Service Delivery Indicators

Cross-Country Comparison:

Kenya, Uganda, Madagascar, Nigeria, Tanzania, Mozambique, Niger, Togo, and Senegal

Acknowledgements

Prepared by:

- Anna Konstantinova
- Benjamin Daniels
- Jishnu Das

Thanks to:

- SDI Team

For any questions, please contact: Jishnu Das, jdas1@worldbank.org

The data used for this analysis can be found https://github.com/worldbank/SDI-Health. Additional documentation on the Service Delivery Indicators can be found https://www.sdindicators.org/.

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Demography Summary

SDI – Cross Country Comparison

Demography Summary

Facility Characteristics

Facilities were selected in each country to provide a representative assessment of service delivery quality in public and private facilities located in rural and urban areas.

Facilities in the different countries were grouped into a common set of categories. Health posts were considered the lowest tier of health facility available, often staffed by a single individual and are without in-patient services. Health centers are larger, serving a greater population, but lack surgical services. Finally, hospitals are the top level of the health care system, typically able to provide all services an individual would seek.

	Kenya 2012	Madagascar 2016	Mozambique 2014	Niger 2015	Nigeria 2013	Senegal 2010	Tanzania 2014	Tanzania 2016	Togo 2013	Uganda 2013
Rural	201 (70%)	220 (48%)	179 (88%)	192 (75%)	2,034 (84%)	96 (65%)	271 (68%)	264 (66%)	126 (70%)	304 (77%)
Urban	86 (30%)	238 (52%)	25 (12%)	64 (25%)	397 (16%)	52 (35%)	129 (32%)	133 (34%)	54 (30%)	91 (23%)
Public	157 (55%)	293 (64%)	202 (100%)	220 (86%)	2,234 (92%)	148 (100%)	266 (67%)	271 (68%)	143 (80%)	237 (60%)
Private	129 (45%)	165 (36%)	-	36 (14%)	198 (8%)	-	134 (33%)	126 (32%)	37 (20%)	158 (40%)
Hospital	51 (18%)	38 (9%)	38 (19%)	16 (6%)	412 (17%)	-	27 (7%)	30 (8%)	16 (9%)	10 (2%)
Health Center	140 (49%)	316 (71%)	8 (5%)	67 (26%)	1,458 (61%)	110 (74%)	83 (22%)	91 (24%)	46 (66%)	133 (34%)
Health Post	96 (33%)	91 (20%)	148 (76%)	172 (68%)	516 (22%)	38 (26%)	270 (71%)	262 (68%)	118 (25%)	253 (64%)
Total	287	458	204	256	2,432	148	400	397	180	396

Some of the facilities contain missing data for the above categories

Demography Summary

Provider Characteristics

Multiple providers were selected within a particular facility to complete the vignette module of the SDI survey. If the facility only had a single provider, that provider completed the module. Across the entire sample, 3 providers were surveyed from each facility, on average.

	Kenya 2012	Madagascar 2016	Mozambique 2014	Niger 2015	Nigeria 2013	Senegal 2010	Tanzania 2014	Tanzania 2016	Togo 2013	Uganda 2013
Rural	415 (66%)	282 (44%)	591 (82%)	278 (46%)	4,066 (80%)	97 (65%)	341 (60%)	310 (57%)	334 (63%)	605 (82%)
Urban	210 (34%)	360 (56%)	134 (18%)	323 (54%)	1,042 (20%)	53 (35%)	229 (40%)	233 (43%)	193 (37%)	130 (18%)
Public	380 (61%)	416 (65%)	714 (100%)	526 (88%)	4,765 (93%)	150 (100%)	379 (66%)	274 (69%)	430 (82%)	492 (67%)
Private	244 (39%)	226 (35%)	-	75 (12%)	345 (7%)	-	191 (34%)	169 (31%)	97 (18%)	244 (33%)
Hospital	166 (27%)	72 (12%)	278 (40%)	151 (25%)	1,102 (22%)	-	77 (15%)	71 (14%)	83 (16%)	18 (2%)
Health Center	303 (48%)	454 (73%)	45 (7%)	220 (37%)	3,235 (64%)	112 (75%)	129 (25%)	134 (27%)	183 (35%)	317 (43%)
Health Post	156 (25%)	95 (15%)	271 (53%)	223 (38%)	686 (14%)	38 (25%)	314 (60%)	294 (59%)	261 (49%)	402 (55%)
Total	625	642	725	601	5,110	150	570	543	527	737

Some of the providers contain missing data for the above categories

Demography Summary

Provider Characteristics

Providers in Kenya, Senegal, and Uganda were not asked survey questions related to their medical education.

A common set of categories for medical education and profession were applied across all contexts to allow for better comparison. Responses given as “other” were converted to missing values for the purposes of analysis for the level of medical training.

	Kenya 2012	Madagascar 2016	Mozambique 2014	Niger 2015	Nigeria 2013	Senegal 2010	Tanzania 2014	Tanzania 2016	Togo 2013	Uganda 2013
Medical Officer	49 (8%)	373 (58%)	107 (15%)	36 (6%)	480 (9%)	-	141 (25%)	149 (27%)	13 (2%)	27 (4%)
Clinical Officer	251 (40%)	-	226 (31%)	-	-	-	291 (51%)	266 (49%)	56 (11%)	134 (18%)
Nurse	320 (51%)	256 (40%)	310 (43%)	350 (58%)	855 (17%)	107 (71%)	78 (14%)	84 (16%)	249 (47%)	330 (45%)
Other	5 (1%)	13 (2%)	82 (11%)	215 (36%)	3,775 (74%)	43 (29%)	60 (10%)	44 (8%)	209 (40%)	246 (33%)
Advanced	-	378 (59%)	57 (9%)	369 (62%)	1,338 (27%)	-	59 (10%)	57 (10%)	148 (28%)	-
Diploma	-	239 (38%)	560 (87%)	102 (17%)	279 (6%)	-	329 (58%)	325 (60%)	163 (31%)	-
Certificate	-	18 (3%)	29 (4%)	128 (21%)	3,206 (65%)	-	169 (30%)	157 (29%)	55 (11%)	-
None	-	1 (0%)	1 (0%)	-	83 (2%)	-	11 (2%)	4 (1%)	157 (30%)	-
Total	625	642	725	601	5,110	150	570	543	527	737

Some of the providers contain missing data for the above categories

Medical Vignettes IRT Methodology

SDI – Cross Country Comparison

Medical Vignettes IRT Methodology

Vignette Structure

The actor delivers the initial script and providers are asked to proceed as though the actor were a real patient.

The enumerator has pre-scripted responses providing:
1) answers to history questions the provider could ask;
2) descriptions of what the provider would observe for a given physical exam, and;
3) the results of a medical test the provider orders.

Providers are then asked to make a diagnosis and may offer treatment recommendations but are not required to.

Vignettes in different countries vary in the treatment options the enumerator can check off in the survey instrument.

	Script of Opening Statement	Treatment (Correct if any one of the options is given, unless specified)
1. Child Diarrhea + Severe Dehydration	"I am a mother of a 13 month old boy. His name is Noel. My son has diarrhea."	IV fluid rehydration, nasogastric tube rehydration, or referral to another clinic if lower level facility.
2. Child Pneumonia	"I am the mother of this 5 year old girl. Her name is Sia. She has a cough."	Amoxicillin (or dosage), benzylpenicillin, or cotrimoxazole.
3. Diabetes (Type II)	"My name is Jack. I am worried that something is wrong with me. I feel weak and without energy even though I feel hungry often and eat frequently. I am 48 years old and work as a clerk."	Oral hypoglycemic or referral to specialized clinic.
4. Tuberculosis	"My name is Bakari. I am 40 years old and I have been suffering from a fever and cough for some time."	Combination therapy (with or without correct dosage, drug names, and timing) or referral to TB clinic. Sputum test/ chest x-ray are allowed in cases where test results were not reported back to clinician.
5. Child Malaria + Anemia	"I am the mother of this 4-year old boy. His name is Sangeti. He has had a fever for some time. Now he is worse, so I have come to you for help."	Artemether-lumefantrine (with or without correct dosage), artemisinin combination therapy (with or without correct dosage), or artesunate-amodiaquine. Treatment must include zinc and folic acid supplements to be considered correct.
6. Post-Partum Hemorrhage	"My name is Fatuma. I am 26 years old and I have vaginal bleeding 24 hours after delivery in a health facility."	IV line, uterine massage, and some type of uterotonic or prostaglandin must all be specified to be considered correct.
7. Neonatal Asphyxia	"A mother gives birth to a baby. The newborn is not crying. The newborn fails to establish regular breathing and appears pail and slightly blue. What do you do?"	Some action to warm and/or dry the baby, clear the airway, and provide ventilation must all be taken to be considered correct.
8. Pelvic Inflammatory Disease	"Hello doctor. The patient is a shy 34-year-old woman who is suffering from pain here [pointing your hand at the lower right abdomen] for 3 months."	Amoxicillin, ciprofloxacin, cotrimoxazole, metronidazole.
9. Pregnant	"Hello. My name is Adila. I have not seen my period for 14 weeks and my sister advised me to consult here because I may be pregnant."	n/a
10. Pre-eclampsia	"Hello. My name is Fati. I must give birth soon. My husband and I came today because my feet are swollen and I cannot see well. My pregnancy has gone well so far. I saw a nurse twice. I took the medicine that the doctor gave me (shows you iron tablets)."	n/a

Medical Vignettes IRT Methodology

Inputs Derived From Vignettes

In a vignette, a provider's diagnostic behavior consists of the questions asked during history taking and the physical exams the provider performs.

Based on each individual's diagnostic behavior pattern across all vignettes, item response theory (IRT) estimates a "theta ability score" or "knowledge score" for each provider in the survey.

Module 3: Case Simulations

Section G: Case Study Patient 5[12]

Case study patient [enumerator reads]

Good morning (afternoon) doctor. I am the mother of this 4-year-old boy. His name is Sangeti. He has had a fever now for some time. Now he is worse, so I have come to you for help.

[All other information is provided only if the clinician asks!]

	Question Asked	Enumerator Response	Yes = 1 No = 2	Notes/other questions
History Taking				
1.	Duration of fever	One week	|___|	
2.	Pattern of fever/Presence or history of fever	Some days fine, some days very sick	|___|	
3.	Shiver or sweat	Yes	|___|	
4.	Convulsions	No	|___|	
5.	Vomiting	Yes, sometimes	|___|	
6.	Appetite	He eats, but not as much as usual, and sometimes he will vomit	|___|	
7.	Diarrhoea	No	|___|	
8.	Cough	Yes	|___|	
9.	Severity of cough	Not severe	|___|	
10.	Difficulty in breathing	No difficulty in breathing	|___|	
11.	Type of cough (productive or dry)	The cough is dry	|___|	
12.	Type of medication given	I started to give him Paracetamol	|___|	
13.	Amount	One dose two days ago, one yesterday and one this morning	|___|	
14.	Vaccinations	He has taken all vaccinations.	|___|	
Physical Examination				
15.	Hands (palmar pallor)	The nail beds are pale	|___|	
16.	Tongue	The tongue is pale	|___|	
17.	Eyes, sunken?	The eyes are not sunken	|___|	
18.	Eyes, pale colour?	The eyes are pale	|___|	
19.	Responsiveness / general condition	He is awake but lethargic	|___|	
20.	Skin condition	The skin is normal	|___|	
21.	Temperature	Temperature is 37.6 degrees (Celsius)	|___|	
22.	Pulse	Pulse is 95 per minute	|___|	
23.	Neck stiffness	Neck is not stiff	|___|	
24.	Puffy face	Face is not puffy	|___|	

Medical Vignettes IRT Methodology

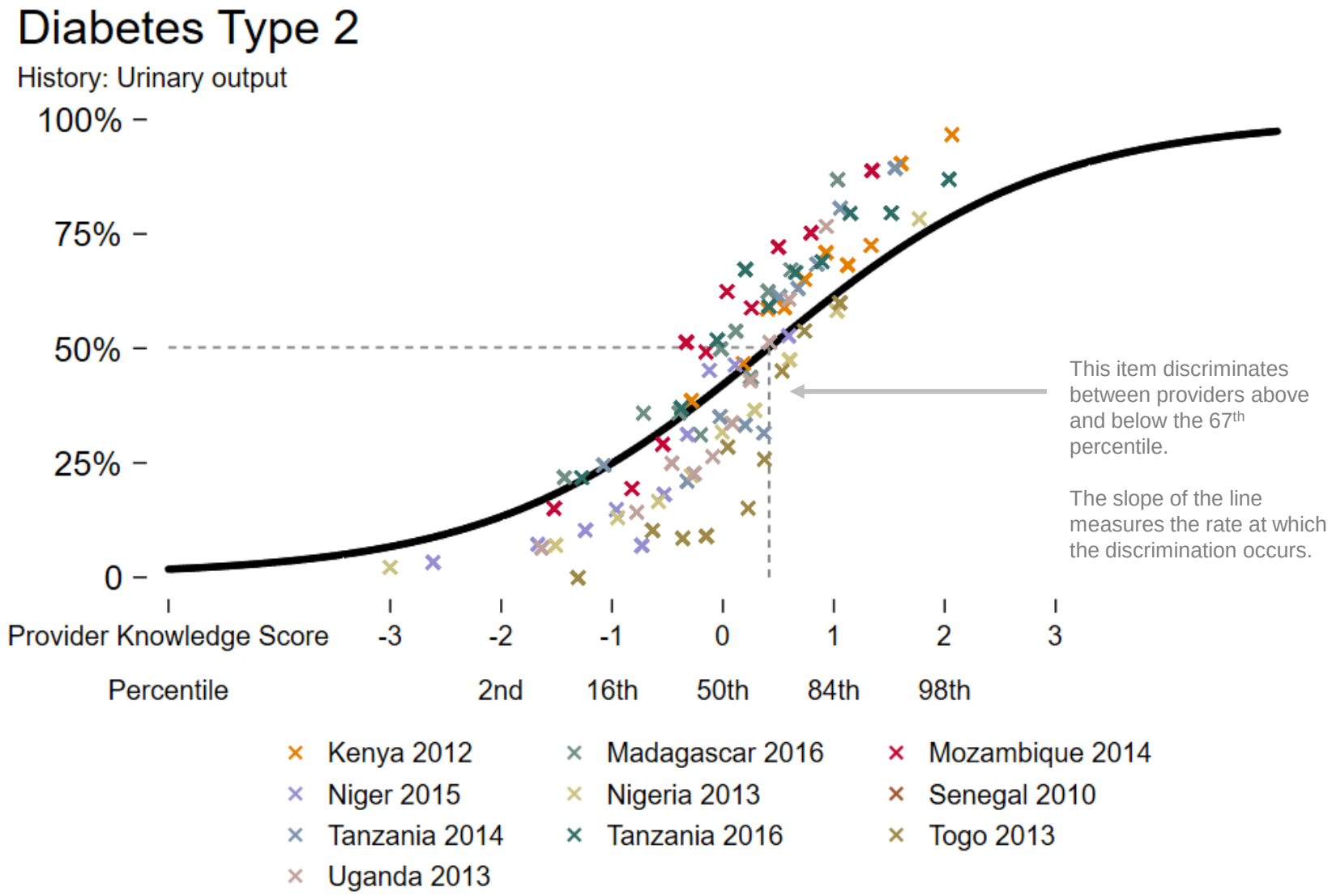
Generating Knowledge Scores

Item response theory fits a predicted relationship for each survey item between the knowledge score and the likelihood of completing the item correctly.

