
**Nigeria Centre for Disease Control**

Protecting the health of Nigerians

# Cholera hotspots mapping in Nigeria

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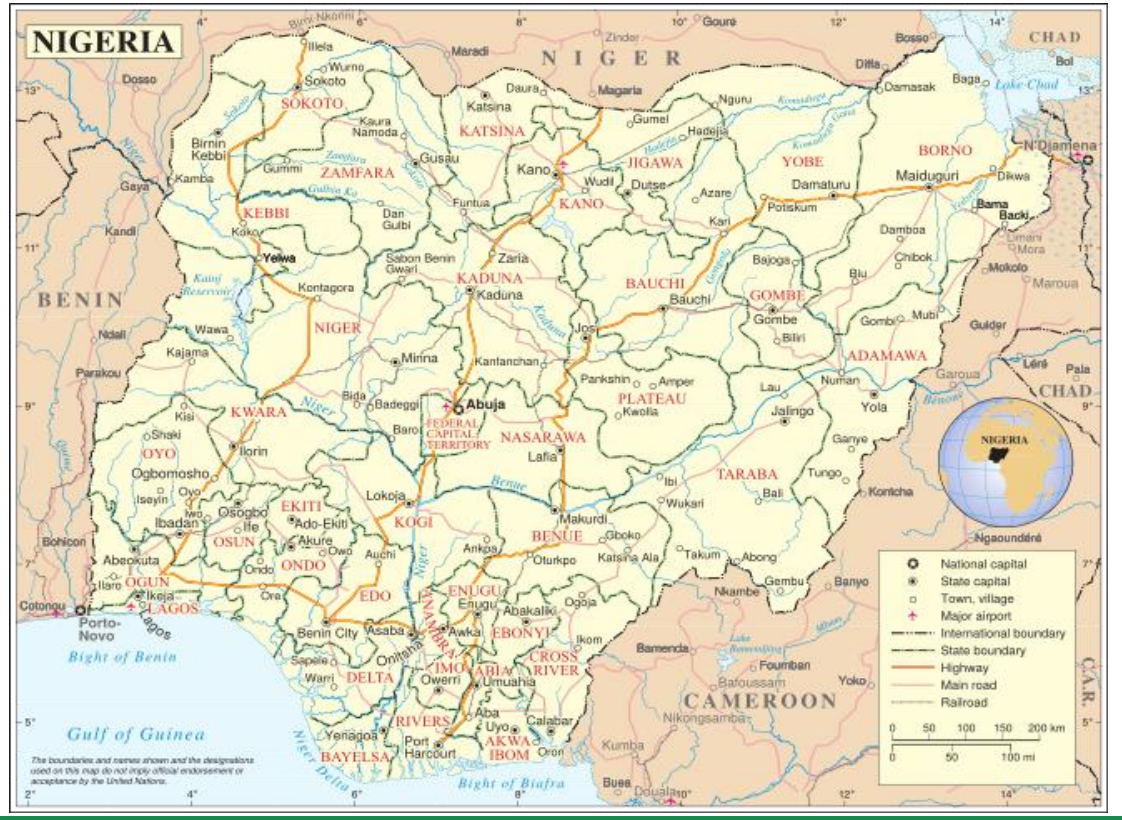
# Profile: Nigeria

- Nigeria is a federal republic comprising 36 states and the Federal Capital Territory, Abuja
- Inhabited by more than 250 ethnic groups with over 500 distinct languages
- Nigeria is divided roughly in half between Christians and Muslims

195.9 million (2018) Census



# Introduction

- Cholera remains a global public health problem, disproportionately affecting the tropical and sub-tropical areas of the world, where focal areas or hotspots play a key role in perpetuating the disease transmission

- Targeting these hotspots with proven interventions e.g. Water, Sanitation and Hygiene (WaSH), as well as Oral Cholera Vaccines (OCV) could reduce the mean annual incidence of the entire sub-Saharan African region by half (Lessler *et al*)

- The Global Task Force on Cholera Control (GTFCC) has thus advocated for a comprehensive cholera control strategy where the use of OCV plays a complementary role to other preventive interventions, chiefly, ensuring access to WaSH

- To align its cholera control strategies with the global road map of the GTFCC, the team at the Nigeria Centre for Disease Control (NCDC) released a document detailing their preparedness and response plans

- Assessing cholera transmission dynamics in Nigeria and identifying cholera hotspots were outlined as immediate-term goals. This help to design and implement relevant long term and cost effective solutions to achieve the ultimate goal of cholera elimination

## Cholera hotspot mapping in Nigeria

"Cholera hotspot" is defined as a geographically limited area (e.g. city, or health district catchment area) where environmental, cultural and/or socioeconomic conditions facilitate the transmission of the disease and where cholera persists or re-appears regularly. Hotspots play a central role in cholera transmission

## Aim

- Overall objective is to identify cholera hotspots (high risk LGAs) in Nigeria to guide the development of cholera prevention and control activities in the country

