

# Antibacterial Utilization for Febrile Illnesses and Laboratory-Confirmed Bloodstream Infections in Northern Tanzania

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## Highlights

- A large proportion of patients with culture-confirmed bloodstream infections were treated with ineffective antibacterials possibly due to alternate suspected diagnoses or empiric prescribing practices
- Consistency of antibacterial prescribing with World Health Organization and Tanzanian treatment guidelines improved over time
- Improved diagnostics for febrile illness, data on local antimicrobial resistance patterns, context-specific clinical guidelines, and provider education may improve prescribing practices

## Background

- Management of febrile patients in low-resource settings is challenging and often relies on syndrome management algorithms
- Ineffective antimicrobial prescriptions and use of broad-spectrum agents contribute to resistance
- Though treatment guidelines exist, levels of adherence in Tanzania are highly variable
- To advance antimicrobial stewardship programs in Tanzania, further data are needed on empiric prescribing, use of appropriate and targeted therapy for lab-confirmed infections, and adherence to treatment guidelines

## Methods

### Fever surveillance studies at hospitals in Moshi, Tanzania

- Kilimanjaro Christian Medical Centre (KCMC): zonal referral hospital
- Mawenzi Regional Referral Hospital (MRRH): regional hospital

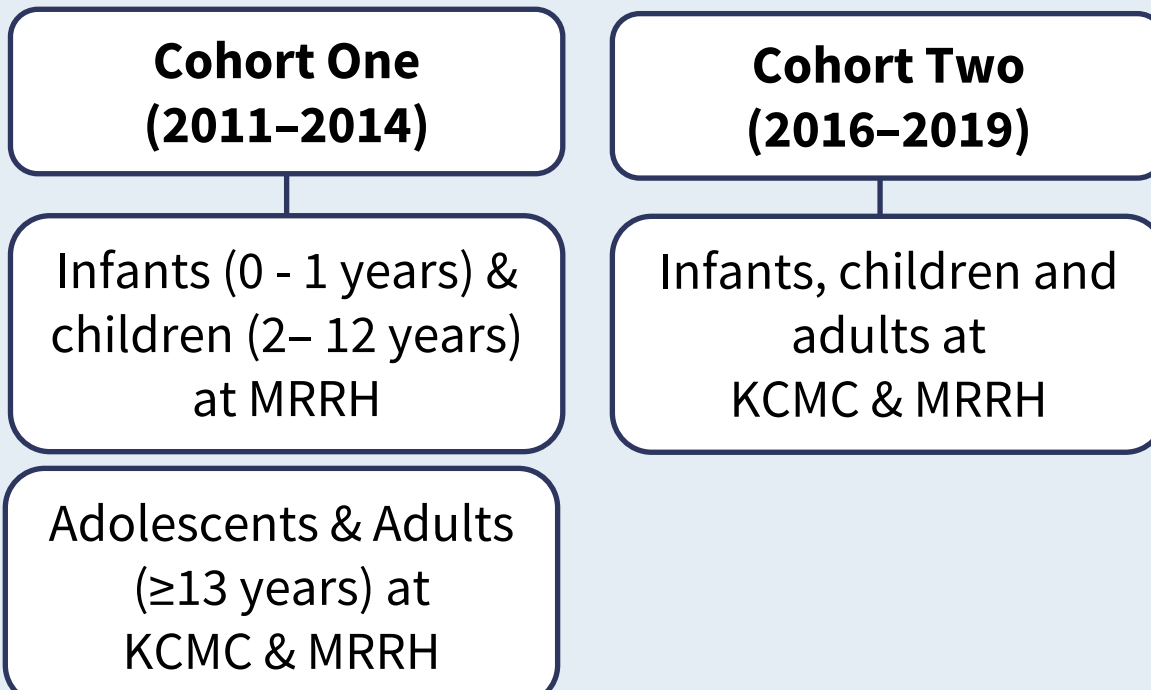


Standardized questionnaire administered and physical exam performed

Preliminary and discharge diagnoses documented using ICD-9 and ICD-10 coding

Blood cultures collected within 24h of admission, monitored on BacTAlert 3D Microbial Detection system for 5 days