A given provider's knowledge score is predicted based on the parameters established for all questions and the provider's responses to those questions.

Using IRT, providers across slightly different surveys (completed in different countries) can be compared.

The predicted response curve and actual decile performance rates for a single item are illustrated here.



Diagnostic Knowledge Assessment

SDI – Cross Country Comparison

Diagnostic Knowledge Assessment

Summary of Performance Across Vignettes

For each vignette, enumerators are only able to check off the questions and exams already listed in the survey instrument. The number and wording of questions and exams varied slightly between the instruments used in different countries.

As a result, the “fraction of questions” and “fraction of exams”, rather than the raw number of questions and exams, are used in subsequent analysis, although the raw numbers are provide here.

		Kenya 2012	Madagascar 2016	Mozambique 2014	Niger 2015	Nigeria 2013	Senegal 2010	Tanzania 2014	Tanzania 2016	Togo 2013	Uganda 2013
Diarrhea + Dehydration	Did Vignette	625	640	725	519	5,098	149	570	543	302	737
	Mean Questions	8.0	6.7	6.9	4.8	6.2	3.9	6.8	8.0	5.6	5.8
	Mean Exams	5.2	3.1	2.9	2.1	2.8	1.8	3.4	4.3	3.4	3.1
Child Pneumonia	Did Vignette	625	639	725	519	5,087	149	570	543	302	737
	Mean Questions	6.8	5.0	5.5	3.6	5.1	2.6	6.4	7.1	4.7	4.5
	Mean Exams	4.2	3.1	2.4	2.1	1.9	1.7	3.2	3.8	2.7	2.2
Diabetes (Type II)	Did Vignette	623	638	724	519	4,950	-	570	543	303	693
	Mean Questions	5.9	4.1	4.7	3.1	4.3	-	6.4	8.1	4.4	3.0
	Mean Exams	3.8	1.9	1.6	1.2	2.4	-	1.9	2.1	2.8	1.3
Tuberculosis	Did Vignette	625	638	725	519	5,017	149	570	543	303	733
	Mean Questions	9.1	5.8	6.7	3.1	5.5	3.4	8.0	9.0	3.8	5.9
	Mean Exams	3.6	1.6	1.4	1.1	2.1	1.2	2.1	2.3	2.6	1.7
Malaria + Anemia	Did Vignette	625	637	725	519	5,069	150	570	543	303	736
	Mean Questions	6.0	4.5	5.3	3.5	4.5	3.5	7.0	7.5	4.7	4.7
	Mean Exams	5.1	2.1	2.4	1.8	3.0	1.7	3.3	3.8	3.4	3.2
Post-Partum Hemorrhage	Did Vignette	625	634	723	601	4,967	-	570	543	521	711
	Mean Questions	3.3	2.6	2.3	1.8	2.1	-	4.4	5.1	2.2	1.8
	Mean Exams	4.9	3.2	2.6	2.2	2.6	-	3.8	4.3	3.9	2.8
Neonatal Asphyxia	Did Vignette	622	596	719	601	4,799	-	570	543	519	643
	Mean Questions	-	-	-	-	-	-	-	-	-	-
	Mean Exams	3.9	1.2	1.4	0.4	1.0	-	1.8	1.7	1.8	2.1
Pelvic Inflammatory Disease	Did Vignette	-	-	-	-	-	139	-	-	-	-
	Mean Questions	-	-	-	-	-	2.1	-	-	-	-
	Mean Exams	-	-	-	-	-	1.2	-	-	-	-
Pregnancy	Did Vignette	-	-	-	601	-	-	-	-	-	-
	Mean Questions	-	-	-	3.3	-	-	-	-	-	-
	Mean Exams	-	-	-	2.0	-	-	-	-	-	-
Pre-Eclampsia	Did Vignette	-	-	-	601	-	-	-	-	-	-
	Mean Questions	-	-	-	0.8	-	-	-	-	-	-
	Mean Exams	-	-	-	1.4	-	-	-	-	-	-

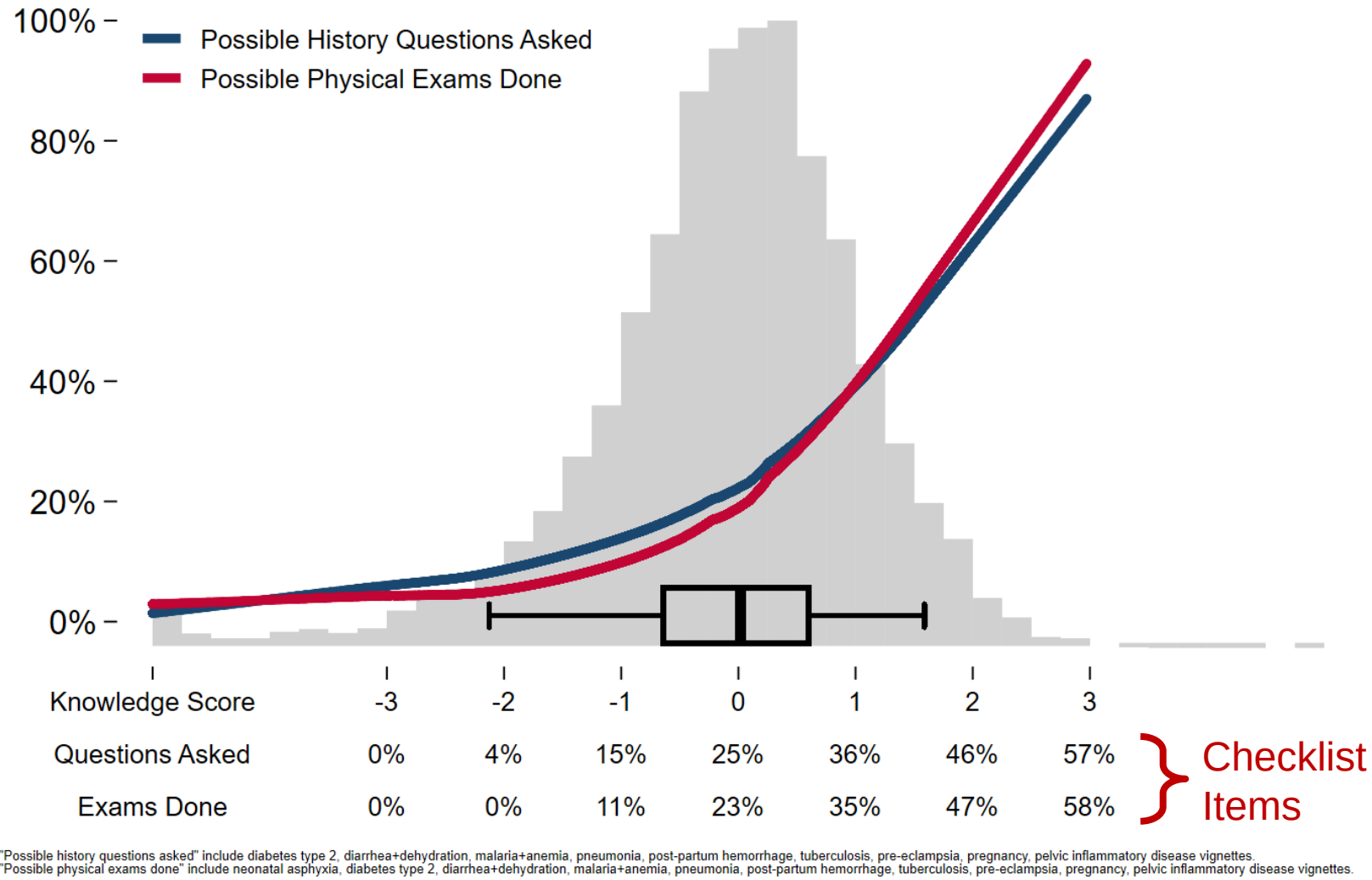
Diagnostic Knowledge Assessment

Knowledge Score Distribution and Measures of Effort

The distribution of knowledge scores obtained from IRT analysis is approximately normal.

The knowledge score is a good predictor of the fraction of history questions asked and physical exams done by providers.

The box plot shows the 5th, 25th, 50th, 75th, and 95th percentiles for reference.



"Possible history questions asked" include diabetes type 2, diarrhea+dehydration, malaria+anemia, pneumonia, post-partum hemorrhage, tuberculosis, pre-eclampsia, pregnancy, pelvic inflammatory disease vignettes.
"Possible physical exams done" include neonatal asphyxia, diabetes type 2, diarrhea+dehydration, malaria+anemia, pneumonia, post-partum hemorrhage, tuberculosis, pre-eclampsia, pregnancy, pelvic inflammatory disease vignettes.

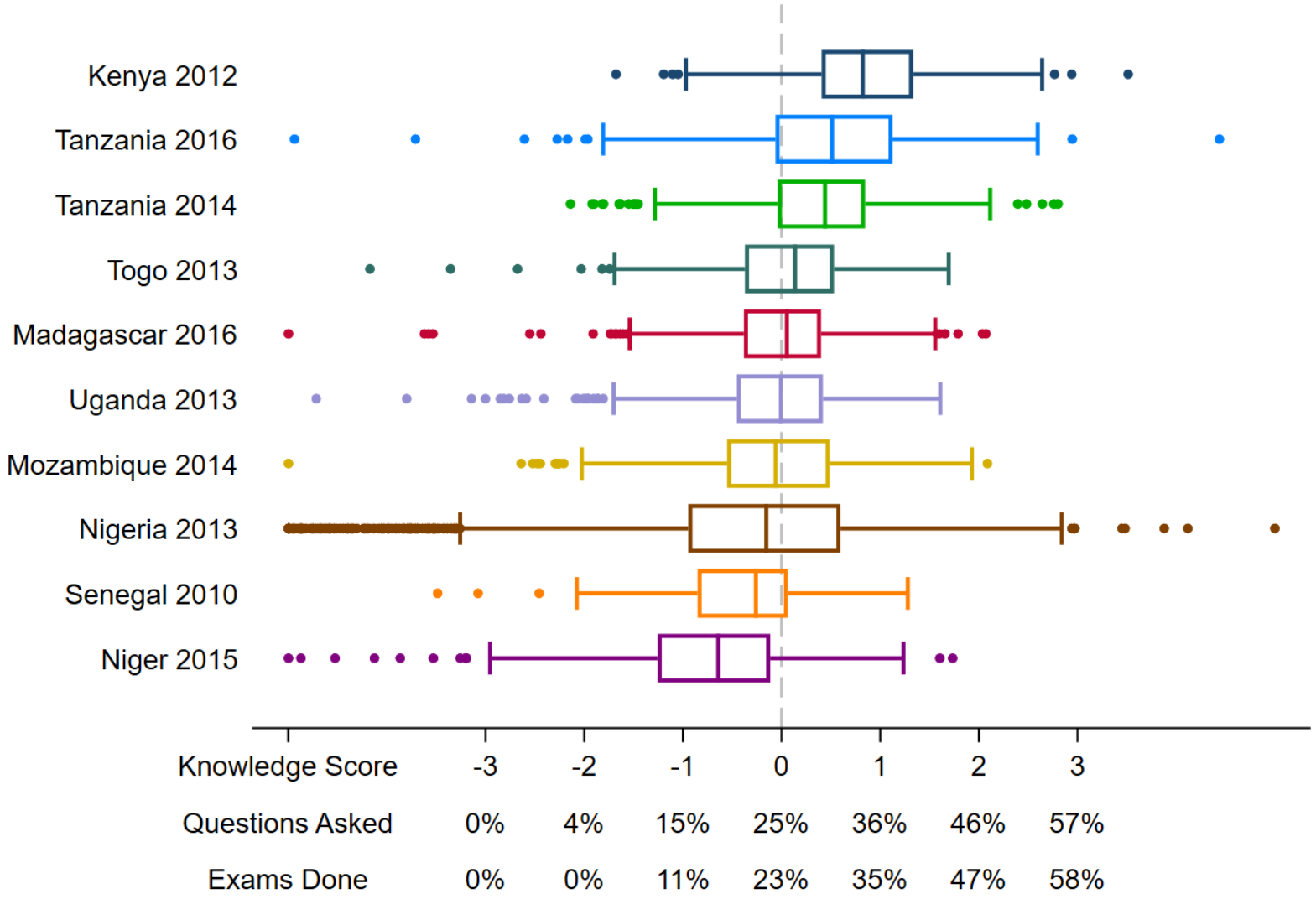
Diagnostic Knowledge Assessment

Knowledge Score Distribution

Providers at the 32nd percentile of the overall distribution only ask and do 15% of the history questions and physical exams. However, those at the 95th percentile ask and do half of the possible history questions and physical exams.

Most providers at the low end of the distribution are from Nigeria. There is also little variation among providers in Tanzania between 2014 and 2016.

Providers in Kenya have the highest ability scores, on average, compared to the other countries. For example, the average Kenyan provider is one standard deviation more knowledgeable than the average provider in Niger (equivalent to half a medical degree's worth of knowledge) .