## Approach

Standardized retrospective cholera case data from 2012 to 2017 (aggregated by week at the LGA level) was used. This comprised of data routinely collated via the IDSR 002 platform and "outbreak data" (line list of medically attended cholera) submitted by states during an outbreak

The data was reformatted for both statistical analysis and mapping using projected population figures (for years 2012-2018) for each LGA obtained from the National Population Commission

- A number of factors for identification and prioritization of hotspots to be targeted for mid-to long-term control activities (including OCV intervention) were utilized

  - ❖ Burden of cholera (mean annual incidence)
  - ❖ Frequency of reporting (number of years an LGA reported cases)
  - ❖ Severity of outbreaks (CFR in %)
  - ❖ WaSH conditions
  - ❖ Nature of settlements in the LGA (predominantly host, mixture of host/IDP and predominantly IDP)

## Burden of cholera and definition of hotspots areas (LGAs)

- Of the total 774 LGAs in Nigeria, 310 (40%) LGAs reported at least one case of cholera for the period under consideration (2012-2017)
- We calculated the mean annual incidence rate for each LGA and set an incidence threshold of 1 case per 10,000 per year as definition of “high risk” / hotspot LGAs (Fig1 A and B)
- Based on this definition, 83 LGAs which are currently homes to an estimated 23 082 577 (11.6%) of the Nigerian population were classified as hotspot areas to be prioritized for interventions
- All 83 LGAs accounted for 83.6% (n = 51 354) of the total number of cases recorded nation-wide from 2012 to 2017

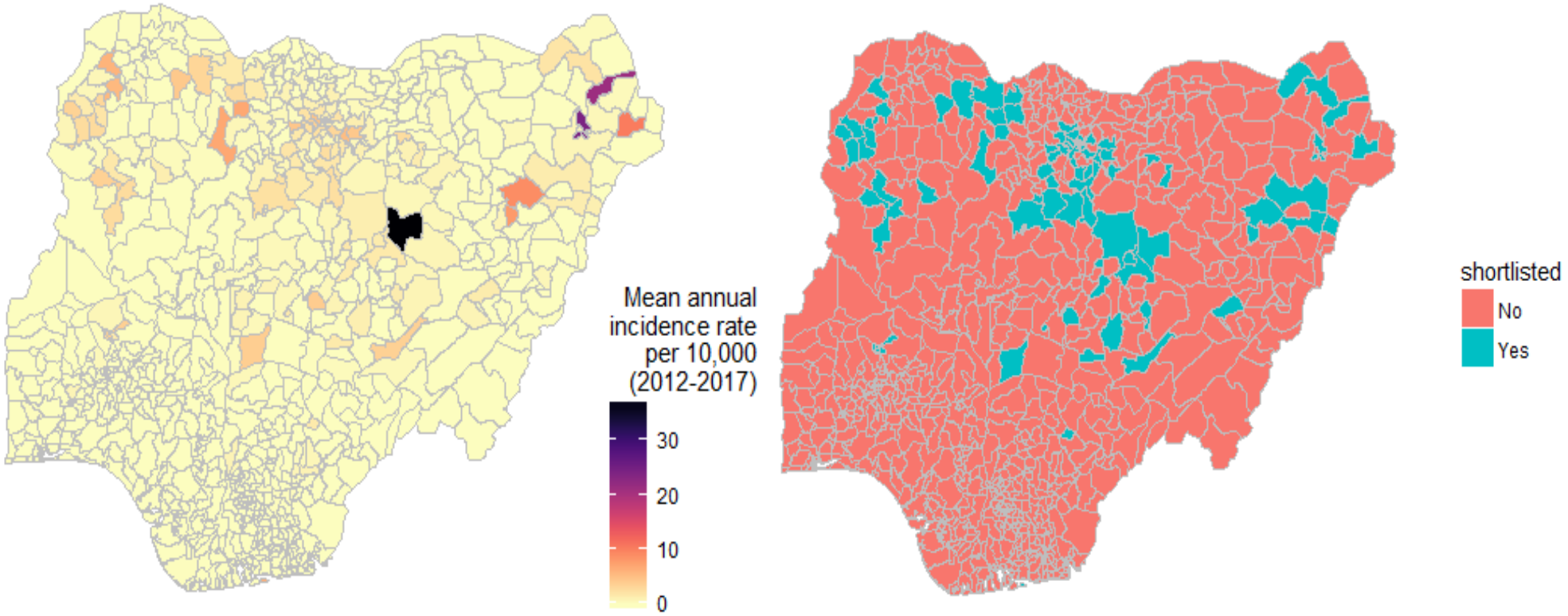



*Fig1 Burden and definition of hotspot areas(LGAs). Panel A illustrates the mean annual incidence rate per 10,000.*

*Panel B depicts all 83"high risk"/hotspot LGAs in blue (i.e. LGAs with >=1 per 10,000 per year) and other 691 LGAs in red*

