Nigeria Country Profile

Service Delivery Indicators – Medical Vignettes

WORLD BANK GROUP

Acknowledgements

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Thanks to:

- SDI Team

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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 – Nigeria

Demography Summary

Facility characteristics

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

Facilities 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.

Rural vs. Urban[1]	
Rural	2,034 (84%)
Urban	397 (16%)
Public vs. Private[2]	
Public	2,234 (92%)
Private	198 (8%)
Facility Level[3]	
Hospital	412 (17%)
Health Center	1,458 (61%)
Health Post	516 (22%)

[1] Data is missing for 1 facility.
[2] All data is present.
[3] Data is missing for 46 facilities.

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.

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

Rural vs. Urban[1]	
Rural	4,066 (80%)
Urban	1,042 (20%)
Public vs. Private[2]	
Public	4,765 (93%)
Private	345 (7%)
Facility Level[3]	
Hospital	1,102 (22%)
Health Center	3,235 (64%)
Health Post	686 (14%)

[1] 2 providers were missing data.
[2] All data is present.
[3] 87 providers were missing data on facility level.

Medical Education[4]	
Advanced	1,338 (27%)
Diploma	279 (6%)
Certificate	3,206 (65%)
None	83 (2%)
Profession[5]	
Medical Officer	480 (9%)
Clinical Officer	-
Nurse	855 (17%)
Other	3,775 (74%)

[4] 204 providers were missing data on medical education.
[5] All data is present.

Medical Vignettes IRT Methodology

SDI – Nigeria

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.

