Identifying etiologic agents of diarrhea through active laboratory-based surveillance in Dadaab, Kenya, 2011 - 2013

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Background

- **Diarrhea causes high morbidity and mortality in refugee camps**
  - Responsible for 10% morbidity and 7% mortality in children <5 years[1]
  - In Kenya diarrheal disease kills an estimated 32,000 children <5 years annually[2]

- **Antibiotics are useful for treatment of severe diarrheal illnesses**
  - Shortens duration of illness
  - Reduces bacterial shedding in stool thus decreasing transmission, morbidity and mortality

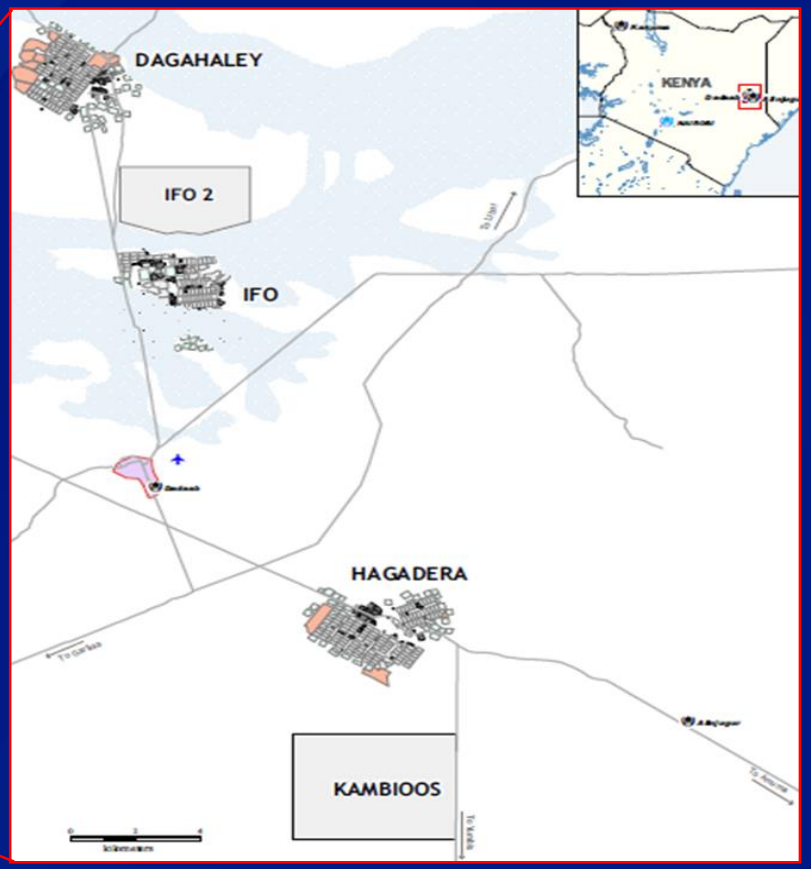
[1] Hershley et al. Incidence and risk factors for Malaria, Pneumonia and diarrhea in children under 5 in UNHCR refugee camps. *Conflict and Health*: 2011,

[2] Pauline Irungu, Kenya Policy Change on Zinc Improves Access to Zinc to tackle diarrhea disease. https://www.deteatdd.org/blog/kenya-policy-change-zinc improves-access-zinc-tackle-diarrhea-disease.

Diarrheal Surveillance Objectives

- To determine the relative contribution of selected bacterial and viral pathogens to the burden of diarrhea
- To determine the antibiotic resistance pattern for bacterial isolates from patients with diarrhea

Methods: Location of Dadaab Refugee Camps



- Hosts the largest single group of refugee population
- Dadaab, Kenya – 5 camp complex with ~ 450,000 registered refugees

Methods: Surveillance Population and Site

- **Enhanced passive surveillance of diarrhea among residents of Dadaab refugee camp**

- **Prospectively enrolled participants with diarrhea**
  - Initially at Hagadera refugee camp from January 1, 2011 through to December 31, 2013
  - Included additional camps (Ifo, Ifo 2, Dagahaley, Kambioss) and 2 cross border towns (Liboi and Dhoobley)

