1 *Supplementary Table 1. Summary of studies of AMR in bloodstream infections, UTIs, meningitis in SSA, 2013-2016*

Author	**Location; Study dates**	**Age range (population type)**	**Clinical Inclusion Criteria**	**Clinical Syndrome**	**Total Number of Samples**	**Prevalence of positive cx, N, %**	**Mortality Rate**	**ESBL Testing, Method, Organisms**	**Common Isolates**
Acquah et al.[2]	Ghana; 2011-2012	Children; 0-14 yrs.	Sepsis not otherwise specified	Bacteremia	331	86/26%	NR	NR	*E. coli* 6.9% *K. pneumoniae* 6.9% *Klebsiella spp.* 6.9% *P. aeruginosa* 3.5% *S. pneumoniae* 1.2% *S. typhi* 6.9% NTS 2.3% *S. aureus* 32% CoNS 29% Beta Hemolytic Strep 1.2%
Christopher et al.[5]	Tanzania; 2011-2012	Children; 2-60 months.	Fever	Bacteremia	317	21/6.6%	2.8%	Y, 25%, double-disk diffusion method *E.coli* *K.pneumoniae* *Citrobacter* spp.	*E. coli* 33% *K. pneumoniae* 28.6% *Pseudomonas spp.* 9.5% *Salmonella spp.* 4.25% *Enterobacter spp.* 4.25%
Endris et al.[7]	Ethiopia; 2012	Children and adults	Fever; Parasitologically confirmed VL; SIRS	Bacteremia	83	16/19.3%	NR	NR	*E. coli* 6.3% *Klebsiella spp.* 12.5% MSSA 56.2% MRSA 12.5% *S. pneumoniae* 6.3%
Isendahl et al.[12]	Guinea-Bissau; 2010	Children; specific ages not specified	Fever, tachycardia	Bacteremia	372	46/12%	NR	Y, 4.3%, Check-MDR Multiplex PCR (Check-Points) *K.pneumoniae*	*S. aureus* 56% *S. pneumoniae* 8.7% *E. coli* 4.3% *S. typhi* 6.5% NTS 10.9% *K. pneumoniae* 6.5% *Enterococcus* spp 4.3%
Labi et al.[13]	Ghana; 2010-2013	NR	Clinical inclusion criteria not specified	Bacteremia	23708	181/6.5% (Salmonella only).	NR	NR	*S. typhi* 36.5% NTS 63.5%
Lunguya et al.[4]	DRC; 2007-2011	0-70 yrs.	Clinical suspicion of bacteremia caused by a local or	Bacteremia	9634	989/10.3%	NR	Y, ¥3.9%, 1.3%, Vitek 2 (bioMérieux), confirmation by double-disk diffusion method	NTS 23.6% *S. typhi* 20.3% **Salmonella spp.* only reported

			systemic infection					*Salmonella typhimurium* *Salmonella* spp.	
Mahende et al.[16]	Tanzania; 2013	Children; 2-59 months	Fever	Bacteremia	808	26/3.2%	NR	NR	*E. coli* 3.8% *S. typhi* 65.4% *S. pneumoniae* 15.4% *NTS* 7.7% *S. aureus* 3.8% *Enterobacter cloacae* 3.8%
Moon et al.[6]	Mozambique; 2012	NR	Fever	Bacteremia	258	39/15.1%	2.6%	NR	*E. coli* 5.1% *Salmonella spp.* 79.5% - *S. typhi* 5.1% - NTS 71% *S. pneumoniae* 10%
Musiime et al.[1]	Uganda, Zimbabwe; 2007-2011	Children; 3 months to 17 yrs.	Fever	Bacteremia	848	123/14.5%	7%	Y, 60%, Phoenix (Becton-Dickinson) *K.pneumoniae*	*E. coli* 4% *K. pneumoniae* 5% *S. aureus* 9% *S. pneumoniae* 28% *Salmonella spp.* 5%
Obaro et al.[18]	Nigeria; 2008-2015	Children; 0-60 months	Fever, altered mental status, dehydration, diarrhea, convulsions/seizures	Bacteremia	10133	1066/10.5%	1.3 % overall mortality. 3.2% for Salmonella typhi.	NR	*S. typhi* 31.8% NTS 8.7%
Preziosi et al.[17]	Mozambique; 2011-2014	Greater than 18 yrs.	Fever, admission in past 24h, no previous antibiotics	Bacteremia	841	63/7.5%	18% mortality in patients with documented outcome, of these 23.2% mortality with bacteremia	Y, 13.6%, double-disk diffusion method *S.typhimurium* *Enterobacter* spp. *K.pneumoniae* *E.coli*	*E. coli* 24% *K. pneumoniae* 6.8% *S. aureus* 28.5% - MSSA 13.5% - MRSA 15% *NTS* 17% *S. pneumoniae* 5% *P. aeruginosa* 1.7% *Enterococcus spp.* 3.4%

Wasihun et al.[15]	Ethiopia; 2014	1-81 yrs.	Fever	Bacteremia	502	115/23%	NR	NR	*S. aureus* 35.7% *E. coli* 10.4% *S. typhi* 6.9% *Klebsiella spp.* 2.6%
Abejew et al.[10]	Ethiopia; 2002-2011	All ages	Sepsis not otherwise specified	UTI	2486	680/27.35%	NR	NR	*E. coli* 60.3% *Pseudomonas spp.* 8.7% *S. aureus* 7.4% *Klebsiella spp.* 9%
Akingbade et al.[14]	Nigeria; NR	NR	UTI Sx. (dysuria, freq., urgency)	UTI	120	NR	NR	NR	Only *E. coli* isolates included
Irenge et al.[8]	DRC; 2012-2013	0-75 yrs.	UTI symptoms	UTI	2724	643/23.6%	NR	Y, 15%, double-disk diffusion method *E.coli* *Enterobacter* spp. *Klebsiella* spp. *Citrobacter* spp. *Proteus* spp. *Acinetobacter* spp.	*E. coli* 58.5% *Klebsiella spp.* 21.9% *Enterobacter spp.* 16.2%
Kibret al al.[9]	Ethiopia; 2003-2010	1-85 yrs.	Clinical inclusion criteria not specified	UTI	1404	319/22.7%	NR	NR	*E. coli* 63.6% *Klebsiella spp.* 8.5% *Proteus spp.* 8.2% *Pseudomonas spp.* 6.9% *S. aureus* 3.8% *Enterobacter spp.* 2.2%
Ochada et al.[19]	Nigeria; NR	0-50+ yrs.	Clinical inclusion criteria not specified	UTI	300	88/29.3%	NR	NR	*E.coli* 21.6% *K.pneumoniae* 15.9% *P.aeruginosa* 10.2% *S.aureus* 13.6%
Renuart et al.[3]	Botswana; 2007-2010	Not fully specified; 0-100 yrs.	Clinical inclusion criteria not specified	UTI	1440	744/51.7%	NR	Y, 11%, Microscan WalkAway (Siemens Healthcare Diagnostics) *E.coli* *Proteus* spp. *Klebsiella* spp.	*E. coli* 63% *Klebsiella spp.* 14%, 7% *S. aureus* 2%, 1% *Pseudomonas spp. 1%,* 3% *Enterobacter spp*. 2%, 2% *Enterococcus spp.* 2%, 4% *Salmonella spp.* <1%