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

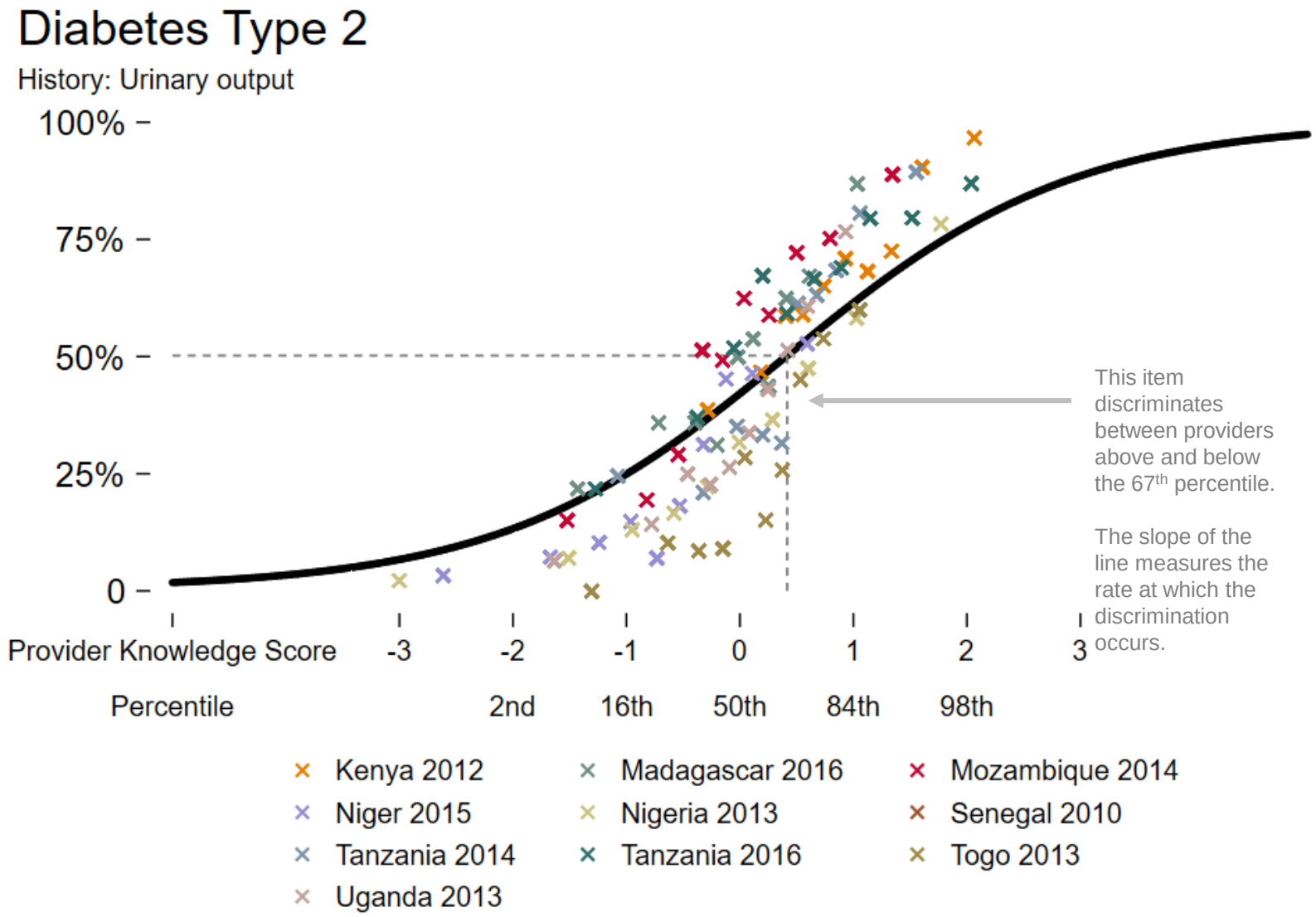
Generating Knowledge Scores

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 – Nigeria

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.

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.

	Child Diarrhea + Dehydration	Child Pneumonia	Diabetes (Type II)	Tuberculosis	Child Malaria + Anemia	Post-Partum Hemorrhage	Neonatal Asphyxia
Number Who Did Vignette	5,098	5,087	4,950	5,017	5,069	4,967	4,799
Did Not Do Vignette	12	23	160	93	41	143	311
History Taking							
Mean Questions Asked	6.2	5.1	4.3	5.5	4.5	2.1	n/a
Fraction of Available Questions	31.0%	30.2%	19.4%	23.0%	29.9%	13.7%	n/a
Physical Examination							
Mean Exams Done	2.8	1.9	2.4	2.1	3.0	2.6	1.0
Fraction of Available Exams	18.7%	21.5%	19.9%	26.3%	21.2%	26.3%	14.8%

