

Severe Typhoid Fever Surveillance in Africa (SETA) Program: First Data from the Six African Sites

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INTERNATIONAL
VACCINE INSTITUTE

SETA

Study sites





Potential new site – serosurvey conducted:
Antsiranana

Potential new site – serosurvey conducted:
Mahajanga

Tertiary Hospitals --- Antananarivo city

- **CHU HJRA** (Centre Hospitalier Universitaire d'Antananarivo -Hopital Joseph Ravoahangy Andrianavalona)
- **HJRB** (Hôpital Raseta **Befelatanana**)
- **HMET** (Hôpital Mère Enfant **Tsaralalana**)

Primary Health Center --- Imerintsiasosika

- **CSB II** (Centres de Santé de Base II)

Catchment population:

Antananarivo city	2.2 million	Urban
Imerintsiasosika	44,666	Rural



Secondary Hospital --- Asante Akim North & Central

- Agogo Presbyterian Hospital (APH)

Tertiary Hospital --- Kumasi

- Komfo Anokye Teaching Hospital (KATH)

Catchment population:

Asante Akim North	140,694	Rural
Asante Akim Central	169,976	Rural
Kumasi	1.7 million	Semi-Urban

SETA – Burkina Faso



Primary Health Center --- Polesgo

- Polesgo Health Center

Secondary Hospital --- Nioko II

- Kossodo Hospital

Tertiary Hospital --- Ouagadougou

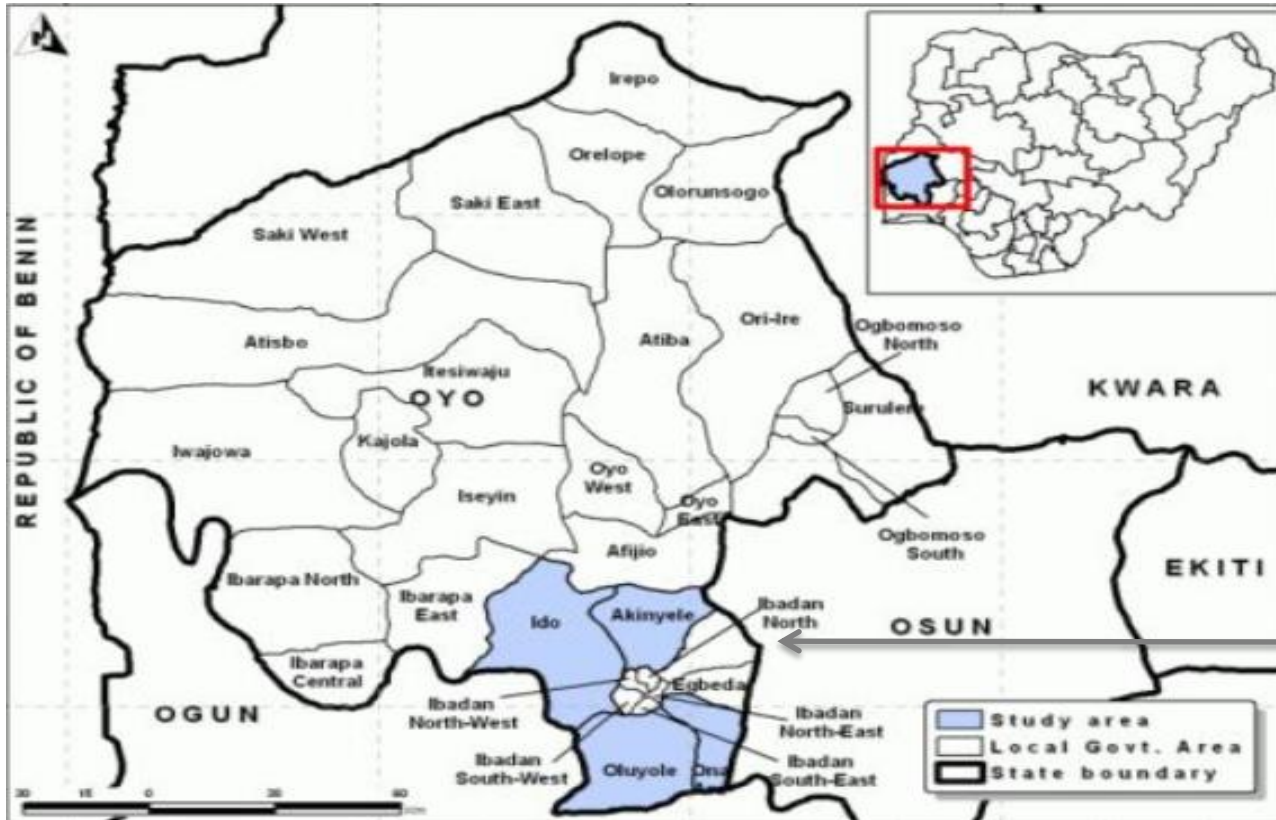
- Yalgado Hospital
- Charles de Gaulle Hospital

Catchment population:

Ouagadougou	2.5 million
Nioko II	17,754
Polesgo	7,574

Urban
Semi-Urban
Semi-Urban





Primary Health Centers --- Ibadan

- Kola Daisi Foundation Community Health Center
- UI Jaja Clinic

Secondary Hospital --- Ibadan

- Our Lady of Apostles Catholic Hospital Oluyoro
- Adeoyo Maternity Teaching Hospital

Tertiary Hospital --- Ibadan

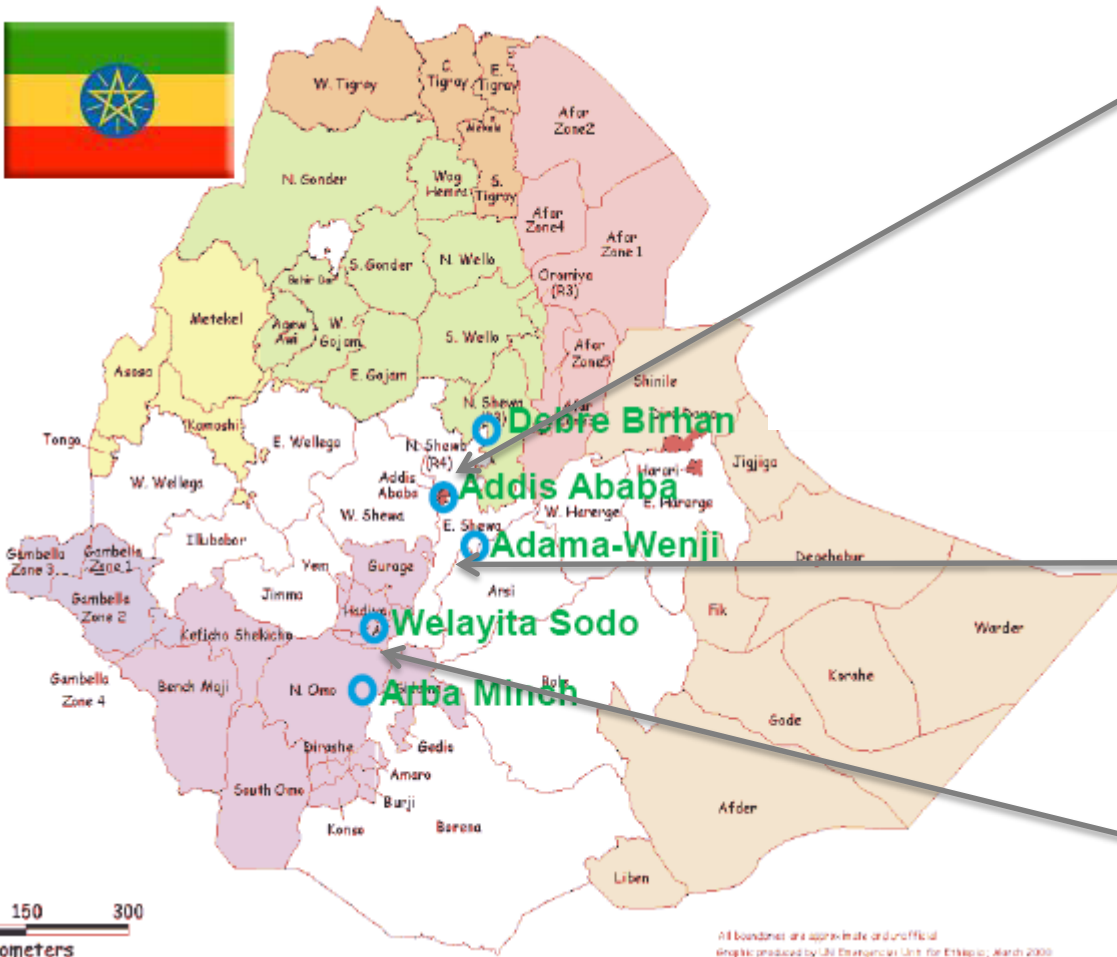
- University College Hospital

Catchment population:

Ibadan

1.3 million

Urban



Tertiary Hospitals --- Addis Ababa

- St. Paul's Hospital
- Tikur Anbessa Hospital

Secondary Hospitals --- Adama Town/Zuria

- Adama General Hospital
- Wenji Hospital

Primary Health Center --- 10 kebele of Wenji

- Gefersa Health Center
- Kuriftu Health Center
- Shewa Alem Tena Health Center

Secondary Hospitals --- Welayita Zone

- Sodo Teaching Hospital
- Sodo Christian Hospital

Primary Health Center --- Sodo Town

- Sodo Health Center

Catchment population:

Addis Ababa

3.2 million

Urban

Adama-Wenji

52,770

Semi-Urban/Rural

Welayita Sodo

117,647

Semi-Urban



SETA – Democratic Republic of the Congo



Province du Bas Congo

Primary Health Center --- Kavuaya
Health Center Kavuaya

Secondary Hospital ---Nkandu
Health Center Nkandu 1

Tertiary Hospital --- Kisantu
Hospital Saint Luc Kisantu

Catchment population:

Kavuaya	6,600	Rural
Nkandu	39,800	Urban
Kisantu	183,700	Urban

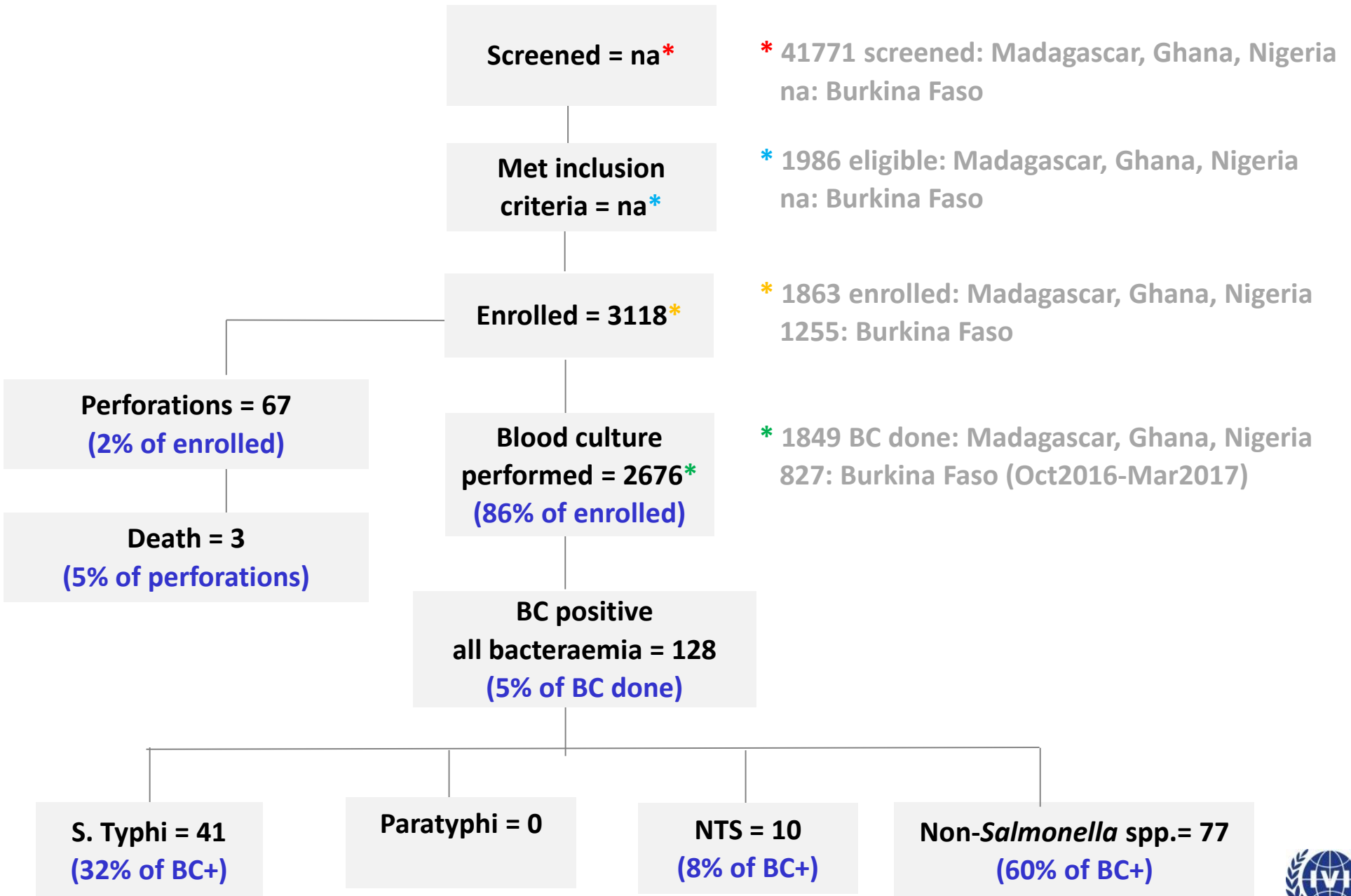


SETA

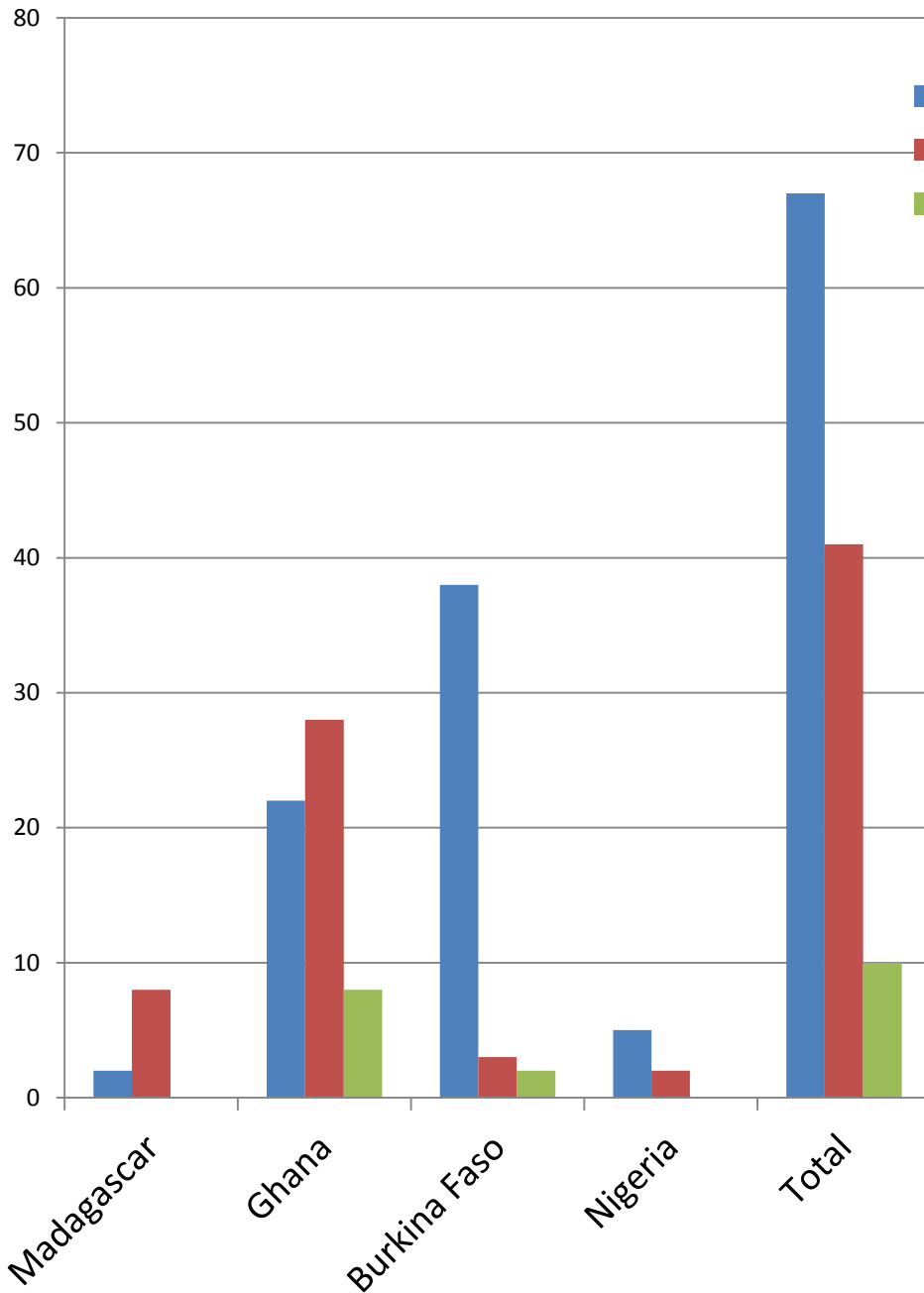
First preliminary data



Madagascar, Ghana, Burkina Faso, Nigeria (Combined)



Country-Specific Cases: Madagascar/Ghana/Burkina Faso/Nigeria



Madagascar 2 perforations (0.2% of enrolled)
8 S. Typhi (30% of BC+)
0 NTS

Ghana 22 perforations (3% of enrolled)
28 S. Typhi (43% of BC+)
8 NTS (12% of BC+)

Burkina Faso 38 perforations (3% of enrolled)
3 S. Typhi (10% of BC+)
2 NTS (7% of BC+)

Nigeria 5 perforations (10% of enrolled)
2 S. Typhi (40% of BC+)
0 NTS



Age-Stratified Cases: Madagascar/Ghana/Burkina Faso/Nigeria

	MG	GH	BF	NI	DRC	ET
Surveillance period (data until Mar 2017)	Feb 2016 (CSBII) May 2016 (HJRA) June 2016 (Bef/Tsa)	May 2016 (APH) May 2016 (KATH)	May 2016 (Kossodo+ Polesgo) Sep 2016 (CHUP-YO) Dec 2016 (CHUP-CDG)	Feb 2017 (UCH)	June 2017	June 2017

Overall findings from MG/GH/BF/NI

* Total **3118** eligible patients consented-enrolled, and **2676** blood culture performed (excluding DRC)

Years\no.	BC+	BC+ S. Typhi	% (out of total 41 S. Typhi)	BC+ NTS	% (out of total 10 NTS)	Perforations	% (out of total 67 perforations)
0<2	na	2	5	5	50	3	4
2<5	na	6	15	3	30	7	10
5<15	na	22	54	1	10	20	30
≥15	na	11	27	1	10	37	55
All	167	41	25% (out of 167 BC+)	10	6% (out of 167 BC+)	67	2%* (out of 3118 enrolled)

Blood (BC) & Stool (SC) Culture at Enrolment: Madagascar

Surveillance period
(data until Mar 2017)

Feb 2016 (CSBII)
May 2016 (HJRA)
June 2016 (Bef/Tsa)