Ochieng' et al.[11]	Kenya; 2010-2012	Children; 1 month to 20 yrs.	Fever, headache, nuchal rigidity, lethargy, dehydration, GI symptoms, bulging fontanelle, signs of local infection at shunt site	Meningitis	127	53/41.7%	4%	NR	*S. aureus* 24.5% - MSSA 15.1% - MRSA 9.4% Other Staph species 26% GNB 40% Streptococci 6% Mixed infection 4%

**NS=not specified. NR=not reported. Y=yes. ¥ Two different ESBL testing methods used: 3.9% by VITEK2 and 1.3% by double-disk diffusion.*

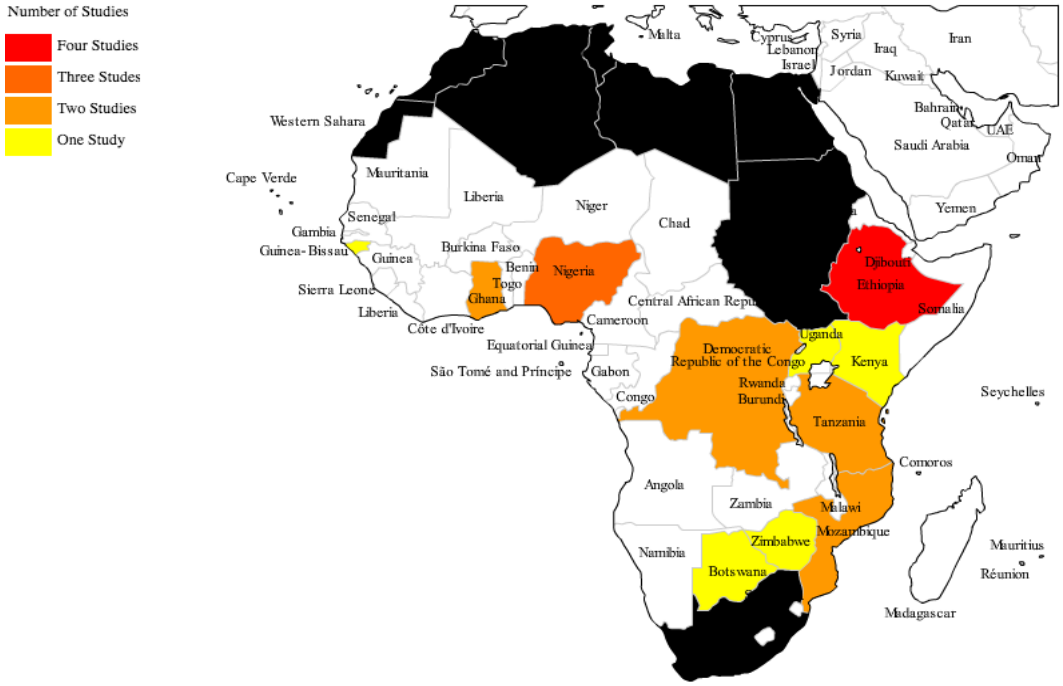
5 *Supplementary Table 2. Microbiologic analysis and methods of selected studies*

Author	**Method of Sample Incubation**	**Method of Organism Identification**	**CLSI criteria used (Y/N)**	**Method of antimicrobial susceptibility testing**	**Possible contaminants identified (Y/N)**	**Identified Contaminants N,%**
Abejew et al.[10]	Manual incubation	Biochemical analysis	Y	Kirby-bauer disk diffusion	NS	NR
Acquah et al.[2]	Bactec	Biochemical analysis	Y	Kirby-bauer disk diffusion	Y	10, 3%
Akingbade et al.[14]	Manual incubation	Biochemical analysis	Y	Kirby-bauer disk diffusion	Y	NR
Christopher et al.[5]	Manual incubation	Biochemical analysis	Y	Kirby-bauer disk diffusion	Y	10, 3.2%
Endris et al.[7]	Manual incubation	Biochemical analysis	Y	Kirby-bauer disk diffusion	Y	4, 4.8%
Irenge et al.[8]	Manual incubation	Biochemical analysis	N	Kirby-bauer disk diffusion; E-test	Y	NR

