



## OPTIMIZING SURVEILLANCE AND INTERVENTIONS TO ADVANCE NATIONAL XDR TYPHOID CONTROL- PAKISTAN

Nada Taqi- World Health Organization



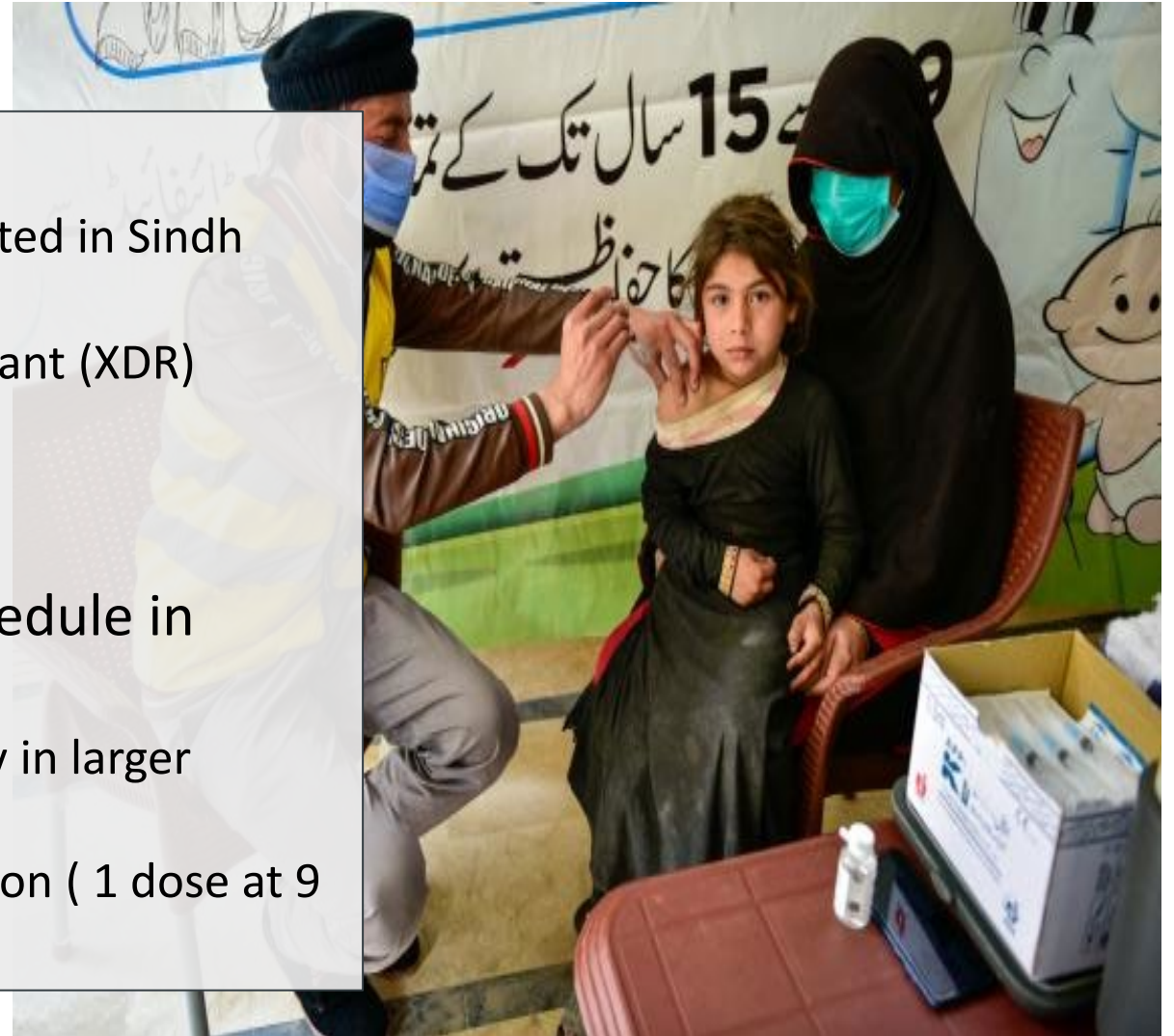
# TYPHOID IN PAKISTAN

1. Background
2. Establishment and standardization of surveillance
3. Surveillance results
  - I. Epidemiology
  - II. Impact of TCV introduction
  - III. XDR Typhoid
4. Conclusions