*Source Photos: Brandan Bannon

Description of Surveillance System

- **Case definitions**
  - Diarrhea: Any person presenting with ≥3 loose stools in 24 hours
  - Suspected rotavirus: A child <5 years old presenting with diarrhea
- **Exclusion criteria**
  - Newborns who have not been discharged from the hospital
  - Infants <1 week old
  - Patients who do not give informed consent

Methods

Data Collection

- Trained surveillance clerks identified and enrolled participants with diarrhea
- Informed consent obtained
- Standardized structured questionnaire administered

Sample Collection

- Whole stool or rectal swabs placed in Cary Blair transport media
- Transported to the lab within 2-4 hours
- Temperature 3^{O} - $8^{O}C$

Methods

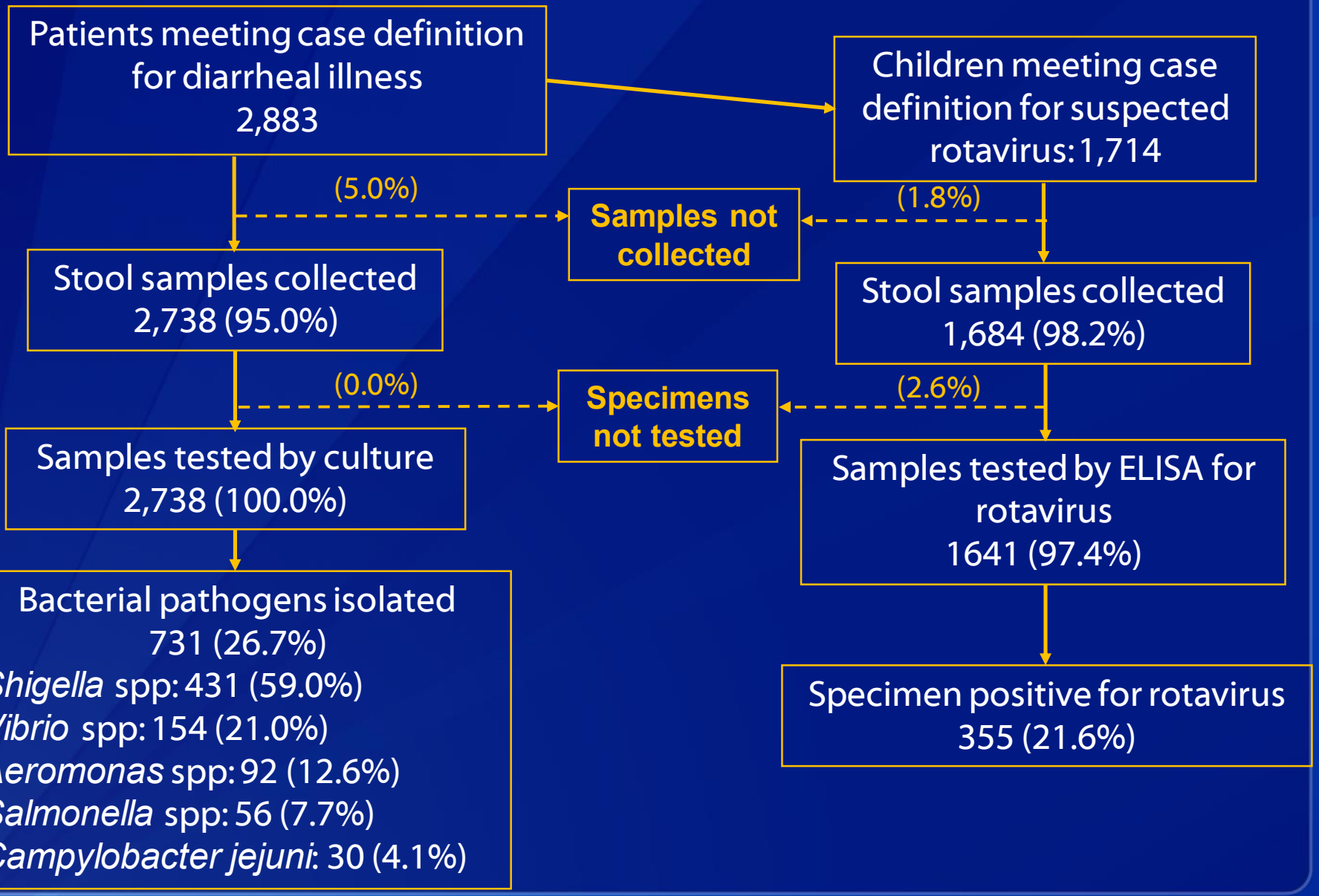
Specimen testing

- Cultures done using standard microbiological techniques
  - *Shigella, Salmonella, Vibrio, Aeromonas, Campylobacter* spp etc
- Antimicrobial susceptibility testing done using Kirby-Bauer disc diffusion method
- Rotavirus : Premier Rotaclone® ELISA