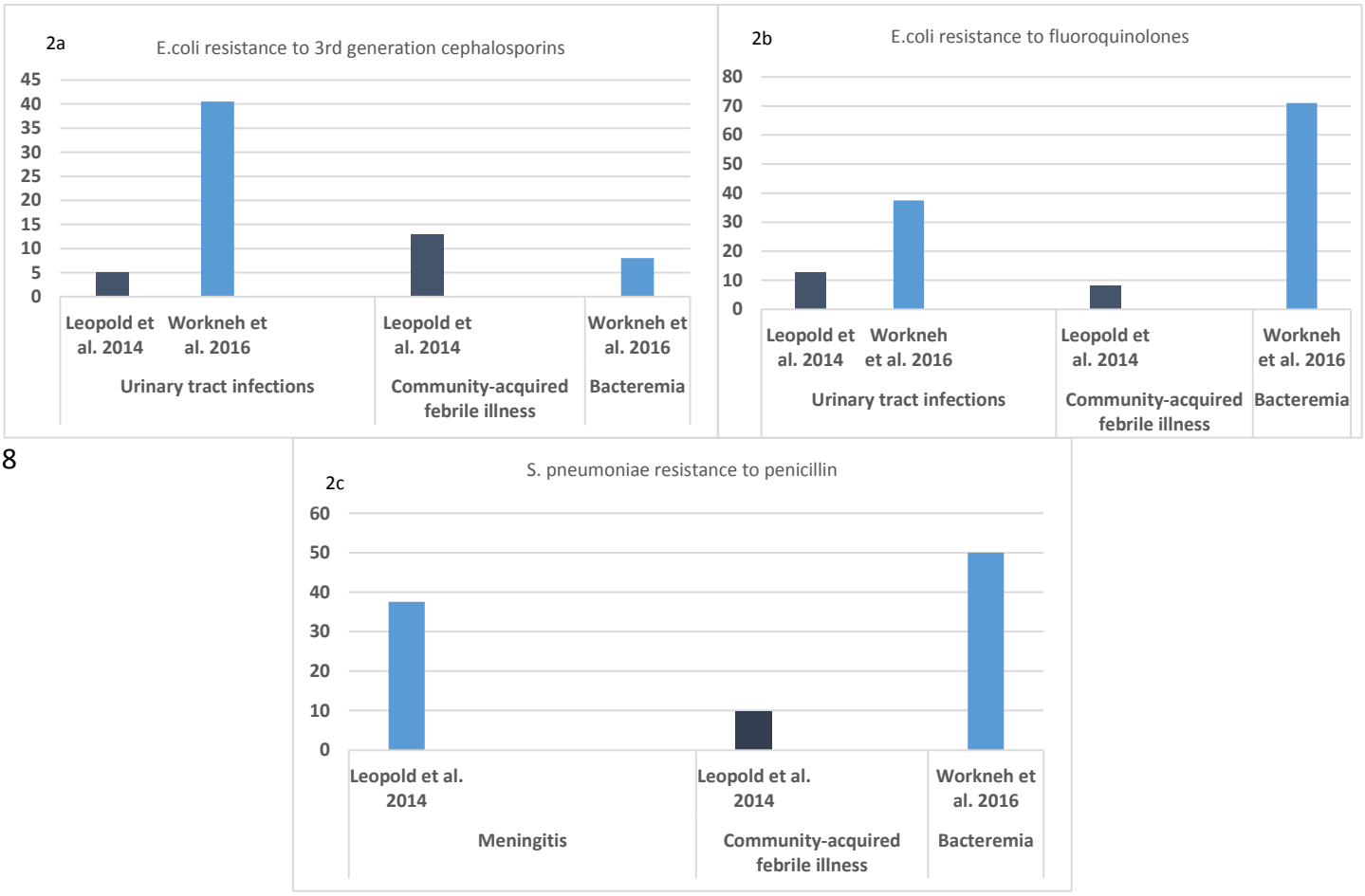
Isendahl et al.[12]	Manual incubation	VITEK2	N	Kirby-bauer disk diffusion; E-test; VITEK2	Y	117/31%
Kibret al al.[9]	Manual incubation	Biochemical analysis	Y	Kirby-bauer disk diffusion	NS	NR
Labi et al.[13]	Bactec	Biochemical analysis; BBL Crystal Enteric/Nonfermenter identification system	Y	Kirby-bauer disk diffusion	N	NR
Lunguya et al.[4]	Manual incubation	Biochemical analysis; VITEK2	Y	E-test; VITEK2	N	NR
Mahende et al.[16]	Bactec	Biochemical analysis	Y	Kirby-bauer disk diffusion	Y	36/58.1%
Moon et al.[6]	Bactec	Biochemical analysis	Y	Kirby-bauer disk diffusion; E-test	N	NR
Musiime et al.[1]	Bactec	Phoenix	Y	Kirby-bauer disk diffusion; Phoenix	Y	52,41%

Obaro et al. [18]	Bactec	Biochemical analysis; API 20E	Y	Kirby-bauer disk diffusion	NS	NR
Ochada et al.[19]	Manual incubation	Biochemical analysis	Y	Kirby-bauer disk diffusion	N	NR
Ochieng' et al.[11]	Other	Not specified	NS	NS	N	NR
Preziosi et al.[17]	Bactec	Biochemical analysis	Y	Kirby-bauer disk diffusion; VITEK2	Y	CoNS and diphtheroids discarded prior to analysis; 50, 5.9% considered contaminants after this
Renuart et al.[3]	Bactec	Biochemical analysis	Y	Kirby-bauer disk diffusion	N	NR
Wasihun et al.[15]	Manual incubation	Biochemical analysis	Y	Kirby-bauer disk diffusion	N	NR

**NS=not specified. NR=not reported.*



*Supplementary Figure 1. Study locations by country and number of studies per country. *Black fill denotes countries not included in this review. Only sub-Saharan African countries included with the exception of South Africa.*



Supplementary Figure 2a. E. coli resistance to 3rd generation cephalosporins. 2b. E. coli resistance to fluoroquinolones. 2c. S. pneumoniae resistance to penicillin.

Search Terms

PubMed was searched with the terms "Drug Resistance, Bacterial"[Mesh] OR “antimicrobial drug resistance”[tiab] AND “Microbial Sensitivity Tests”[Mesh] OR “Anti-Bacterial Agents/therapeutic use”[Mesh] OR “antimicrobial susceptibility”[tiab] AND "Africa South of the Sahara"[Mesh] OR “sub-Saharan Africa”[tiab] NOT ("South Africa"[Mesh] OR “South Africa”[tiab])). Filters were publication date from 02/01/2013 to 22/03/2016 and human

studies. Embase was searched with the terms 'antibiotic resistance'/exp OR 'antimicrobial drug resistance':ab,ti AND 'antiinfective agent'/exp/dd_dt OR 'microbial sensitivity test'/exp OR 'antimicrobial susceptibility':ab,ti AND 'africa south of the sahara'/exp OR 'sub-saharan africa':ab,ti NOT ('south africa'/exp OR 'south africa':ab,ti). Filters were 2013 to 2016 and humans. We also searched African Journals Online (AJO) with the terms “antimicrobial drug resistance” AND “antimicrobial susceptibility” AND “sub-Saharan Africa.” Cochrane Library was searched with the same search string as AJO.