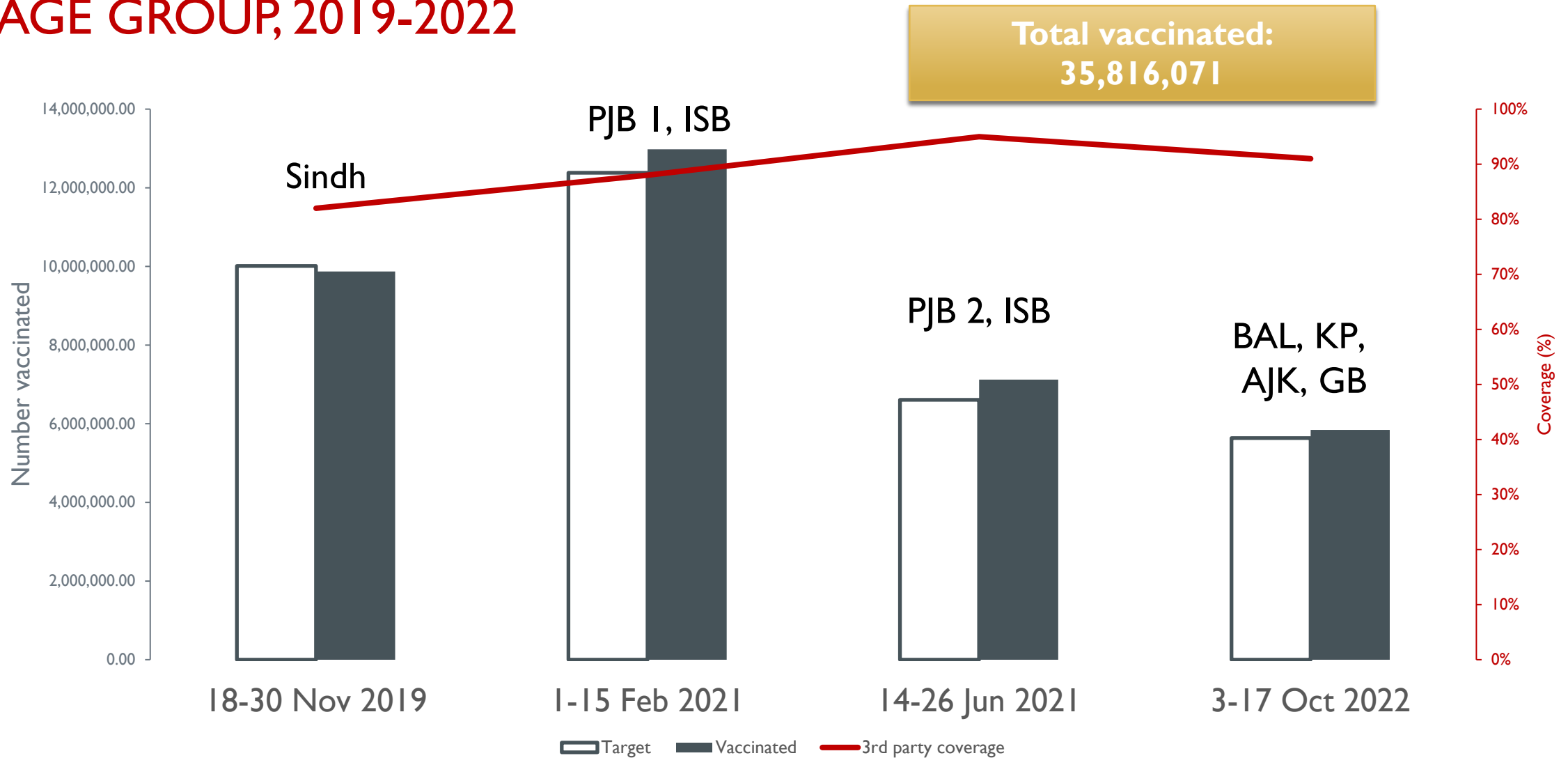


## **BACKGROUND: AN OUTBREAK THAT LED TO TYPHOID CONJUGATE VACCINE [TCV] INTRODUCTION IN PAKISTAN**

- November 2016 - December 2018:
  - 8,188 confirmed typhoid fever cases reported in Sindh province
    - 5274 (64%) were Extensive Drug Resistant (XDR)
      - 69% in Karachi
      - 27% in Hyderabad
      - 4% in other districts
- Pakistan included TCV in the routine schedule in multiple phases from 2019-2022
  1. Initial TCV campaign to improve immunity in larger groups (9M<15years) in urban cities
  2. Introduction of TCV in routine immunization ( 1 dose at 9 months of age)



# INITIAL TCV CAMPAIGNS IN PAKISTAN TARGETING THE 9M-<15 YEARS AGE GROUP, 2019-2022



# SURVEILLANCE: ESTABLISHMENT OF TYPHOID SENTINEL SITES

## Timeline

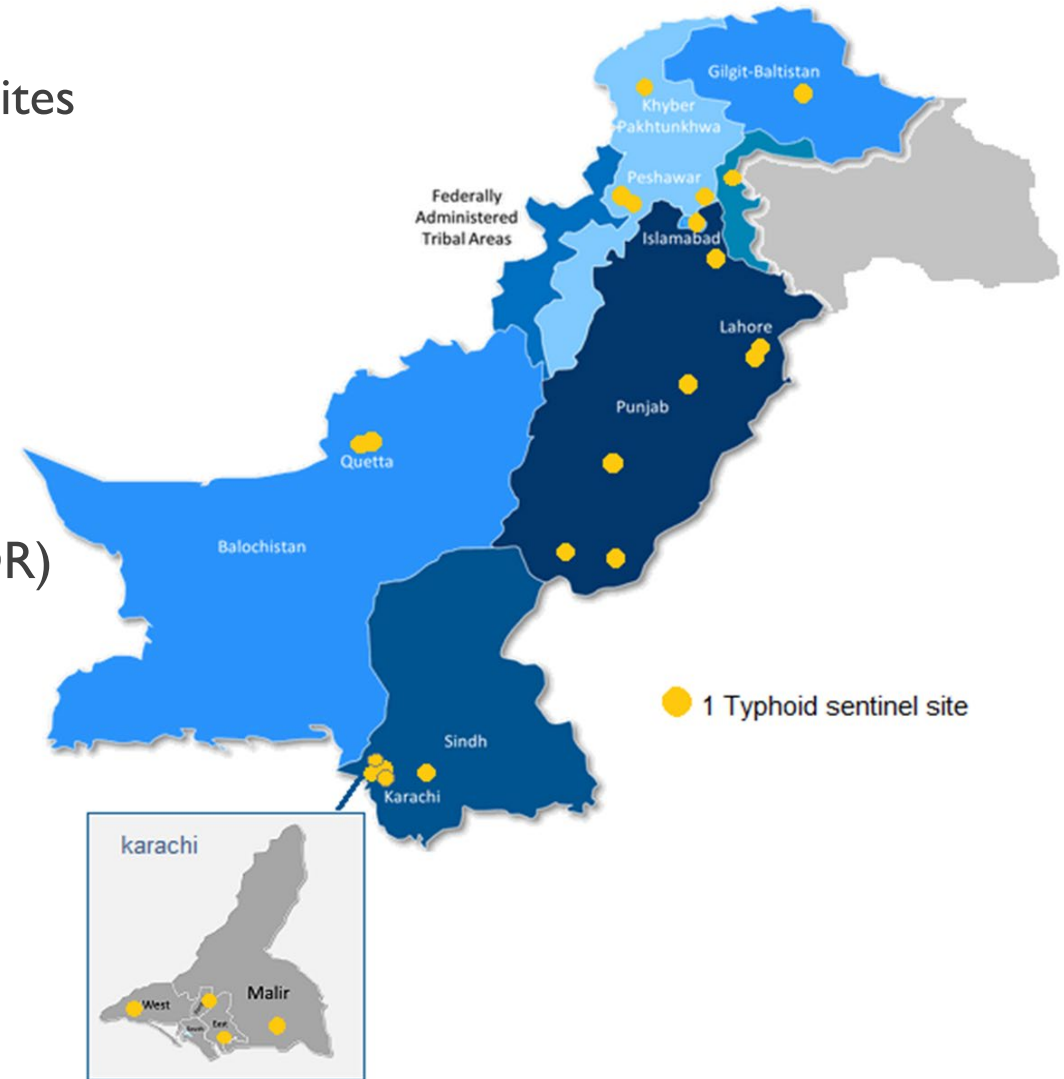
- May 2020: WHO established typhoid sentinel surveillance sites
- 2020-2023: Gradual expansion to include 21 sites