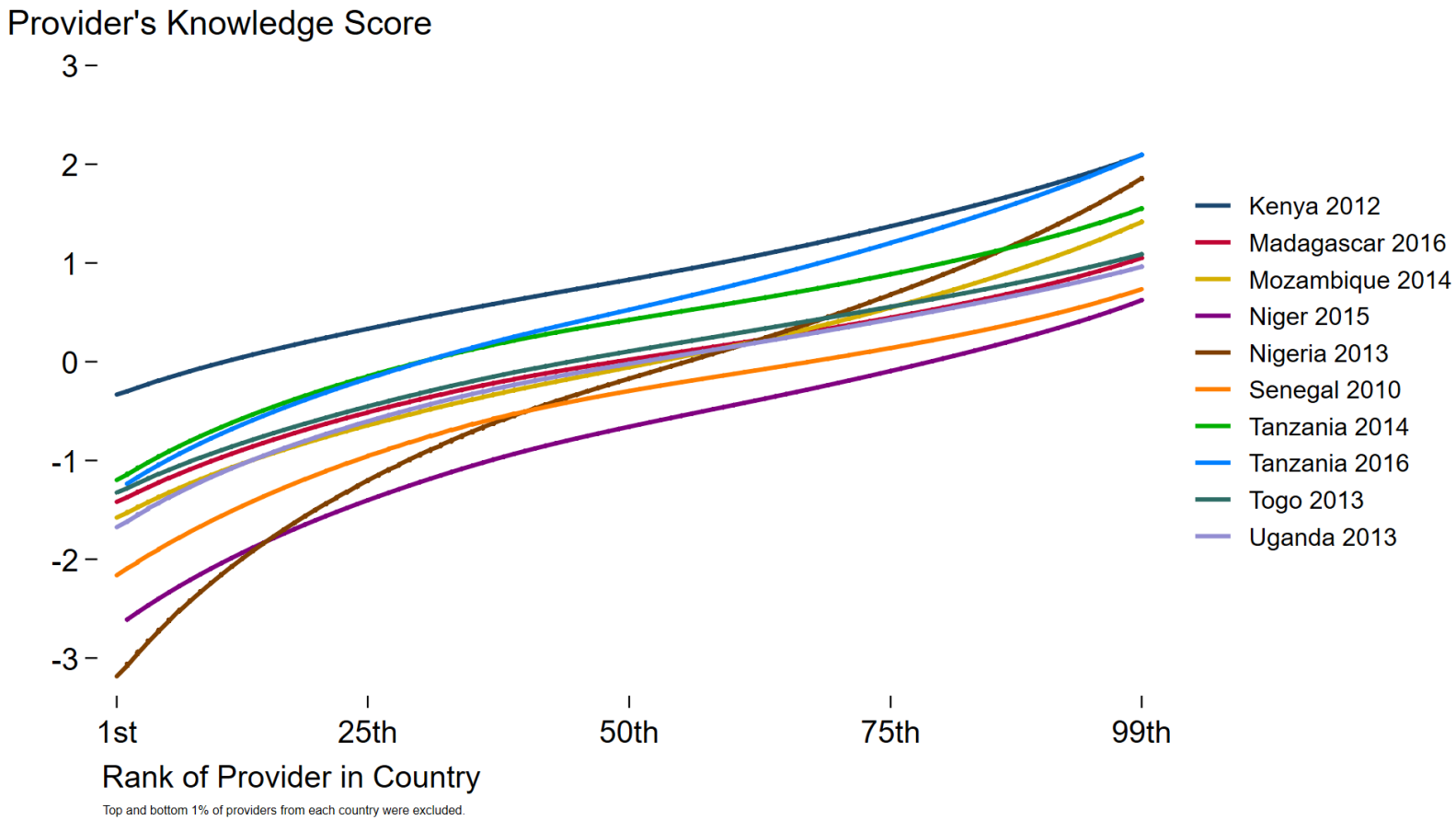
Diagnostic Knowledge Assessment

Translating Between Knowledge Scores and Rank

Translating the knowledge score to the provider's rank within his or her country of residence offers a simpler means of comparing between and within countries.

The best providers in Niger and Senegal are as knowledgeable as the 25th percentile provider in Kenya.

The worst providers in Nigeria make up the worst providers overall, but the best providers are nearly equivalent to those in Kenya and Tanzania.

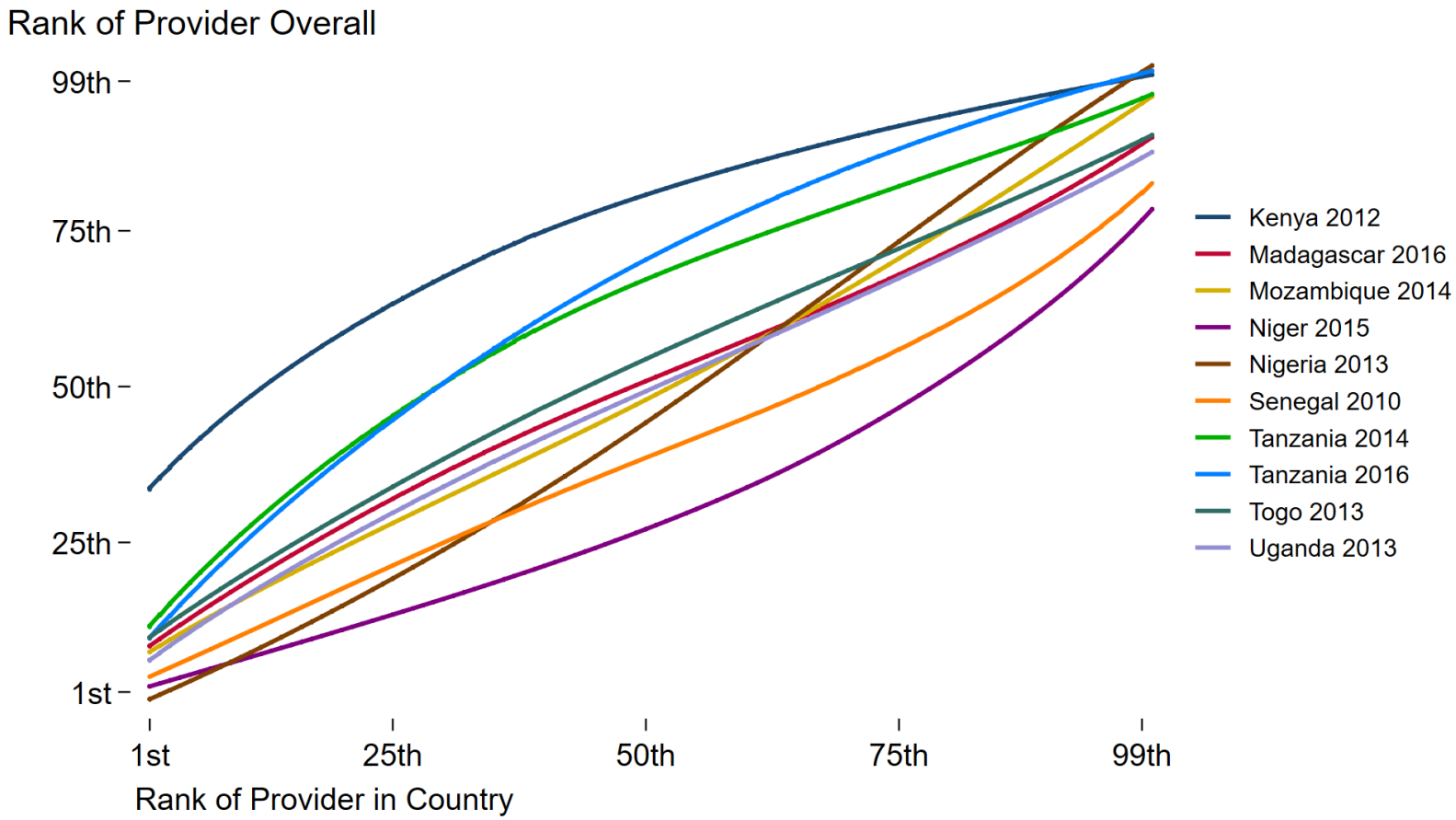


Diagnostic Knowledge Assessment

Providers' Percentile Ranking

The median provider in the global distribution is as knowledgeable as providers in the:

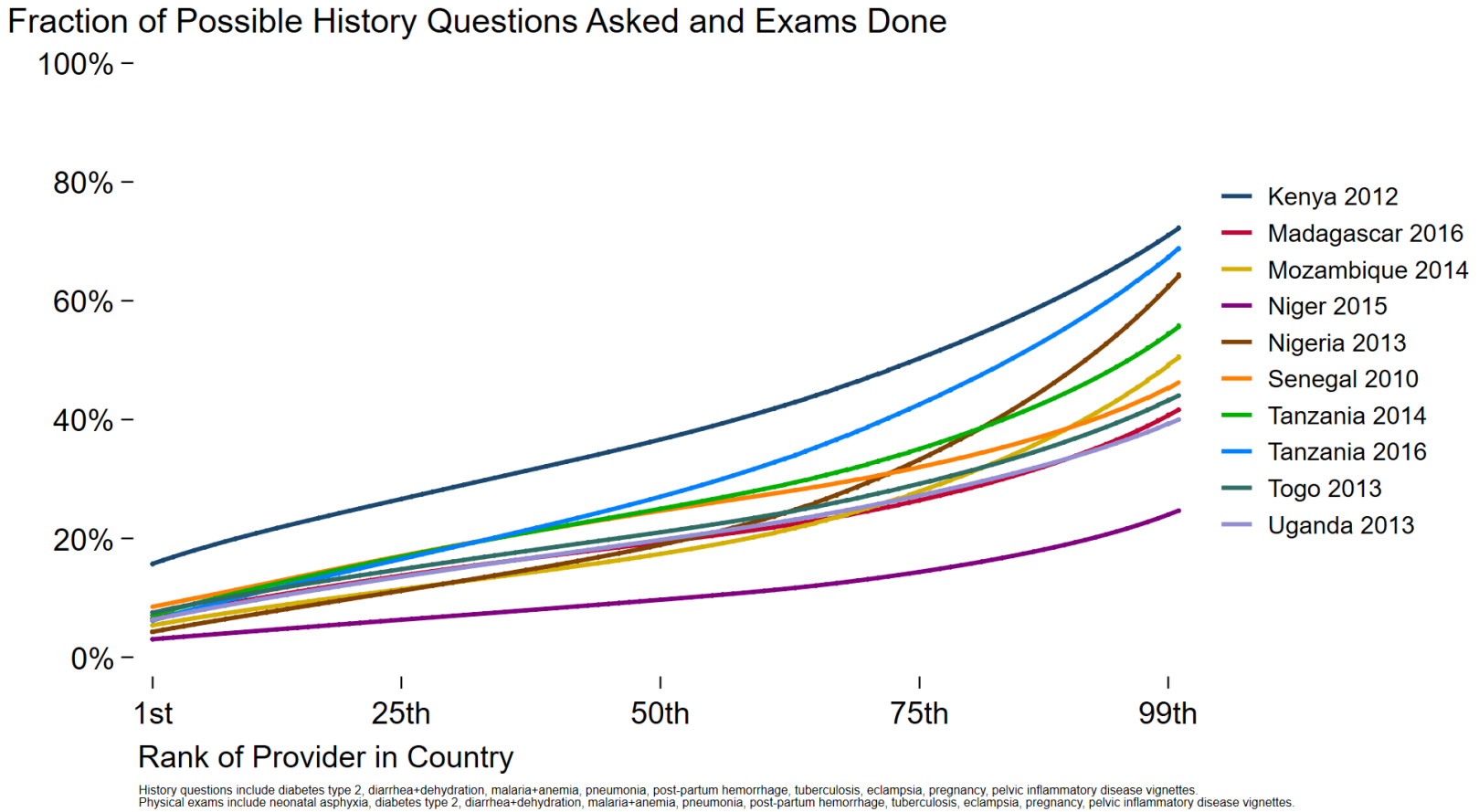
- 80th percentile in Niger
- 70th percentile in Senegal
- 45th percentile in Madagascar
- 30th percentile in Tanzania
- 10th percentile in Kenya



Diagnostic Knowledge Assessment

History Taking and Physical Examination by Providers' Percentile Ranking

There is little difference in history taking and physical exam behavior among providers in the bottom 50% of their countries distribution. However, at the top end, providers in Kenya, Tanzania, and Nigeria complete more diagnostic items than those in the remaining countries.



Diagnostic – Treatment Linkages

SDI – Cross Country Comparison

Diagnostic – Treatment Linkages

Summary of Performance Across Vignettes

Two vignettes included common comorbidities: diarrhea with severe dehydration and malaria with anemia. In some versions of the survey, the response form lists the two components separately and it would be possible to leniently accept only the diarrhea diagnosis as correct during analysis; in other versions the combined diagnosis is the only available option and therefore leniency was at the enumerator's discretion. Accordingly, among the four countries where the diarrhea comorbidity was listed as a single checklist item, 34% of providers were reported to have correctly diagnosed the condition, whereas only 15% of providers were judged to have correctly diagnosed the condition when the comorbidities were listed separately and both were required.

In the case of pneumonia, the antibiotics not typically used to treat the condition were considered "incorrect". In the case of tuberculosis and diarrhea, any antibiotic went against the recommended treatment guidelines.

		Kenya 2012	Madagascar 2016	Mozambique 2014	Niger 2015	Nigeria 2013	Senegal 2010	Tanzania 2014	Tanzania 2016	Togo 2013	Uganda 2013
Diarrhea + Dehydration	Correct Diagnosis	516 (83%)	104 (16%)	58 (8%)	15 (3%)	1,382 (27%)	38 (25%)	109 (19%)	152 (28%)	69 (23%)	293 (40%)
	Correct Treatment	384 (61%)	48 (7%)	296 (41%)	121 (23%)	777 (15%)	33 (22%)	209 (37%)	283 (52%)	133 (44%)	296 (40%)
	Inapprop. Antibiotics	321 (51%)	188 (29%)	316 (44%)	97 (19%)	2,377 (47%)	33 (22%)	236 (41%)	160 (29%)	127 (42%)	189 (26%)
	Number of Tests	0.8	0.1	0.3	0.2	0.4	0.1	0.8	0.8	0.5	0.3
Child Pneumonia	Correct Diagnosis	521 (83%)	234 (37%)	489 (67%)	241 (46%)	2,209 (43%)	89 (60%)	441 (77%)	436 (80%)	176 (58%)	364 (49%)
	Correct Treatment	543 (87%)	398 (62%)	460 (63%)	375 (72%)	2,846 (56%)	96 (64%)	404 (71%)	416 (77%)	249 (82%)	448 (61%)
	Inapprop. Antibiotics	-	88 (14%)	112 (15%)	-	-	-	140 (25%)	134 (25%)	-	-
	Number of Tests	0.8	0.5	1.2	0.5	0.6	0.1	1.1	1.2	1.2	0.4
Diabetes (Type II)	Correct Diagnosis	519 (83%)	92 (14%)	298 (41%)	68 (13%)	1,739 (35%)	-	227 (40%)	268 (50%)	117 (39%)	360 (52%)
	Correct Treatment	476 (76%)	379 (59%)	283 (39%)	220 (42%)	1,354 (27%)	-	363 (64%)	385 (71%)	138 (46%)	306 (44%)
	Number of Tests	1.7	0.9	0.9	0.8	1.3	-	1.6	1.7	1.1	0.9
Tuberculosis	Correct Diagnosis	607 (97%)	561 (88%)	643 (89%)	392 (76%)	3,001 (60%)	111 (74%)	509 (89%)	498 (92%)	254 (84%)	608 (83%)
	Correct Treatment	409 (65%)	269 (42%)	423 (58%)	148 (29%)	1,783 (36%)	126 (85%)	373 (65%)	367 (68%)	161 (53%)	283 (39%)
	Inapprop. Antibiotics	276 (44%)	52 (8%)	31 (4%)	48 (9%)	903 (18%)	23 (15%)	65 (11%)	84 (15%)	60 (20%)	137 (19%)
	Number of Tests	2.2	1.0	2.1	0.9	1.4	1.0	1.7	1.9	1.6	1.1
Malaria + Anemia	Correct Diagnosis	220 (35%)	1 (0%)	118 (16%)	27 (5%)	737 (14%)	1 (1%)	148 (26%)	136 (25%)	100 (19%)	234 (32%)
	Correct Treatment	494 (79%)	8 (1%)	139 (19%)	18 (3%)	3,551 (70%)	2 (1%)	152 (27%)	129 (24%)	107 (35%)	474 (64%)
	Number of Tests	1.4	1.0	2.0	1.2	1.3	1.1	1.7	1.8	1.7	1.5
Post-Partum Hemorrhage	Correct Diagnosis	584 (93%)	327 (52%)	564 (78%)	354 (59%)	2,651 (53%)	-	482 (85%)	496 (91%)	335 (64%)	486 (68%)
	Correct Treatment	348 (56%)	39 (6%)	150 (21%)	132 (22%)	706 (14%)		280 (49%)	328 (60%)	159 (31%)	297 (42%)
	Number of Tests	1.0	0.2	0.4	0.3	0.5	-	1.0	1.1	0.3	0.3
Neonatal Asphyxia	Correct Diagnosis	445 (72%)	238 (40%)	441 (61%)	70 (12%)	1,623 (34%)	-	371 (65%)	414 (76%)	26 (5%)	369 (57%)
	Correct Treatment	266 (43%)	202 (34%)	317 (44%)	67 (11%)	937 (20%)		283 (50%)	302 (56%)	112 (22%)	100 (16%)

Diagnostic – Treatment Linkages

Summary of Performance Across Vignettes

The diagnostic and treatment accuracy for conditions which were only included as vignettes once across the country surveys are summarized here.

