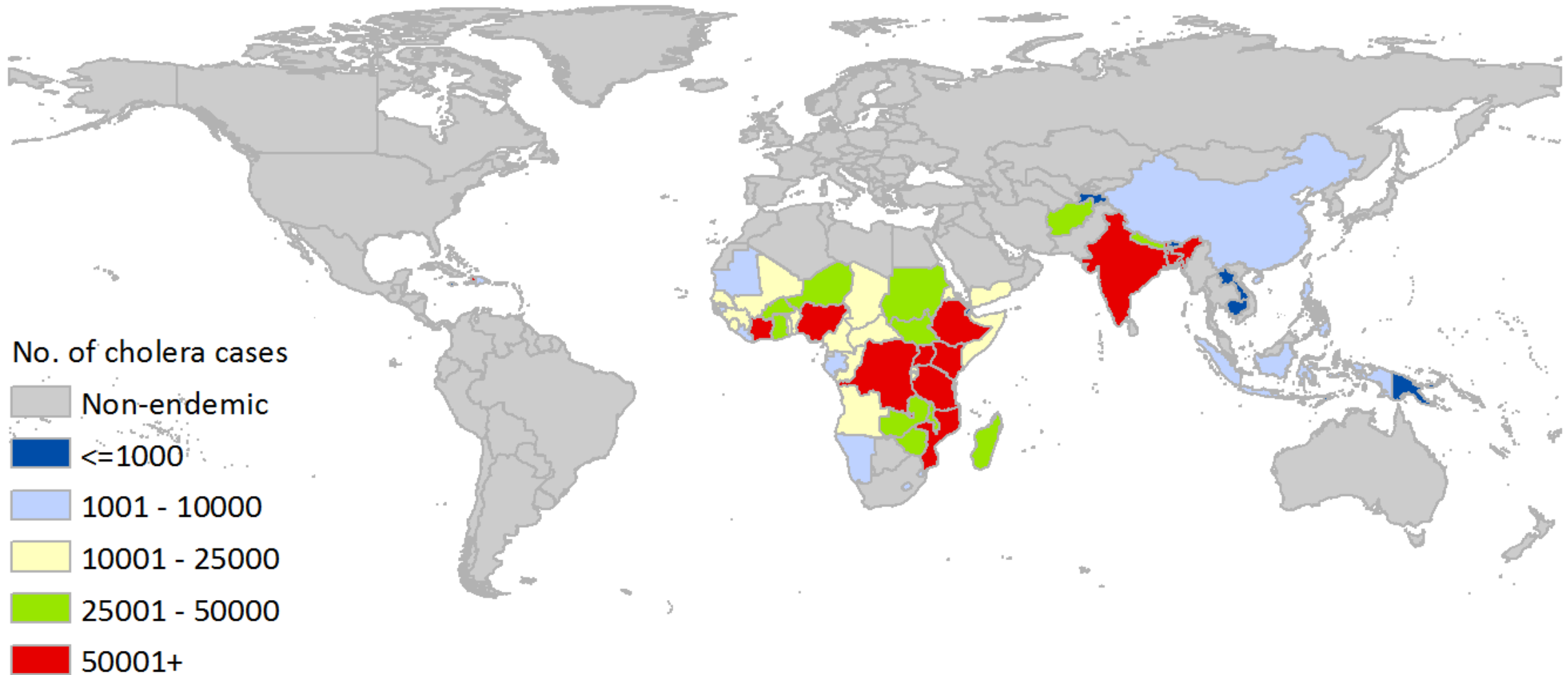
15 outbreaks of cholera have been reported from Jan 2015 - June 2016

(104,451 cases and 1,853 deaths)

Time Period	Country	Area	Number of cases	Number of deaths	CFR
June 2015	South Sudan	Jonglei	139	1	0.7%
21 Aug 2015 - 22 May 2016	United Republic of Tanzania (incl. Zanzibar)	Nationwide	21,581	338	1.6%
Oct 2015 - Feb 2016	Uganda	Arua, Busia, Hoima, Kampala, Kasese, Mbale, Moroto, Sironko, Wakiso	1,583	148	9.3%
4 Feb - 3 May 2016	Zambia	Lusaka, Central, Northern and Southern Provinces	1,130	14	1.4%
Total			104,451	1,853	-

Time Period	Country	Area	Number of cases	Number of deaths	CFR
17 Feb - April 2016	Benin	Aguégués, Sô-Ava	94	0	0.0%
20 Sept - May 2016	Democratic Republic of Congo	Nationwide	18,513	344	1.9%
7 Nov 2015 - May 2016	Ethiopia	Oromia, Somali	1,727	19	1.2%
1 June 2015 - 19 March 2016	Haiti	Nationwide	30,214	307	1.0%
8 Sept - Nov 2015	Iraq	15 governorates including Baghdad, Babil, Diwaniya and Muthanna	2,847	2	0.1%
1 June 2015 - May 2016	Kenya	Nationwide	14,878	234	1.6%
18 Dec 2015 - 20 May 2016	Malawi	Blantyre, Karonga, Kasungu, Lilongwe, Machinga, Mangochi, Mchinji, Nkhata Bay, Phalombe, Zomba	1,540	42	2.7%
Aug 2015 - Jan 2016	Mozambique	Nampula, Niassa, Zambezia	1,433	8	0.6%
October 2015	Myanmar	Karen	188	11	5.8%
7 Sept 2015 - April 2016	Nigeria	Borno, Jigawa, Kano	1,241	19	1.5%
Jan 2015 - April 2016	Somalia	Banadir, Bay, Lower and Middle Juba, Lower and Middle Shabelle, and Hiraan	7,343	366	5.0%

Burden of cholera in endemic countries 2008-2012



Progress in the prevention and control of cholera

Cholera has been a persistent public health problem in some countries in the region for the past 10 years

Cholera is not only a health problem, it is the direct consequence of poor sanitation and poor quality and inadequate water supply, linked to various environmental, climatic and socio-economic situations

Cholera can be prevented and controlled via complementary, synergistic and multidisciplinary interventions such as prompt case management, WASH (water, sanitation and hygiene), vaccination



• Waldman rJ, mintz ED, Papowitz HE. *The cure for cholera—improving access to safe water and sanitation. N Engl J Med* 2013;368:592–4. www.nejm.org/doi/full/10.1056/nEJmp1214179

• Taylor DL, Kahawita TM, Cairncross S, Ensink JHJ (2015) *The Impact of Water, Sanitation and Hygiene Interventions to Control Cholera: A Systematic Review. PLoS ONE* 10(8): e0135676

The Impact of Water, Sanitation and Hygiene Interventions to Control Cholera: A Systematic Review