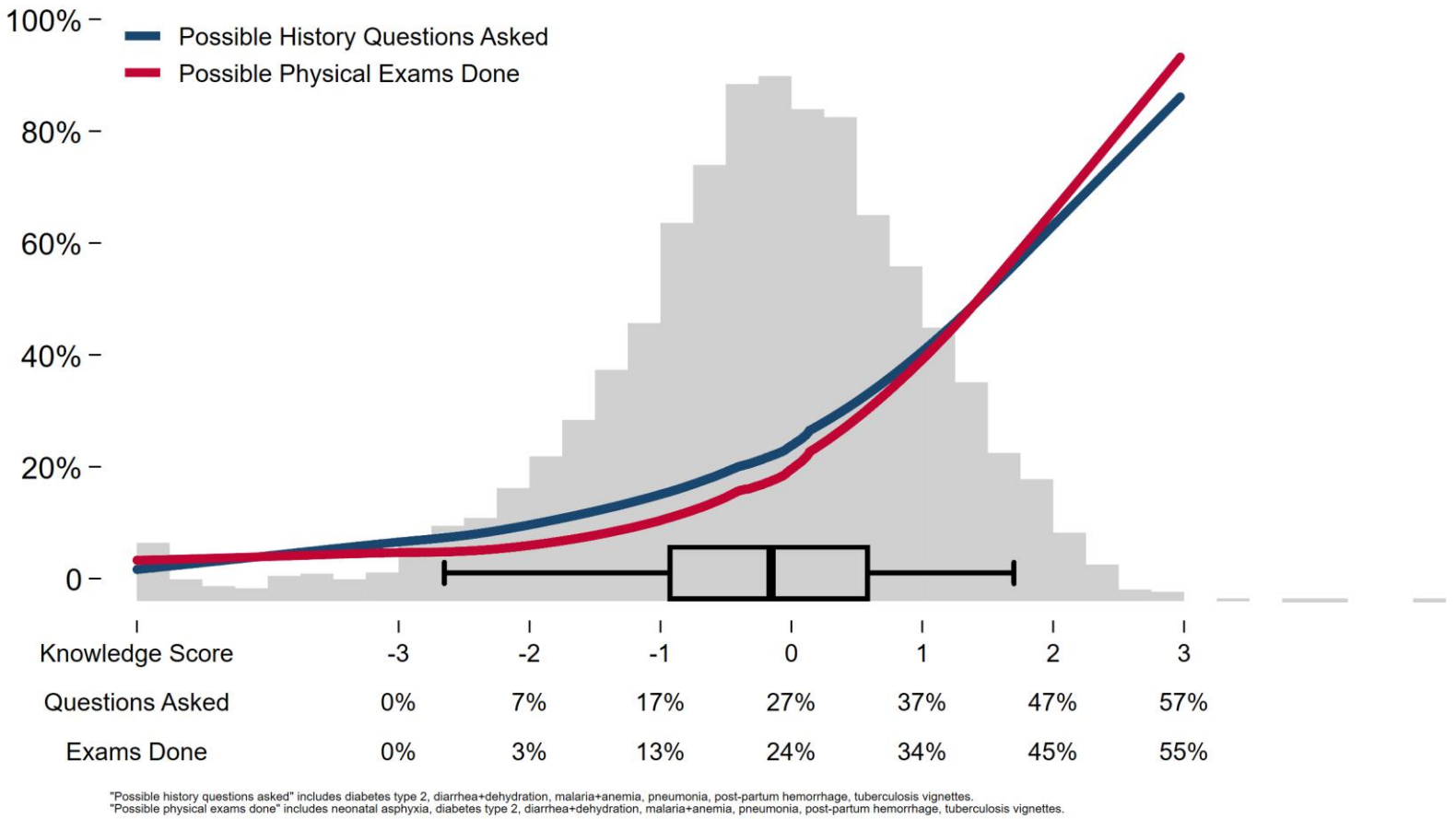
Diagnostic Knowledge Assessment

Knowledge Score Distribution ad 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.