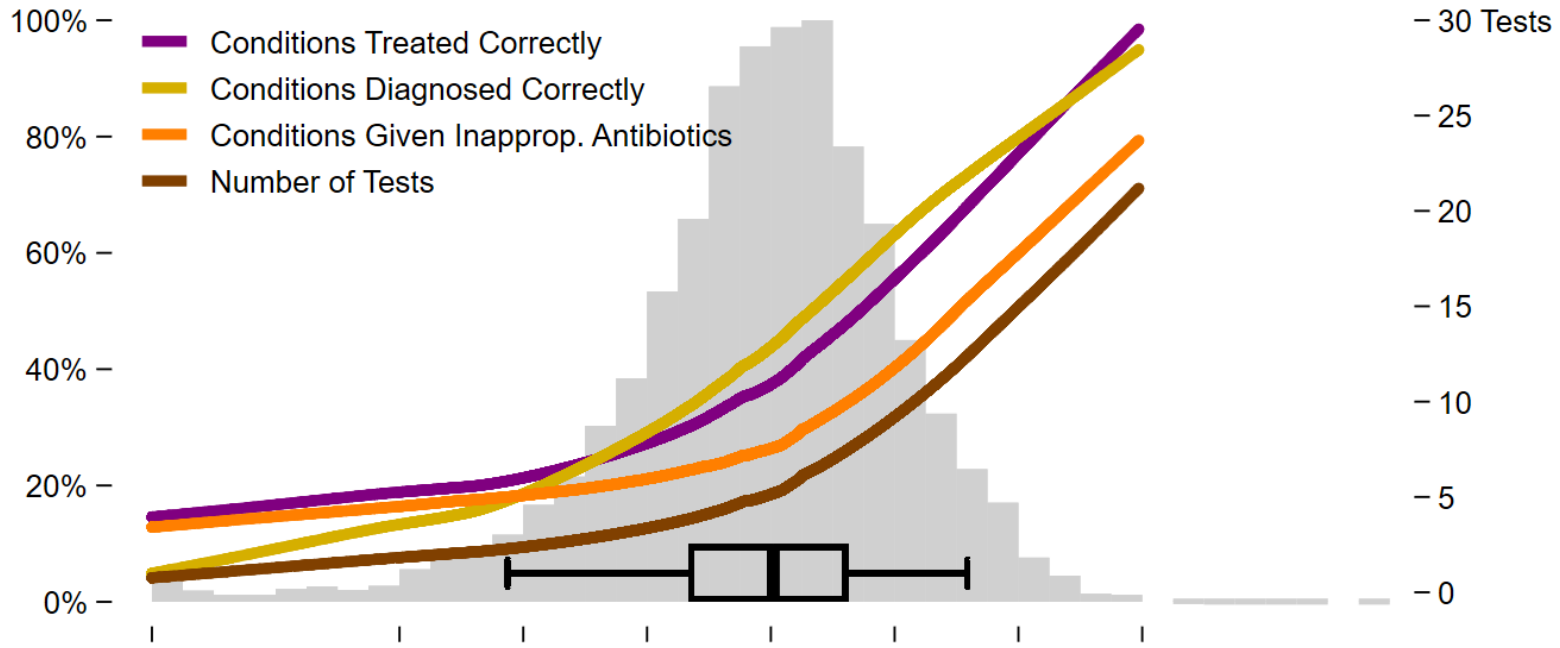
		Kenya 2012	Madagascar 2016	Mozambique 2014	Niger 2015	Nigeria 2013	Senegal 2010	Tanzania 2014	Tanzania 2016	Togo 2013	Uganda 2013
Pelvic Inflammatory Diseases	Correct Diagnosis	-	-	-	-	-	9 (6%)	-	-	-	-
	Correct Treatment	-	-	-	-	-	62 (45%)	-	-	-	-
	Inapprop. Antibiotics	-	-	-	-	-	7 (5%)	-	-	-	-
	Number of Tests	-	-	-	-	-	0.1	-	-	-	-
Pregnancy	Correct Diagnosis	-	-	-	5 (1%)	-	-	-	-	-	-
	Number of Tests	-	-	-	2.5	-	-	-	-	-	-
Pre-Eclampsia	Correct Diagnosis	-	-	-	242 (40%)	-	-	-	-	-	-
	Number of Tests	-	-	-	0.5	-	-	-	-	-	-

Diagnostic – Treatment Linkages

IRT Score Distribution and Measures of Quality

The IRT score is a good predictor of diagnostic and treatment accuracy. It is also a good predictor of the number of tests ordered by a provider.

The box plot shows the 5th, 25th, 50th, 75th, and 95th percentiles for reference.



Knowledge Score	-3	-2	-1	0	1	2	3
Correct Diagnoses	3%	17%	31%	46%	60%	74%	88%
Correct Treatment	6%	17%	29%	40%	52%	63%	75%
Number of Tests	0.0	1.1	3.5	6.0	8.4	10.8	13.2
Inapprop. Antibiotics	6%	14%	22%	29%	37%	45%	53%

Treatment Outcomes

"Correct treatment" include neonatal asphyxia, diabetes type 2, diarrhea+dehydration, malaria+anemia, pneumonia, post-partum hemorrhage, tuberculosis, pelvic inflammatory disease vignettes.
"Correct diagnoses" include neonatal asphyxia, diabetes type 2, diarrhea+dehydration, malaria+anemia, pneumonia, post-partum hemorrhage, tuberculosis, pre-eclampsia, pregnancy, pelvic inflammatory disease vignettes.
"Number of tests" include diabetes type 2, diarrhea+dehydration, malaria+anemia, pneumonia, post-partum hemorrhage, tuberculosis, pre-eclampsia, pregnancy, pelvic inflammatory disease vignettes.
"Prescribed inappropriate antibiotics" include diarrhea+dehydration, pneumonia, tuberculosis, pelvic inflammatory disease vignettes.

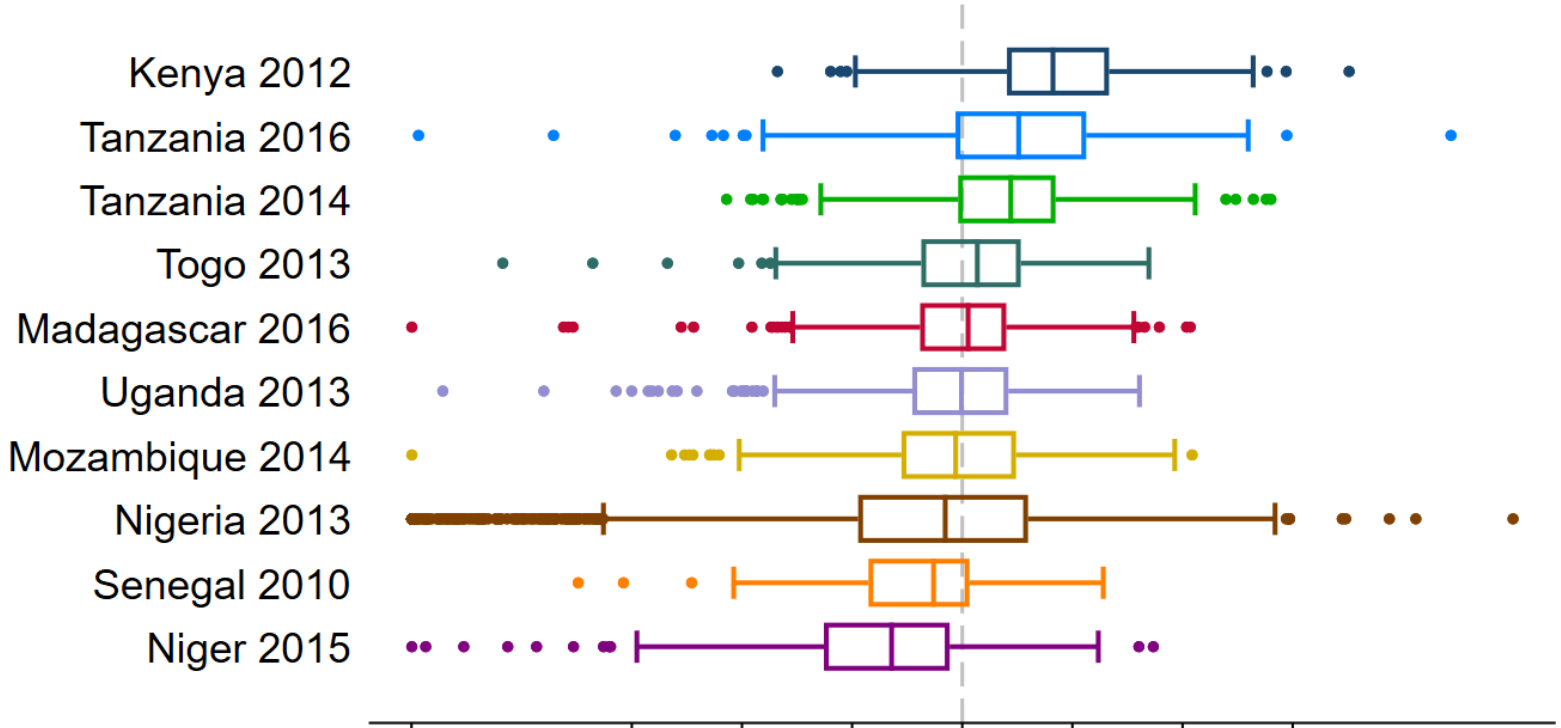
Diagnostic – Treatment Linkages

Knowledge Score Distribution

An increase in one standard deviation of the knowledge score (the difference between the worst and best performing countries, on average) leads to:

- 14% more conditions diagnosed correctly
- 12% more conditions treated correctly
- Nearly 3 more tests ordered
- 12% more of the conditions given inappropriate antibiotics.

On average across the countries, more knowledgeable providers do prescribe inappropriate antibiotics at a greater rate.



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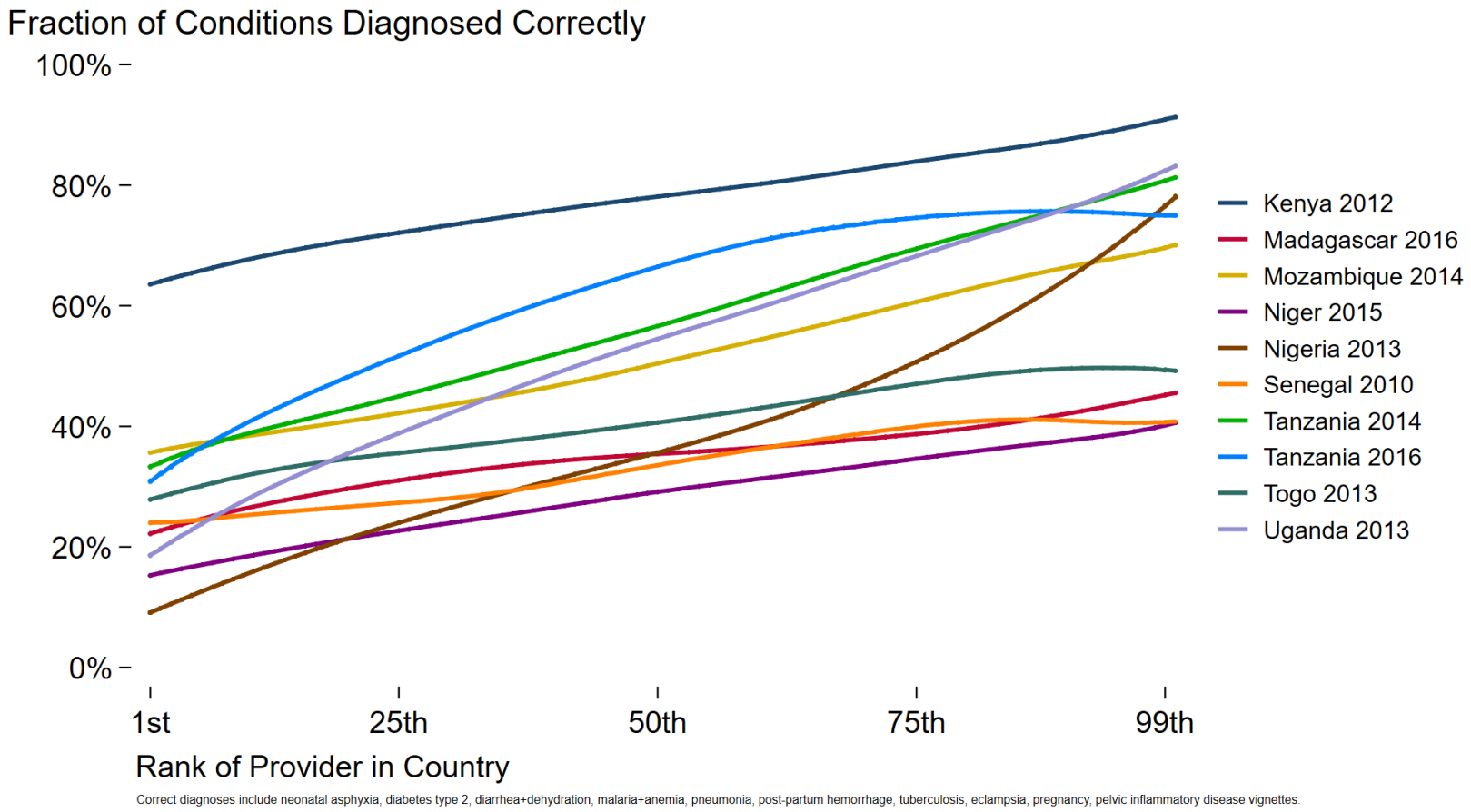
Diagnostic – Treatment Linkages

Accurate Diagnosis

In Kenya, all providers are able to accurately diagnose at least 60% of the conditions.