Consented-Enrolled **1015**

BC performed (enrolment) **1001**
(99% of enrolled)

BC+ all bacteremia **28**
(3% of BC done)

BC+ *non-Salmonella* spp. **20**
(71% of BC+)

BC+ *S. Typhi* **8**
(29% of BC+)

BC+ NTS **0**

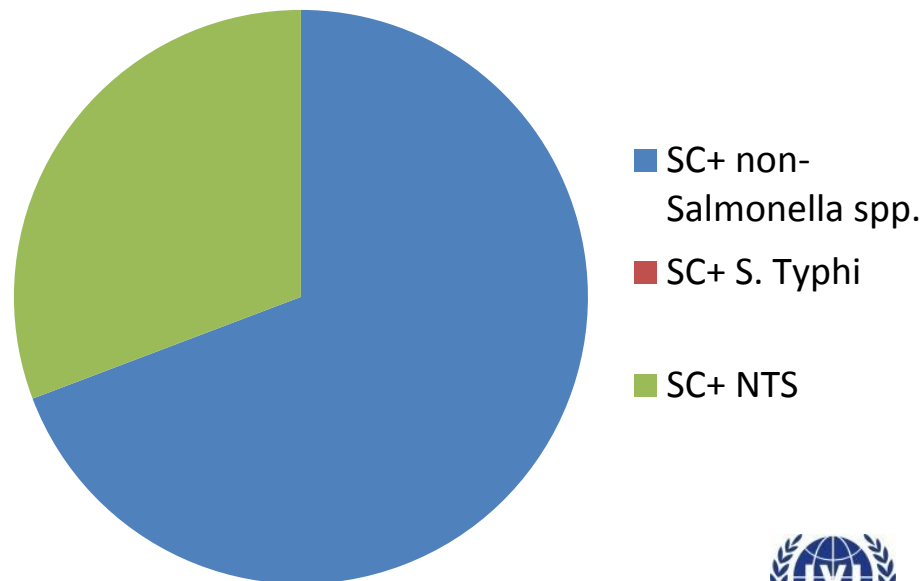
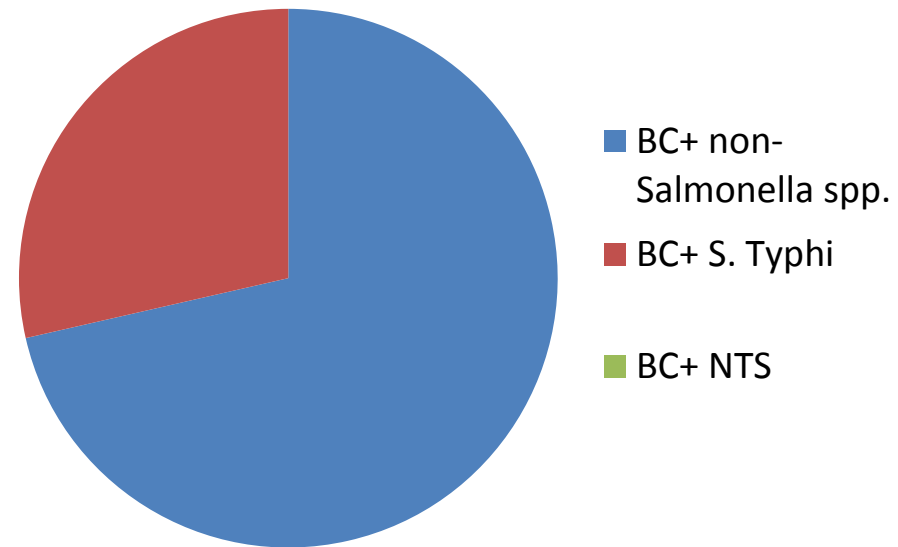
SC performed (enrolment) **985**
(97% of enrolled)

SC+ all bacteria **13**
(1.3% of SC done)

SC+ *non-Salmonella* spp. **9**
(69% of SC done)

SC+ *S. Typhi* **0**

SC+ NTS **4**
(31% of SC+)



Blood (BC) & Stool (SC) Culture at Enrolment: Ghana

Surveillance period
(data until Mar 2017) May 2016 (APH)
May 2016 (KATH)

Consented-Enrolled **796**

BC performed (enrolment) **796**
(100% of enrolled)

BC+ all bacteremia 65
(8% of BC done)

BC+ non-*Salmonella* spp. 37
(57% of BC done)

BC+ *S. Typhi* 28
(43% of BC+)

BC+ NTS 8
(12% of BC+)