Study	Intervention	Country, Setting	Study design	Outcome Measure	Sample Size	Results	Category, Quality
Water treatment at source							
Cavallaro et al. (2011)	Pot chlorination of wells. Pierced plastic bottle with layers of sand, gravel and calcium hypochlorite.	Guinea-Bissau, cholera outbreak	Intervention trial	FRC	30 wells in 22 Bissau neighbourhoods affected by cholera	WHO recommended emergency FRC level for outbreaks (>1mg/l) maintained in 15% of wells at 24 hours. No measurement of pH or turbidity, abstraction rate, rainfall or indicator bacteria. Pot chlorination is ineffective and should be discouraged.	C, LOW
Garandeau et al. (2006)	Well chlorination devices. Floating chlorinator, locally made pot chlorinator, pressed hypochlorite in sand filled pierced plastic bag.	Liberia, cholera outbreak	Intervention trial	FRC	12 public wells in 3 peri-urban communities of Monrovia hosting displaced people	No numerical results presented. Statements on effectiveness (FRC remaining between 0.2–1.0mg/l) and appropriateness (availability of local materials and acceptability) for each device trialled. Locally pressed calcium hypochlorite tablets in pierced plastic bags together with adequate training can be effective.	C, LOW
Guevart et al. (2008)	Well chlorination device. Hypochlorite and river sand in pierced plastic bag.	Cameroon, cholera outbreak	Intervention trial	FRC	18 wells in 2 Douala neighbourhoods	Maximum chlorine level reached after 24 hours in 31 out of 35 wells. On Day 4 the FRC was <0.2mg/l in half the wells. Presentation of results only, no analysis.	C, LOW

Water treatment at point of use							
Colwell et al. (2003)	Filtration. Intervention: Sari and nylon filters. Control: no filter.	Bangladesh, endemic cholera	Non-random controlled trial	Cholera incidence	133,000 people in rural Matlab randomised to sari (27 villages), nylon (25 villages) or control (13 villages).	Sari compared to control—48% reduction cholera. ($p < 0.001$). Nylon compared to control—41% reduction cholera ($p < 0.02$). No significant difference between nylon and sari groups.	A, MED
Conroy et al. (2001)	Solar disinfection. Intervention: 1.5L plastic bottles kept on roof. Control: water kept indoors.	Kenya, cholera outbreak	Randomised controlled trial, retrospective	Cholera incidence	155 and 144 Maasai children <6yrs randomised to solar disinfection (67 household) or control (64 households)	Cholera in invention group compared to control group: Adults: RR 1.2, 95% CI 0.59–2.5. Children aged 6–15: RR 1.09, 95% CI 0.58–2.05. Children <5 years: OR 0.12 (0.02–0.65) $p = 0.014$.	A, MED
Deb et al. (1986)	Household water treatment, safe storage. Interventions: Chlorine tablets; narrow mouthed storage container ('sorai'); Control: nothing.	India, endemic cholera	Non-random controlled trial	Cholera incidence	91 families of index cases, (31, 30, 30) residing in Calcutta slums.	Cholera incidence reduced by 75% ($p < 0.001$) in the storage container group compared to control. Cholera incidence reduced by 58% ($p < 0.01$) in the chlorination group compared control group. Mean FRC in chlorination group was 0.2mg/l.	A, MED
Dunston et al. (2001)	Safe Water System. 0.5% sodium hypochlorite, narrow mouthed jerry can and education.	Madagascar, cholera outbreak and cyclones	Intervention trial	FRC, Chlorine product utilisation rate	375 households in 15 Antananarivo neighbourhoods	Utilisation rate of chlorine 11% after 6 months. Stratified by the stage of the mobilisation process completed. Median FRC in households using products and those not, 0.23mg/l, 0.1mg/l respectively ($p = 0.005$).	C, LOW
Huq et al. (2010)	Filtration. Sari filtration.	Bangladesh, endemic cholera	Cross-sectional study	Use of filter, Cholera incidence	7,470 rural women in Matlab	Five year after original trial, 31% reported using a filter of any type with 60% of those using a folded sari filter. 25% reduction in cholera incidence, not statistically significant.	A, MED
Lantagne & Clasen (2012)	Household water treatment, safe storage (HWTS). Kenya: chlorine tablets, flocculant/disinfectant—NFI distribution, Nepal: liquid chlorine and tablets—continuous distribution	Kenya, flood & cholera. Nepal, cholera outbreak	Cross-sectional study	Effective use, Coliform count, (CFU/10ml), FRC	400 households in Nepal, 409 households in Kenya	Confirmed use of HWTS method: Kenya—11.7%, Nepal—18.5%. Effective use at 1 CFU/100ml breakpoint: Kenya—Aquatabs, PuR—5.3%, 2.3%. Nepal—not measured, unable to incubate at 44°C. Data compared with other emergencies—Targeted intervention more effective than NFI distribution where population is familiar with method.	C, LOW
Patrick, Berendes et al. (2013)	Household water treatment. Mass distribution of chlorine based products.	Haiti, cholera outbreak	Cross-sectional study	FRC & bacterial colony counts	433 households in 37 clusters in Artibonite, 108 water samples	51% improved sources contaminated with E. coli. 81% respondents reported treating water in the past 3 months. 32% households had a water treatment product present. 49% of respondents reported using an acceptable dose of Aquatabs. 16% of respondents reported using an acceptable dose of liquid bleach. 13% of respondents with water to test sample had a detectable FRC.	C, MED

Hygiene promotion

Beau De Rochars et al. (2011)	Cholera prevention campaign	Haiti, cholera outbreak	Cross-sectional study	Cholera awareness, FRC, Coliform count,	405 household heads in 27 clusters in resource limited areas, in and near Port au Prince.	Preferred method of messaging: TV 71%, Radio 69%. Knowledge of cholera symptoms: Diarrhoea (89%), vomiting (83%). Knowledge of transmission: Contaminated water (72%), contaminated food (61%). Cholera awareness: 86% mentioned hand washing as prevention method. 94% reported washing their hands with soap. Water treatment practices increased from 30% before to 74% after the outbreak (p<0.05). 66.6% used water purification tablets, 57.7% used bleach. 64% water sources positive for E.coli with 60% stored water samples showed detectable FRC.	C, MED
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Water storage vessel disinfection

Steele et al. (2008)	Disinfection of jerry can with sodium hypochlorite	Uganda, cholera outbreak	Cross-sectional study	Coliform count	13 households in Kitgum displaced camp	Water sources not contaminated. Methods used were effective for cleaning of jerry cans but did not prevent recontamination. Raw data presented but no analysis.	C, LOW
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Household disinfection