In the other countries, the worst providers range from being able to diagnose 10% of the conditions in Nigeria to 45% of the conditions in Mozambique.

The best providers range from being able to diagnose 30% of the conditions in Niger to 70% of the conditions in Uganda.

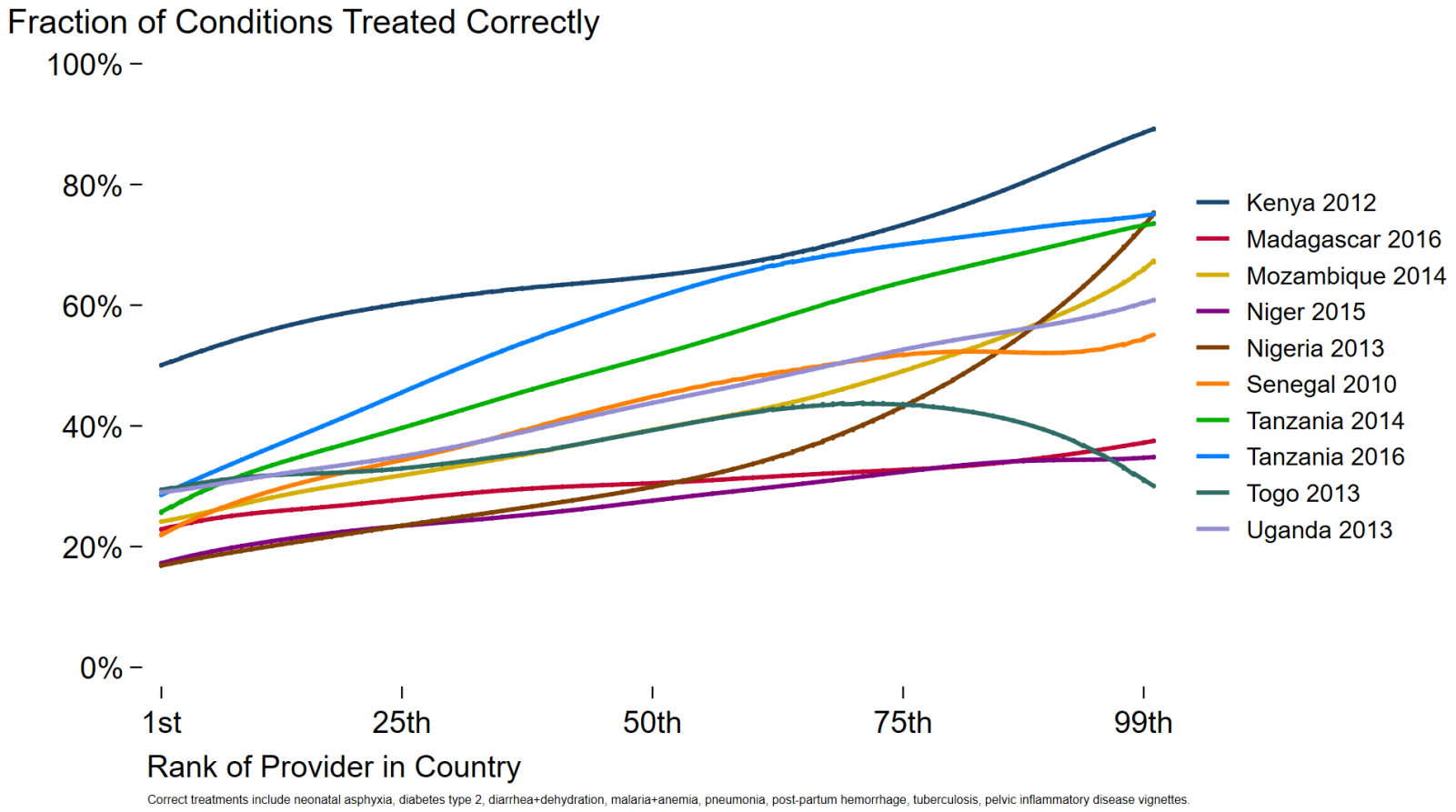


Diagnostic – Treatment Linkages

Accurate Treatment

About half of all providers in most countries are able to treat more than half of the conditions accurately, although they may not have been able to properly identify the disease in question.

The differences in treatment accuracy across countries are greatest among those providers who are the most knowledgeable in their respective countries.

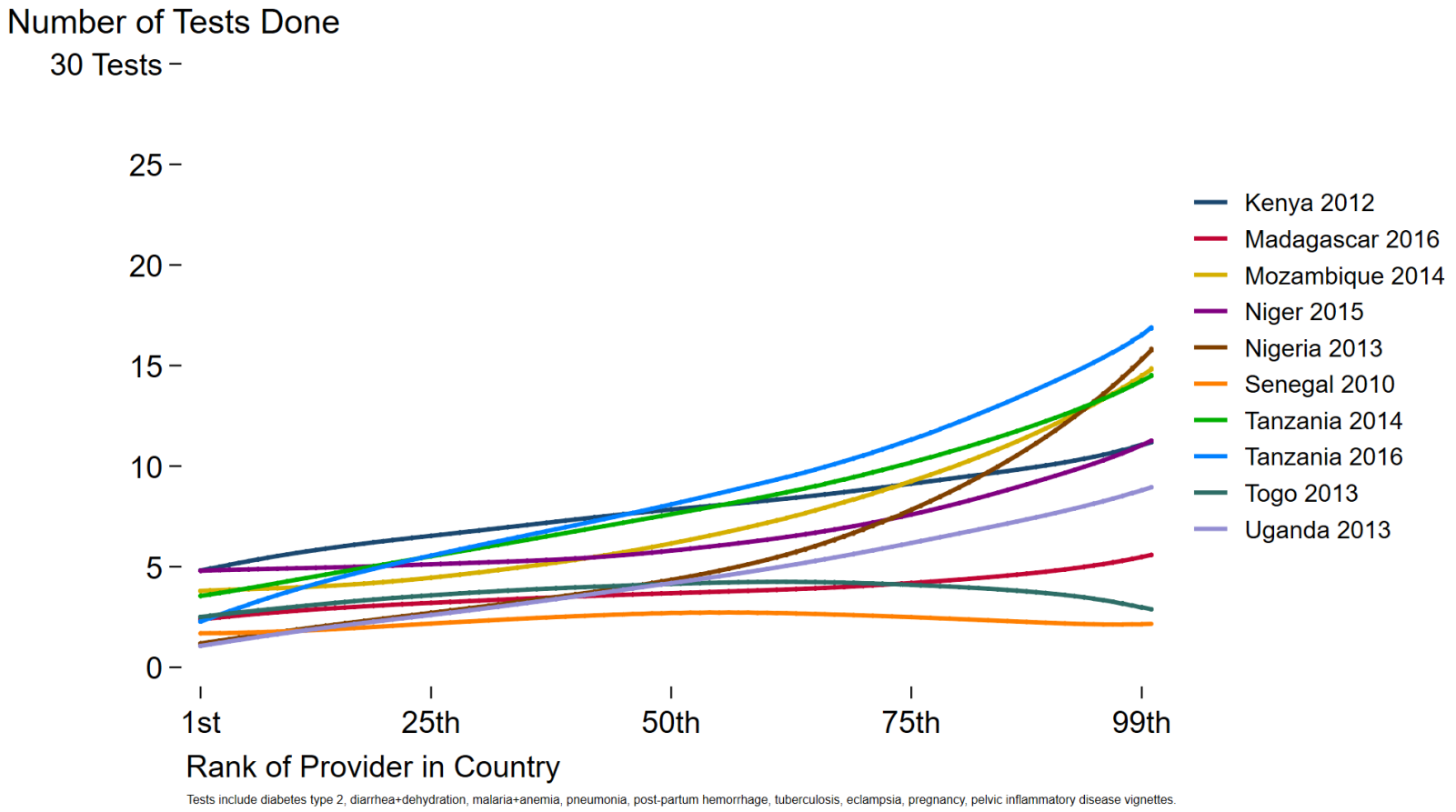


Diagnostic – Treatment Linkages

Ordering Tests

The largest differences in test ordering behavior among providers of different countries occurs among the best providers in each country.

In Togo, Madagascar, and Senegal, the best and worst providers order the same number of tests.



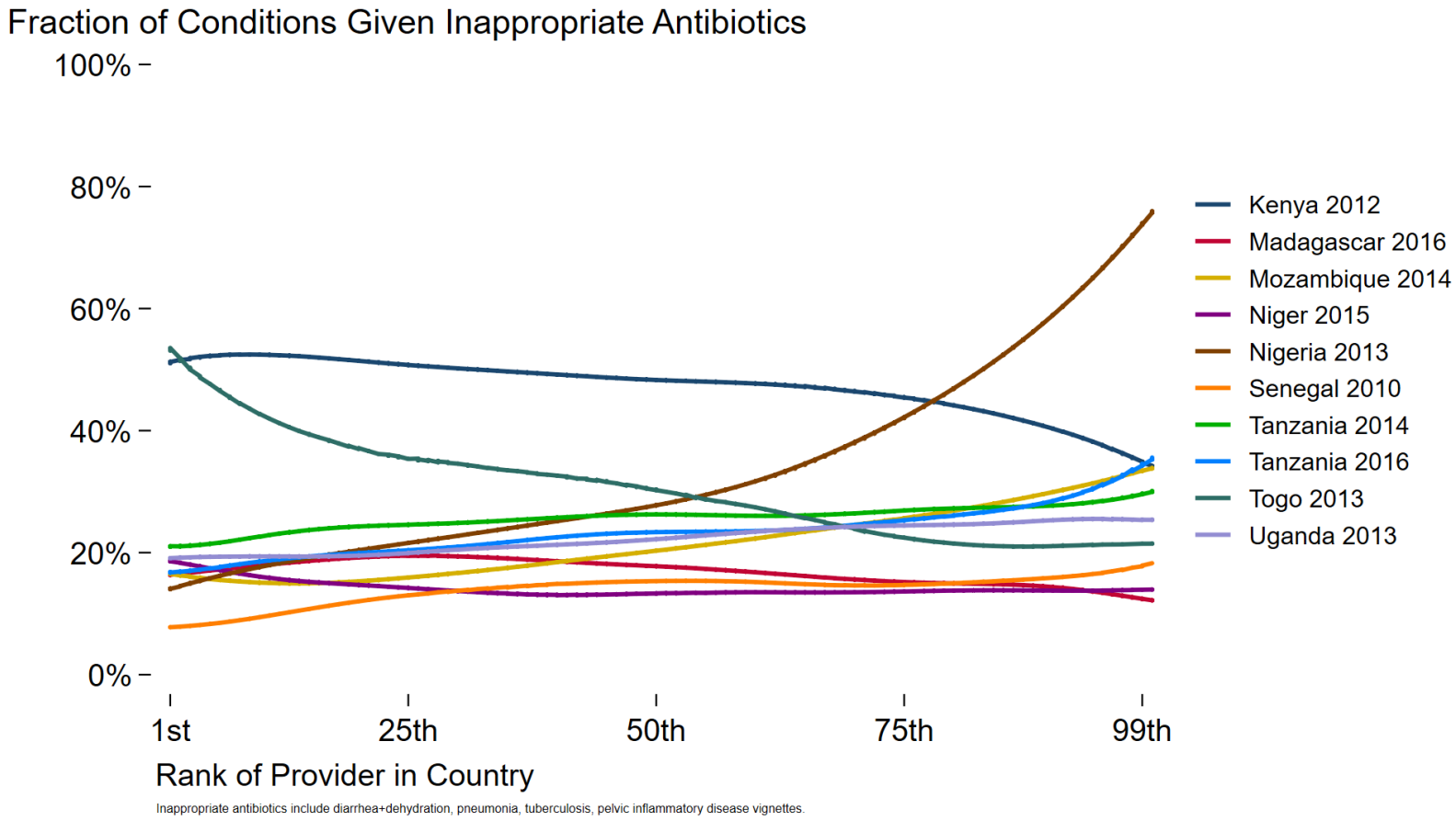
Diagnostic – Treatment Linkages

Prescribing Inappropriate Antibiotics

Inappropriate antibiotics behavior is dependent on country.

Providers in Kenya and Madagascar decrease inappropriate antibiotic usage as they become more knowledgeable whereas providers in Tanzania and Nigeria do the opposite, increasing inappropriate antibiotic usage as they become more knowledge.

In the remaining countries, antibiotic prescription behavior remains unchanged regardless of whether the provider is the best or worst in the country.