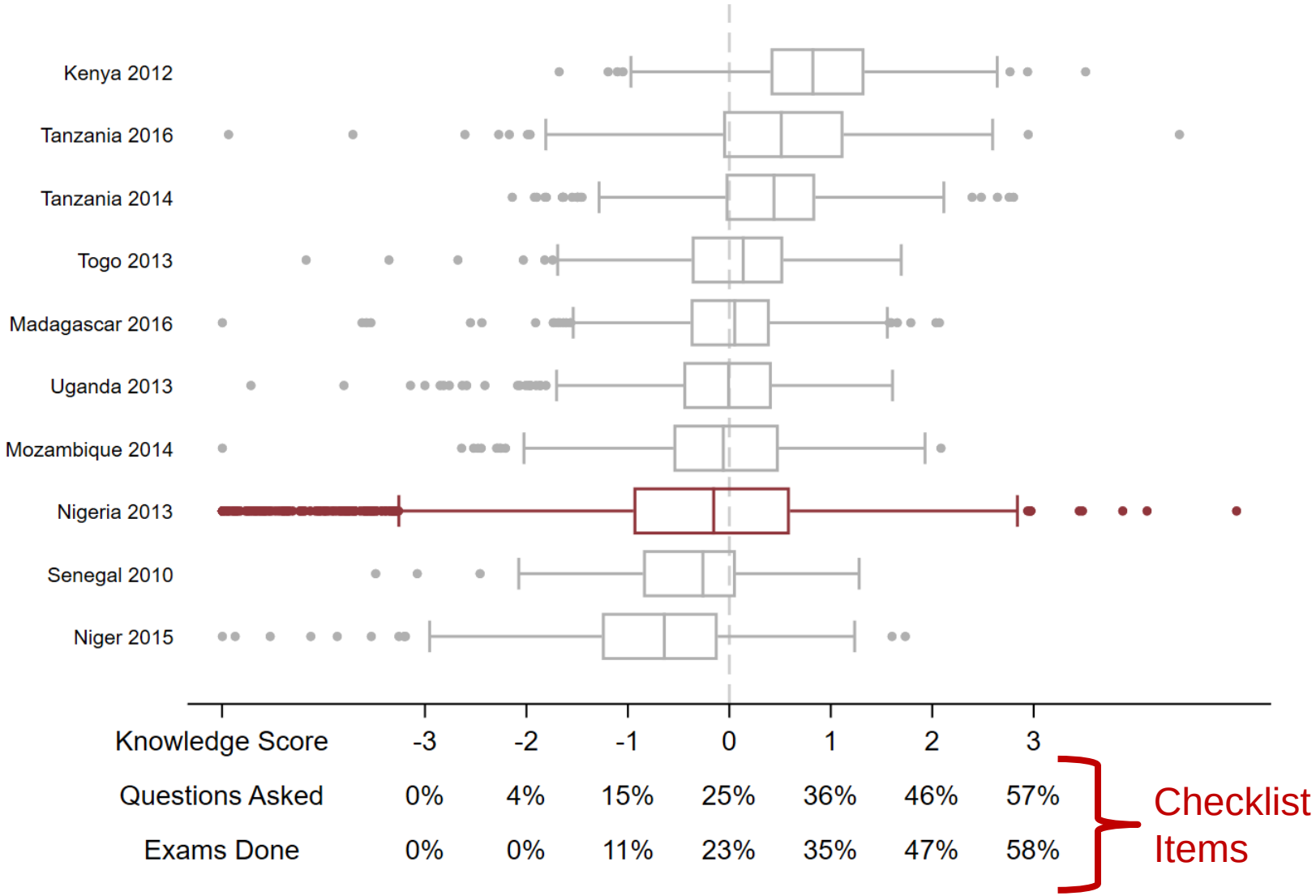
Knowledge Score	-3	-2	-1	0	1	2	3
Questions Asked	0%	7%	17%	27%	37%	47%	57%
Exams Done	0%	3%	13%	24%	34%	45%	55%

"Possible history questions asked" includes diabetes type 2, diarrhea+dehydration, malaria+anemia, pneumonia, post-partum hemorrhage, tuberculosis vignettes.
"Possible physical exams done" includes neonatal asphyxia, diabetes type 2, diarrhea+dehydration, malaria+anemia, pneumonia, post-partum hemorrhage, tuberculosis vignettes.

Diagnostic Knowledge Assessment

Knowledge Score Distribution Compared to Other Countries

The boxplot shows the distribution of provider knowledge in Nigeria as compared to the distribution of provider knowledge in other countries. The countries are ranked by their median knowledge score.