Antimicrobial susceptibility testing done and interpreted according to Clinical Laboratory Standards Institute guidelines



## Study Aims

Describe antibacterial prescribing patterns in participants with febrile illnesses and laboratory-confirmed bacterial bloodstream infections (BSI) in northern Tanzania

In patients with microbiologically identified bloodstream infections: assess concordance of antimicrobial therapy with *in vitro* susceptibility of the organism

In patients with diagnosis of pneumonia, urinary tract infection, and sepsis: describe concordance of prescribed antibacterials with either the World Health Organization treatment guidelines<sup>1-3</sup> and the Tanzania Standard Treatment Guidelines<sup>4</sup>

Identify factors associated with odds of receiving antibacterial prior to enrollment

## Definitions of appropriateness of administered antibacterial therapy and guideline concordance



### Appropriateness of administered antibacterial therapy

**Effective therapy:** receipt of an antibacterial to which the organism was susceptible

**Ineffective therapy:** receipt of an antibacterial that did not have adequate activity against microbiologically identified organism or participant did not receive inpatient antibacterial therapy

**Resistant organism:** microbiologically identified organism is generally susceptible to the empiric agent, but this specific isolate was resistant to the antimicrobial administered

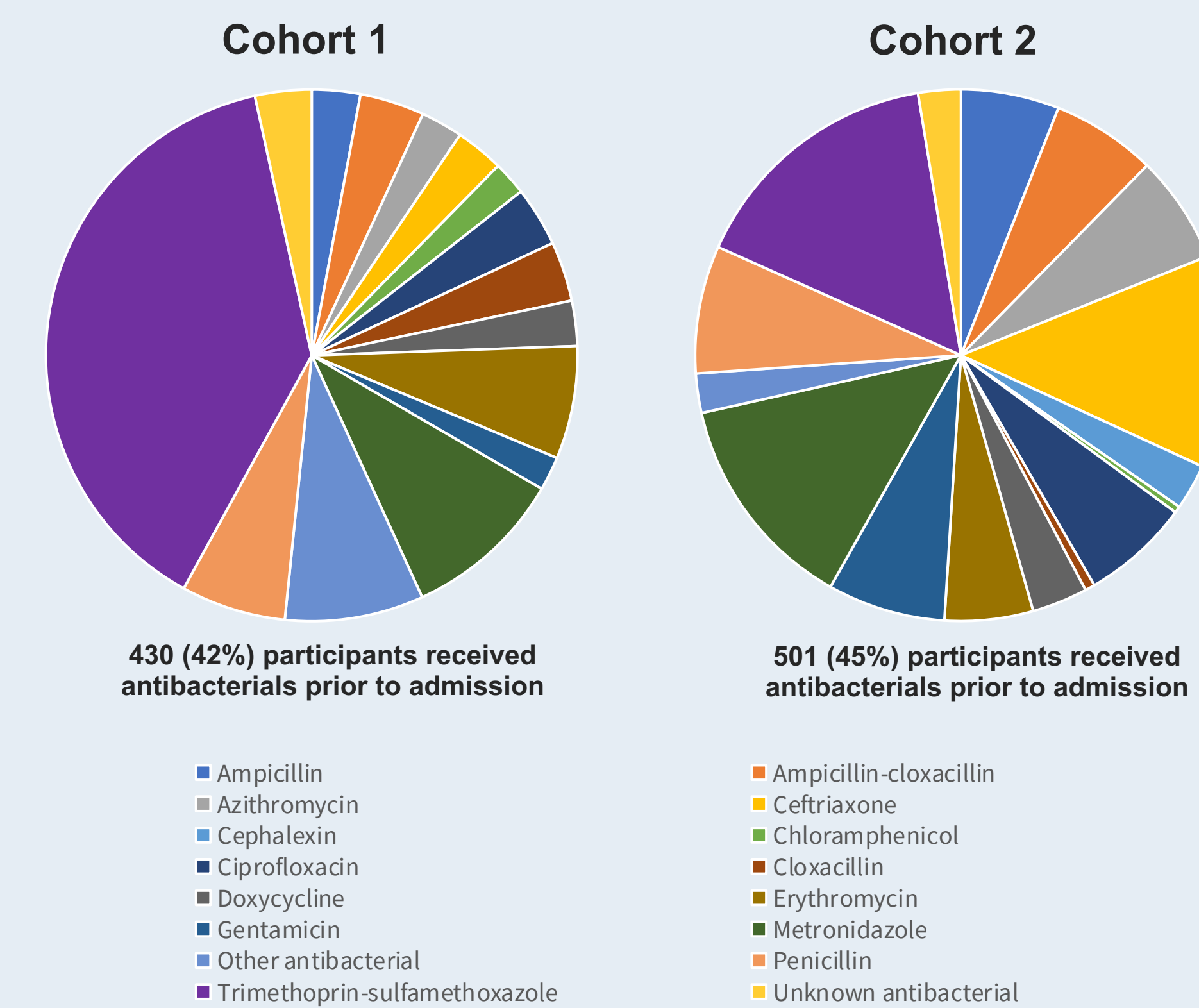


### Concordance of administered antibacterial therapy with standard treatment guidelines

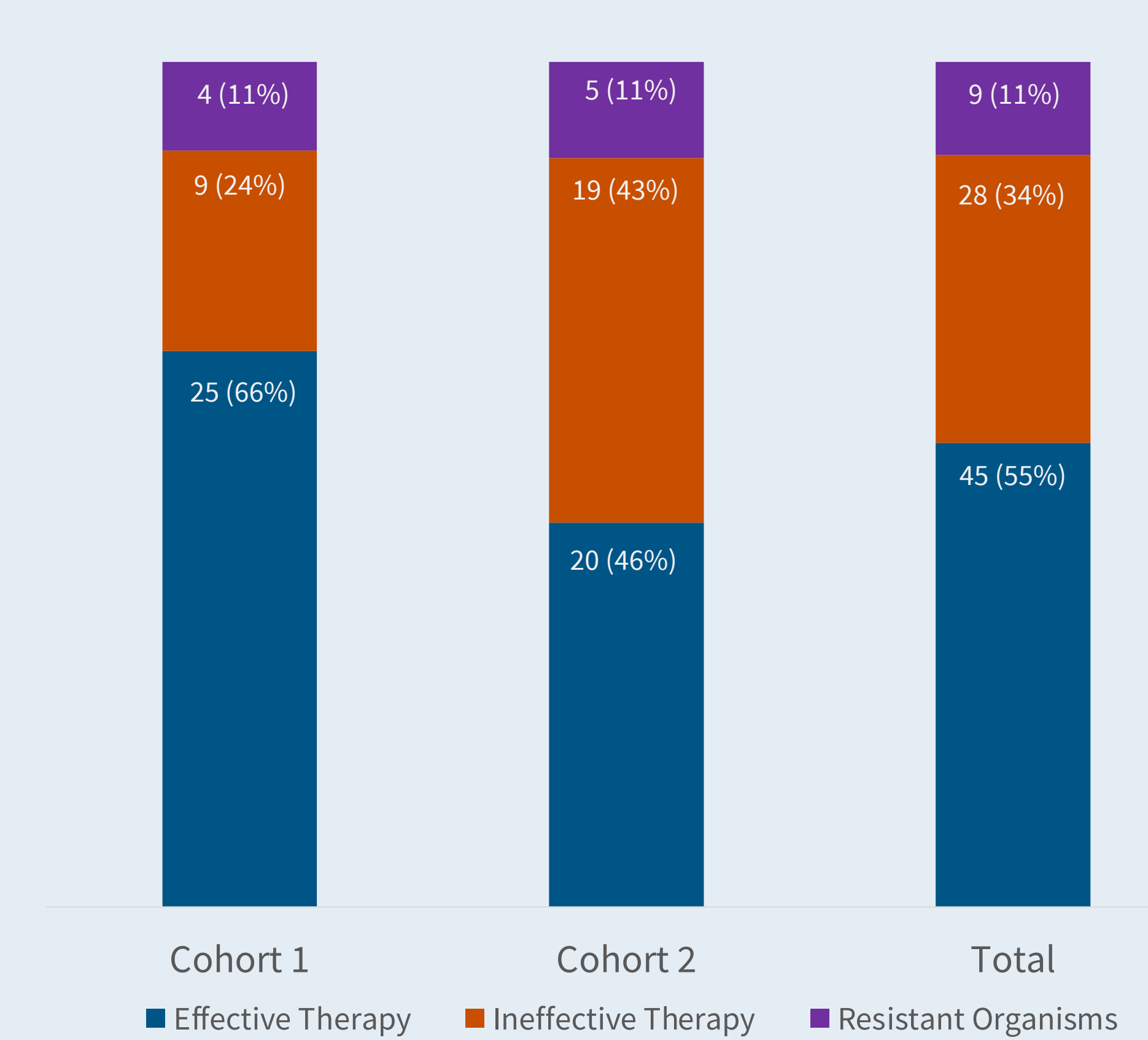
**Guideline consistent therapy:** inpatient antibacterial selection was consistent with either available guidelines for any preliminary or final diagnosis presumed to be causing the clinical syndrome