Demographic Variation in Diagnostics & Treatment

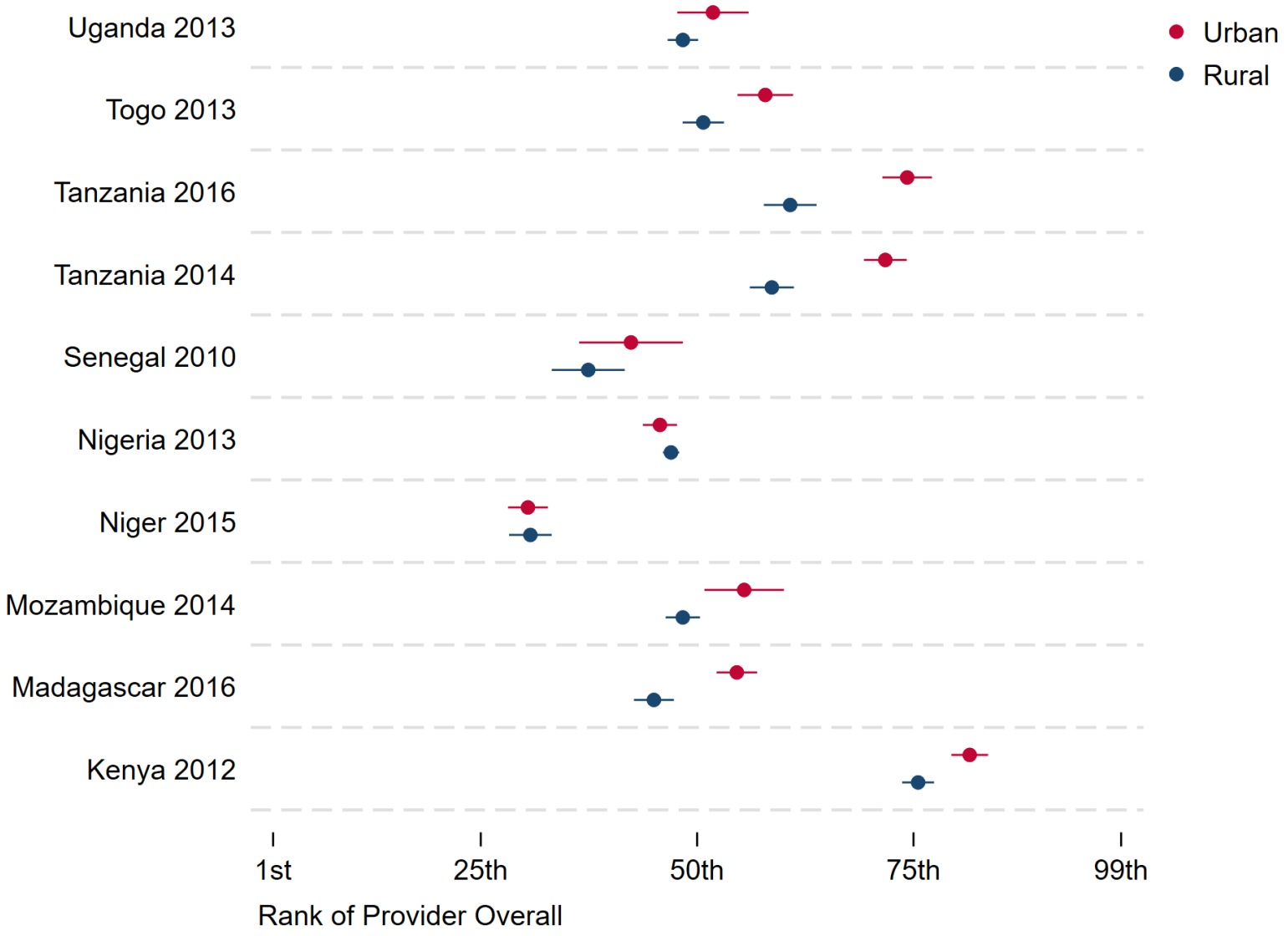
SDI – Cross Country Comparison

Demographic Variation

Rural vs. Urban Providers

Urban providers rank higher in the overall distribution compared to rural providers in all countries except Nigeria. In other words, urban providers are more knowledgeable, on average, than rural providers.

The largest difference between rural and urban providers occurs in Tanzania, where urban providers are near the 75th percentile while rural providers are near the 55th percentile of the global distribution.



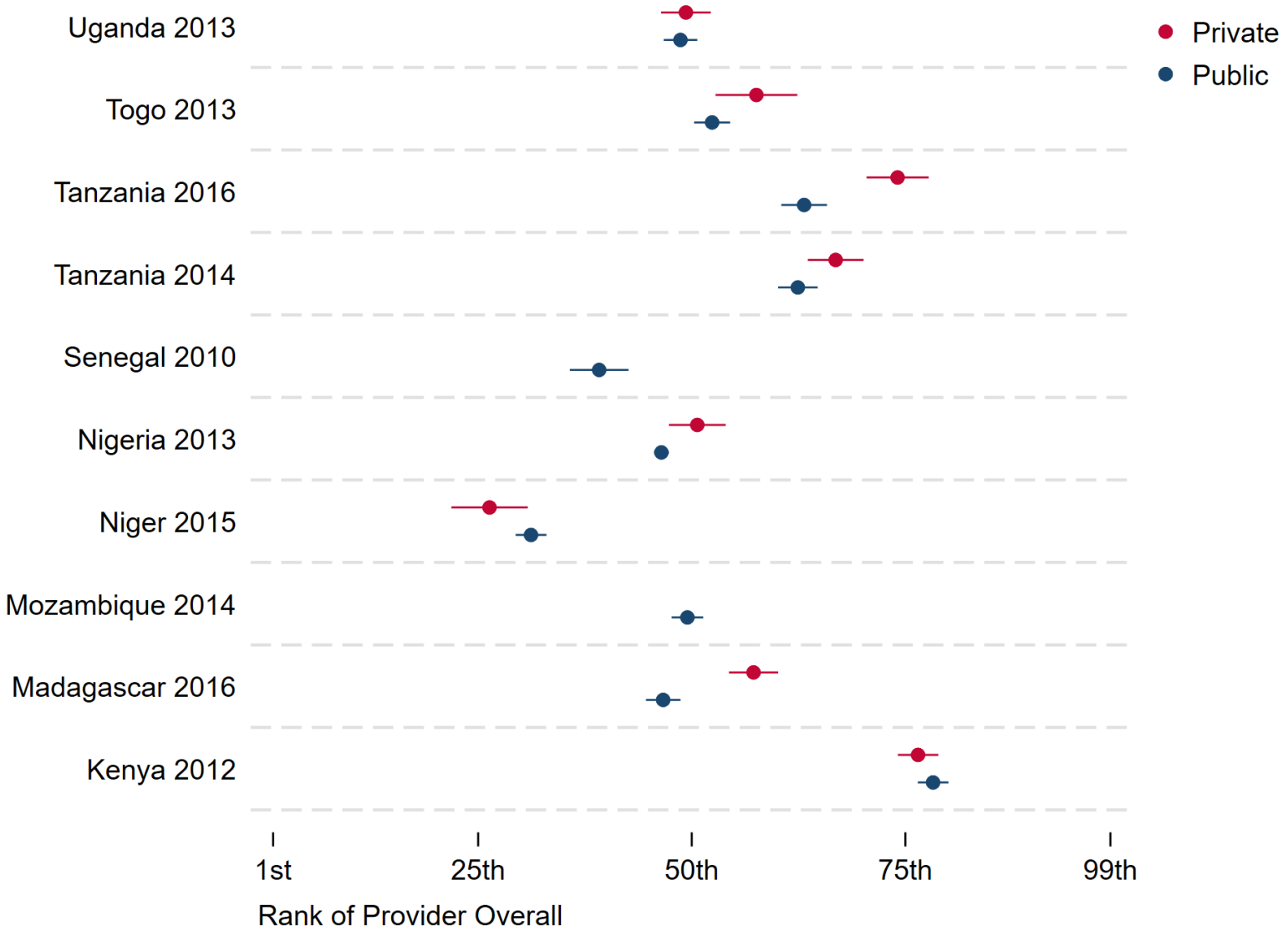
Demographic Variation

Public vs. Private Providers

Private providers are more knowledgeable than public providers in all countries except Uganda, Kenya, and Niger.

The largest difference between public and private providers occurs in Tanzania and Madagascar, where the private providers rank 10 points higher than public providers.

There were no private facilities surveyed in either Senegal or Mozambique.

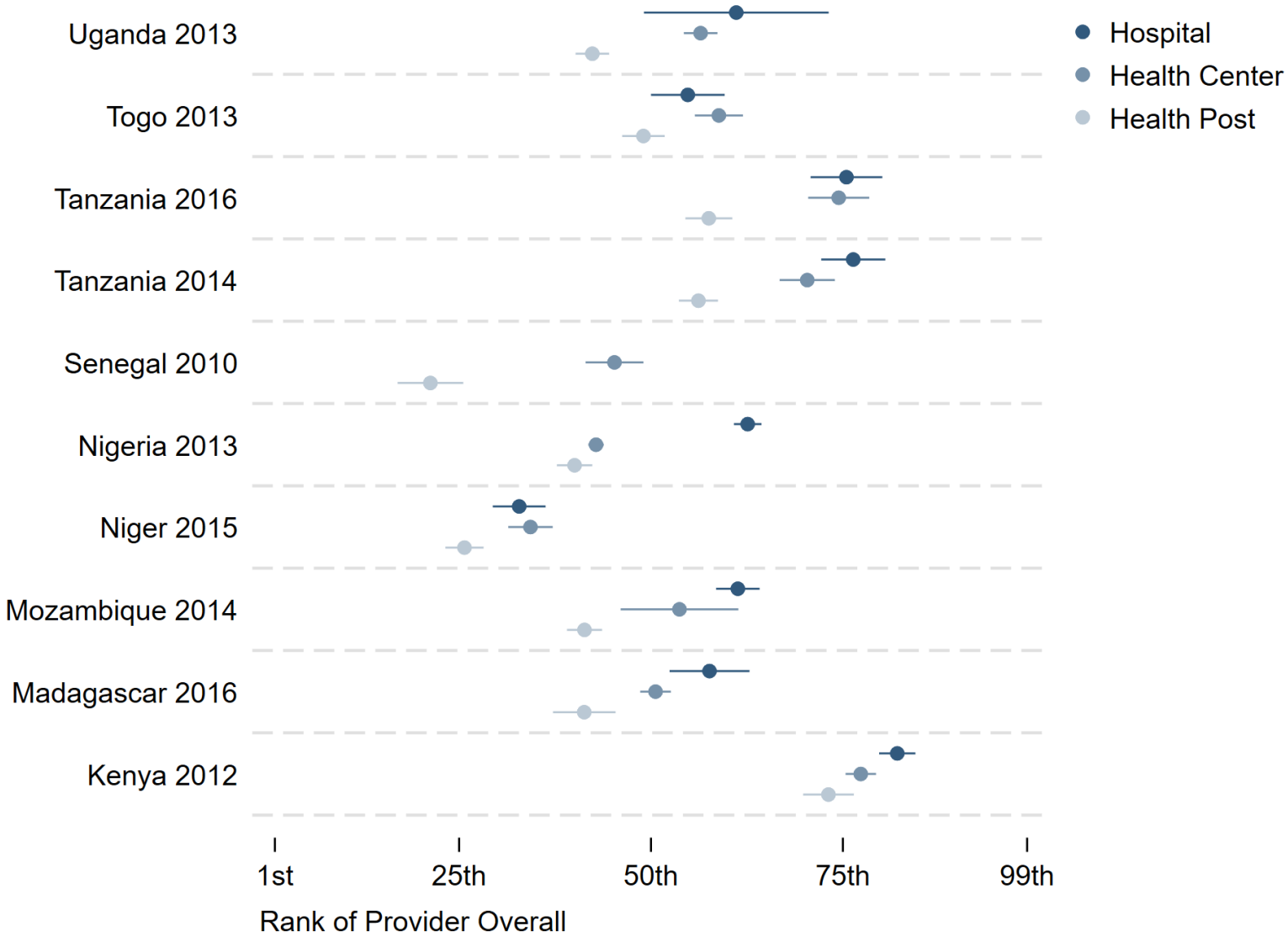


Demographic Variation

Comparing Providers at Different Facility Types

In general, providers who work at hospitals are more knowledgeable than those at health centers and health posts.

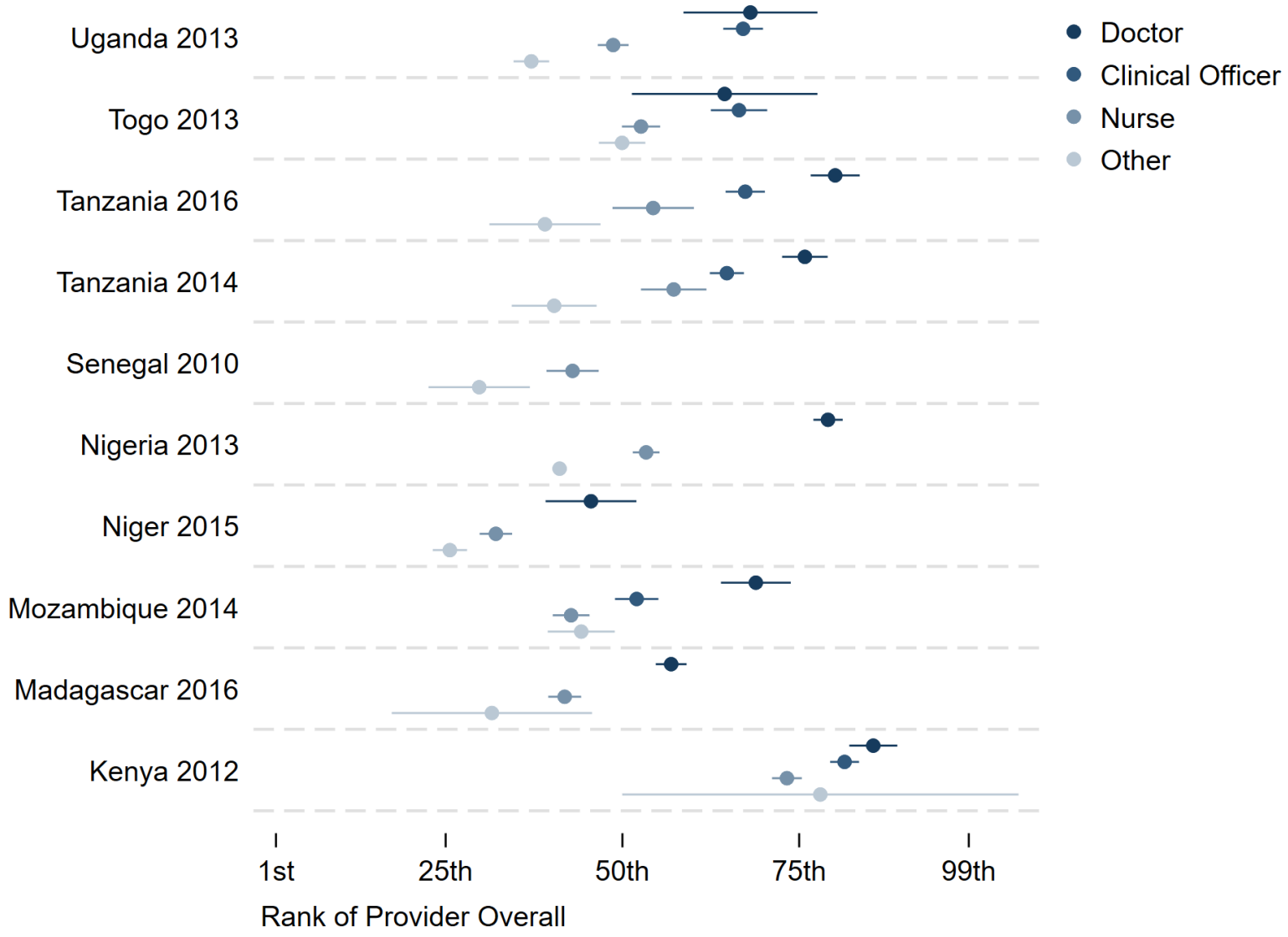
Providers at health posts in Kenya, typically nurses, are more knowledgeable than providers in hospitals in all other countries, on average.