## Objectives:

- Describe typhoid epidemiology by time, place and person
- Evaluate the impact of TCV introduction
- Estimate the proportion of Extensive Drug Resistance (XDR) among cases

## Criteria of site selection:

- Referral (tertiary) hospitals
- Adequate number and qualification of lab staff
- Well-equipped laboratory





# CASE DEFINITION AND TESTING

## WHO definitions:

### **Suspected cases: \***

- Fever for at least 3 out of 7 consecutive days.

### **Confirmed cases: \***

- Suspected cases with positive blood culture

### **Discarded cases:**

- Suspected cases with negative blood culture

## **Laboratory tests used for surveillance**

- Blood culture (using Bactec bottles)

# TECHNICAL SURVEILLANCE OPERATIONS

## Development/adjustments of :

- Typhoid sentinel site surveillance guidelines
- Typhoid case-investigation form
- Typhoid dashboard
- Monthly analysis and updates.

## Plans:

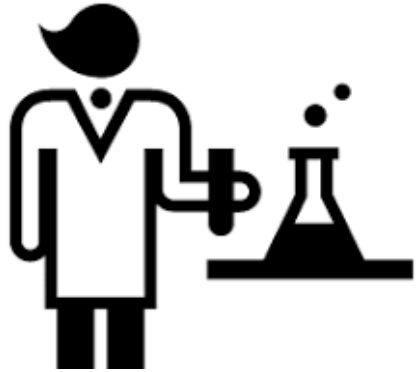
- Online reporting of cases from the sentinel site
  - EPI Management information system (EPI-MIS)

**Case investigation and Blood Culture Form**

MR #: \_\_\_\_\_ EPID #: \_\_\_\_\_

<b>Sentinel site information</b>		Province: _____																																	
Name of Health facility: _____		Date of investigation: _____																																	
District: _____		1. Name: _____																																	
<b>Patient's information</b>		2. Sex: <i>Male</i> <i>Female</i>																																	
1. Father / Husband Name: _____		Mobile Phone Number: _____																																	
3. Age: _____ If less than 2 Yrs.: _____ Months		4. Address: Village/Mohallah: _____ /UCR: _____																																	
Town/Tehsil: _____ District: _____		Type of Locality: Urban Peri Urban Rural																																	
Drinking Water Source: Municipality Ground water (Well), Surface water (Shallow well, streams etc.) Other		If other, please specify: _____																																	
5. History of Fever for at least 03 days during last week present? Yes No		If No, Stop investigation and exclude the case.																																	
6. typhoid conjugate vaccine (TCV): Yes No Unknown		If Yes, Number of Doses: _____ Date of Last Vaccination: ____/____/____																																	
<b>History of current illness:</b>		1. Onset of illness symptoms: ____/____/____																																	
1. Symptoms: History of Fever <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown (related to current visit)		2. Household contact with a confirmed case of typhoid or paratyphoid fever in 28 days before onset of illness: Yes No																																	
4. Medication prior to current medical evaluation (check all that apply)		If Yes, please mention details: _____																																	
<table border="1"> <thead> <tr> <th>Medicine</th> <th>Yes</th> <th>No</th> <th>Unknown</th> </tr> </thead> <tbody> <tr> <td>Antibiotics</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Medicine	Yes	No	Unknown	Antibiotics				3. Travel history within last 28 days before onset of illness for persons to endemic settings: Yes No																									
Medicine	Yes	No	Unknown																																
Antibiotics																																			
Name of Antibiotics: _____		If yes, please mention details of travelled destination: _____																																	
<b>Hospitalization:</b>		Date of admission: ____/____/____																																	
Was patient admitted to Hospital during current illness? <input type="checkbox"/> Yes <input type="checkbox"/> No		Outcome of Case: Cured Complicated Died																																	
Were there any associated complications? <input type="checkbox"/> Yes <input type="checkbox"/> No		If yes, please mention details: _____																																	
Name & Designation of the investigating Officer: _____																																			
<b>Laboratory Part: (To be filled by Lab)</b>																																			
1. Was blood sample taken? Yes No		2. Date of Sample collection: ____/____/____																																	
4. Date of Sample received in Lab: ____/____/____		3. Date of Sample sent to the Lab: ____/____/____																																	
5. Date of Result: ____/____/____		6. Date of Result: ____/____/____																																	
<b>Blood Culture Result:</b>		If Positive, Type of isolate: Salmonella Typhi Salmonella Para typhi (A, B, C)																																	
Positive Negative Not Done		Was antibiotic Sensitivity Testing Performed? Yes No																																	
Was antibiotic Sensitivity Testing Performed? Yes No		If Yes, Was the Organism Resistant to: (use ✓)																																	
Yes No		<table border="1"> <thead> <tr> <th>Antibiotic</th> <th>Yes</th> <th>No</th> <th>Not Tested</th> </tr> </thead> <tbody> <tr> <td>Chloramphenicol</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Ampicillin</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Co-Trimoxazole</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Fluoroquinolones</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Cefixime/Ceftriaxone</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Azithromycin</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Meropenem</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Antibiotic	Yes	No	Not Tested	Chloramphenicol				Ampicillin				Co-Trimoxazole				Fluoroquinolones				Cefixime/Ceftriaxone				Azithromycin				Meropenem			
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<b>Final Classification</b>		Name & Designation of Lab focal person: _____ Date: _____																																	
Discarded Salmonella Positive																																			
If Salmonella Positive, Specify Type: XDR MDR Non-resistant inconclusive																																			