Data management

- Data entered and stored into a Microsoft Access 2010 database
- Analysis was done using Microsoft Excel and SAS version 9.3
- Discrepancies were resolved through verification and validation of data

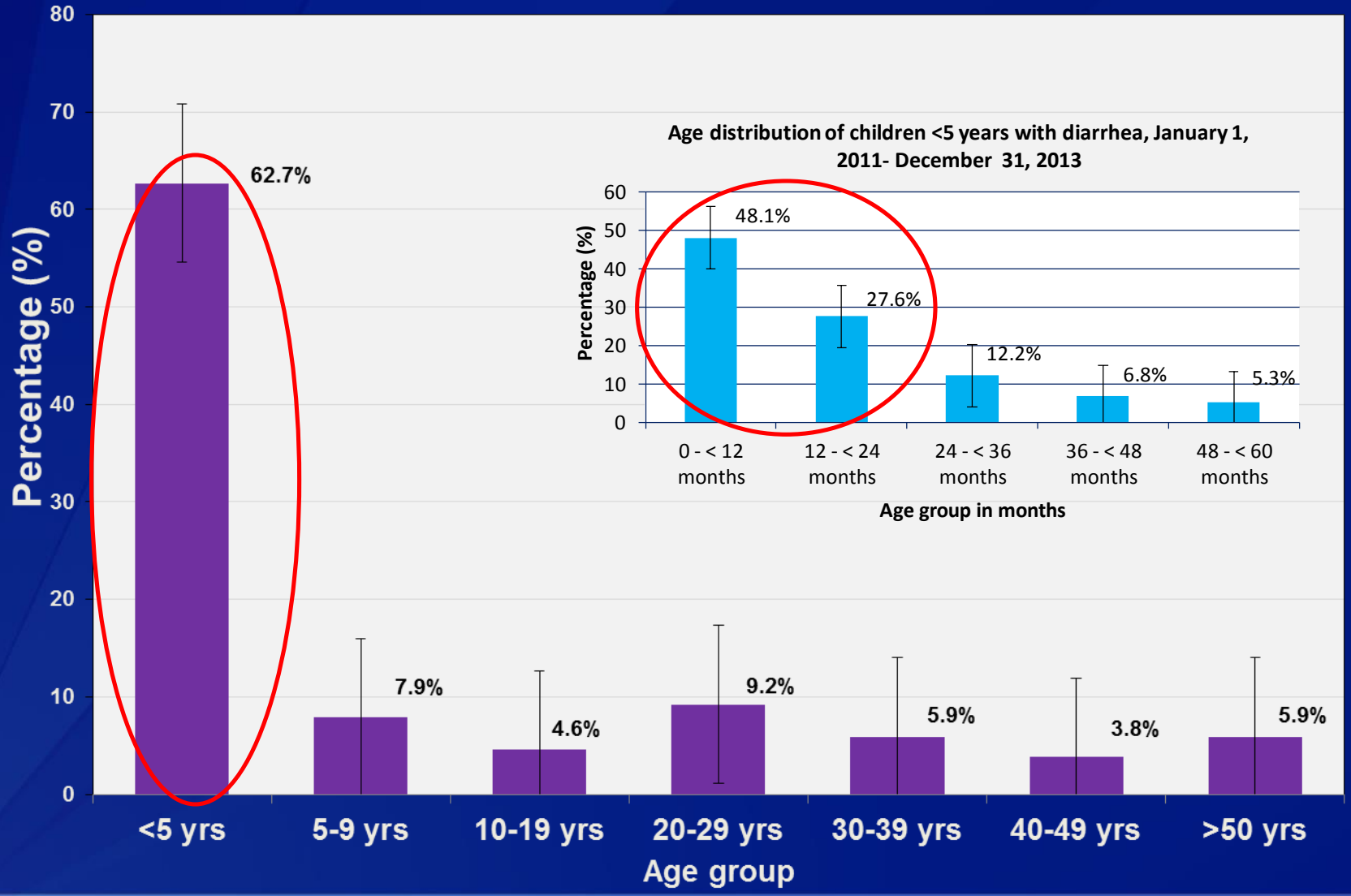
Specimen Flow Chart and Results



Demographic Characteristics of Patients with diarrhea in Dadaab Refugee Camp, 2011-2013

Characteristics	All ages	Children <5 years
Age **Median (range)**	24 months (range=1 month – 95 years)	12 months (range=1 – 57 months)
Gender **Male**	1,372 (50.1%)	914 (53.3%)
Number of days of illness before visiting health facility **Median (Range)**	2 (0 – 12) days	2 (0 – 12) days

Distribution of cases with diarrhea by age group, January 1, 2011- December 31, 2013



Antimicrobial Resistance Profiles of *Shigella* and *Vibrio* isolates

Shigella spp (N=431)			
Antibiotic	**Resistant, n(%)**	**Intermediate, n(%)**	**Sensitive, n(%)**
Tetracycline, 30µg	393 (91.2)	4 (0.9)	34 (7.9)
Cotrimoxazole, 25µg	376 (87.2)	3 (0.7)	52 (12.1)
Ampicillin, 10µg	346 (80.3)	4 (0.9)	81 (18.8)
Nalidixic-acid, 30µg	54 (12.5)	10 (2.3)	367 (85.2)
Ceftriaxone, 30µg	8 (1.9)	10 (2.3)	413 (95.8)
Ciprofloxacin, 5µg	6 (1.4)	0 (0.0)	425 (98.6)
Vibrio cholerae O1 (N=154)			
Antibiotic	**Resistant, n(%)**	**Intermediate, n(%)**	**Sensitive, n(%)**
Cotrimoxazole, 25µg	151 (98.1)	0 (0.0)	3 (1.9)
Furazolidone, 100µg	104 (67.5)	0 (0.0)	50 (32.5)
Erythromycin, 15µg	45 (29.0)	94(61.0)	15 (10.0)
Tetracycline, 30µg	3 (1.9)	0 (0.0)	151 (98.1)
Chloramphenicol, 30µg	0 (0.0)	29 (18.8)	125 (81.2)
Ciprofloxacin, 5µg	0 (0.0)	0 (0.0)	154 (100.0)