Demographic Variation

Comparing Providers of Different Professions

In all countries except Uganda, medical officers are the most knowledgeable and have one standard deviation higher average IRT scores than the least knowledgeable provider (typically the para-professional).

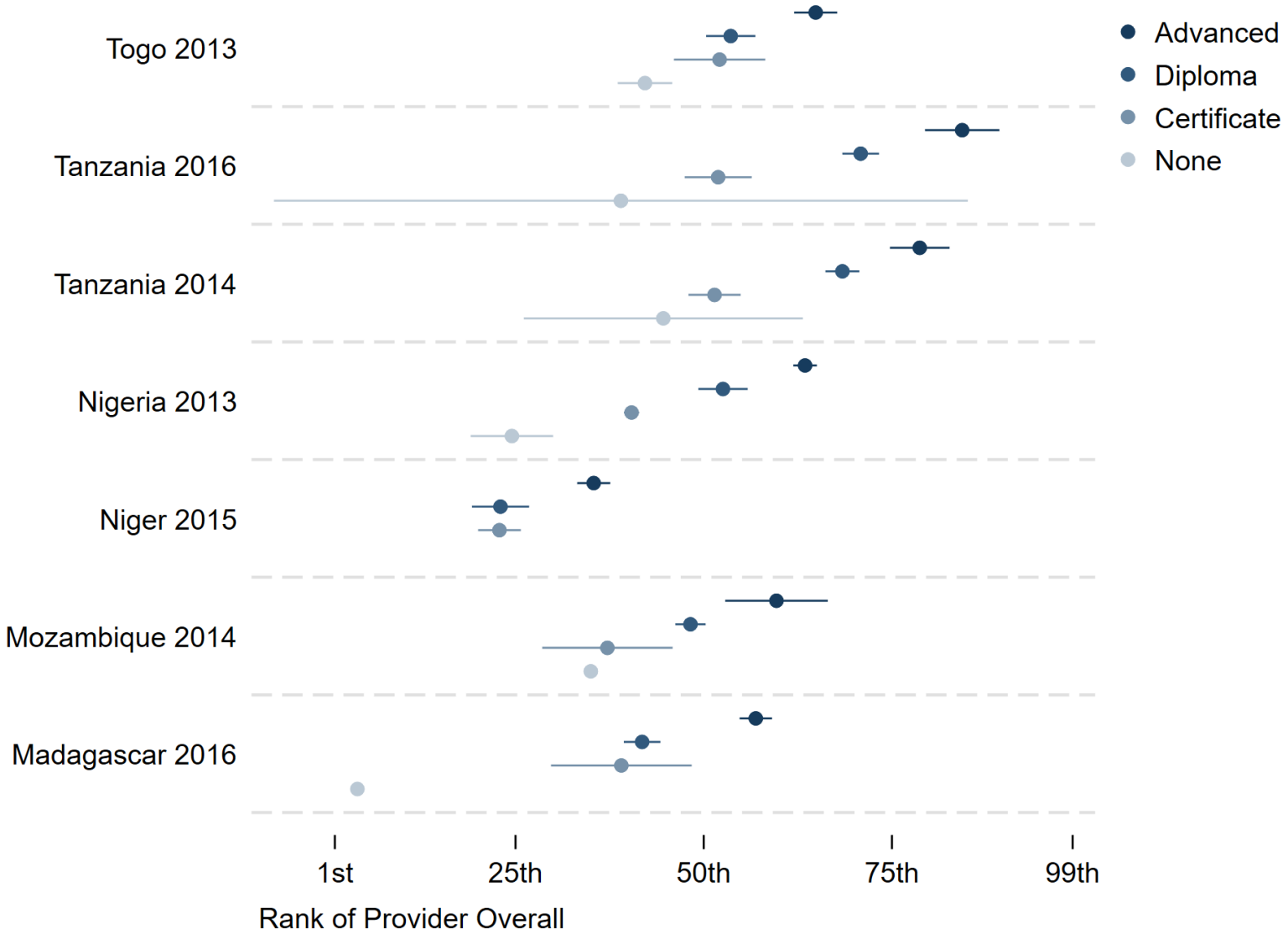


Demographic Variation

Comparing Providers of Varying Levels of Medical Education

Providers with advanced degrees rank higher in the overall distribution as compared to providers with lower level medical qualifications.

There is at least a 20 percentile-point difference between the most highly trained and least highly trained across the countries, on average. That gap is particularly large in Tanzania, Nigeria, and Madagascar.



Appendix I: Comparing Across Vignettes

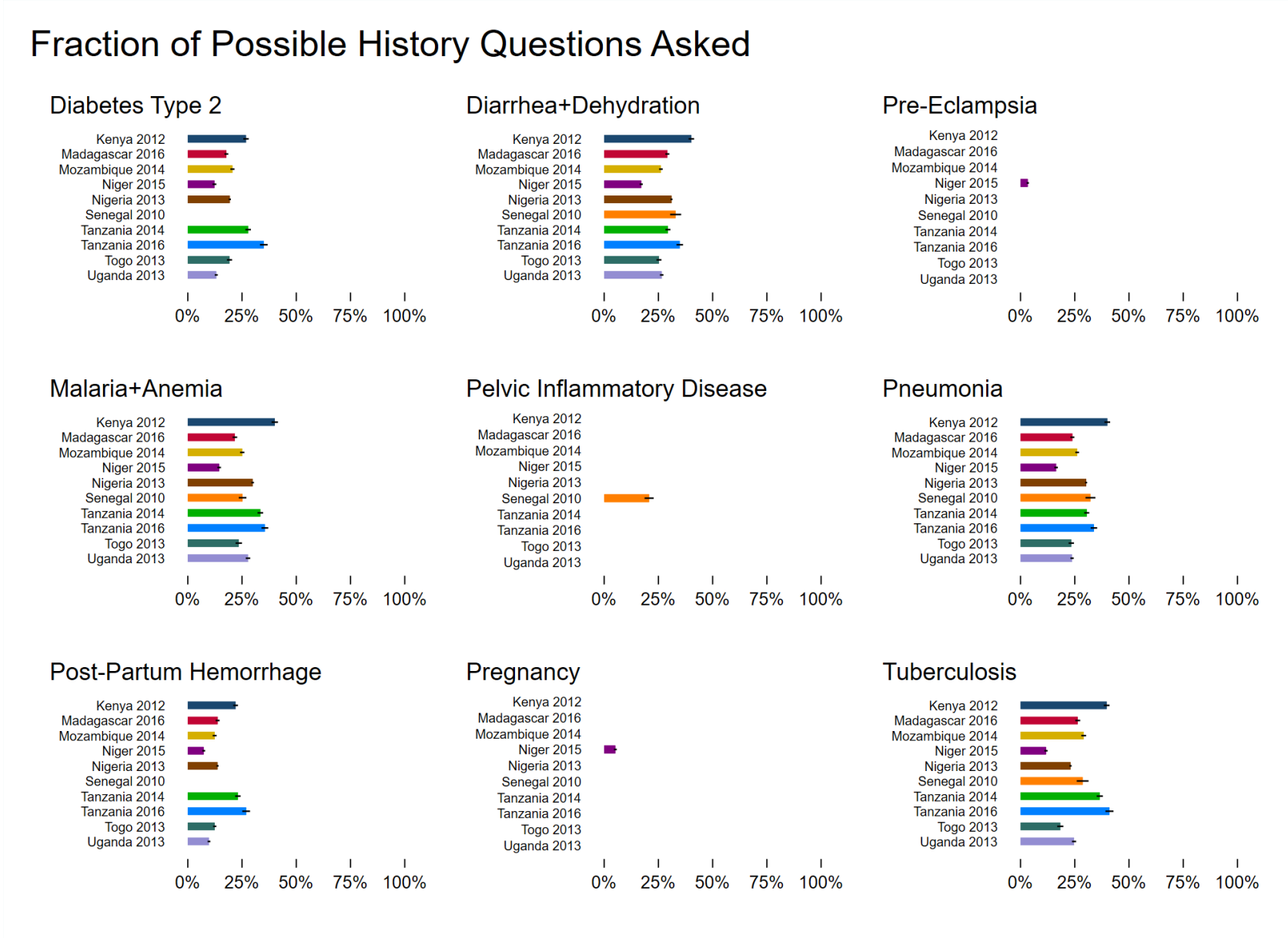
SDI – Cross Country Comparison

Comparing Across Vignettes

History Taking Behavior

Across all vignettes, Kenyan providers ask a larger fraction of the checklist questions, although the differences among countries is not very large on this metric.

In general, a smaller fraction of the checklist is completed for post-partum hemorrhage and type II diabetes as compared to the other vignettes.

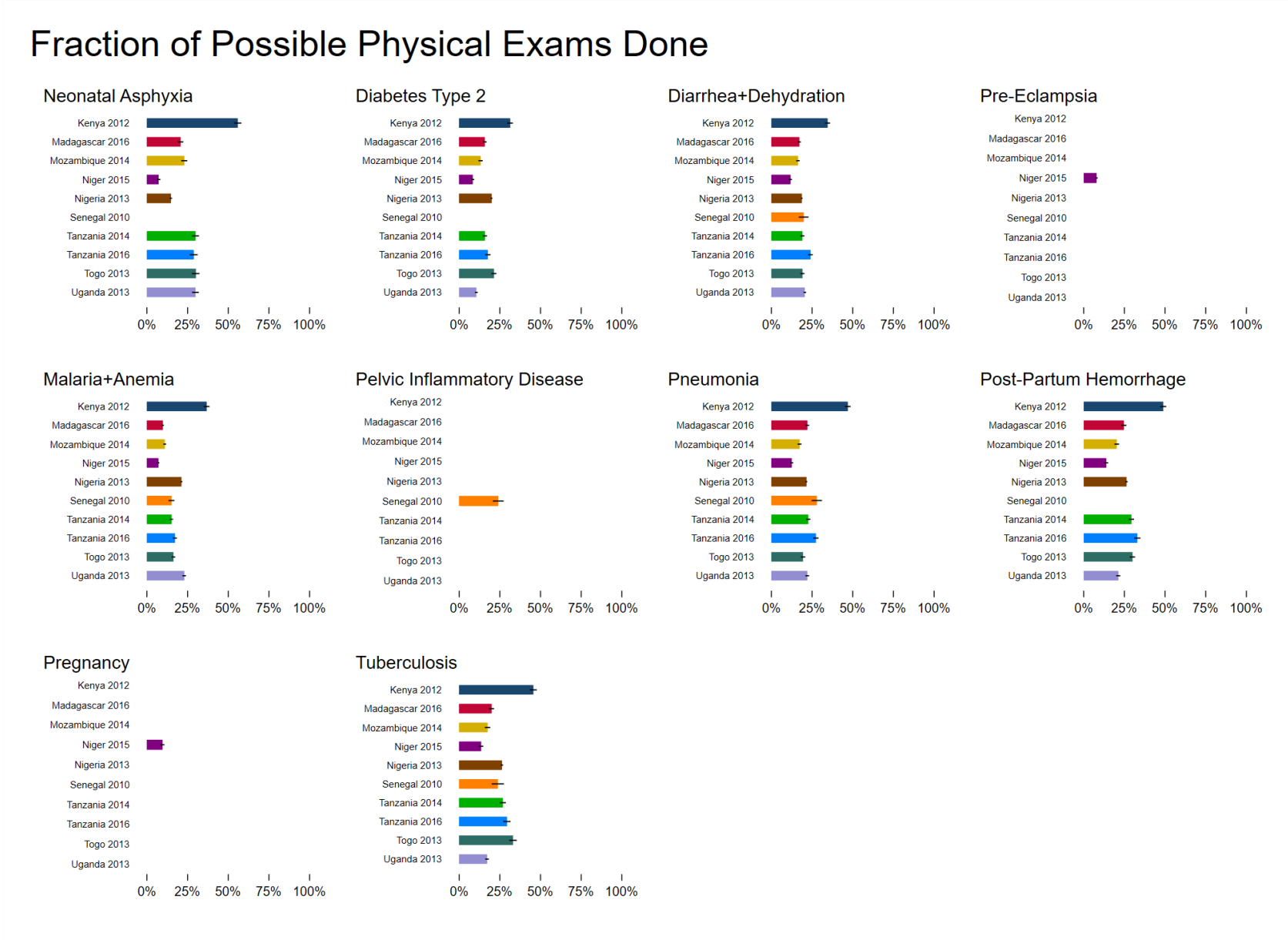


Comparing Across Vignettes

Physical Examination

Again, Kenyan providers perform a larger fraction of the physical examinations on the checklist than providers from other countries, regardless of the condition presented in the vignette.

For a given country, the fraction of the physical examination checklist items completed is similar among the different vignetes.