**Guideline inconsistent therapy:** empiric antibacterial selection was inconsistent with available guidelines for any preliminary or final diagnosis presumed to be causing the clinical infection

## In both cohorts, participants received a variety of antibacterials prior to admission to KCMC or MRRH



## In patients with culture-confirmed bloodstream infections, antibacterial therapy was effective in approximately 50% of patients



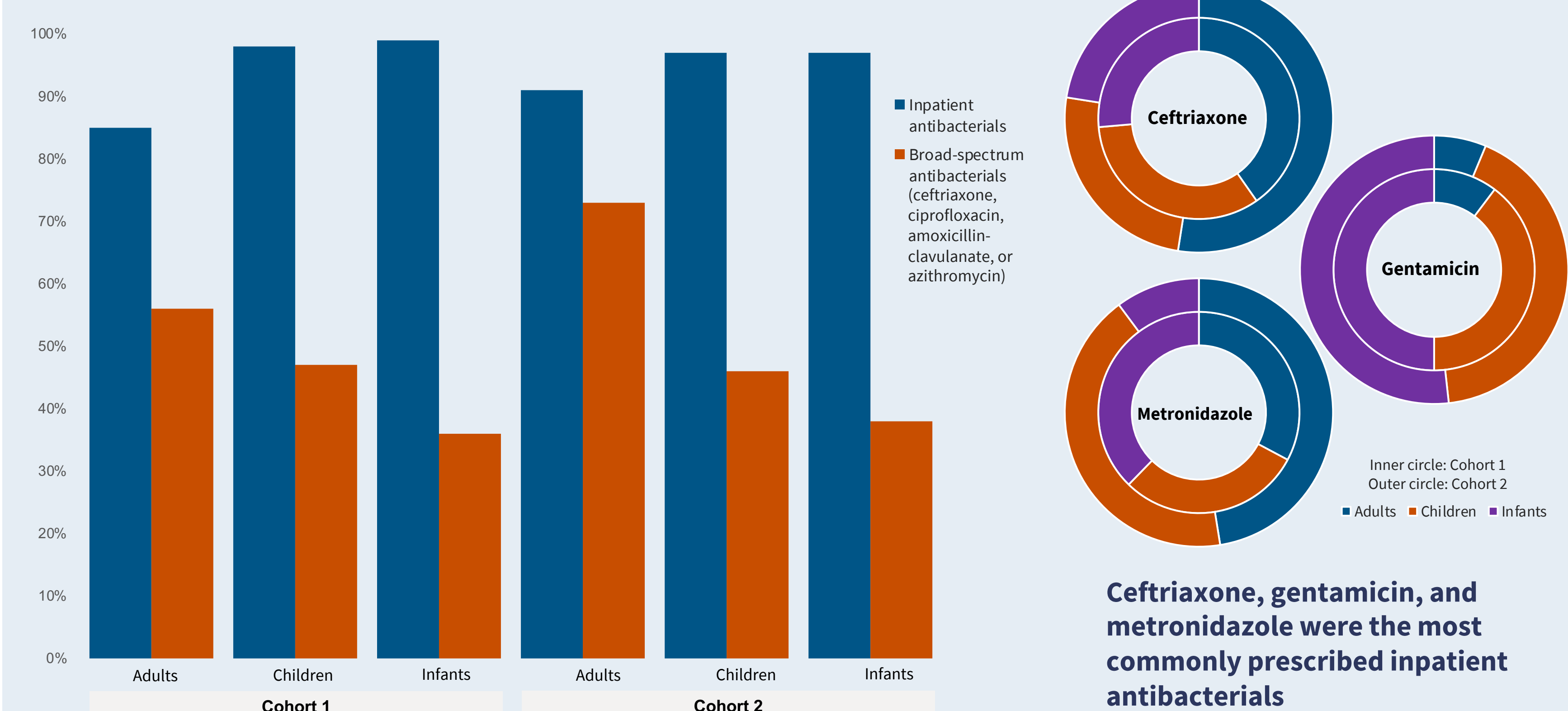
Note: 82 of the 86 study files had complete data to determine appropriateness of antibacterial utilization