## Criteria 1: Frequency of reporting of cholera cases

To further prioritize the 83 hotspots LGAs, we assigned a weight of 20 for the criteria frequency of reporting and the following scores were assigned to the number of years of reporting:

- 1 to 2 years = 1
- 3 to 4 years = 2
- 5 to 6 years = 3

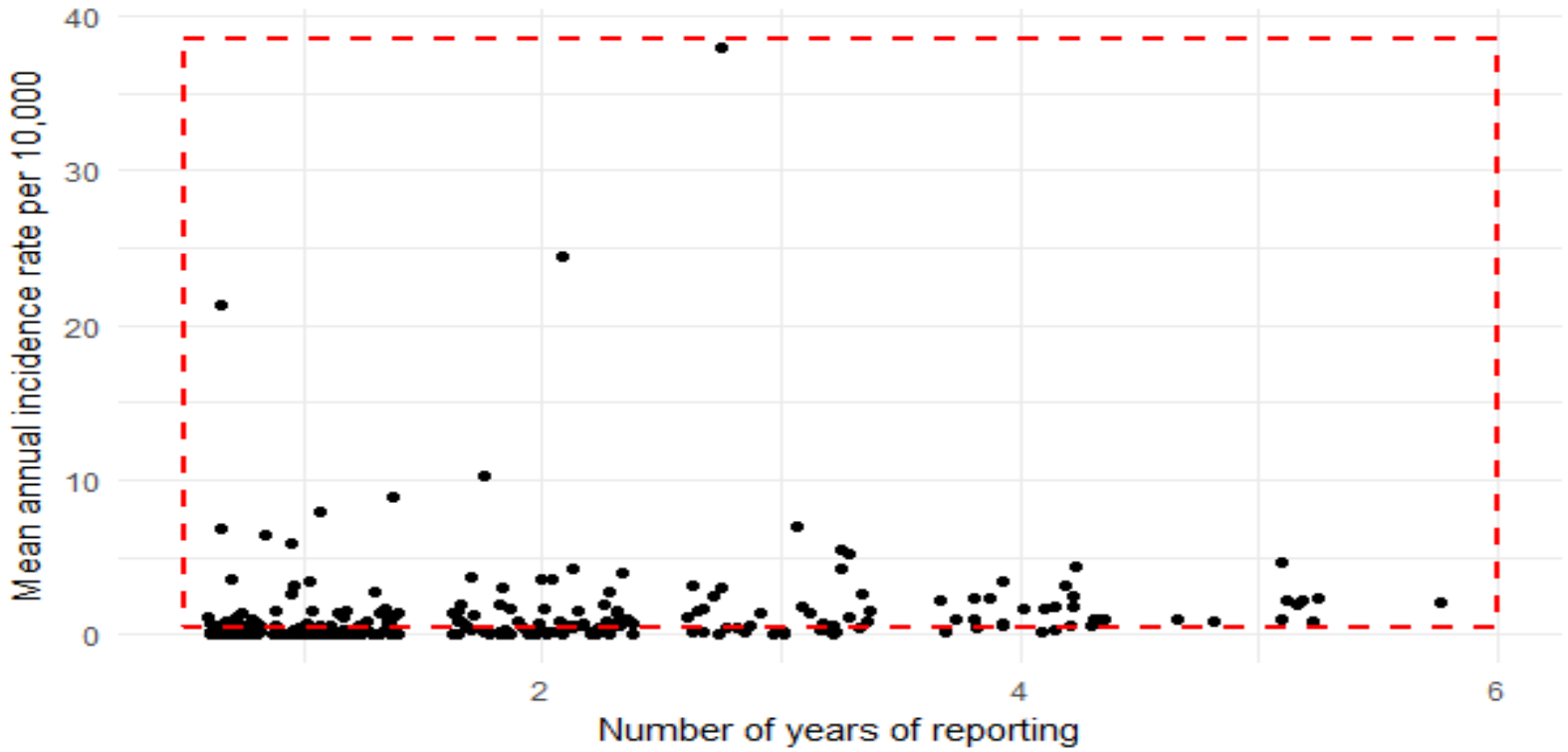



*Fig 2 Plot of mean annual incidence (per 10 000) with frequency of reporting in years*

## Criteria 2: Responsible for the first 50% of all cholera cases reported

By arranging the total number of cases reported by each LGA in descending order, we observed that only 14 LGAs (of the total 310 reporting LGAs) were responsible for 50% of the total cases recorded from 2012 to 2017. We assigned a weight of 20 to this criterion with the following scores assigned to each sub category:

- Responsible for first 50% (Yes)= 2
- Responsible for first 50% (No) =1

## Criteria 3: Severity of outbreaks (CFR in %)

Owing to the fact that data used in our exercise were gathered mainly by passive surveillance, we assigned the smallest **weight** of **10** to this criterion with the following scores:

- 0% CFR =1
- 0.1 to 10% CFR = 2
- >10% CFR = 3

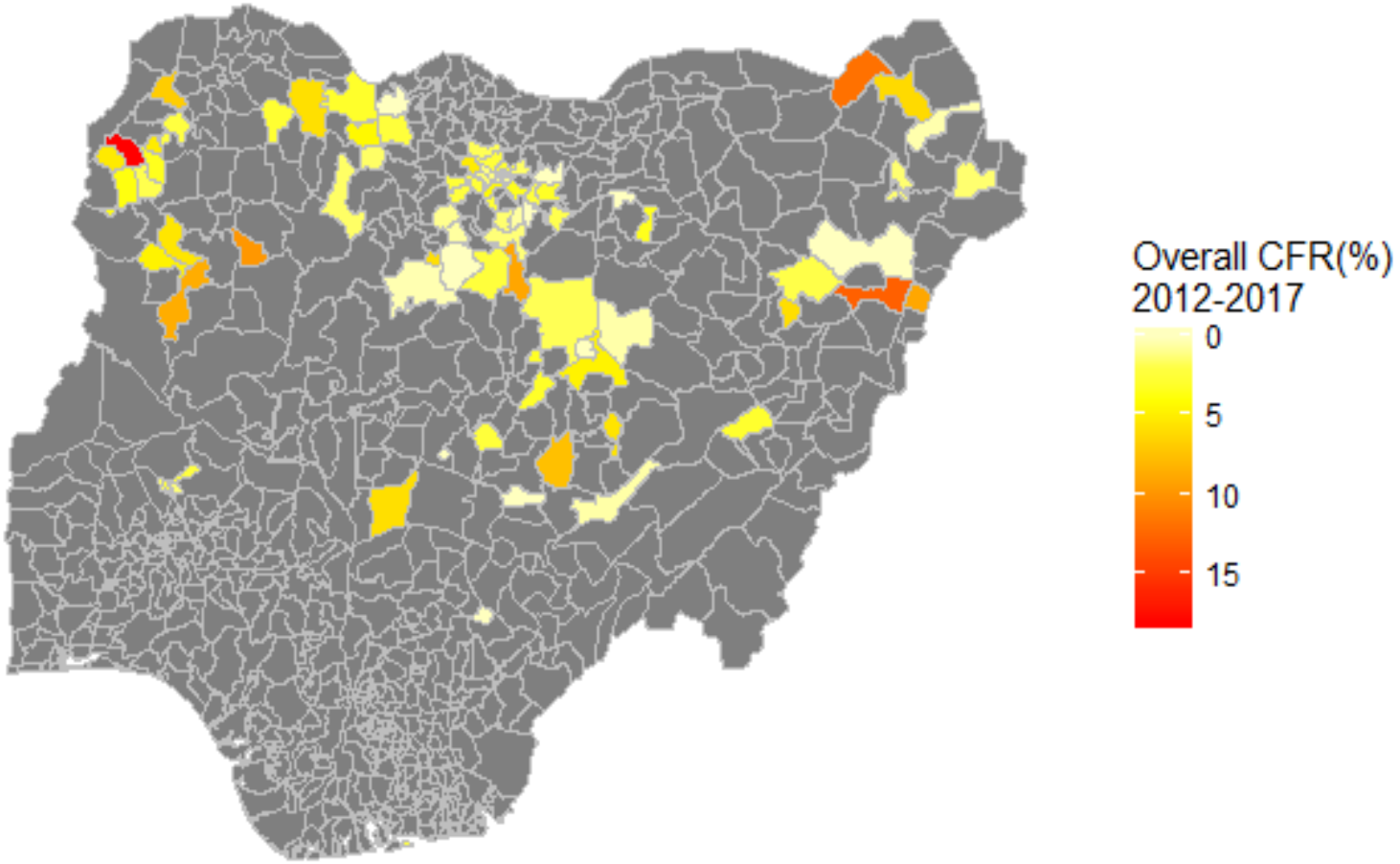



*Fig 3 Map showing distribution of overall CFR in (%) for 2012 to 2017. LGAs colored in grey represent those not classified as hotspot*

- **Criteria 3: Current WaSH conditions**

For each LGA, we classified WaSH condition has **satisfactory** if at least 50% of the population have access to potable water and the presence of active WaSH partners / government agencies could be verified. We classified as **unsatisfactory** when less than 50% of the population have access to potable water or no active WaSH partners / government agencies were present in the LGA or both.

For this category, we assigned a weight of 25 with the following score breakdown:

Satisfactory = 1

Unsatisfactory = 2

- **Criteria 4: Nature of settlement**

Each hotspot LGA was broadly classified into 3 settlement types. The criterion was assigned a weight of 25 and the following scores were assigned to each sub classifications;

- Predominantly host = 1
- Mixture of host and IDPs = 2
- Predominantly IDPs = 3

## Criteria 5: Ongoing transmission

As at 20th June, 2018 (week 24) of conducting this exercise, a total of 13,009 cases of cholera have been reported with a case fatality ratio (CFR) of 0.89%. Altogether, 57 LGAs of 12 states had been affected.