Exclusion Criteria

Of the 120 full text articles screened, 96 articles in total were excluded. 46 included samples obtained from non-sterile sites[20-65], 29 were not associated with a disease process[66-94], 6 were studies on gonorrhea or other STDs[95-100], 3 were pooled data or meta-analysis[101-103], 2 were case reports, reviews or commentaries[104-105], 1 did not report sufficient susceptibility data[106], 1 did not test enough unique isolates[107], 1 was a poster presentation or abstract[108], 1 was in the wrong country (outside sub-Saharan Africa)[109], 1 included pathogens that were inconsistent with the clinical scenario[110], 2 were studies of environmental samples[111-112], 2 were duplicate studies not screened out previously and 1 full text was not able to be retrieved. 24 studies were included for data extraction and an additional 5 studies were excluded during data extraction; 1 was a letter to the editor that did not describe methods or report susceptibilities[113], 1 included samples from non-sterile sites[114], 1 did not report complete antimicrobial susceptibilities[115], and 2 were not associated with a disease process[116-117].

References

1 Musiime V, Cook A, Bakeera-Kitaka S et al. Bacteremia, causative agents and antimicrobial susceptibility among HIV-1-infected children on antiretroviral therapy in Uganda and Zimbabwe. *Pediatr Infec Dis J* 2013; 32: 856-62.

2 Acquah SE, Quaye L, Sagoe K et al. Susceptibility of bacterial etiological agents to commonly-used antimicrobial agents in children with sepsis at the Tamale Teaching Hospital. *BMC Infect Dis* 2013; 13: 89.

3 Renuart, AJ, Goldfarb, DM, Mokomane, M et al. Microbiology of Urinary Tract Infections in Gaborone, Botswana. *PLoS One* 2013; 8: e57776.

4 Lunguya O, Lejon V, Phoba MF et al. Antimicrobial resistance in invasive non-typhoid Salmonella from the Democratic Republic of the Congo: emergence of decreased fluoroquinolone susceptibility and extended-spectrum beta lactamases. *PLoS Negl Trop Dis* 2013; 7: e2103.

5 Christopher A, Mshana SE, Kidenya BR et al. Bacteremia and resistant gram-negative pathogens among under-fives in Tanzania. *Ital J Pediatr* 2013; 39: 27.

6 Moon TD, Silva WP, Buene M et al. Bacteremia as a cause of fever in ambulatory, HIV-infected Mozambican adults: Results and policy implications from a prospective observational study. *PLoS One* 2013; 8: e83591.

7 Endris M, Takele Y, Woldeyohannes D et al. Bacterial sepsis in patients with visceral leishmaniasis in Northwest Ethiopia. *BioMed Res Int* 2014; 2014: 361058.

8 Irenge LM, Kabego L, Vandenberg O et al. Antimicrobial resistance in urinary isolates from inpatients and outpatients at a tertiary care hospital in South-Kivu Province (Democratic Republic of Congo). *BMC Res Notes* 2014; 7: 374.

9 Kibret M, Abera B. Prevalence and antibiogram of bacterial isolates from urinary tract infections at Dessie Health Research Laboratory, Ethiopia. *Asian Pac J Trop Biomed* 2014; 4: 164-168.

10 Abejew AA, Denboba AA, Mekonnen AG. Prevalence and antibiotic resistance pattern of urinary tract bacterial infections in Dessie area, North-East Ethiopia. *BMC Res Notes* 2014; 7: 687.

11 Ochieng' N, Okechi H, Ferson S et al. Bacteria causing ventriculoperitoneal shunt infections in a Kenyan population. *J Neurosurg Pediatr* 2015; 15: 150-5.

12 Isendahl J, Manjuba C, Rodrigues A et al. Prevalence of community-acquired bacteraemia in Guinea-Bissau: an observational study. *BMC Infect Dis* 2014; 14: 3859.

13 Labi AK, Obeng-Nkrumah N, Addison NO et al. *Salmonella* blood stream infections in a tertiary care setting in Ghana. *BMC Infect Dis* 2014; 14: 3857.

14 Akingbade O, Balogun S, Ojo D et al. Resistant plasmid profile analysis of multidrug resistant *Escherichia coli* isolated from urinary tract infections in Abeokuta, Nigeria. *Afr Health Sci* 2014; 14: 821-8.

15 wasihun, AG, Wlekidan LN, Gebremariam SA et al. Diagnosis and Treatment of Typhoid Fever and Associated Prevailing Drug Resistance in Northern Ethiopia. *Int J Infect Dis* 2015; 35: e96-e102.

16 Mahende C, Ngasala B, Lusingu J et al. Bloodstream bacterial infection among outpatient children with acute febrile illness in north-eastern Tanzania. *BMC Res Notes* 2015; 8: 289.

17 Preziosi M, Zimba TF, Lee, K et al. A prospective observational study of bacteraemia in adults admitted to an urban Mozambican hospital. *S Afr Med J* 2015; 105: 370-374.

18 Obaro SK, Hassan-Hanga F, Olateju EK et al. *Salmonella* bacteremia among children in central and Northwest Nigeria, 2008-2015. *Clin Infect Dis* 2015; 61: S325-S331.

19 Ochada NS, Nasiru IA, Thairu Y et al. Antimicrobial susceptibility pattern of urinary pathogens isolated from two tertiary hospitals in Southwestern Nigeria. *Afr J Clin Exp Micro* 2015; 16: 12-22.

20 Abamecha A, Wondafrash B, Abdissa A. Antimicrobial resistance profile of *Enterococcus* species isolated from intestinal tracts of hospitalized patients in Jimma, Ethiopia. *BMC Res Notes* 2015; 8: 213. 2015

21 Abera B, Kibret M. Azithromycin, fluoroquinolone and chloramphenicol resistance of non-chlamydia conjunctival bacteria in rural community of Ethiopia. *Indian J Ophthalmol* 2014; 62: 236-9.

22 Adugna A, Kibret M, Abera B et al. Antibiogram of *E. coli* serotypes isolated from children aged under five with acute diarrhea in Bahir Dar town. *Afr Health Sci* 2015; 15: 656-64.