Gartley et al. (2013)	Household disinfection kit distribution	Haiti, cholera outbreak	Cross-sectional study	Uptake and use of kits	208 recipient households in Carrefour	98% of households had used the kit. 75% used 5 or more items. Most popular was chlorine and soap. Increased use observed after hygiene education messages strengthened.	C, LOW
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Improved WASH infrastructure

Azurin & Alvero (1974)	Improved water and sanitation facilities. Intervention: Improved water, improved communal toilets, improved water & toilets. Control: none	Philippines, endemic cholera	Non-random controlled trial	Cholera incidence	4 communities in Bacolod city	Compared to the control community: 68% reduction in cholera incidence rate in community with improved sanitation. 73% reduction in cholera incidence rate in community with improved water supply. 65% reduction in cholera incidence rate in community with improved water and sanitation. Cholera is less likely to produce secondary cases where improved WASH measures are in place.	B, MED
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The Impact of Water, Sanitation and Hygiene Interventions to Control Cholera: A Systematic Review

Conclusion

Several recent review shortage of evidence for WASH interventions in emergencies

The Impact of WASH interventions on cholera lack of studies evaluating WASH interventions to control cholera

The majority of studies lacked a disease outcome, or failed to assess compliance, or use of the intervention

Need for studies evaluating cholera response interventions, in the spirit of the WHO Minimum Evaluation Procedure

Further research is required to evaluate not only adherence to the intervention but also the delivery method in an outbreak setting

The results of this much needed to informing international WASH policy, standards and practice with the ultimate aim being, to contribute to reducing the global burden of cholera

Oral Cholera Vaccine

February 2015 - March 2016

2,720,130 doses were shipped to nine different countries

OCVs have been given through mass campaigns in urban and rural settings in Asia, Africa and Latin America and recommended for routine use in Vietnam

Doses of OCV shipped from the stockpile to different countries and contexts, Feb 2015- March 2016


Request Date	Country	Context	Doses shipped
June 2015	United Republic of Tanzania	Outbreak response	254,590
July 2015	South Sudan	Outbreak response	270,340
July 2015	South Sudan	Humanitarian crisis	66,780
July 2015	Cameroon	Humanitarian crisis	116,375

August 2015	Bangladesh	Clinical study	200,025
October 2015	Iraq	Outbreak response	510,020
September 2015	Haiti	Preventive campaign	236,215
January 2016	Niger	Preventive campaign in a humanitarian crisis	195,160
January 2016	Malawi	Outbreak response	160,020
February 2016	Malawi	Outbreak response	40,005
March 2016	Zambia	Outbreak response	598,150
March 2016	South Sudan	Preventive campaign in a humanitarian crisis	72,450
Total number of doses shipped: 2,720,130			
Number of doses currently (May 2016) in stock: 1,700,000			


Cholera Rapid Diagnostic Tests

The usual approach for diagnosis:


clinical examination and confirmation by (+) culture of stool specimens



However, poor quality of sampling and delays in shipment will affect the efficacy of culture as a primary diagnostic tool



Management of cholera outbreaks **requires immediate identification** (due to the pathogen's potential for spread and devastating consequences of epidemics)



RDTs for the detection of *V. cholerae* O1 and/or O139, have been marketed as an **alternative to culture or PCR** for the confirmation of clinically suspected cholera cases in situations where access to appropriate laboratory services is not readily available

There are more than 20 cholera RDTs currently marketed, mainly based on detection of O1 and O139 antigens in human stool specimens using monoclonal antibodies

Cholera in Indonesia

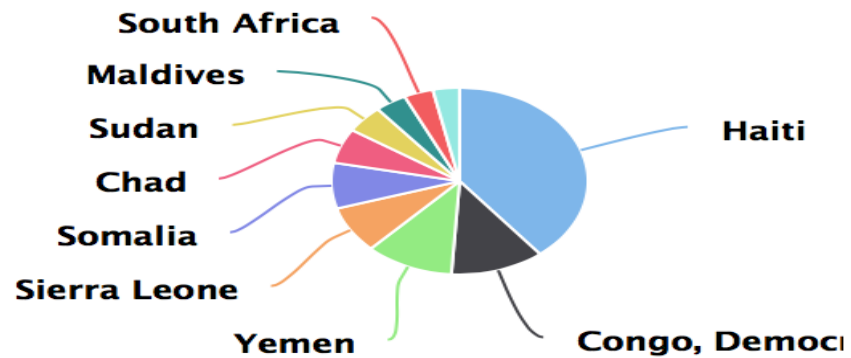


Data Set	Value	Year	Source
Population total	255,708,785	2015	UN data
Area (km ²)	1,910,930	2015	World bank
Gross domestic product in exchange rates (USD)	861,933,968,740	2015	World bank
Gross domestic product per capita (USD)	3,346	2015	World bank

Cholera epidemiologi in Indonesia- 2008

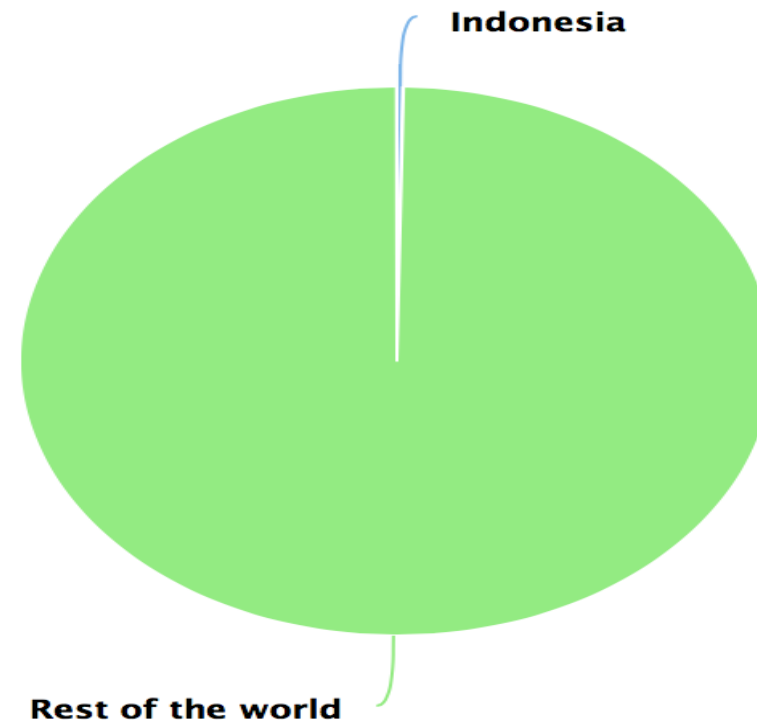
Cholera cases

Top 10 countries in the world



Cholera cases

World share for Indonesia



Sorce: UN data

Breast feeding
Hand hygiene
Clean water
Enviromental hygiene
Zinc
Immunization

Ministry of Health survey

Causes of death among infants and children in Indonesia

Age < 1 years old n = 173		%	Age < 5 years old n = 103		%
1	Diarrhea	31.4	Diarrhea	25.2	
2	Pneumonia	23.8	Pneumonia	15.5	
3	Meningitis /encephalitis	9.3	Enterocolitis	10.7	
4	Gastrointestinal disorders	6.4	Meningitis/encephalitis	8.8	
5	Congenital heart disease and hydrocephalus	5.8	Dengue fever	6.8	