Of these, 4 LGAs had been vaccinated or approved for vaccination in 2018

In 2017, OCV was introduced to Nigeria for the first time during which 6 LGAs of Borno state were vaccinated

For prioritization of hotspots to be targeted for OCV intervention, we factored in LGAs with on-going /active transmission with the following consideration:

- Only LGAs with at least one case confirmed by stool culture or minimum of 30 cases confirmed by RDT were considered as LGAs with confirmed outbreak and were thus prioritized over those not confirmed
- LGAs not yet vaccinated or approved for vaccination were prioritized over those vaccinated in 2017 and 2018 and those approved for vaccination in 2018

Based on these considerations, all 83 hotspot LGAs were assigned 3 main groups: Group 1 (active transmission with confirmed outbreak but not yet vaccinated), Group 2(active transmission without confirmed outbreak and not yet vaccinated) and Group 3(all other LGAs not belonging to Group 1 or 2)

For reach criterion assessed, an LGA's score for that criterion was multiplied by the weight assigned to the criterion to determine the composite risk score

# Results

## Group 1, Priority no 1

Hotspots (LGAs) **with active transmission**, with **a minimum of one case confirmed by stool culture** or **30% of all suspected cases positive for *V. cholerae* by RDT** and **not yet vaccinated (or not already approved for vaccination in year 2018)**

All 3 LGAs of 3 different states constitute a total population of 1 282 143 and a **targeted population of 1 230 855**. The total number of doses (for 2 rounds) was **2 461 710**

Targeted population excludes children below 1 year of age who are not eligible for OCV and are estimated to constitute 4% of the total population

# Table 1. Target population prioritized (no 1) for OCV intervention in Nigeria, 2018

| State | LGA | Attack rate per 10,000 (2018 ) | Mean annual incidence rate per 10,000 (2012-2017) | 2018 Population | Target Pop(96% total population) | Number of OCV doses required |
|---|---|---|---|---|---|---|
| PLATEAU | Jos North | 4.1 | 1.7 | 575 487 | 552 467 | 1 104 934 |
| ZAMFARA | Gusau | 2.7 | 6.9 | 541 825 | 520 152 | 1 040 304 |
| NASARAWA | Toto | 0.5 | 3.8 | 164 830 | 158 236 | 316 472 |

## Group 2

Hotspots (LGAs) **with active transmission**, **but without** a **minimum of one case confirmed by stool culture** or with **less than 30% of all suspected cases** positive for *V. cholerae* by RDT and not yet vaccinated (or not already approved for vaccination in year 2018).

## Priority 2

LGAs within Group 2 with population density ≥ 1000 inhabitants /km$^2$ (score value: 4). These correspond to 6 LGAs of Kano state with a total population of 2 678 553 and a **targeted population** of **2 571 411.** The total number of doses was **5 142 822**.

# Table 2. Target population prioritized (no 2) for OCV intervention in Nigeria, 2018

| State | LGAs | Population 2018 | Target Pop(96% total population) | Number of doses | Composite score | Population density score |
|---|---|---|---|---|---|---|
| KANO | Gezawa | 403 143 | 387 017 | 774 034 | 4 | 4 |
| KANO | Ungongo | 528 327 | 507 194 | 1 014 387 | 3 | 4 |
| KANO | Kumbotso | 423 023 | 406 103 | 812 205 | 3 | 4 |
| KANO | Fagge | 284 172 | 272 805 | 545 610 | 3 | 4 |
| KANO | Gwale | 517 467 | 496 769 | 993 537 | 3 | 4 |
| KANO | Kano Municipal | 522 421 | 501 524 | 1 003 048 | 3 | 4 |

## Group 2

Hotspots (LGAs) **with active transmission**, **but without** a **minimum of one case confirmed by stool culture** or with **less than 30% of all suspected cases** positive for *V. cholerae* by RDT and not yet vaccinated (or not already approved for vaccination in year 2018).

## Priority no. 3

LGAs within Group 2 with population density ranging from 500 to 1000 inhabitants /km$^2$ (score value: 3). These correspond to 8 LGAs of 2 states with a total population of 2 059 902 and a **targeted population** of **1 977 506.** The total number of doses was **3 955 012**

# Table 3. Target population prioritized (no 3) for OCV intervention in Nigeria, 2018

| State | LGAs | Population 2018 | Target Pop(96% total population) | Number of doses | Composite score | Population density score |
|---|---|---|---|---|---|---|
| KANO | Bagwai | 232 747 | 223 437 | 446 873 | 4 | 3 |
| KANO | Bichi | 396 039 | 380 198 | 760 396 | 4 | 3 |
| KANO | Wudil | 264 679 | 254 091 | 508 183 | 3 | 3 |
| KANO | Madobi | 195 266 | 187 456 | 374 911 | 3 | 3 |
| KANO | Dawakin Tofa | 354 272 | 340 101 | 680 201 | 3 | 3 |
| KANO | Dawakin Kudu | 322 134 | 309 248 | 618 497 | 3 | 3 |
| KANO | Garum Mallam | 166 497 | 159 837 | 319 675 | 2 | 3 |
| NASARAWA | Keffi | 128 269 | 123 138 | 246 276 | 1 | 3 |