23 Akinkunmi EO, Adesunkanmi AR, Lamikanra A. Pattern of pathogens from surgical wound infections in a Nigerian hospital and their antimicrobial susceptibility profiles. *Afr Health Sci* 2014; 14: 802-9.

24 Ako-Nai AK, Abumbere G, Akinyoola AL et al. Characterisation of bacterial isolates from patient wounds and environmental factors predictive of post-surgical infections at the orthopedic ward in Ile-Ife, Nigeria. *E Afr Med J* 2013; 90: 380-6.

25 Alabi AS, Frielinghaus L, Kaba H et al. Retrospective analysis of antimicrobial resistance and bacterial spectrum of infection in Gabon, Central Africa. *BMC Infect Dis* 2013; 13: 455.

26 Anagaw B, Gezachew M, Biadgelgene F et al. Antimicrobial susceptibility patterns of *Streptococcus pneumoniae* over 6 years at Gondar University Hospital, Northwest Ethiopia. *Asian Pac J Trop Biomed* 2013; 3: 536-541.

27 Anago E, Ayi-Fanou L, Akpovi CD et al. Antibiotic resistance and genotype of beta-lactamase producing *Escherichia coli* in nosocomial infections in Cotonou, Benin. *Ann Clin Microbiol Antimicrob* 2015; 14: 5.

28 Assefa Y, Moges F, Endris M et al. Bacteriological profile and drug susceptibility patterns in dacryocystitis patients attending Gondar University Teaching Hospital, Northwest Ethiopia. *BMC Ophthalmol* 2015; 15: 34.

29 Bisi-Johnson MA, Olowe OA. Studies on bacterial agents of surgical site infection in Osogbo, South Western Nigeria. *Int J Infect Dis* 2014; 21: 346.

30 Bos JC, Beishuizen SJ, Madeira GC et al. Antimicrobial susceptibility of *Streptococcus pneumoniae* in adult patients with pneumococcal pneumonia in an urban hospital in Mozambique. *BMC Res Notes* 2014; 7: 110.

31 Chukwu Emelda E, Nwaokorie Francisca O, Umeizudike Kehinde A et al. Susceptibility pattern of *Prevotella* and *Porphyromonas* species from patients with odontogenic infections in Lagos University Teaching Hospital to amoxicillin. *Int J Pharm Bio Sci* 2013; 4: B760-B765.

32 Coles CL, Mabula K, Seidman JC et al. Mass distribution of azithromycin for trachoma control is associated with increased risk of azithromycin-resistant *Streptococcus pneumoniae* carriage in young children 6 months after treatment. *Clin Infect Dis* 2013; 56: 1519-26.

33 Eguale T, Gebreyes WA, Asrat D et al. Non-typhoidal *Salmonella* serotypes, antimicrobial resistance and co-infection with parasites among patients with diarrhea and other gastrointestinal complaints in Addis Ababa, Ethiopia. *BMC Infect Dis 2015*; 15: 497.

34 Eguale T, Gebreyes W, Asrat D et al. Non-typhoidal salmonellosis, antimicrobial resistance and co-infection with parasites among patients with diarrhea and gastroenteritis in Addis Ababa, Ethiopia. *Trop Med Int Health* 2015; 20: 271.

35 Fadeyibi IO, Raji MA, Ibrahim NA et al. Chronic ulcers in Ikeja-Lagos, Nigeria: an eighteen-month review of infecting bacterial agents and susceptibility pattern. *Nig Q J Hosp Med* 2013; 23: 145-8

36 Godebo G, Kibru G, Tassew H. Multidrug-resistant bacterial isolates in infected wounds at Jimma University Specialized Hospital, Ethiopia. *Ann Clin Microbiol Antimicrob* 2013; 12: 17.

37 Iliyasu G, Habib AG, Aminu MB. Antimicrobial susceptibility pattern of invasive pneumococcal isolates in North West Nigeria. *J Glob Infect Dis* 2015; 7: 70-74.

38 Iyamba JM, Wambale JM, Lukukula CM et al. High prevalence of methicillin resistant staphylococci strains isolated from surgical site infections in Kinshasa. *Pan Afr Med J* 2014; 18: 322.

39 Kihla AJ, Ngunde PJ, Evelyn MS et al. Risk factors for wound infection in health care facilities in Buea, Cameroon: aerobic bacterial pathogens and antibiogram of isolates. *Pan Afr Med J* 2014; 18: 6.

194 40 Kityamuwesi R, Muwaz L, Kasangaki A et al. Characteristics of pyogenic odontogenic
195 infection in patients attending Mulago Hospital, Uganda: a cross-sectional study. *BMC Micro*
196 2015; 15: 46.
197 41 Langendorf C, Le Hello S, Moumouni A et al. Enteric bacterial pathogens in children with
198 diarrhea in Niger: Diversity and antimicrobial resistance. *PLoS One* 2015; 10: e0120275
199 42 Lengerh A, Moges F, Unakal C et al. Prevalence, associated risk factors and antimicrobial
200 susceptibility pattern of *Campylobacter* species among under five diarrheic children at Gondar
201 University Hospital, Northwest Ethiopia. *BMC Pediatr* 2013; 13: 82.
202 43 Mahmud ZH, Islam S, Zaman RU et al. Phenotypic and genotypic characteristics of *Vibrio*
203 *cholerae* O1 isolated from the Sierra Leone cholera outbreak in 2012. *Trans R Soc Trop Med*
204 *Hyg* 2014; 108: 715-20.
205 44 Maina EK, Kiiyukia C, Wamae CN et al. Characterization of methicillin-resistant
206 *Staphylococcus aureus* from skin and soft tissue infections in patients in Nairobi, Kenya. *Int J*
207 *Infect Dis* 2013; 17: e115-9.
208 45 Mama M, Abdissa A, Sewunet T et al. Antimicrobial susceptibility pattern of bacterial
209 isolates from wound infection and their sensitivity to alternative topical agents at Jimma
210 University Specialized Hospital, South-West Ethiopia. *Ann Clin Microbiol Antimicrob* 2014; 13:
211 14.
212 46 Manyahi J, Matee MI, Majigo M et al. Predominance of multi-drug resistant bacterial
213 pathogens causing surgical site infections in Muhimbili National Hospital, Tanzania. *BMC Res*
214 *Notes* 2014; 7: 500.