## Participants were primarily non-HIV infected, young adults; prevalence of blood-culture confirmed bacteremia and mortality were low

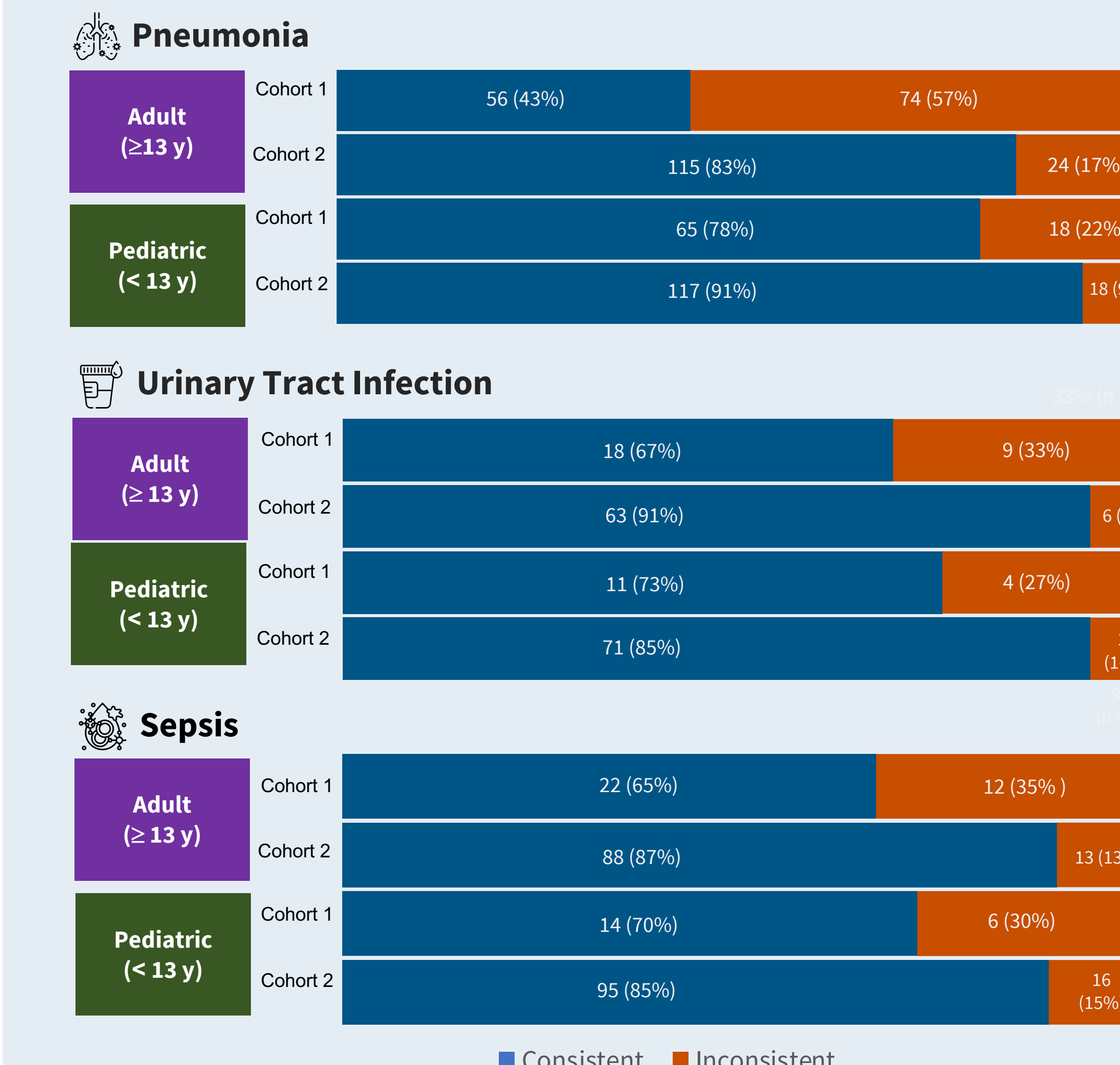
	Cohort 1 (2011-2014)	Cohort 2 (2016-2019)	Total
<b>2175</b> total participants	1043	1132	2175
<b>4.4%</b> inpatient mortality			
<b>4.0%</b> Blood-culture confirmed bacteremia			
<b>91.4%</b> received inpatient antibacterials			
<b>Number enrolled</b>	1043	1132	2175
<b>Age, mean (SD)</b>	27.4 (20.1)	25.9 (24.3)	26.6 (22.4)
<b>Adults, ≥13 years (%)</b>	729 (69.9)	653 (57.7)	1382 (63.5)
<b>Children, 2-12 years (%)</b>	241 (23.1)	320 (28.3)	561 (25.8)
<b>Infant, 0-1 year (%)</b>	73 (7.0)	159 (14.0)	232 (10.7)
<b>Female sex (%)</b>	569 (54.6)	518 (45.8)	1087 (50.0)
<b>Death during admission (%)</b>	30 (2.9)	66 (5.8)	96 (4.4)
<b>Days of illness, mean (SD)</b>	14.6 (29.4)	12.1 (25.4)	13.2 (27.3)
<b>Days of fever, mean (SD)</b>	8.8 (13.5)	6.8 (11.4)	7.8 (12.5)
<b>HIV-infection confirmed by testing*, n (%)</b>	Not Done	196 (17.4)	196 (17.4)
<b>Trimethoprim-sulfamethoxazole prophylaxis (%)</b>	117 (11.2)	114 (10.1)	231 (17.7)
<b>Received antimalarials prior to admission (%)</b>	353 (34.2)	122 (10.8)	475 (22.0)