Diarrhea in Indonesia

2010	411/1000 populations
2006	423 /1000 populations
2003	374 /1000 populations
2000	301/ 1000 populations

Ministry of Health survey

Outbreak diarrhea in Indonesia

2010	33 districts 4204 cases 73 death
2009	24 districts 5756 cases 100 death
2008	69 districts 8133 cases 239 death

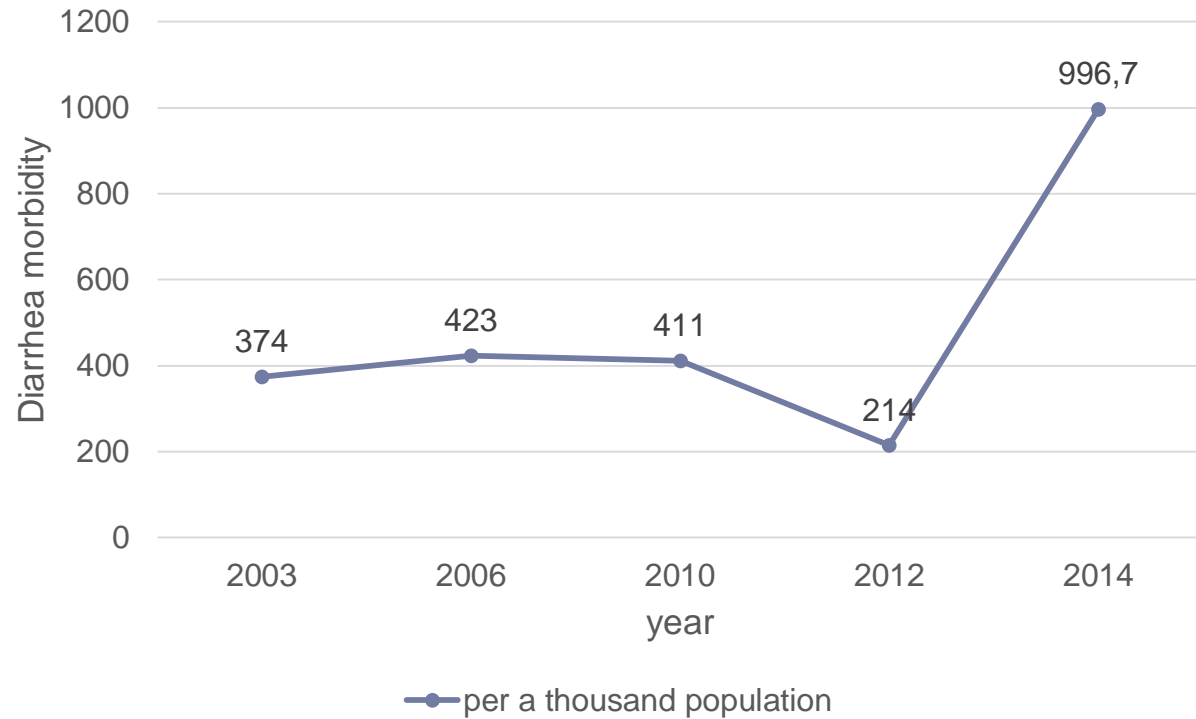
Ministry of Health survey

Diarrhea situation in Indonesia 2013

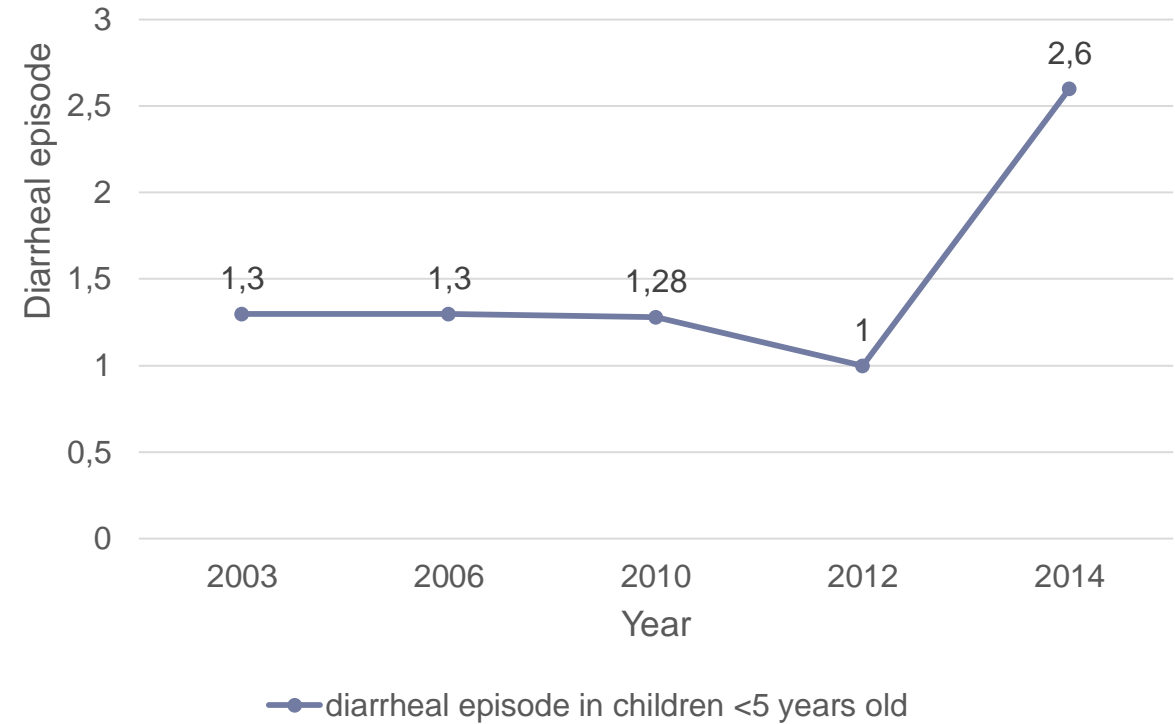
Incidence for all age population is 350/1000 population and
670/ 1000 children < 5 years old