## SUPPORT TO TYPHOID SENTINEL SITES

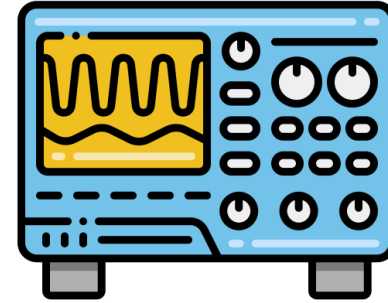


### Incentive

Surveillance coordinator  
Microbiologist  
Lab. technician  
Phlebotomist  
Data entry operator



Provision of Bactec  
bottles



In some sites, one-time  
procurement of Bactec  
machine



One-time procurement  
of desktops and printers  
Provision of case  
investigation forms



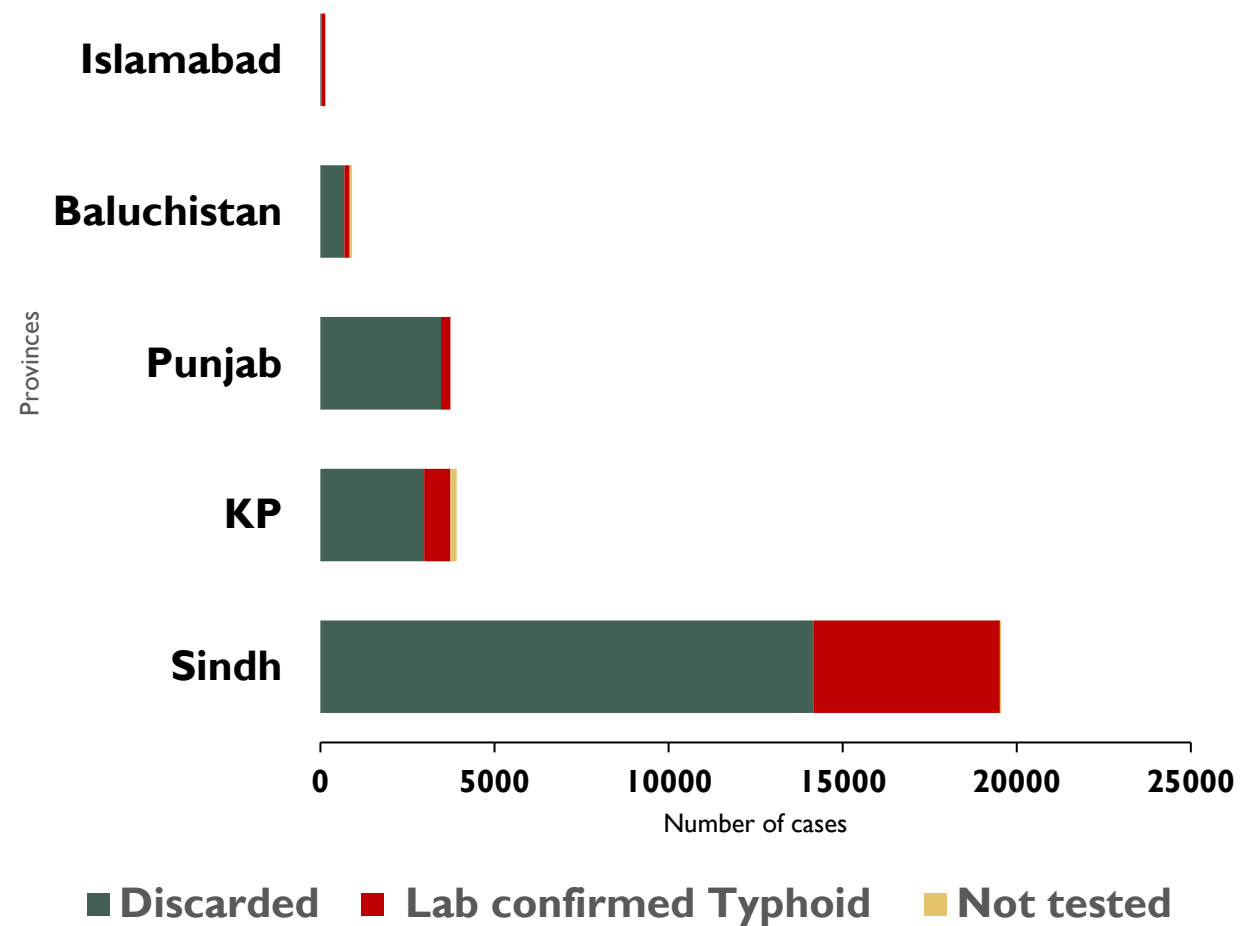


## SURVEILLANCE RESULTS (JAN-JUN 2023)

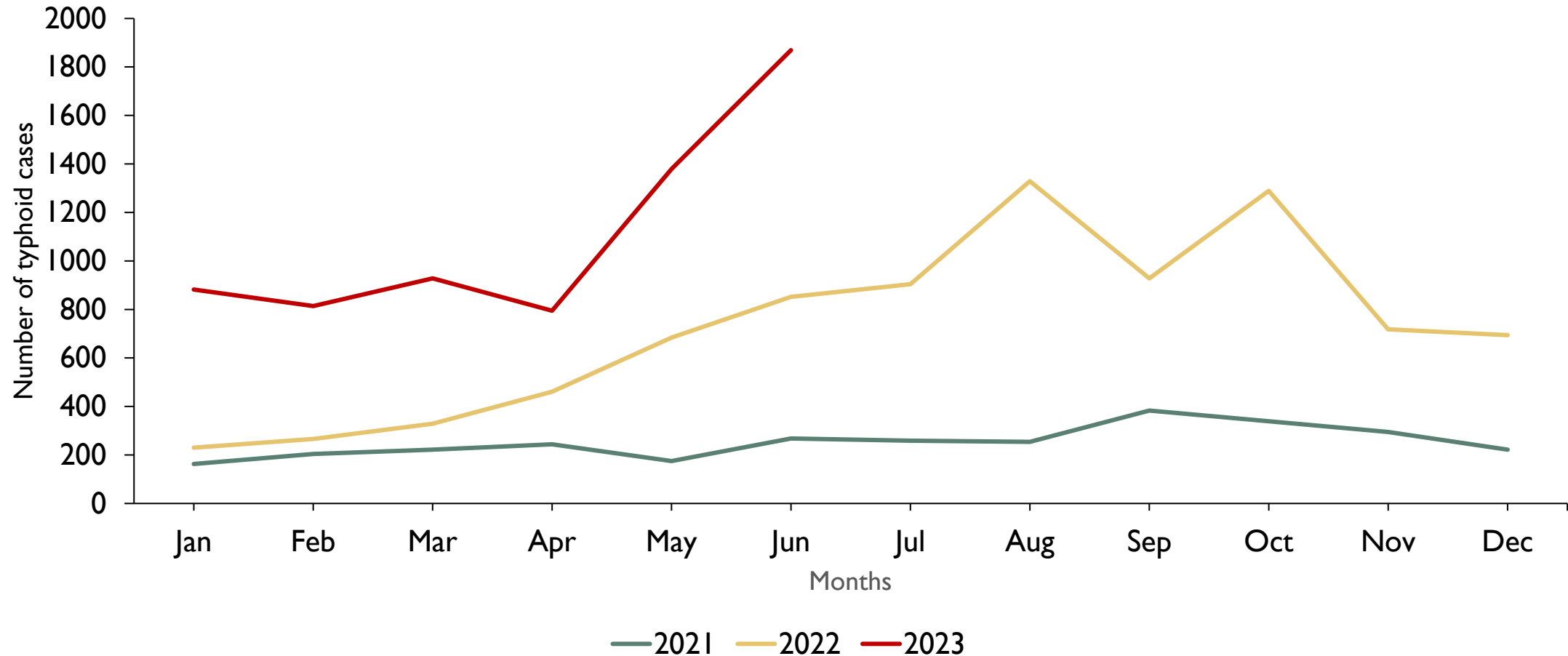
# EPIDEMIOLOGY: NUMBER OF DISCARDED, CONFIRMED AND NOT TESTED CASES BY PROVINCE, JAN-JUN, 2023