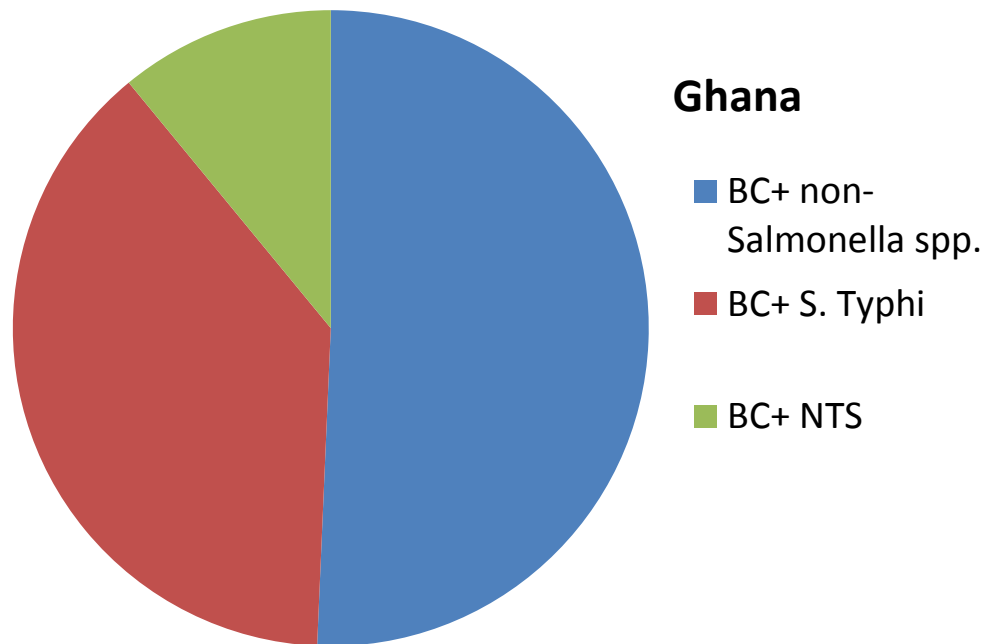
SC performed (enrolment) **261**
(33% of enrolled)

SC+ all bacteria na

SC+ non-*Salmonella* spp. na

SC+ *S. Typhi* 3
(11% of BC+ *S. Typhi*)

SC+ NTS 0



SETA

Challenges encountered



- Standardization of protocol and site-specific considerations
- Screening and enrolment of patients at tertiary hospitals
- Defining catchment area for tertiary hospitals
- Healthcare assessment/utilization survey in big catchment areas
- Follow-up of cases and enrolment of controls
- Collection of stool samples
- Logistical challenges (i.e. power supply, procurement of consumables and equipment)

- Four SETA sites have started (GH, MG, BF, NG)
- Ethiopia and DR Congo starting in June 2017
- Significant number of perforations in Burkina Faso
- Changes and improvements being implemented to align with SEAP
- Health-care utilization surveys underway to obtain initial incidences by Q4/2017



SETA site collaborators - Acknowledgements

Madagascar

- Raphael Rakotozaindrainy
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Ghana

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Burkina Faso

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Charles de Gaulle Pediatric Hospital

Nigeria

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Ethiopia

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SABIN VACCINE INSTITUTE



UNIVERSITY OF WASHINGTON

- David Pigott



Thank you



Perforations

	Madagascar	Ghana	Burkina Faso	Nigeria	DRC*	Ethiopia	Total*
Surveillance period (data until Mar 2017)	Feb 2016 (CSBII) May 2016 (HJRA) June 2016 (Bef/Tsa)	May 2016 (APH) May 2016 (KATH)	May 2016 (Kossodo+ Polesgo) Sep 2016 (CHUP-YO) Dec 2016 (CHUP-CDG)	Feb 2017 (UCH)	Start in June 2017	Start in June 2017	*Excluding DRC
Screened	40561	1052	na	158	---	---	---
Eligible	1038	848	na	100	---	---	---
Consented-Enrolled	1015	796	1255	52	---	---	3118
Perforations	2	22	38	5	---	---	67
Inpatient-Surgical	2	22	38	5	---	---	67
Inpatient	58	---	102	12	---	---	---
BC performed (enrolment)	1001	796	827 (Oct2016-Mar2017)	52	4276	---	2676
SC performed (enrolment)	985	261	118 (Oct2016-Mar2017)	34	---	---	1398
Deaths	1	1	---	1	---	---	3