<b>Received antibacterials prior to admission (%)</b>	430 (42.0)	501 (45.1)	931 (43.6)
<b>Positive malaria parasite smear (%)</b>	23 (2.2)	42 (3.8)	65 (3.0)
<b>Blood-culture confirmed bacteremia (%)</b>	38 (3.6)	48 (4.2)	86 (4.0)
<b>Received inpatient HIV antiretroviral medications (%)</b>	125 (12.0)	147 (13.0)	272 (12.5)
<b>Received inpatient treatment for tuberculosis (%)</b>	41 (4.0)	25 (2.2)	66 (3.0)
<b>Received inpatient antibacterials for febrile illness (%)</b>	929 (89.1)	1060 (93.6)	1989 (91.4)

\*HIV status was obtained by self-report in Cohort 1 and by HIV Rapid Antibody Test in Cohort 2. Abbreviations: standard deviation (SD), number (n)

## Nearly all participants received inpatient antibacterials and adults frequently received broad spectrum therapy



## Consistency with WHO and Tanzanian treatment guidelines varied by diagnosis and age, and improved over time



## Infancy and duration of fever were associated with more frequent antibacterial prescribing prior to enrollment

Predictor	Odds Ratio		95% CI
	Male Ref.	Female	
Sex	Ref.	1.19	1.00 – 1.42
	Adult (≥13 years)	Ref.	–
Age	Child (2-12 years)	1.43	1.16 – 1.75
	Infant (0-1 year)	1.65	1.23 – 2.20
Study Cohort	Cohort 1	Ref.	–
	Cohort 2	1.21	1.02 – 1.45
Duration of fever in days	1.03	1.02 – 1.04	