47 Mercy N, Mohamed AA, Zipporah N et al. Phenotypic and genetic characterization of *Vibrio cholerae* O1 isolated from various regions of Kenya between 2007 and 2010. *Pan Afr Med J* 2014; 19: 8.

48 Miwanda B, Moore S, Muyembe JJ et al. Antimicrobial Drug Resistance of *Vibrio cholerae*, Democratic Republic of the Congo. *Emerg Infect Dis* 2015; 21: 847-51.

49 Moremi N, Mushi MF, Fidelis M et al. Predominance of multi-resistant gram-negative bacteria colonizing chronic lower limb ulcers (CLLUs) at Bugando Medical Center. *BMC Res Notes* 2014; 7: 211.

50 Mulatu G, Beyene G, Zeynudin A. Prevalence of *Shigella*, *Salmonella* and *Campylobacter* species and their susceptibility patters among under five children with diarrhea in Hawassa town, south Ethiopia. *Ethiop J Health Sci 2014*; 24: 101-8.

51 Muluye D, Wondimeneh Y, Moges F et al. Types and drug susceptibility patterns of bacterial isolates from eye discharge samples at Gondar University Hospital, Northwest Ethiopia. *BMC Res Notes* 2014; 7: 292.

52 Nwankwo EO, Mofolorunsho CK, Akande AO. Aetiological agents of surgical site infection in a specialist hospital in Kano, north-western Nigeria. *Tanzan J Health Res* 2014; 16:289-95.

53 Nzouankeu AA, Ngandjio A, Nkamga V et al. Two variants of multidrug resistant *Vibrio Cholerae* O1 Biotype El Tor involved in two consecutives outbreaks of Cholera in Cameroon (2004-2005 and 2010-2012). *Am J Trop Med Hyg* 2014; 91: 500-501.

54 Obeng-Nkrumah N, Twum-Danso K, Krogfelt KA et al. High levels of extended-spectrum beta-lactamases in a major teaching hospital in Ghana: the need for regular monitoring and evaluation of antibiotic resistance. *Am J Trop Med Hyg* 2013; 89: 960-4.

55 Olowe OA, Aboderin BW, Idris OO et al. Genotypes and phenotypes of Shiga toxin-producing *Escherichia coli* (STEC) in Abeokuta, Southwestern Nigeria. *Infect Drug Resist* 2014; 7: 253-259.

56 Petro D, Mushi MF, Moremi N et al. In vitro susceptibility of multi-drug resistant *Pseudomonas aeruginosa* and extended-spectrum β-lactamase-producing *Klebsiella pneumoniae* isolated from clinical specimens at Bugando Medical Centre, Tanzania to Piperacillin-Tazobactam. *Tanzan J Health Res* 2014; 16: 54-7.

57 Ramos JM, Pérez-Tanoira R, García-García C et al. Leprosy ulcers in a rural hospital of Ethiopia: pattern of aerobic bacterial isolates and drug sensitivities. *Ann Clinical Microbiol Antimicrob* 2014; 13: 47.

58 Schaumburg F, Alabi AS, Kaba H et al. Molecular characterization of *Shigella spp.* from patients in Gabon 2011-2013. *Trans R Soc Trop Med Hyg* 2015; 109: 275-9.

59 Seni J, Bwanga F, Najjuka CF et al. Molecular characterization of *Staphylococcus aureus* from patients with surgical site infections at Mulago Hospital in Kampala, Uganda. *PloS One* 2013; 8: e66153.

60 Seni J, Najjuka CF, Kateete, DP et al. Antimicrobial resistance in hospitalized surgical patients: a silently emerging public health concern in Uganda. *BMC Res Notes* 2013; 6: 298.

255 61 Smith AM, Njanpop-Lafourcade BM, Mengel MA et al. Comparative Characterization of
256 *Vibrio cholerae* O1 from Five Sub-Saharan African Countries Using Various Phenotypic and
257 Genotypic Techniques. *PLoS One* 2015; 10: e0142989.
258 62 Tapia MD, Tennant SM, Bornstein K et al. Invasive nontyphoidal *salmonella* infections
259 among children in Mali, 2002-2014: Microbiological and epidemiologic features guide vaccine
260 development. *Clin Infect Dis* 2015; 61: S332-S338.
261 63 Udobi CE, Obajuluwa AF, Onaolapo JA. Prevalence and antibiotic resistance pattern of
262 methicillin-resistant *Staphylococcus aureus* from an orthopaedic hospital in Nigeria. *BioMed*
263 *Res Int* 2013; 2013: 860467.
264 64 van der Meeren BT, Millard PS, Scacchetti M et al. Emergence of methicillin resistance
265 and Panton-Valentine leukocidin positivity in hospital- and community-acquired
266 *Staphylococcus aureus* infections in Beira, Mozambique. *Trop Med Int Health* 2014; 19: 169-76.
267 65 Paglietti B, Falchi, G, Mason, P et al. Diversity among human non-typhoidal salmonellae
268 isolates from Zimbabwe. *Trans R Soc Trop Med Hyg* 2013; 107: 487-492.
269 66 Ayeni FA, Gbarabon T, Andersen C et al. Comparison of identification and antimicrobial
270 resistance pattern of *Staphylococcus aureus* isolated from Amassoma, Bayelsa state, Nigeria.
271 *Afr Health Sci* 2015; 15: 1282-1288.
272 67 Ayepola OO, Olasupo NA, Egwari LO et al. Molecular characterization and antimicrobial
273 susceptibility of *Staphylococcus aureus* isolates from clinical infection and asymptomatic
274 carriers in Southwest Nigeria. *PLoS One* 2015; 10: e0137531.

68 Birri DJ, Brede DA, Tessema GT et al. Bacteriocin Production, Antibiotic Susceptibility and Prevalence of Haemolytic and Gelatinase Activity in Faecal Lactic Acid Bacteria Isolated from Healthy Ethiopian Infants. *Microb Eco* 2013; 65: 504-516.