Diarrhea in Indonesia 2003-2014

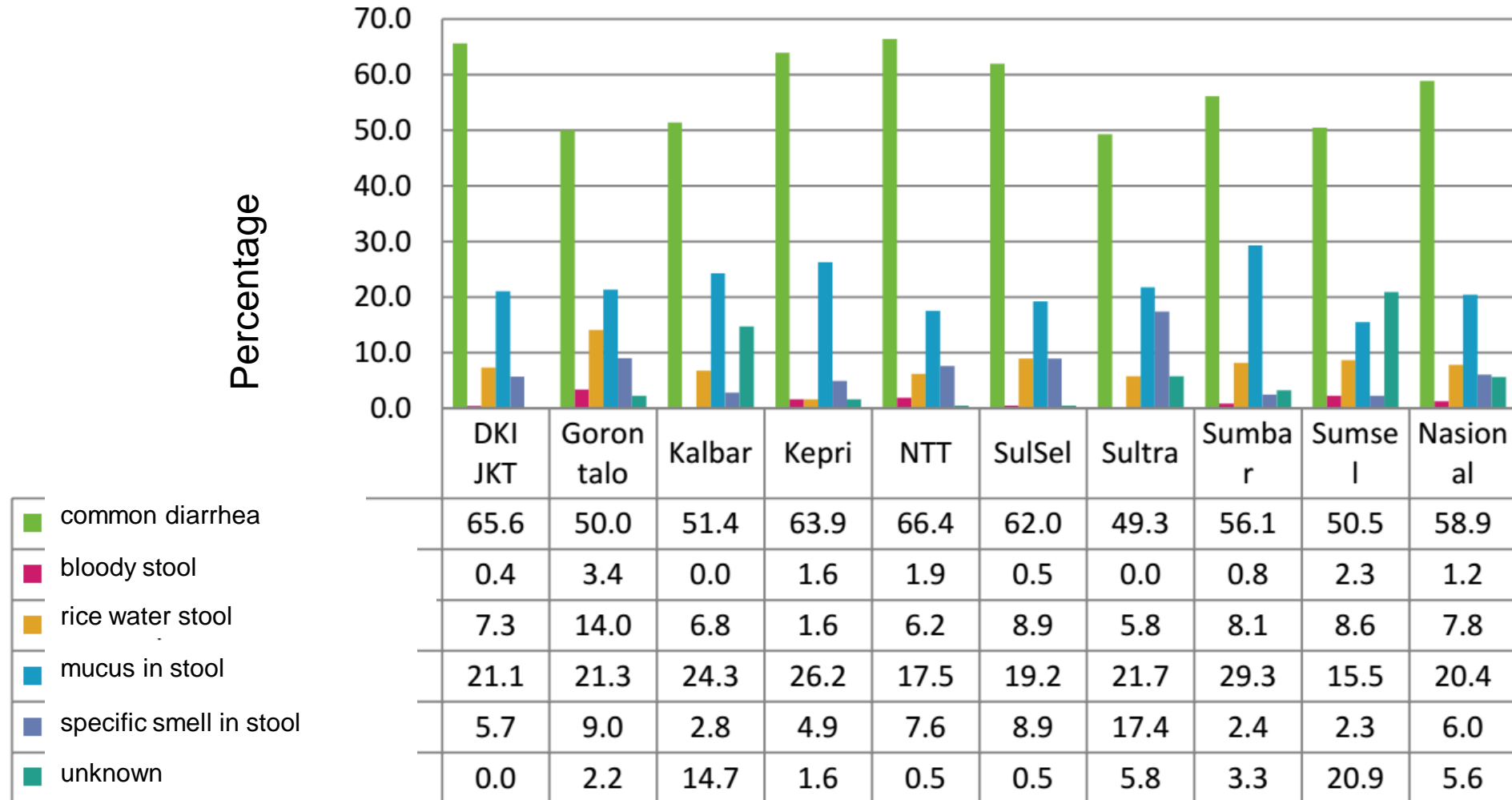
Diarrhea cases in Indonesia



Diarrhea episode in children



Stool Characteristics in children under 5 years old in Indonesia 2014



Diarrhea cases in Indonesia in 2016

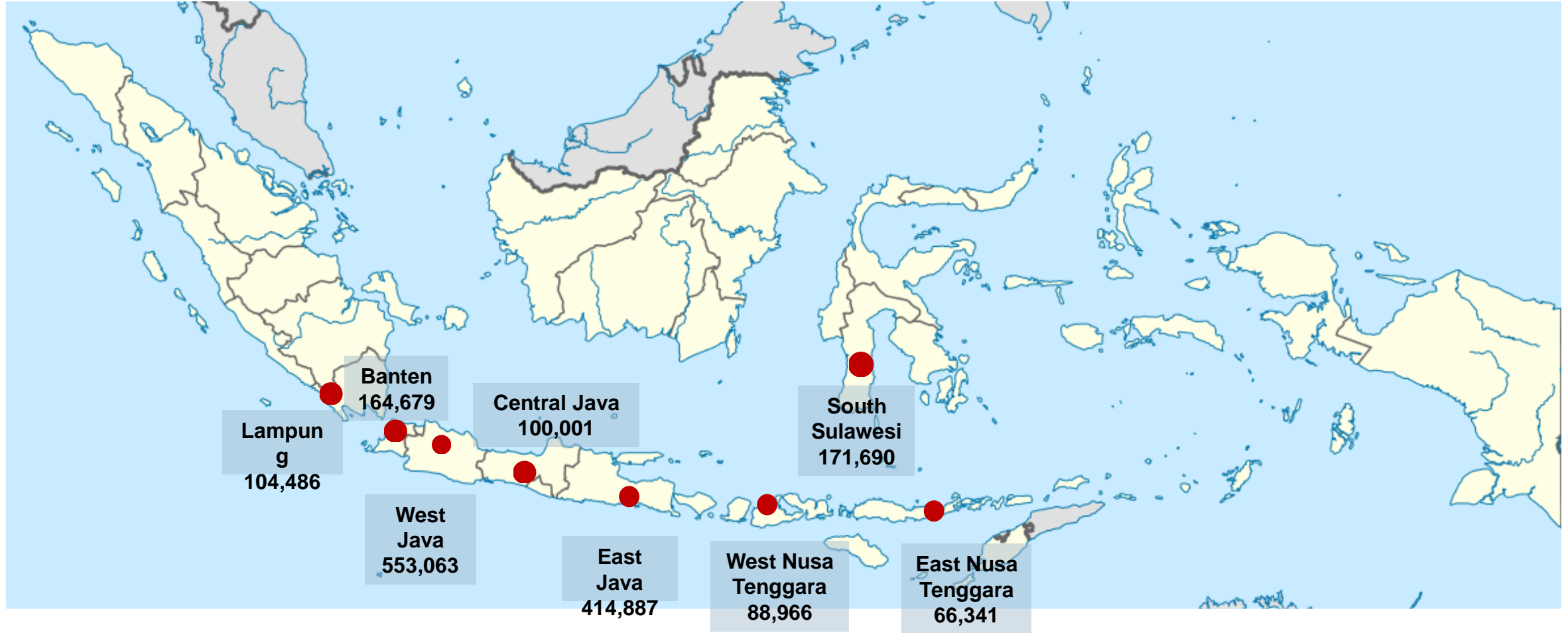
NO	PROVINCE	TOTAL DIARRHEA CASES
1	ACEH	21,004
3	WEST SUMATERA	36,322
4	RIAU	18,970
5	RIAU ISLANDS	24,310
6	JAMBI	66,207
7	SOUTH SUMATERA	43,116
8	BENGKULU	17,080
9	LAMPUNG	104,486
10	DKI JAKARTA	18,344
11	WEST JAVA	553,063
12	CENTRAL JAVA	100,001
13	DI YOGYAKARTA	8,424
14	EAST JAVA	414,887
16	CENTRAL KALIMANTAN	25,577
17	SOUTH KALIMANTAN	23,725