## Group 2

Hotspots (LGAs) **with active transmission**, **but without** a **minimum of one case confirmed by stool culture** or with **less than 30% of all suspected cases** positive for *V. cholerae* by RDT and not yet vaccinated (or not already approved for vaccination in year 2018).

## Priority no. 4

LGAs within Group 2 with population density ranging from 100 to < 500 inhabitants /km$^2$ (score value: 2) and those less than 100 inhabitants / km$^2$ (score value: 1). These correspond to 5 LGAs of 3 states with a total population of 1 813 710 and a **targeted population** of **1 741 162.** The total number of doses was **3 482 323**

# Table 4. Target population prioritized (no 4) for OCV intervention in Nigeria, 2018

| State | LGAs | Population 2018 | Target Pop (96% total population) | Number of doses | Composite score | Population density score |
|---|---|---|---|---|---|---|
| KADUNA | Igabi | 595 538 | 571 716 | 1 143432 | 4 | 2 |
| BAUCHI | Tafawa-Balewa | 317 779 | 305 068 | 610135 | 3 | 2 |
| ZAMFARA | Bakura | 264 300 | 253 728 | 507456 | 2 | 2 |
| BAUCHI | Dass | 129 925 | 124 728 | 249456 | 1 | 2 |
| BAUCHI | Toro | 506 168 | 485 922 | 971843 | 2 | 1 |

## Group 3

Hotspot LGAs **without** active transmission

## Priority no. 5

LGAs within Group 3 with population density ≥ 1000 inhabitants /km$^2$ (score value: 4). These correspond to 5 LGAs of 3 states with a total population of 2 220 512 and a **targeted population** of **2 131 691.** The total number of doses should be **4 263 383**

## Group 3

Hotspot LGAs **without** active transmission

## Priority no. 6

LGAs within Group 3 with population density ranging from 500 to 1000 inhabitants /km$^2$ (score value: 3). These correspond to 5 LGAs of 3 states with a total population of 1 055 084 and a **targeted population** of **1 012 881.** The total number of doses was **1 055 084.**

## 3.7 Group 3

Hotspot LGAs without active transmission

Priority no. 7

LGAs within Group 3 with population density ranging from 100 to < 500 inhabitants /km$^2$ (score value: 2). These correspond to 38 LGAs of 11 states with a total population of 9 759 127 and a **targeted population** of **6 831 389.** The total number of doses should be **13 662 777.**

Group 3

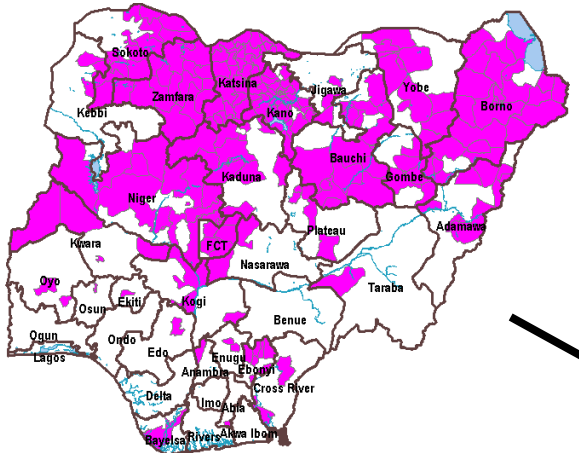
Hotspot LGAs without active transmission

Priority no. 8

LGAs within Group 3 with population density <100 inhabitants /km$^2$ (score value: 1). These correspond to 13 LGAs of 3 states with a total population of 2 213 546 and a **targeted population** of **2 125 004.** The total number of doses was **4 250 009.**