69 Cholley P, Ka R, Guyeux C et al. Population structure of clinical *Pseudomonas aeruginosa* from West and Central African countries. *PloS One* 2014; 9: e107008.

70 Conceição T, Coelho C, Santos-Silva I et al. Epidemiology of methicillin-resistant and -susceptible *Staphylococcus aureus* in Luanda, Angola: first description of the spread of the MRSA ST5-IVa clone in the African continent. *Microb Drug Resist* 2014; 20: 441-9.

71 Egyir B, Guardabassi L, Nielsen SS et al. Prevalence of nasal carriage and diversity of *Staphylococcus aureus* among inpatients and hospital staff at Korle Bu Teaching Hospital, Ghana. *J Global Antimicrob Resist* 2013; 1: 189-193.

72 Egyir B, Guardabassi L, Sørum M et al. Molecular epidemiology and antimicrobial susceptibility of clinical *Staphylococcus aureus* from healthcare institutions in Ghana. *PLoS One* 2014; 9: e89716.

73 Ekundayo EO, Ndubuisi RN. In-vitro antimicrobial susceptibility pattern of *Staphylococcus aureus* isolates in Umuahia, Abia State, Nigeria. Afr J Clin Exper Micro 2015; 16: 62-66.

74 Ernest AI, Ng'Walida N, Ndaboine E et al. Maternal vaginorectal colonization by *Group B Streptococcus* and *Listeria monocytogenes* and its risk factors among pregnant women attending tertiary hospital in Mwanza, Tanzania. *Tanzan J Health Res 2015*; 17: 2.

295 75 Eyoh AB, Toukam M, Atashili J et al. Relationship between multiple drug resistance and
296 biofilm formation in *Staphylococcus aureus* isolated from medical and non-medical personnel
297 in Yaounde, Cameroon. Pan Afr Med J 2014; 17: 186.
298 76 Hamdan HZ, Kubbara E, Adam AM et al. Urinary tract infections and antimicrobial
299 sensitivity among diabetic patients at Khartoum, Sudan. *Ann Clin Microbiol Antimicrob* 2015;
300 14: 26.
301 77 Harrois D, Breurec S, Seck A et al. Prevalence and characterization of extended-
302 spectrum β-lactamase-producing clinical *Salmonella enterica* isolates in Dakar, Senegal, from
303 1999 to 2009. Clin Micro Infect 2014; 20: O109-16.
304 78 Keenan JD, Klugman KP, McGee L et al. Evidence for clonal expansion after antibiotic
305 selection pressure: Pneumococcal multilocus sequence types before and after mass
306 azithromycin treatments. J Infect Dis 2015; 211: 988-994.
307 79 Lemma MT, Zenebe Y, Tulu B et al. Methicillin resistant *Staphylococcus aureus* among
308 HIV infected pediatric patients in northwest Ethiopia: Carriage rates and antibiotic co-
309 resistance profiles. *PLoS One* 2015; 10: e0137254.
310 80 Lerbech AM, Opintan JA, Bekoe SO et al. Antibiotic exposure in a low-income country:
311 screening urine samples for presence of antibiotics and antibiotic resistance in coagulase
312 negative staphylococcal contaminants. *PloS One* 2014; 9: e113055.
313 81 Moyo S, Haldorsen B, Aboud S et al. Identification of VIM-2-producing *Pseudomonas*
314 *aeruginosa* from Tanzania is associated with sequence types 244 and 640 and the location of
315 blaVIM-2 in a TniC integron. *Antimicrob Agents Chemother* 2015; 59: 682-5.

316 82 Moyo SJ, Aboud S, Blomberg B et al. High nasal carriage of methicillin-resistant
317 *Staphylococcus aureus* among healthy Tanzanian under-5 children. Microb Drug Resist 2014;
318 20: 82-8.
319 83 Mushi MF, Mshana SE, Imirzalioglu C et al. Carbapenemase genes among multidrug
320 resistant gram negative clinical isolates from a tertiary hospital in Mwanza, Tanzania. *BioMed*
321 *Res Int* 2014; 2014: 303104.
322 84 Ndossa A, Okamo B, Mushi MF et al. Factors associated with colonization of
323 *Streptococcus pneumoniae* among under-fives attending clinic in Mwanza city, Tanzania.
324 *Tanzan J Health Res* 2015; 17: 1.
325 85 Nelson E, Kayega J, Seni J et al. Evaluation of existence and transmission of extended
326 spectrum beta lactamase producing bacteria from post-delivery women to neonates at
327 Bugando Medical Center, Mwanza-Tanzania. *BMC Res Notes* 2014; 7: 279.
328 86 Ntirenganya C, Manzi O, Muvunyi CM et al. High prevalence of antimicrobial resistance
329 among common bacterial isolates in a tertiary healthcare facility in Rwanda. *Am J Trop Med*
330 *Hyg* 2015; 92: 865-70.
331 87 Nurjadi D, Olalekan AO, Layer F et al. Emergence of trimethoprim resistance gene dfrG
332 in *Staphylococcus aureus* causing human infection and colonization in sub-Saharan Africa and
333 its import to Europe. *J Antimicrob Chemother* 2014; 69: 2361-8.
334 88 Nwadike VU, Ojide CK, Kalu EI et al. Multidrug resistant *acinetobacter* infection and their
335 antimicrobial susceptibility pattern in a Nigerian tertiary hospital ICU. *Afr J Infect Dis* 2014; 8:
336 14-18.

89 Ogbolu DO, Webber MA. High-level and novel mechanisms of carbapenem resistance in Gram-negative bacteria from tertiary hospitals in Nigeria. *Int J Antimicrob Agents* 2014; 43: 412-7.

90 Okoje-Adesomoju VN, Ifesanya JU, Alonge TO. Antimicrobial susceptibility pattern of oral microbial isolates among pregnant women in Ibadan South-East local government area, Nigeria. *Afr J Biomed Res* 2015; 18: 29-3.

91 Oladeinde BH, Omoregie R, Oladeinde OB. Asymptomatic urinary tract infection among pregnant women receiving ante-natal care in a traditional birth home in Benin City, Nigeria. *Ethiop J Health Sci* 2015; 25: 3-8.

92 O'Malley SM, Emele FE, Nwaokorie FO et al. Molecular typing of antibiotic-resistant *Staphylococcus aureus* in Nigeria. *J Infect Pub Health* 2015; 8: 187-93.