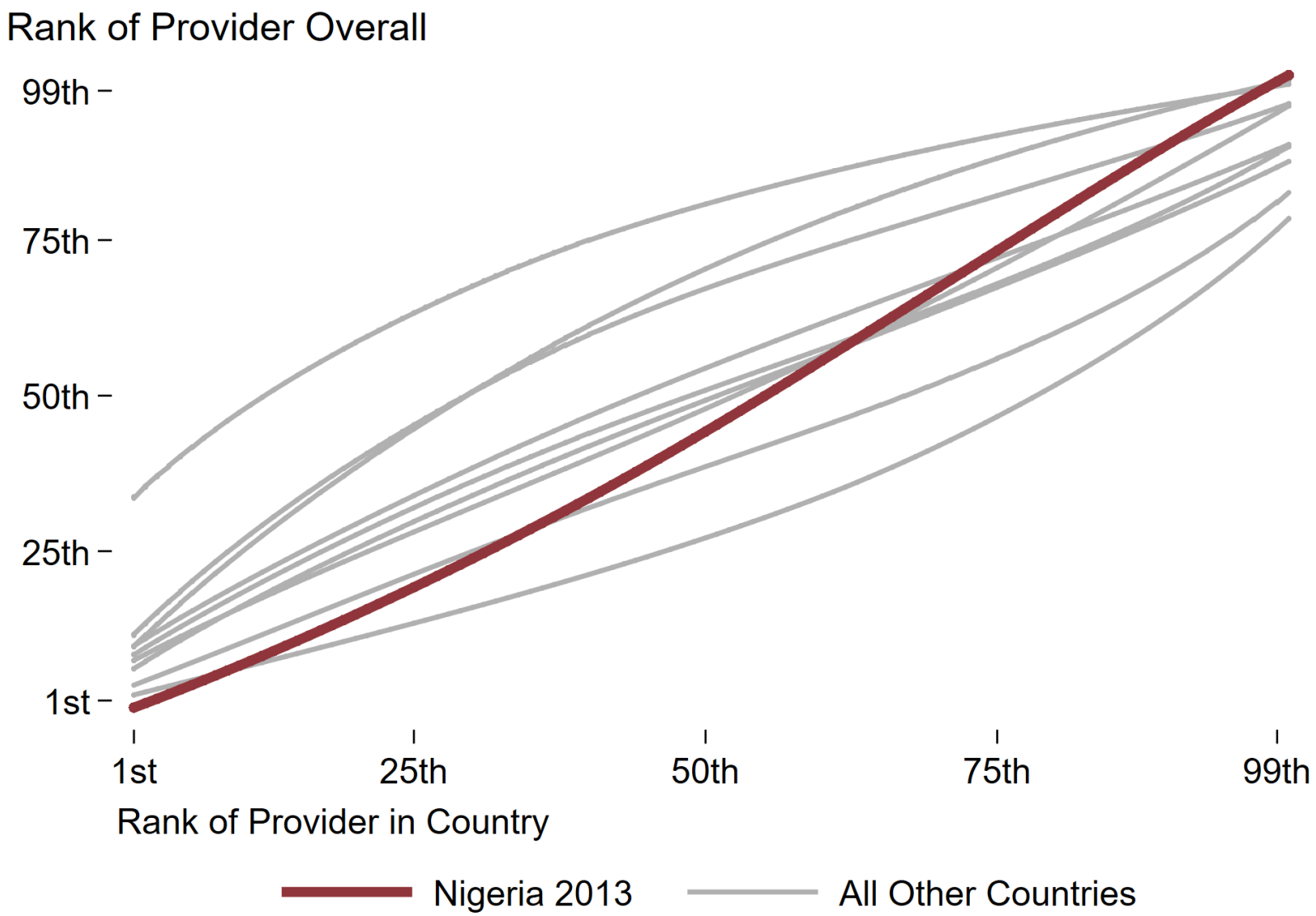


Diagnostic Knowledge Assessment

Providers' Percentile Ranking

In the following figure, one can see how the median provider in Nigeria compares to the global distribution.

In addition, one can see where the median provider in the global distribution is in the Nigeria rankings. In other words, is the median provider one of the best providers, one of the worst, or average.