*** DRC data is from existing surveillance; non-SETA.**



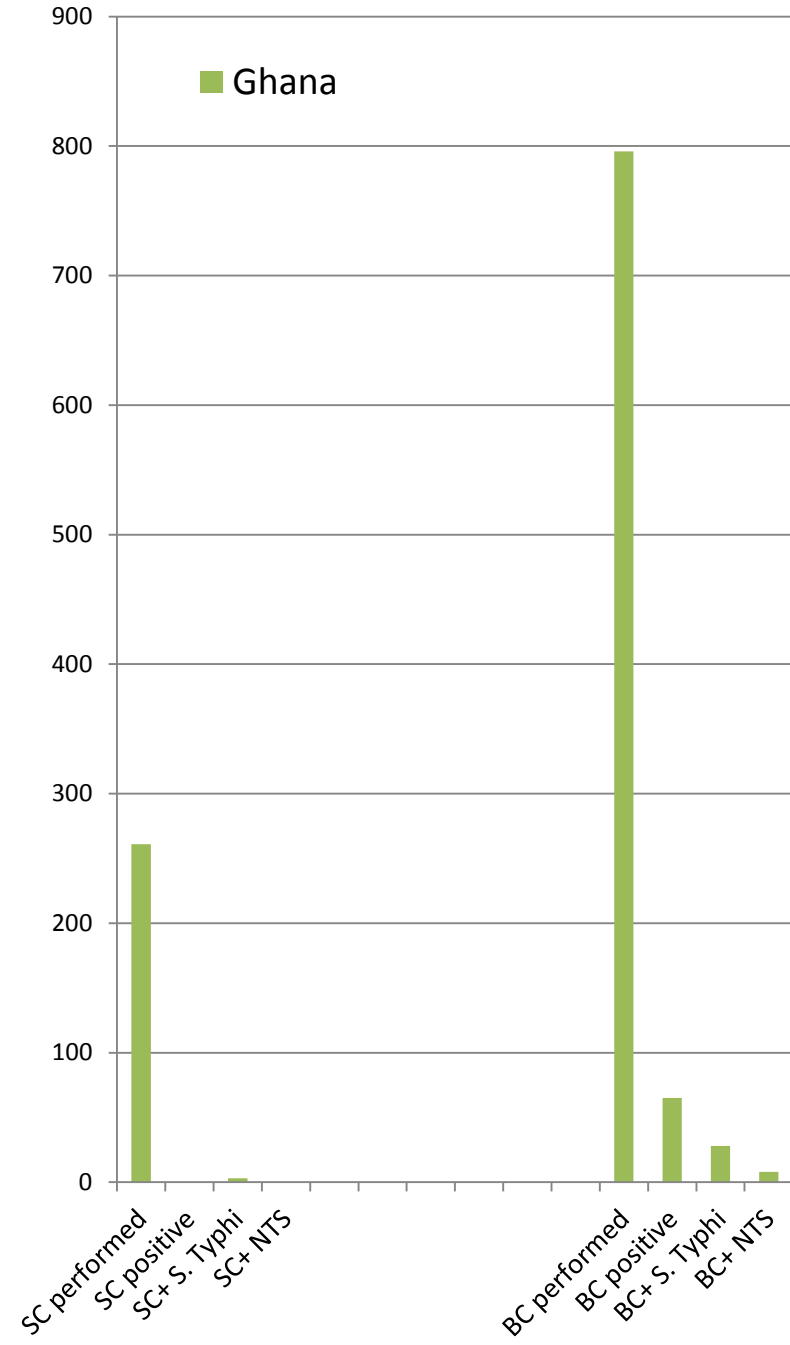
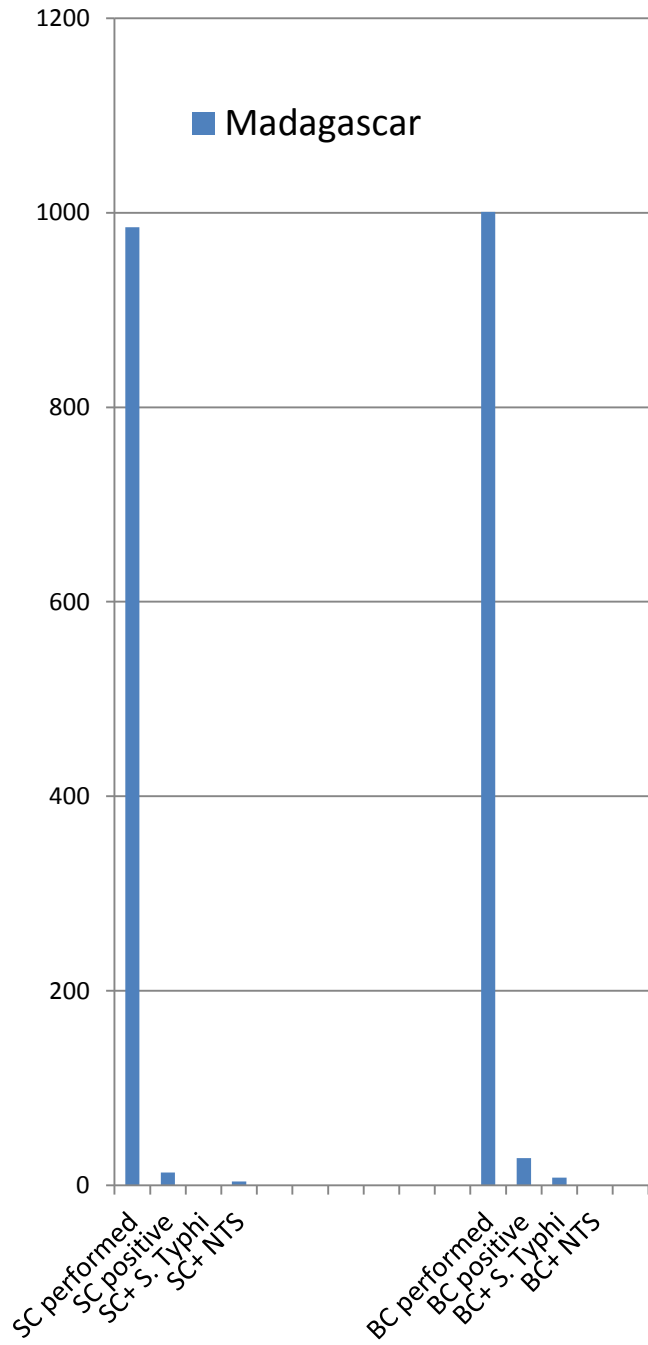
SETA update – Overall confirmed cases (BC and SC results)