Diarrhea cases in Indonesia in 2016

NO	PROVINCE	TOTAL DIARRHEA CASES
18	EAST KALIMANTAN	73,721
19	NORTH KALIMANTAN	6,337
21	CENTRAL SULAWESI	48,401
22	SOUTH SULAWESI	171,690
23	SOUTH EAST SULAWESI	33,463
24	WEST SULAWESI	25,552
25	BALI	28,548
26	WEST NUSA TENGGARA	83,966
27	EAST NUSA TENGGARA	66,341
28	MALUKU	15,377
30	PAPUA	35,109
32	BANTEN	164,679
34	BANGKA BELITUNG	29,731
	TOTAL	2,222,109

Diarrhea cases in Indonesia in 2016

> 50 000 cases



Risk Factors of diarrhea in Indonesia

Hygiene

- Only 38.7% households practiced healthy and hygiene behavior

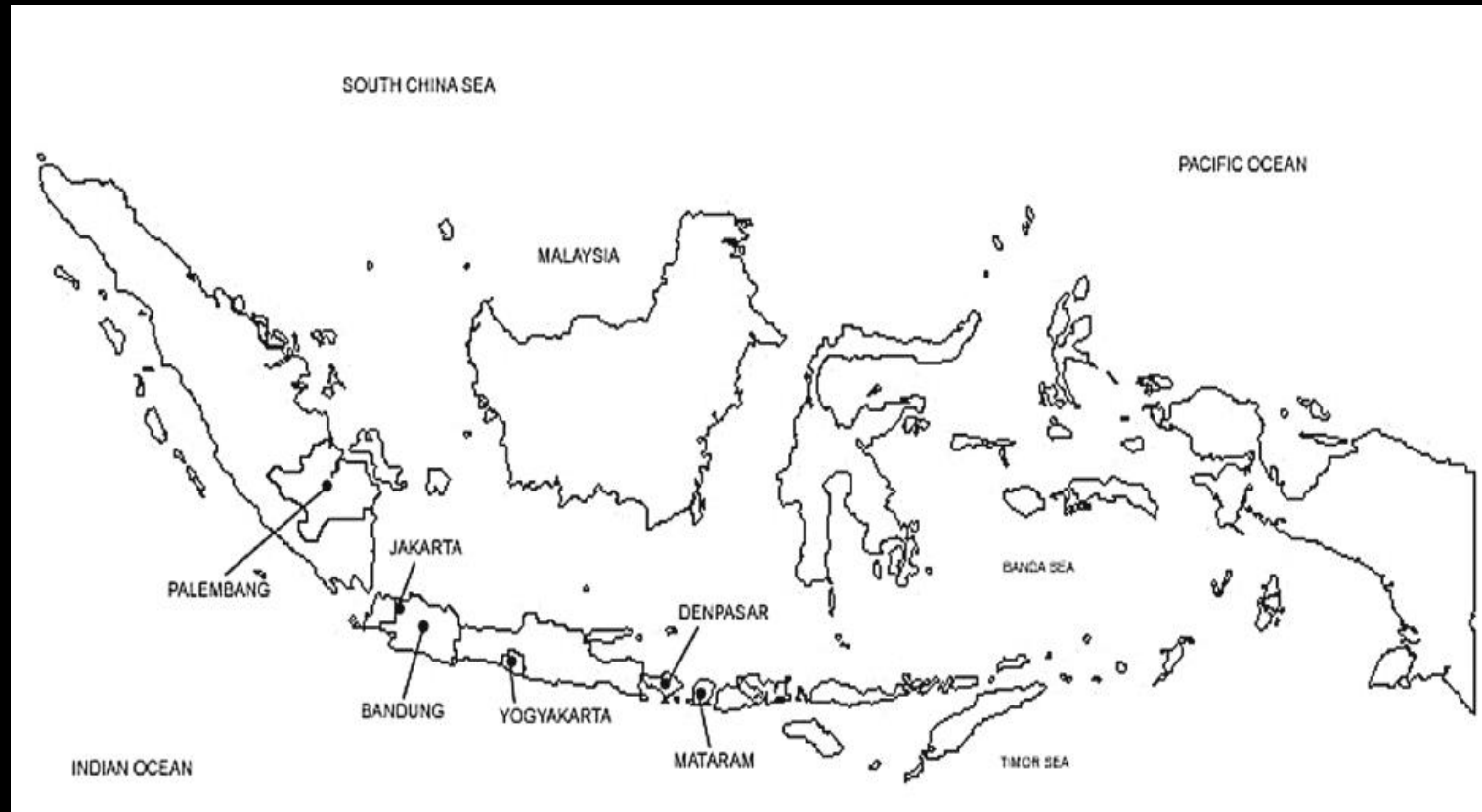
Sanitation

- 9.4% households still practicing open defecation

Water supply

- 10.9% is from unsafe water source
- 7.3% drinks uncooked waters

Multi-centered study

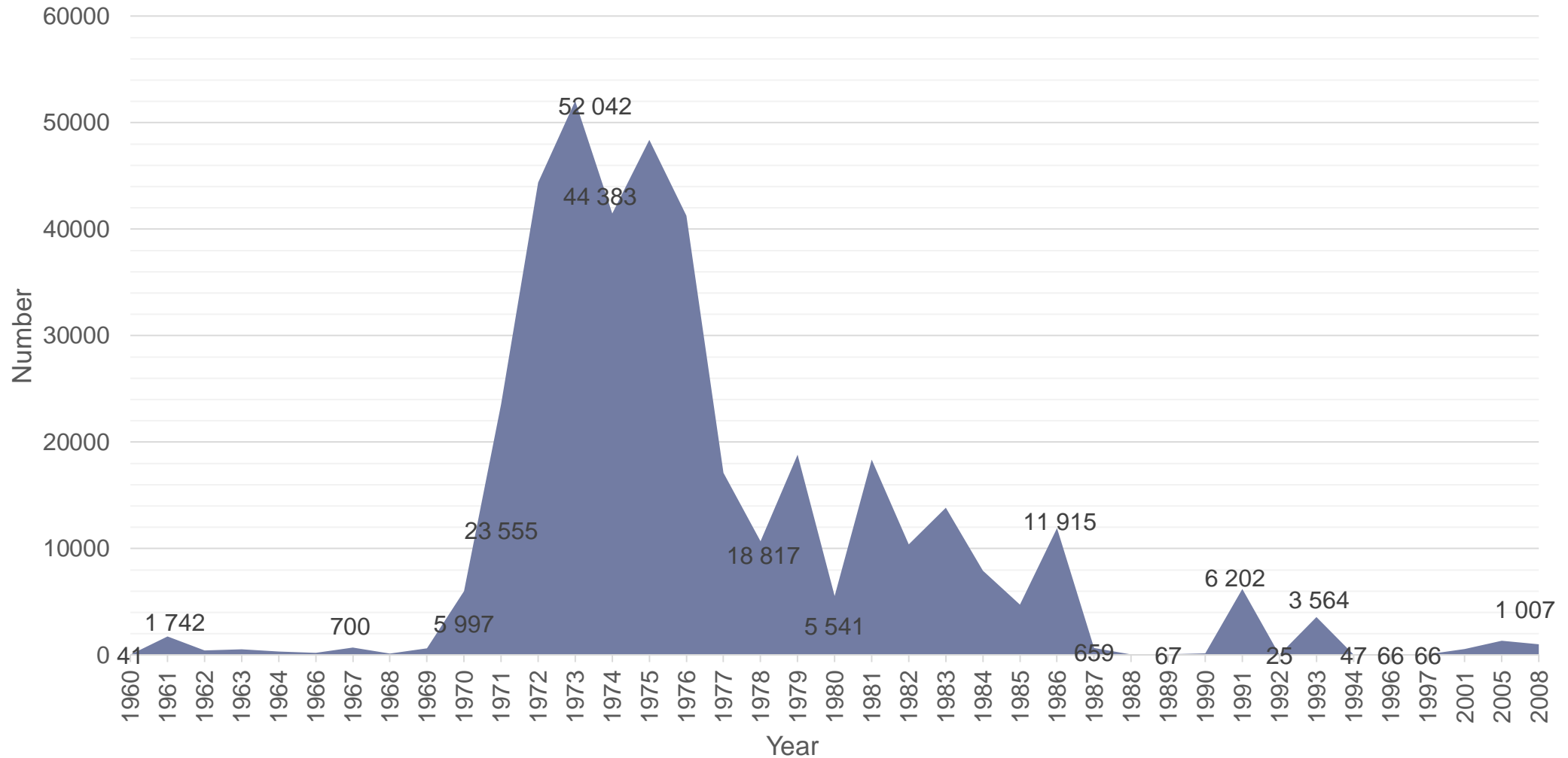


Journal Infectious Disease 2009

Multi-centered study

Patient group, location	Hospital	No. of patients enrolled	No. (%) of patients tested for rotavirus	Patients with rotavirus- positive diarrhea	
				No.	Percentage of tested patients (95% CI)
Inpatients					
Palembang	Muhammad Hussein	534	513 (96)	326	64 (60–68)
Jakarta	Cipto Mangunkusumo	106	99 (93)	66	67 (58–76)
Bandung	Hasan Sadikin	138	137 (99)	70	51 (43–59)
Yogyakarta	Sardjito	262	246 (94)	95	39 (33–45)
Denpasar	Sanglah	557	557 (100)	339	61 (57–65)
Mataram	Mataram	710	688 (97)	449	65 (61–69)
Subtotal	...	2307	2240 (97)	1345	60 (58–62)
Outpatients					
Bandung	Hasan Sadikin	27	27 (100)	11	41 (22–58)
Yogyakarta	Sardjito	38	29 (76)	3	10 (1–21)
Mataram	Mataram	123	120 (98)	59	49 (41–59)
Subtotal	...	188	176 (94)	73	41 (34–48)