28,251 suspected typhoid cases reported through sentinel sites

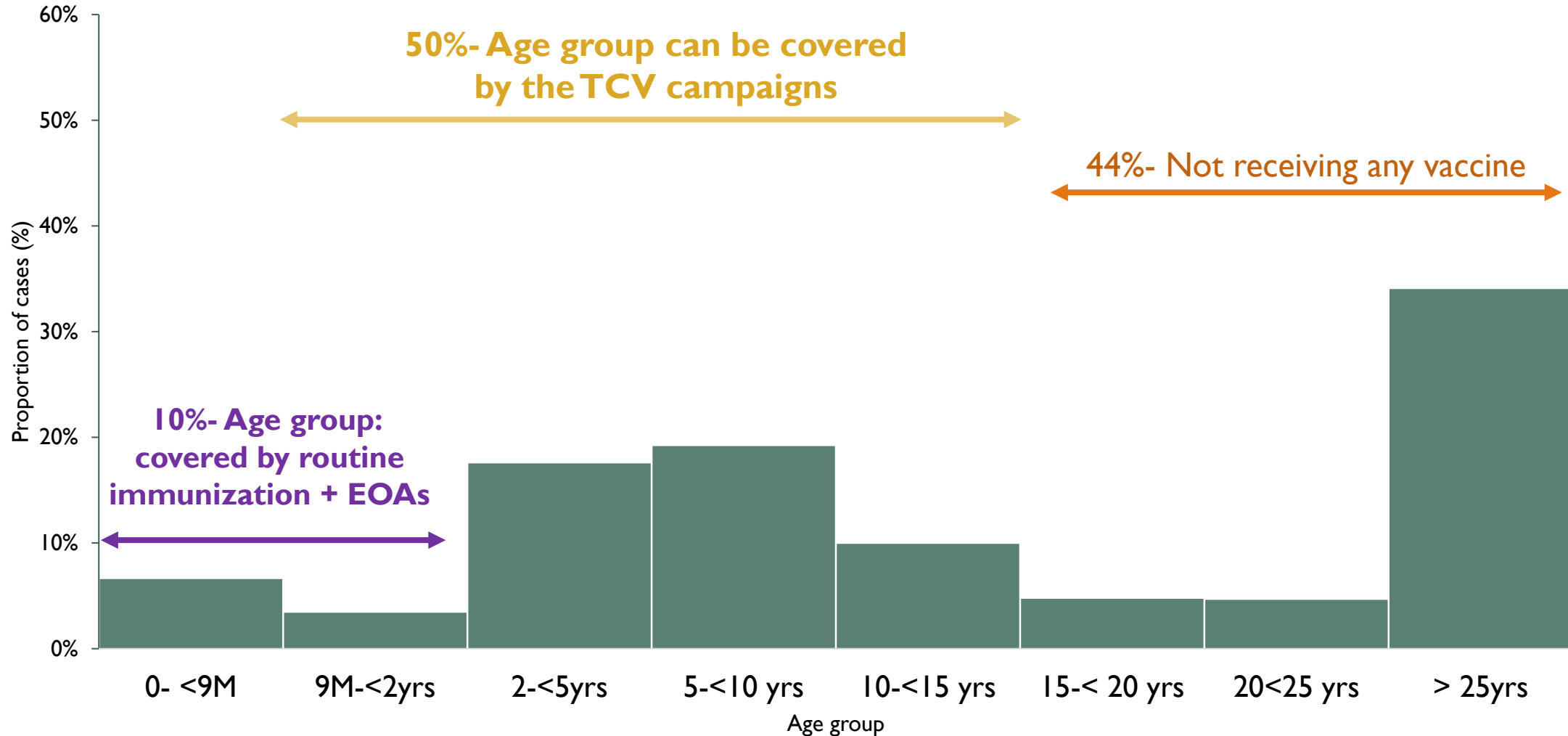
- **99% (27,964) Tested**
  - 76% (21,331) discarded cases
    - 24% (6,633) laboratory-confirmed typhoid
      - 81% (5361) from Sindh
      - 96% (5155) of Sindh cases from Karachi
- 1% (287) not lab tested, not included in the analysis