93 Omuse G, Kabera B, Revathi G. Low prevalence of methicillin resistant *Staphylococcus aureus* as determined by an automated identification system in two private hospitals in Nairobi, Kenya: a cross sectional study. *BMC Infect Dis* 2014; 14: 669

94 Parameswarappa J, Basavaraj VP, Basavaraj CM. Isolation, identification, and antibiogram of *enterococci* isolated from patients with urinary tract infection. *Ann Afr Med*; 12: 176-81

95 Hailemariam M, Abebe T, Mihret A et al. Prevalence of *Neisseria gonorrhea* and their antimicrobial susceptibility patterns among symptomatic women attending gynecology outpatient department in Hawassa referral hospital, Hawassa, Ethiopia. *Ethiop J Health Sci* 2013; 23: 10-18.

96 Kouegnigan Rerambiah L, Ndong JC, Medzegue S et al. Genital *Mycoplasma* infections and their resistance phenotypes in an African setting. *Eur J Clin Microbiol Infect Dis* 2015; 34: 1087-90.

97 Vandepitte J, Hughes P, Matovu G et al. High prevalence of ciprofloxacin-resistant *gonorrhea* among female sex workers in Kampala, Uganda (2008-2009). *Sex Transm Dis* 2014; 41: 233-7.

98 Tsai AY, Dueger E, Macalino GE et al. The U.S. military's *Neisseria gonorrhoeae* resistance surveillance initiatives in selected populations of five countries. *MSMR* 2013; 20: 25-7.

99 Tibebu M, Shibabaw A, Medhin G et al. *Neisseria gonorrhoeae* non-susceptible to cephalosporins and quinolones in Northwest Ethiopia. *BMC Infect Dis* 2013; 13: 415.

100 Takuva S, Mugurungi O, Mutsvangwa J et al. Etiology and antimicrobial susceptibility of pathogens responsible for urethral discharge among men in Harare, Zimbabwe. *Sex Transm Dis* 2014; 41: 713-717.

101 Odhiambo F, Galgalo T, Wences A et al. Antimicrobial resistance: capacity and practices among clinical laboratories in Kenya, 2013. *Pan Afr Med J* 2014; 19: 332.

102 Tadesse G. A meta-analysis of the proportion of antimicrobial resistant human *Salmonella* isolates in Ethiopia. *BMC Pharm Tox* 2014; 15: 51.

103 Baltazar M, Ngandjio A, Holt KE et al. Multidrug-resistant *Salmonella enterica serotype Typhi*, Gulf of Guinea Region, Africa. *Emerg Infect Dis* 2015; 21:655-9.

104 Leopold SJ, van Leth F, Tarekegn H et al. Antimicrobial drug resistance among clinically relevant bacterial isolates in sub-Saharan Africa: a systematic review. *J Antimicrob Chemother* 2014; 69: 2337-2353.

105 Feasey NA, Cain AK, Msefula CL et al. Drug resistance in *Salmonella enterica ser. Typhimurium* bloodstream infection, Malawi. *Emerg Infect Dis* 2014; 20: 1957-9.

106 Dia ML, Sonko MA, Kâ R et al. Serotype and antimicrobial susceptibility patterns of *Streptococcus pneumoniae* isolates in Senegal between 1996 and 2010. *Méd Mal Infect* Jul 2013; 43: 304-5.

107 Diene SM, Fall B, Kempf M et al. Emergence of the OXA-23 carbapenemase-encoding gene in multidrug-resistant *Acinetobacter baumannii* clinical isolates from the Principal Hospital of Dakar, Senegal. *Int J Infect Dis* 2013; 17: e209-10

108 Guedezounme L, Chodaton M, Ahoyo TA et al. Resistance evaluation of *Escherichia coli* strains isolated from urines in the urban environment in Benin. Antimicrob Resist Infect Control 2013; 2: P19.

109 Ibrahim ME, Bilal NE, Hamid ME. Comparison of phenotypic characteristics and antimicrobial resistance patterns of clinical *Escherichia coli* collected from two unrelated geographical areas. *Glob J Health Sci* 2014; 6: 126-35.

110 Odongo CO, Anywar DA, Luryamamoi K et al. Antibiograms from community-acquired uropathogens in Gulu, northern Uganda--a cross-sectional study. *BMC Infect Dis* 2013; 13: 193.

111 Elmadiena MM, El Hussein AA, Muckle CA et al. Antimicrobial susceptibility and multi-drug resistance of *Salmonella enterica subspecies enterica serovars* in Sudan. *Trop Anim Health Prod* 2013; 45: 1113-8.

112 Walters MS, Routh J, Mikoleit M et al. Shifts in Geographic Distribution and Antimicrobial Resistance during a Prolonged Typhoid Fever Outbreak - Bundibugyo and Kasese Districts, Uganda, 2009-2011. *PLoS Neg Trop Dis 2014*; 8: e2726.

113 Bouba G, Nelly Michèle G, Lombart JP. *Neisseria meningitidis* susceptibility in North-Cameroon. *Méd Mal Infect* 2014; 44: 443-4.

114 Maina D, Omuse G, Revathi G et al. Spectrum of microbial diseases and resistance patterns at a private teaching hospital in Kenya: Implications for clinical practice. *PLoS One* 2016; 11: e0147659.

115 Mkony MF, Mizinduko MM, Massawe A et al. Management of neonatal sepsis at Muhimbili National Hospital in Dar es Salaam: diagnostic accuracy of C-reactive protein and newborn scale of sepsis and antimicrobial resistance pattern of etiological bacteria. *BMC Pediatr* 2014; 14: 293.

116 Raji MA, Jamal W, Ojemeh O et al. Sequence analysis of genes mediating extended-spectrum beta-lactamase (ESBL) production in isolates of Enterobacteriaceae in a Lagos Teaching Hospital, Nigeria. *BMC Infect Dis* 2015; 15: 259.

117 Raji MA, Jamal W, Ojemhen O et al. Point-surveillance of antibiotic resistance in Enterobacteriaceae isolates from patients in a Lagos Teaching Hospital, Nigeria. *J Infect Pub Health* 2013; 6: 431-7.