Conclusion

- **Bacterial enteropathogens**
  - Bacterial causes were identified in 26.7% of all diarrheal cases
  - The most common bacterial enteropathogens isolated were
    - *Shigella* mostly serotype *S. flexneri*
    - Cholera mostly *V. cholerae* O1 serotype Inaba
- **Diarrhea causes in children <5 years of age**
  - Rotavirus: 21.6%
  - Bacterial enteropathogens: 17.3%
  - Co-infection with bacteria and rotavirus: 2.7%
- **Antibiotic resistance**
  - *Shigella* spp: showed high resistance to commonly used antibiotics
    - Effective antibiotics include ciprofloxacin and ceftriaxone
  - *V. cholerae* O1
    - Susceptible to 1st line antibiotics used in adults
    - Resistant to 1st line antibiotics used in children

Recommendation

- **Surveillance data is sensitive indicator of pathogens with potential for explosive outbreaks in refugee camps**
  - Early detection of
    - *V. cholerae* O1 i.e., serotype Inaba, Ogawa
    - *Shigella* spp. i.e., *S. dysenteriae*, *S. flexneri*, *S. boydii*, *S. sonnei* and unspeciated *Shigella*
- **Surveillance data can be used as baseline to inform diarrhea prevention and control strategies**
  - Measuring the effectiveness of the rotavirus vaccine in Dadaab set to role out this month
- **Monitoring of antibiotic resistance is necessary**
  - Guide rational use of antibiotic in patient management
  - Detects changes in local antimicrobial resistance patterns

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Thank you
for your attention!

Questions?

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