# Nigeria: LGAs/States affected by Cholera, Wks 01-52, 2018-19 & Wk01-25 2020

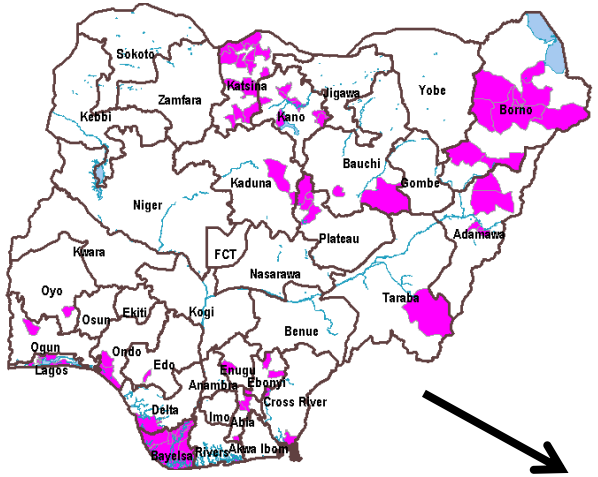
## Wk25-52, 2018




Affected: LGAs = 247; States = 30

Cases = 50719; Lab C.=956; Deaths=1136

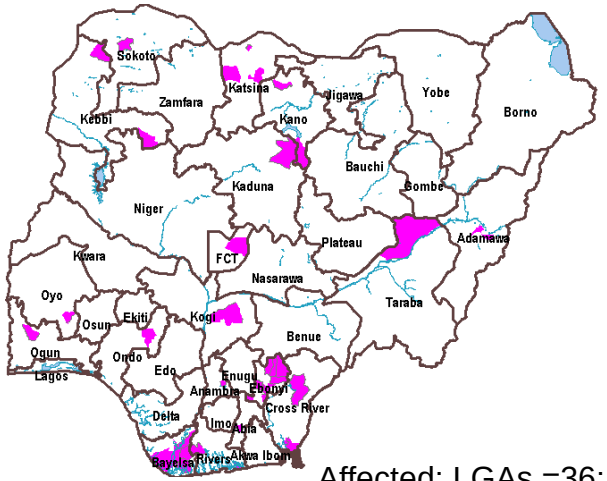
## Wk25-52, 2019




Affected: LGAs = 85; States = 19

Cases = 3513; Lab C.=595; Deaths=71

## Wk01-25, 2020

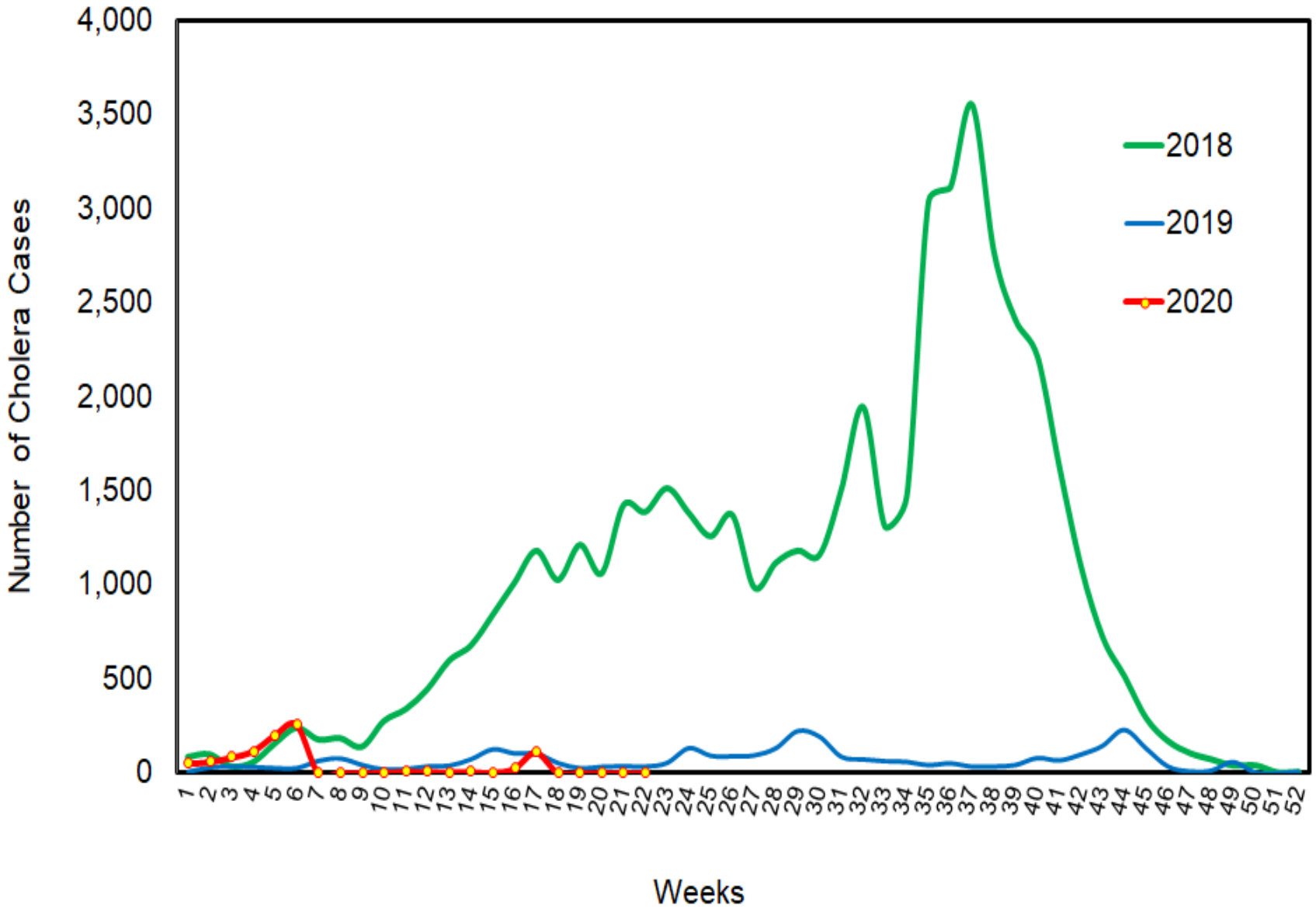