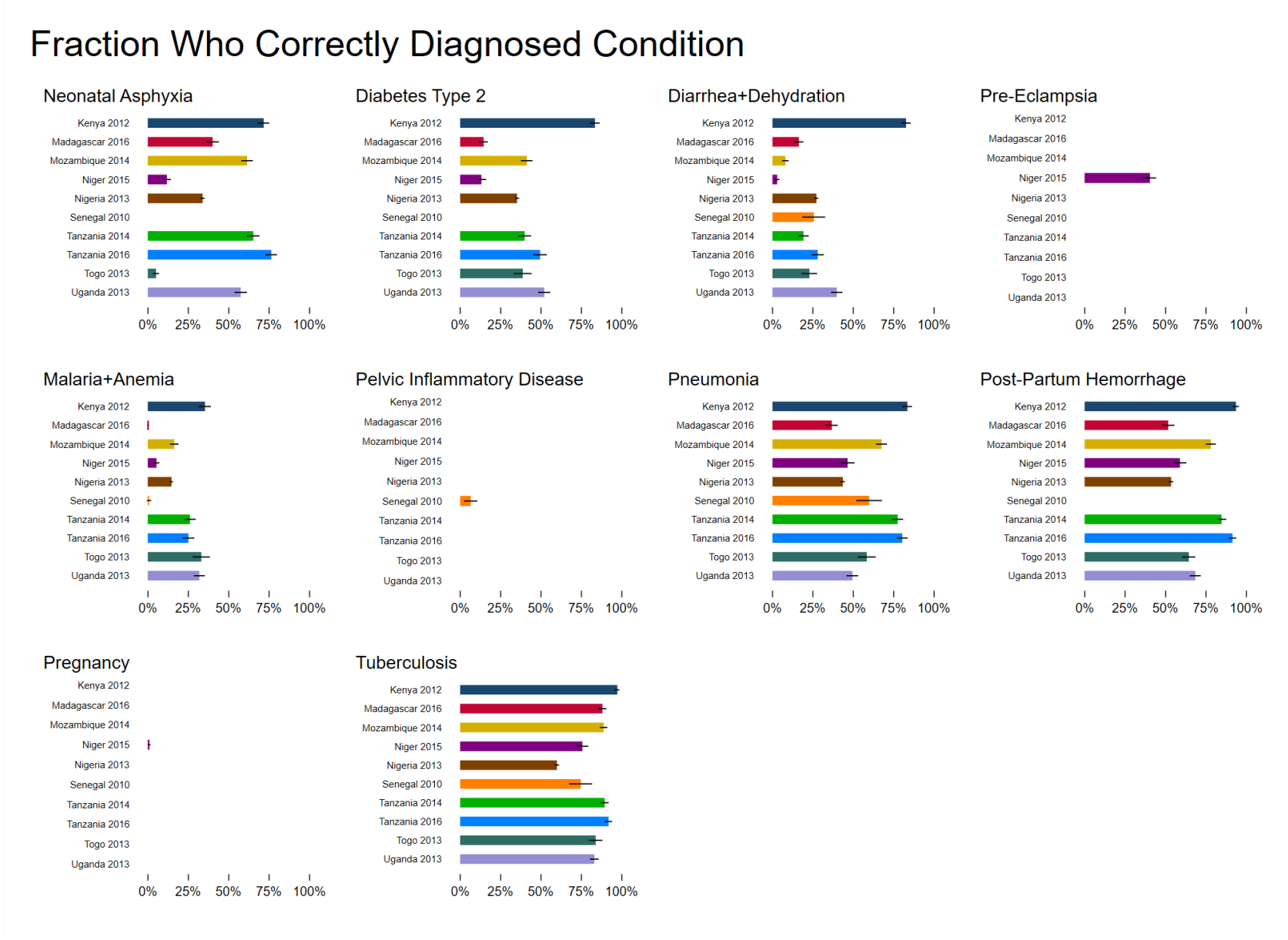


Comparing Across Vignettes

Diagnosis Behavior

Providers who fail to diagnose one condition may perform different when diagnosing another. For example, providers in Mozambique do as well as higher performing countries in diagnosing tuberculosis, pneumonia, post-partum hemorrhage, and neonatal asphyxia. However, these same providers are nearly unable to correctly diagnose diarrhea with dehydration.

On average, providers perform the worst at diagnosing malaria with anemia, often failing to identify the anemia.



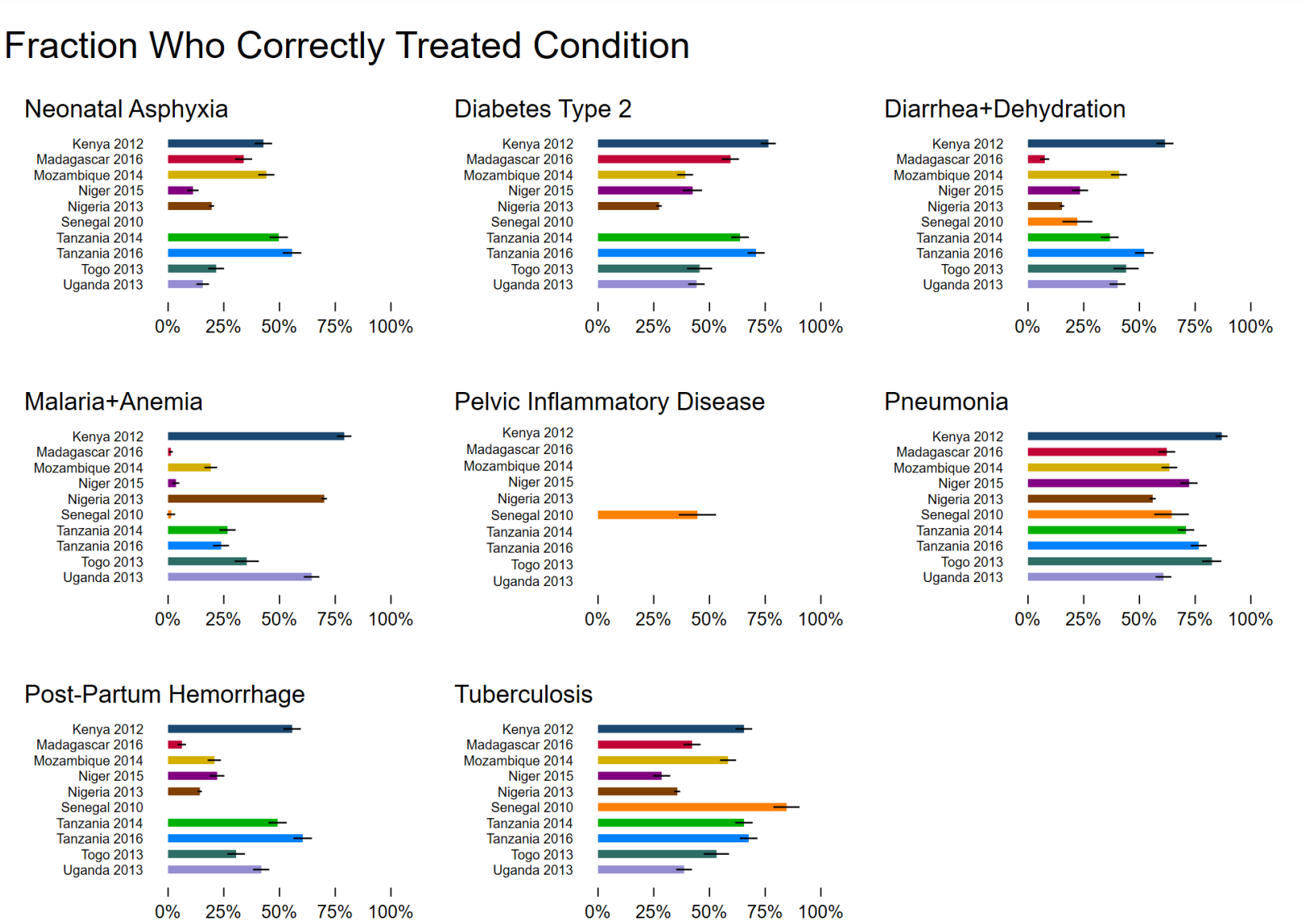
Comparing Across Vignettes

Treatment Behavior

Quality is multidimensional.

Providers who know how to treat one condition do not necessarily know others, and there are interesting cross-country patterns by condition.

Nigerian providers outperform Mozambican providers in treating malaria with anemia, but the opposite is true for neonatal asphyxia.

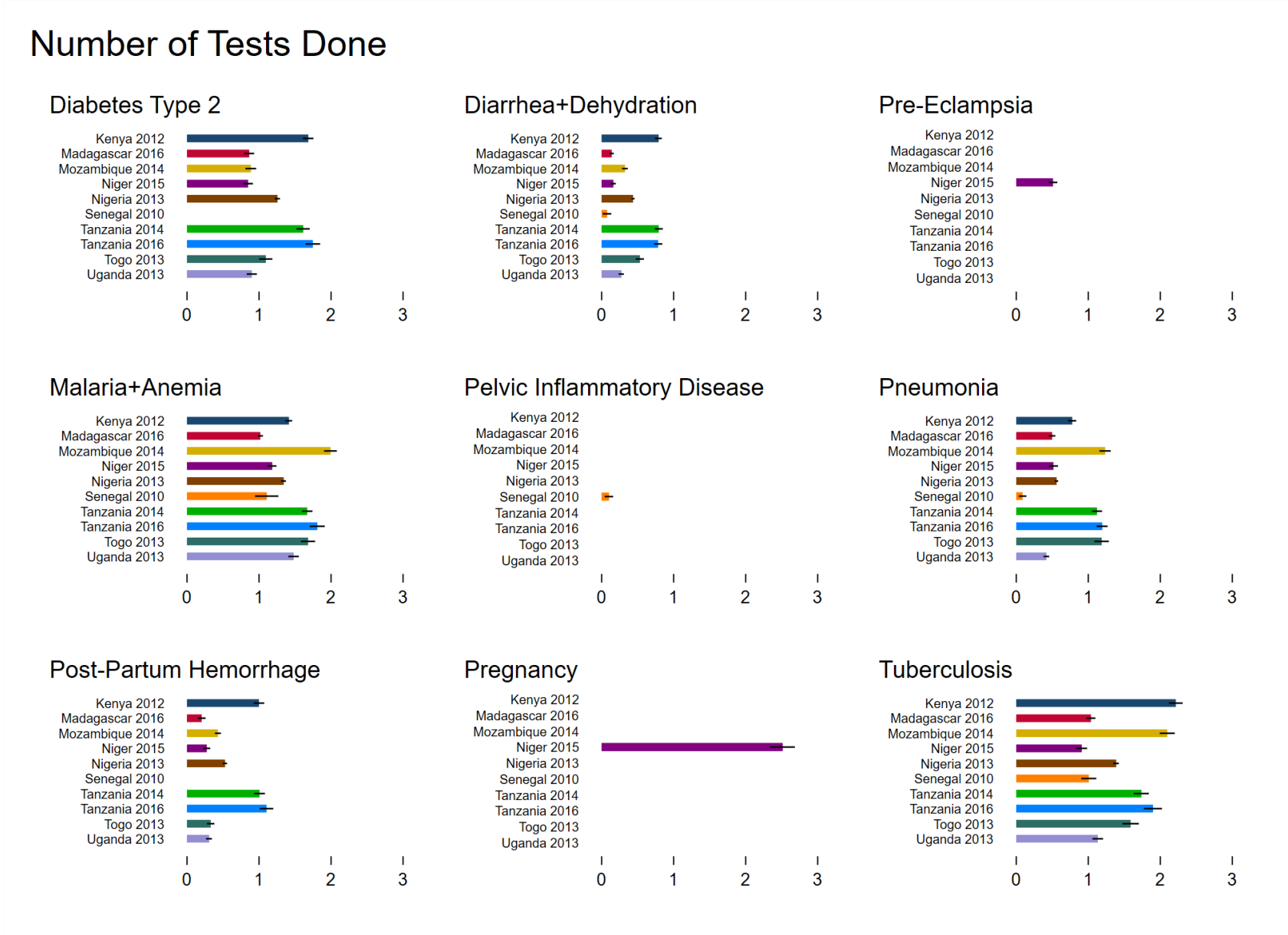


Comparing Across Vignettes

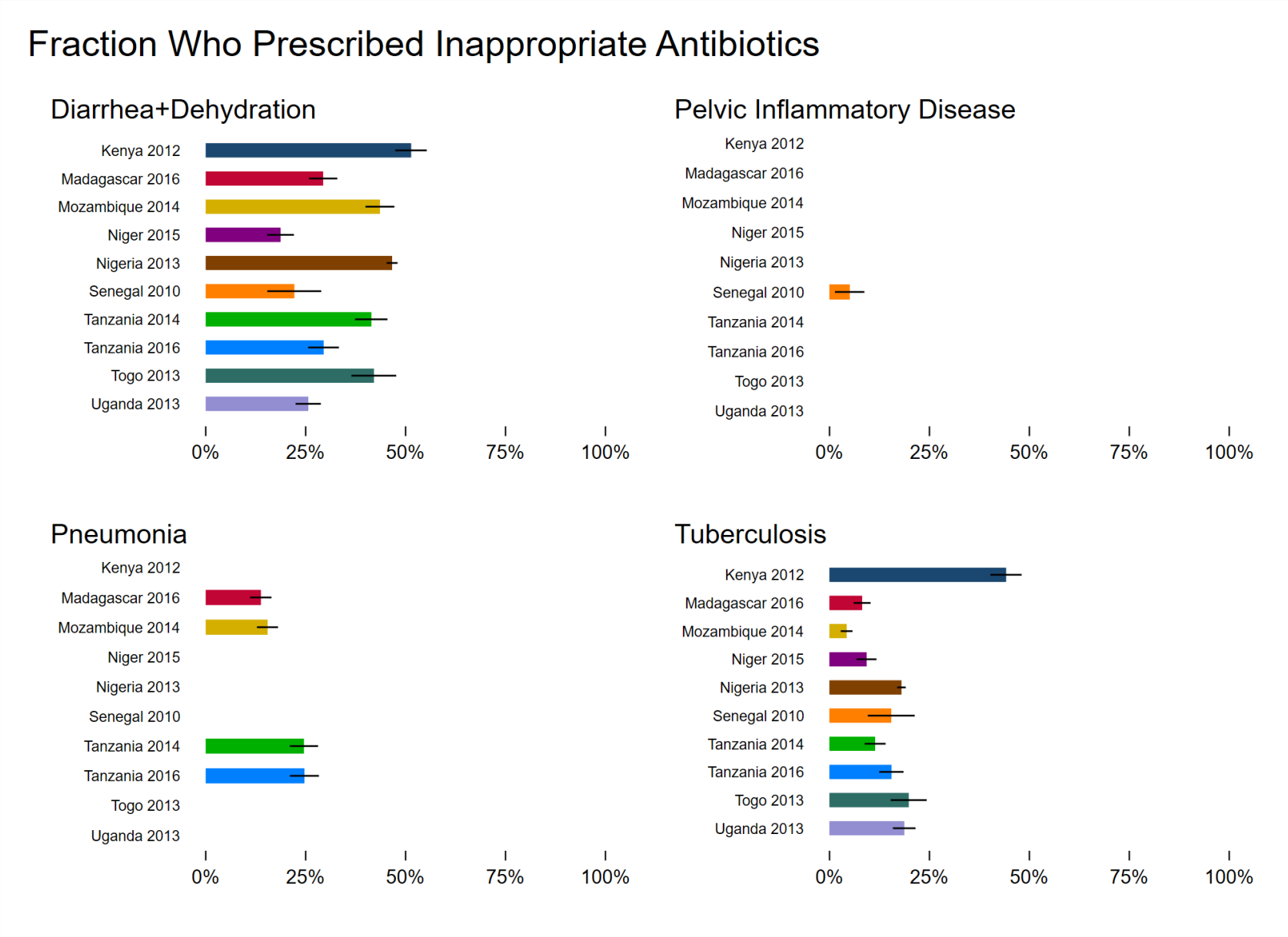
Test Ordering Behavior

In general, most tests are ordered for diabetes, malaria, and tuberculosis.

While varying in the number of tests prescribed for each vignette, providers in Kenya and Tanzania tend to order the most tests, followed by Nigeria, Uganda and Madagascar.



Comparing Across Vignettes

Antibiotics Prescription Behavior

Providers in Kenya are the most likely to prescribe inappropriate antibiotics compared to providers in other countries for the treatment of diarrhea with dehydration and tuberculosis. This different is much starker for tuberculosis, where Kenyan providers prescribe antibiotics about 45% of the time while other providers only do so about 15% of the time.