## **EPIDEMIOLOGY: LABORATORY-CONFIRMED TYPHOID CASES, BY MONTH OF CASE REPORTING, PAKISTAN, 2021 –JUNE 2023**

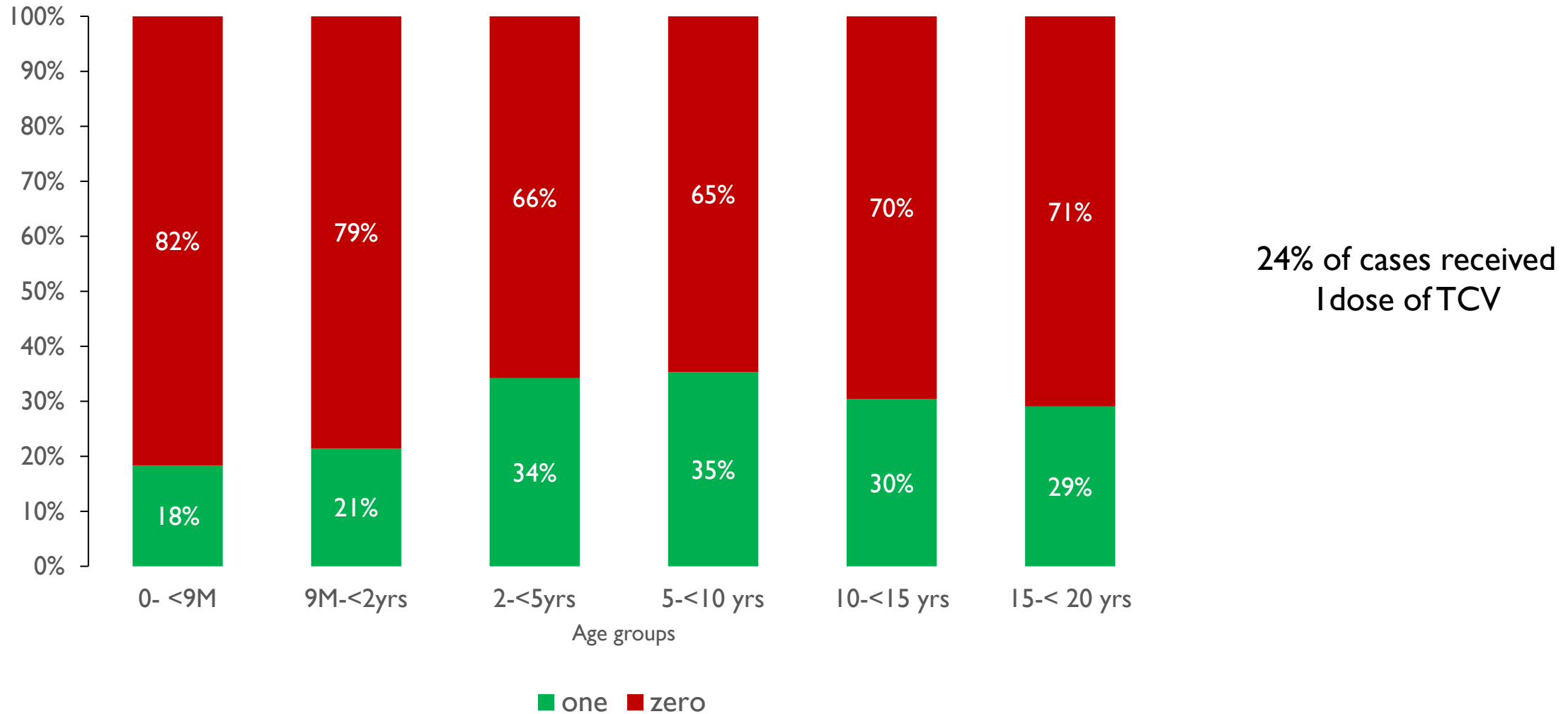


# EPIDEMIOLOGY: DISTRIBUTION OF TYPHOID CASES BY AGE GROUP, PAKISTAN, JAN-JUN 2023

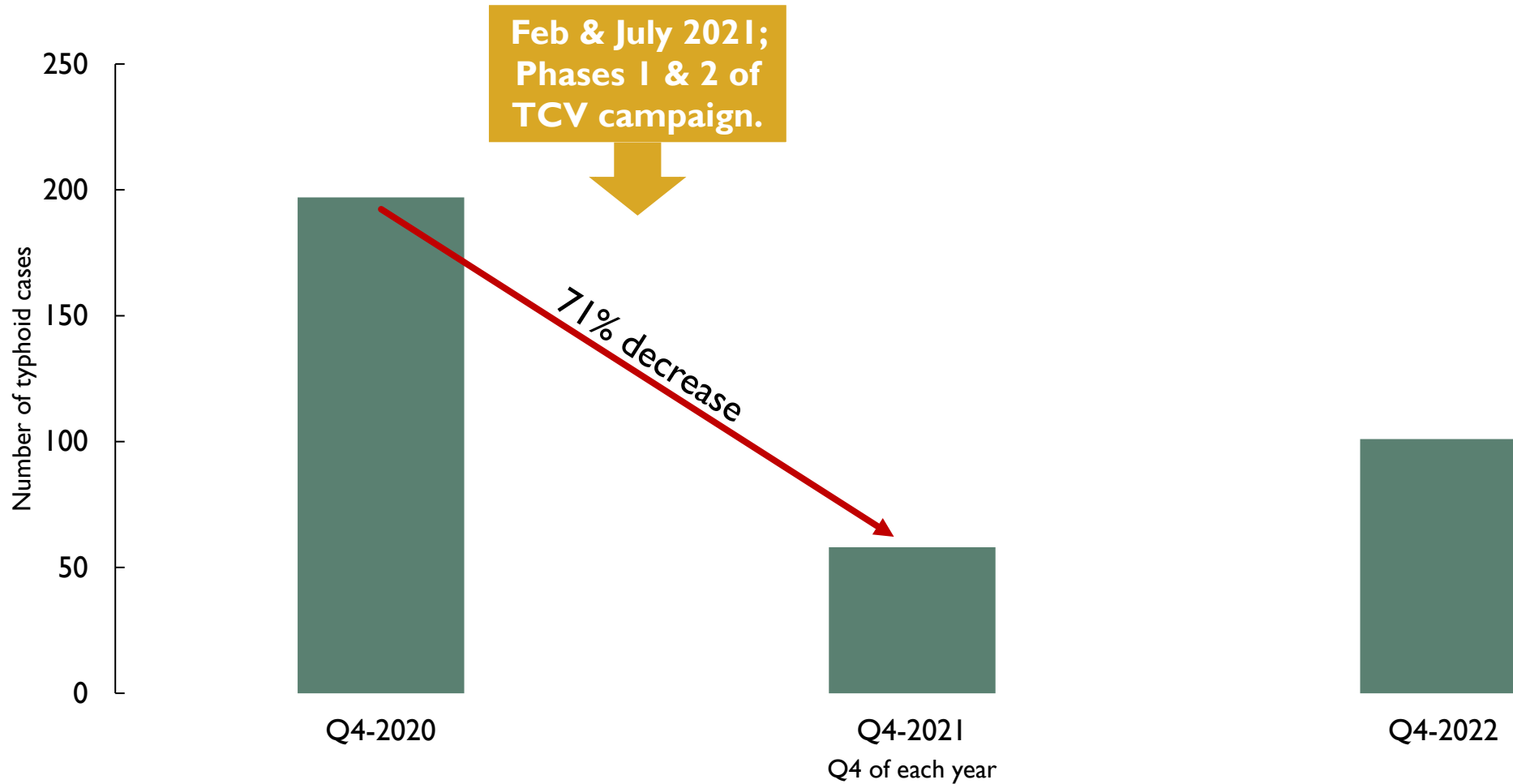




# EPIDEMIOLOGY: TYPHOID CASES VACCINATION STATUS, BY AGE GROUP FROM ALL REPORTING SITES JAN-JUN, 2023

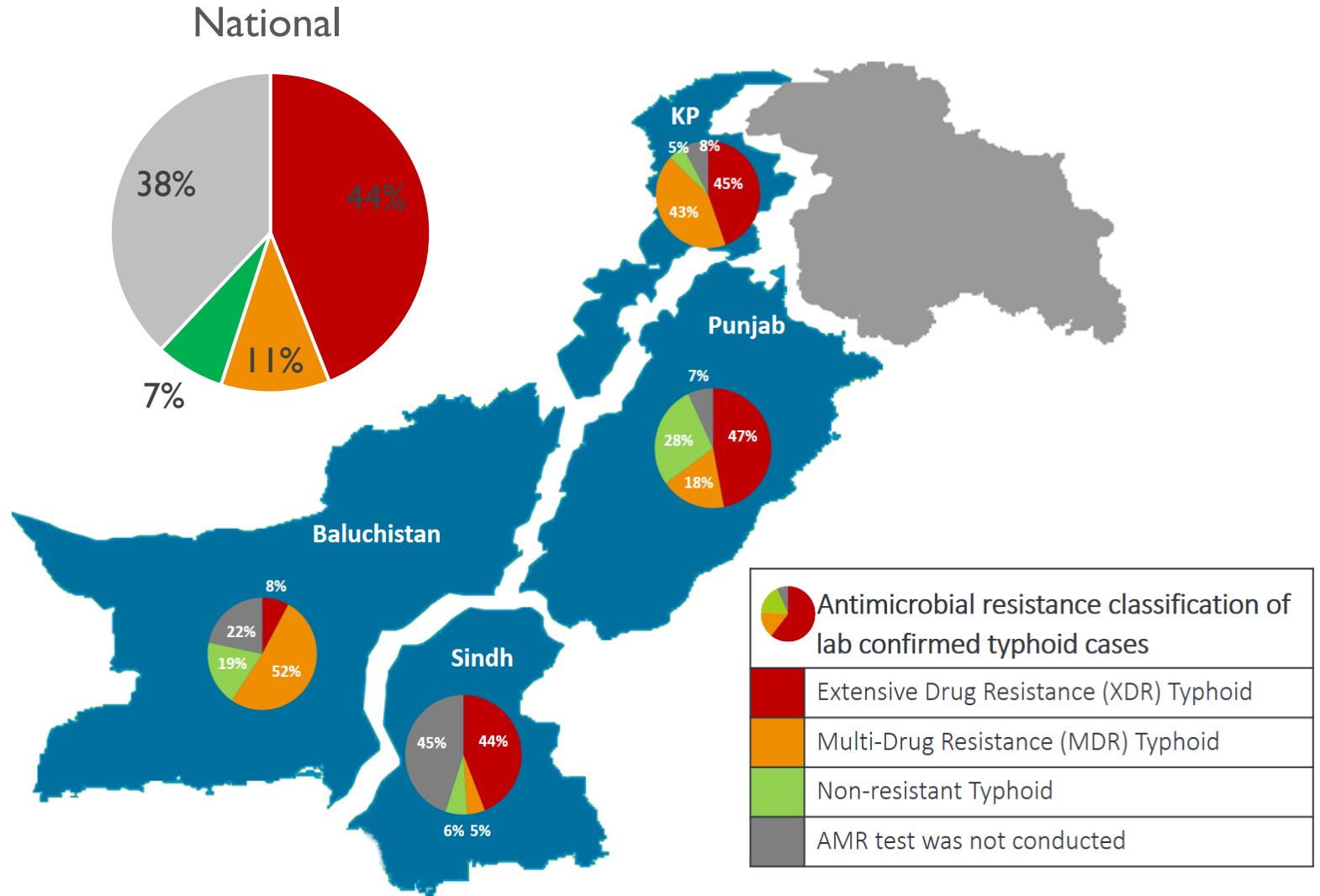


# IMPACT OF TCV INTRODUCTION: TYPHOID CASES REPORTED IN LAST QUARTER, PUNJAB, 2020-2022



# PROPORTION OF XDR CASES: DISTRIBUTION OF TYPHOID CASES BY RESISTANCE PATTERN, PAKISTAN, 2023

- 2016-2018, Before TCV vaccine :
  - 64% of cases were XDR
- In 2023: XDR cases= 44%
  - 35% of XDR cases received 1 TCV dose
  - 75% are <15 years
- Other antibiotic resistance:
  - 2.2% (148 cases) resistant to Azithromycin
  - 0.4% (29 cases) resistant to Meropenem



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## CONCLUSION

- Surveillance is crucial for countries that introduced/plan to introduce Typhoid vaccine
- Surveillance enhance the evidence-informed decision making
  - Epidemiology
  - Impact of vaccine introduction