Affected: LGAs =36; States = 18

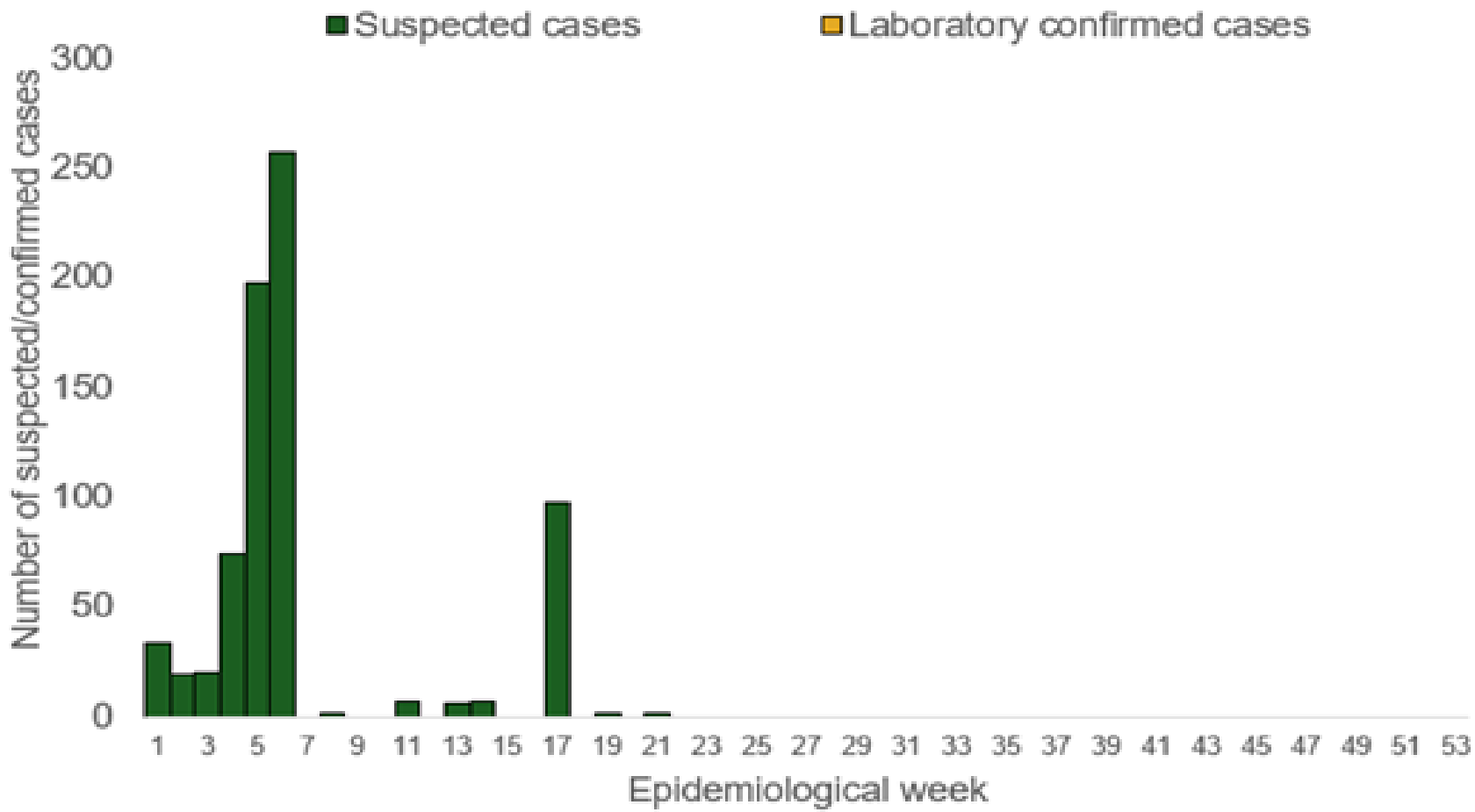
Cases = 956; Lab C.= 40; Deaths = 55

LGAs/States affected by Cholera

# Reported Cholera Cases by Week, 2018 - 2020



# Epidcurve: Showing number of suspected and confirmed cases of Cholera, Nigeria, week 1 – 25, 2020



# Conclusion

- Mapped cholera hotspots in Nigeria are an important step towards attaining the Global Roadmap Strategic goals

# Thank you