	Madagascar	Ghana	Burkina Faso	Nigeria	DRC*	Ethiopia	Total*
Surveillance period (data until Mar 2017)	Feb 2016 (CSBII) May 2016 (HJRA) June 2016 (Bef/Tsa)	May 2016 (APH) May 2016 (KATH)	May 2016 (Kossodo+ Polesgo) Sep 2016 (CHUP-YO) Dec 2016 (CHUP-CDG)	Feb 2017 (UCH)	Start in June 2017	Start in June 2017	*Excluding DRC
Consented-Enrolled	1015	796	1255	52	---	---	3118
BC performed (enrolment)	1001	796	827	52	4276	---	2676
BC+ all bacteremia	28	65	30	5	---	---	128
BC+ S. Typhi	8	28	3	2	49	---	41
BC+ NTS	0	8	2	0	360	---	10
BC+ S. Paratyphi	0	0	0	0	---	---	0
SC performed (enrolment)	985	261	118	34	---	---	1398
SC+ all bacteremia	13	---	---	0	---	---	na
SC+ S. Typhi	0	3	---	0	---	---	na
SC+ NTS	4	0	---	0	---	---	na
SC+ S. Paratyphi	0	0	---	0	---	---	na

* DRC data is from existing surveillance; non-SETA.



Blood & Stool Culture : Enrolled patients from Madagascar/Ghana



SEVERE TYPHOID FEVER CASES - ANECDOTE



Severe TF cases (anecdote) – Madagascar

Severe TF case #1 – Madagascar

Age: 16 year old

Sex: Female

Residence: within catchment area

Clinical characteristics:

- Fever upon enrolment: 38°C (axillary)
- 7 day history of consecutive fever
- *Ileal perforation (30 cm from ileocecal angle)*
- Abdominal pain, vomit, headache, constipation
- Pre-treatment for 3 days prior to hospital visit, but treatment unknown
- Hospitalized for surgery (1 day)
- Patient died after surgery



Severe TF cases (anecdote) – Burkina Faso

Severe TF case #2 – Burkina Faso

Age: 12 year old

Sex: Male

Residence: within catchment area, in the outskirts of Ouagadougou

Clinical characteristics:

- Fever upon enrolment: 38.4 (axillary).
- 10 days before arrival at the hospital the case had a fever and headache.
- Due to increased volume of abdominal fluid, touching of the abdomen/around the belly button extremely painful (Cri de l'ombilic), and tympanic percussion, a perforation was suspected.
- Good general and mental state, eye lids slightly dis-coloured without jaundice. No sign of oedema of feet/ ankles. Not dehydrated. Malnourished.
- Pretreatment with ceftriaxone (1g, 2xday), metronidazole (185mg, 2xday), paracetamol (375mg, 3xday). Antimalarial treatment unknown.
- Ileal perforation confirmed during surgery.
- Patient recovered and discharged.



Severe TF cases (anecdote) – Ghana

Severe TF case #3 - Ghana

Age: 5 year old

Sex: Male

Residence: 2hr away from catchment area

Clinical characteristics:

- Fever upon enrolment: 37.9°C (axillary).
- 7 days history of consecutive fever.
- 3 day history of progressive abdominal pain.
- Ill looking, vomiting, abdominal distension and absolute constipation.
- Pre-treatment for 2 days with IV cipro, metronidazole, IVFs and analgesic.
- No reported co-morbidities/pre-existing diagnoses.
- **Preliminary diagnosis:** generalised peritonitis secondary to perforated hollow viscus was made with differential diagnosis of typhoid ileal perforation.
- **Outcome at first clinical assessment:** Patient condition improved progressively after surgery and recovered fully by POD 6 and was discharged home.



Severe TF cases (anecdote) – Nigeria

Severe TF case #4 - Nigeria

Age: 3 year old

Sex: Male

Clinical characteristics:

- History of recurrent fevers (1 month), constipation and likely intestinal perforation.
- Previously treated with antimalarials and analgesics.
- Placed on ceftriaxone.
- Enrolled in SETA as a special case and received emergency surgery for perforation.
- Blood culture: nil.
- Histology: typhoid ileitis with ulceration.
- Peritoneal fluid culture: *Enterobacter cloacae*.
- Intestinal biopsy culture: *Enterobacter cloacae*.
- Remained ill and on admission for a further month during which fecal leakage caused scheduling another surgery, which could not be performed due to complications.
- Complications: low protein, enterocutaneous fistula, multi-organ dysfunction.
- Transferred to ICU, entered a coma, and died.