Cholera epidemiologi in Indonesia

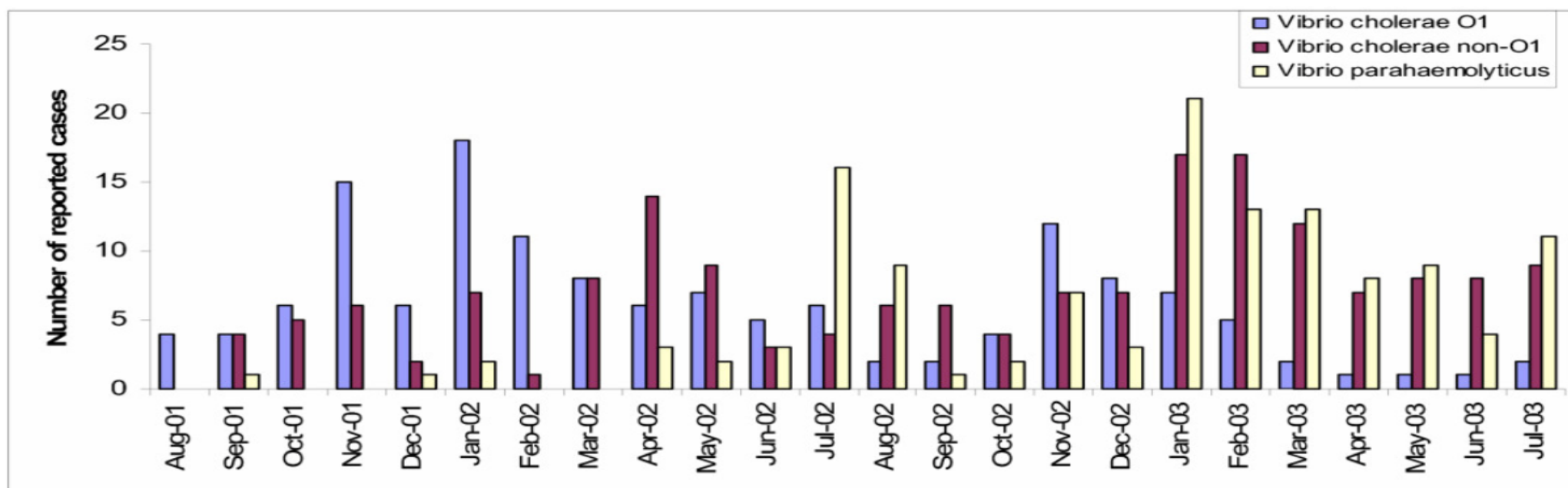


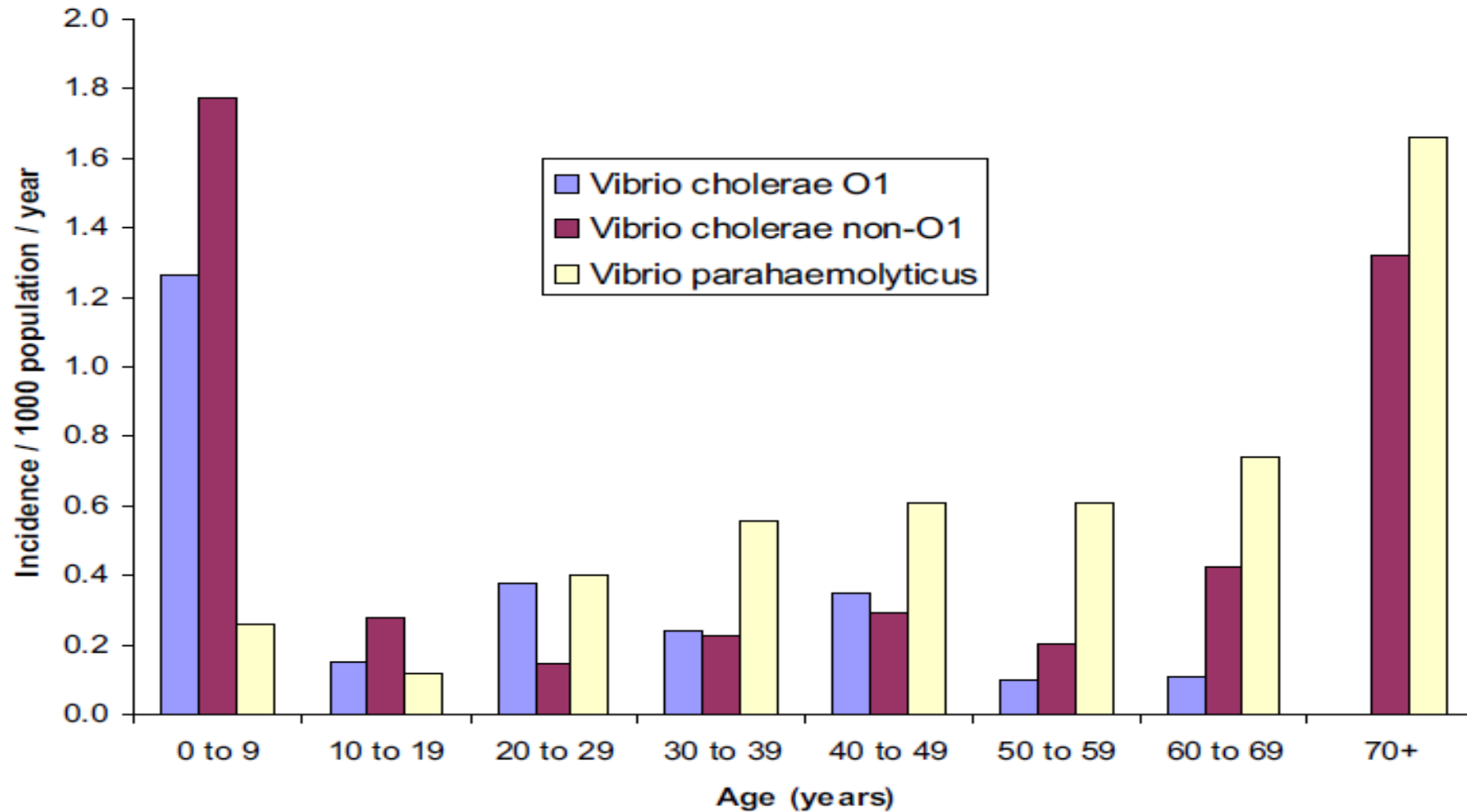
Source: UN data

Cholera In Indonesia: North Jakarta 2003

Overall incidence of cholera of 0.5/1 000/year

Significantly more cases were detected between December and March (162/443; 37%) during the cooler months compared to the remaining 9 months of the year (281/443; 37% ; $p < 0.001$)





Agtini MD, Soeharno R, Lesmana M, et al. The burden of diarrhoea, shigellosis, and cholera in North Jakarta, Indonesia: findings from 24 months surveillance. *BMC Infectious Diseases*. 2005;5:89. doi:10.1186/1471-2334-5-89.

Cholera In Indonesia: Papua 2008

Cholera outbreak in District Nabire and Paniai, Papua province

May to August in 2008

551 cases, killed 105 people

CFR 5.2%

Nelly Puspandari, Kambang Sariadji, and Melati Wati
Research and development, ministry of health

Outbreaks of cholera in Indonesia (2009- 2011)

No	Province	Year	Cases	Deaths	CFR	Laboratory
1	West Java	2009	910	6	0.66	26 rectal swab samples: 10 (+) V. Cholera type Ogawa 2 river samples: 1 (+)
2	East Nusa Tenggara	2009	303	10	3.30	Rectal swab : V. cholera (+)
			20	6	30.00	Rectal swab : V. cholera (+)
3	Banten	2009	241	6	2.49	V. cholera (+)
4	Central Java	2009	95	6	6.32	V. cholera (+)

No	Province	Year	Cases	Deaths	CFR	Laboratory
5	East Java	2010	28	3	10.71	9 rectal swab, 1 (+) V. cholera
			54	1	1.85	3 rectal swab (-), 1 water (+) V. cholera
			747	4	0.54	32 rectal swab 16 (+) V. cholera 1 water (+) V. cholera
			51	0	0.00	3 Rectal swab, (+) V. cholera
6	South Sulawesi	2010	45	2	4.44	5 rectal swab (+) V. cholera
			80	0	0.00	32 rectal swab 16 (+) V. cholera, 16 (+) E. Coli
7	West Java	2010	973	3	0.31	6 Rectal swab : (+) V. cholera
			95	2	2.11	7 rectal swab, 6 (+) V. cholera 1 faecal, (+) V. cholera 2 food, 1 (+) V. cholera
8	Banten	2010	87	3	3.45	34 Rectal swab, 15 (+) V. cholera ogawa, 9 water 1 (+) V. cholera ogawa and inaba

No	Province	Year	Cases	Deaths	CFR	Laboratory
9	Banten	2011	268	1	0.37	25 rectal swab, 10 (+) V. cholera ogawa,
10	East Java	2011	32	0	0.00	3 rectal swab, 2 (+) V. cholera



THANK YOU