  - AMR typhoid



# CONCLUSION: TYPHOID EPIDEMIOLOGY

## TIME

- After 2022 floods; >2-fold increase in Typhoid cases in 1st half of 2023, compared to 2022

## PLACE

- 81% of reported cases in 2023 are from Sindh province, and 96% are from Karachi district

## PERSON: predominance of children, but cases in older age groups

- 56% of cases are <15 years

**(Plans for TCV campaign in Karachi Sindh in 2024)**

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## CONCLUSION-TCV INTRODUCTION

- TCV introduction resulted in a 71% decrease in typhoid cases in 2021 compared to the same period in 2020
- No evidence of vaccine failure, but the age groups covered may limit the impact at the population immunity level.

(Enhancing TCV in RI through EOA in different provinces)

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## CONCLUSION- XDR TYPHOID

- The proportion of XDR typhoid decreased in 2023 but it remains predominant
- Azithromycin and Meropenem typhoid resistance is alarming

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THANK YOU





# OPERATIONAL CHALLENGES

## Health facility related

- Turnover of staff, staff strike
- Shift of priority to other diseases (i.e., COVID-19)

## Suspected case definition highly sensitive

- Covers a wide spectrum of diseases
- Many suspected cases
- Laboratory confirmation expensive

## Supplies

- Limited number of Bactec bottles in the local market; long process of international procurement

## Sustainability: *Measures are taken to improve government ownership of typhoid surveillance*

- Memorandum of understanding between the provincial EPI and sites
- Surveillance review at the Federal Directorate of EPI
- Sentinel sites must contribute with laboratory supplies beyond Bactec bottles
- No hiring of external staff

## Laboratory quality control:

- NIH conducts quality assurance limited to several surveillance sites

## LIMITATIONS

- Union council (UCs) level data is not available for most cases, where addresses are recorded, which is not easy to analyze. Hence, the inability to:
  - Identify clusters of cases
  - Conduct UCs level analysis
- In 2023, 38% of typhoid cases have incomplete AMR tests
- Incomplete data of line list (patient outcome, complications, water source...etc.)
- Sentinel data limits the usefulness of time trends