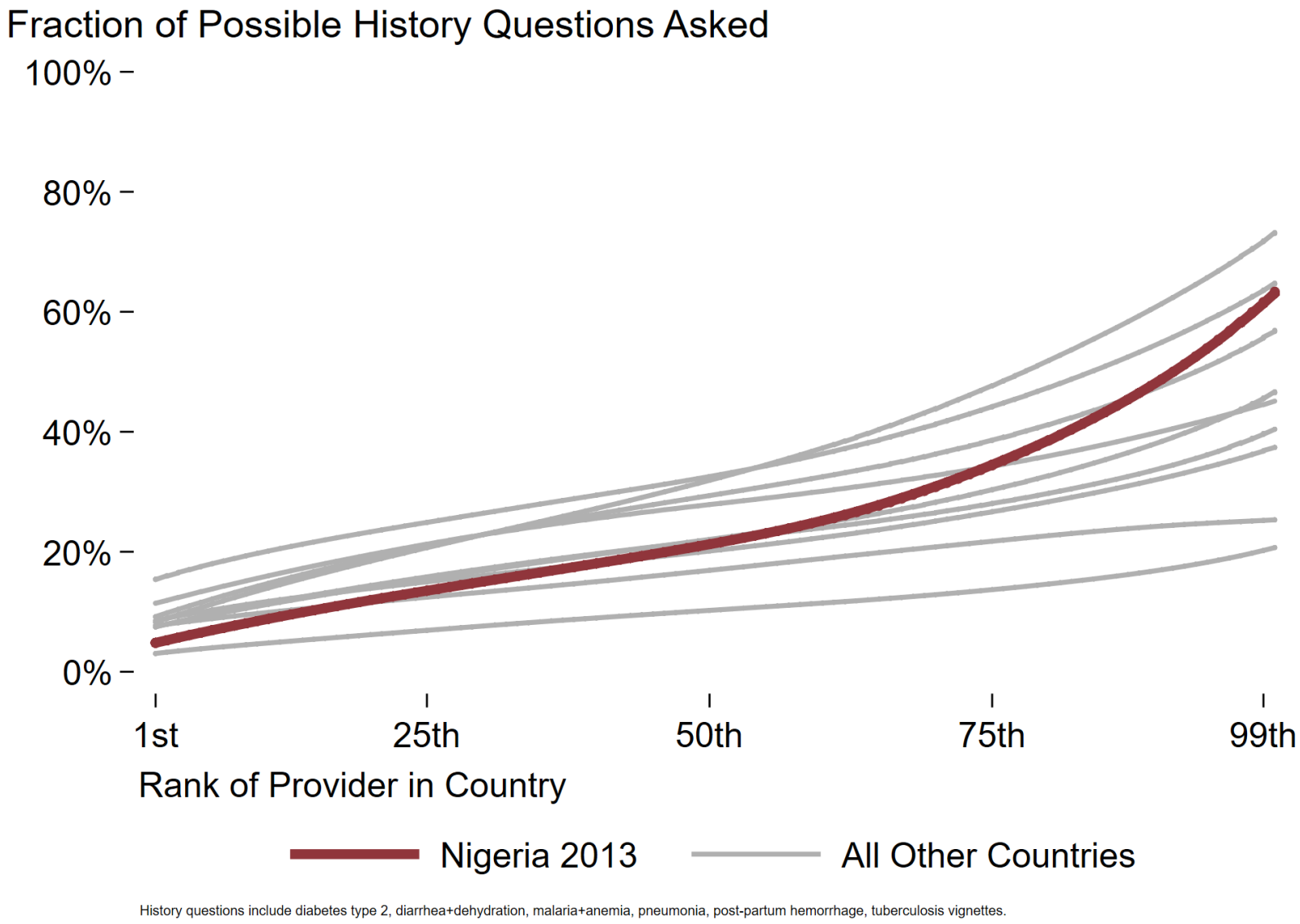


Diagnostic Knowledge Assessment

History Taking Behavior in Nigeria Compared to Other Countries

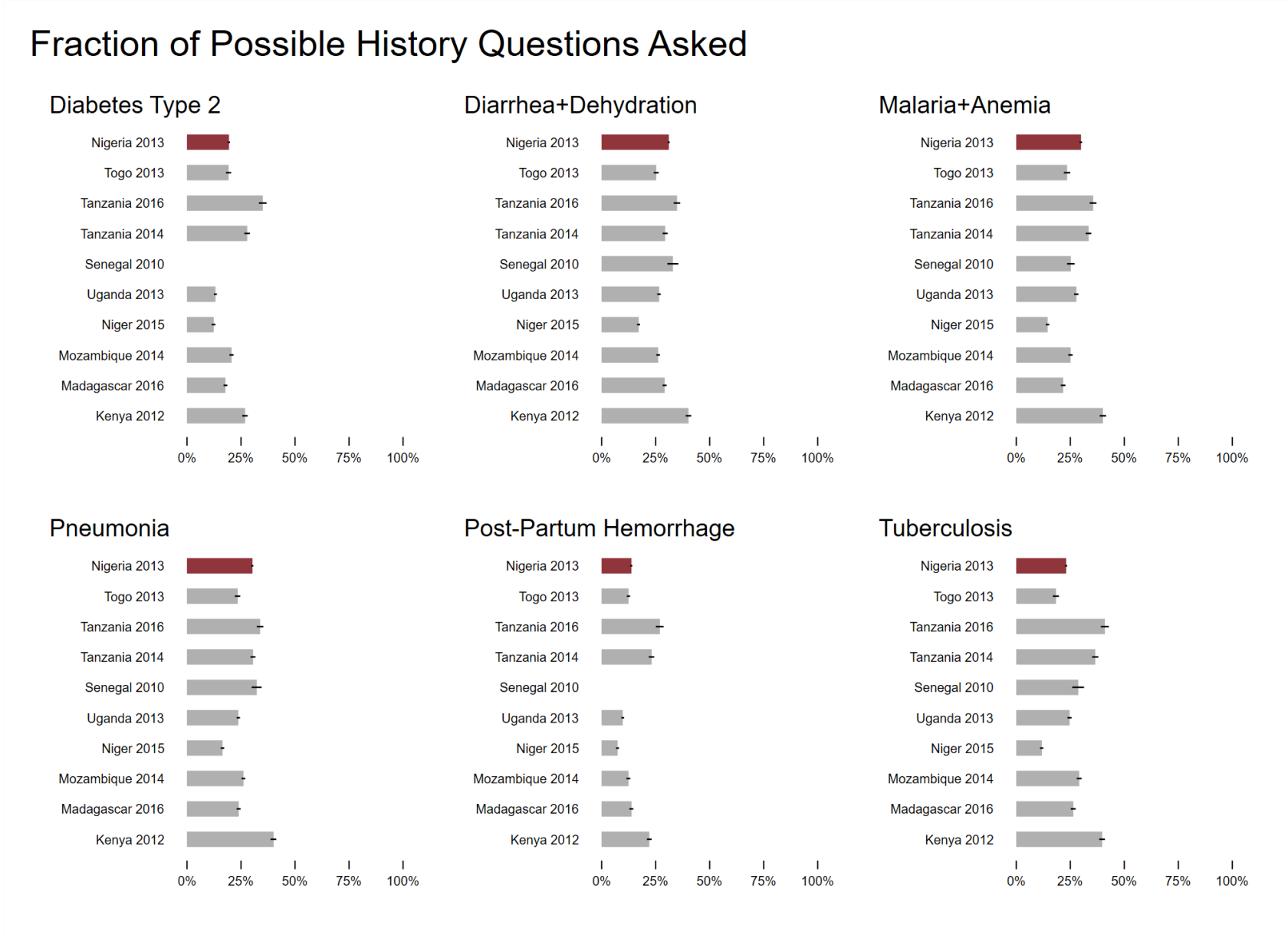
Here, one can compare the most and least knowledgeable providers in Nigeria to see whether the best performing providers ask more of the items on the history taking checklist.

In addition, the figure shows how the best and worst providers in Nigeria compare to the best and worst providers in other countries with regard to how much of the history checklist they complete.



Diagnostic Knowledge Assessment

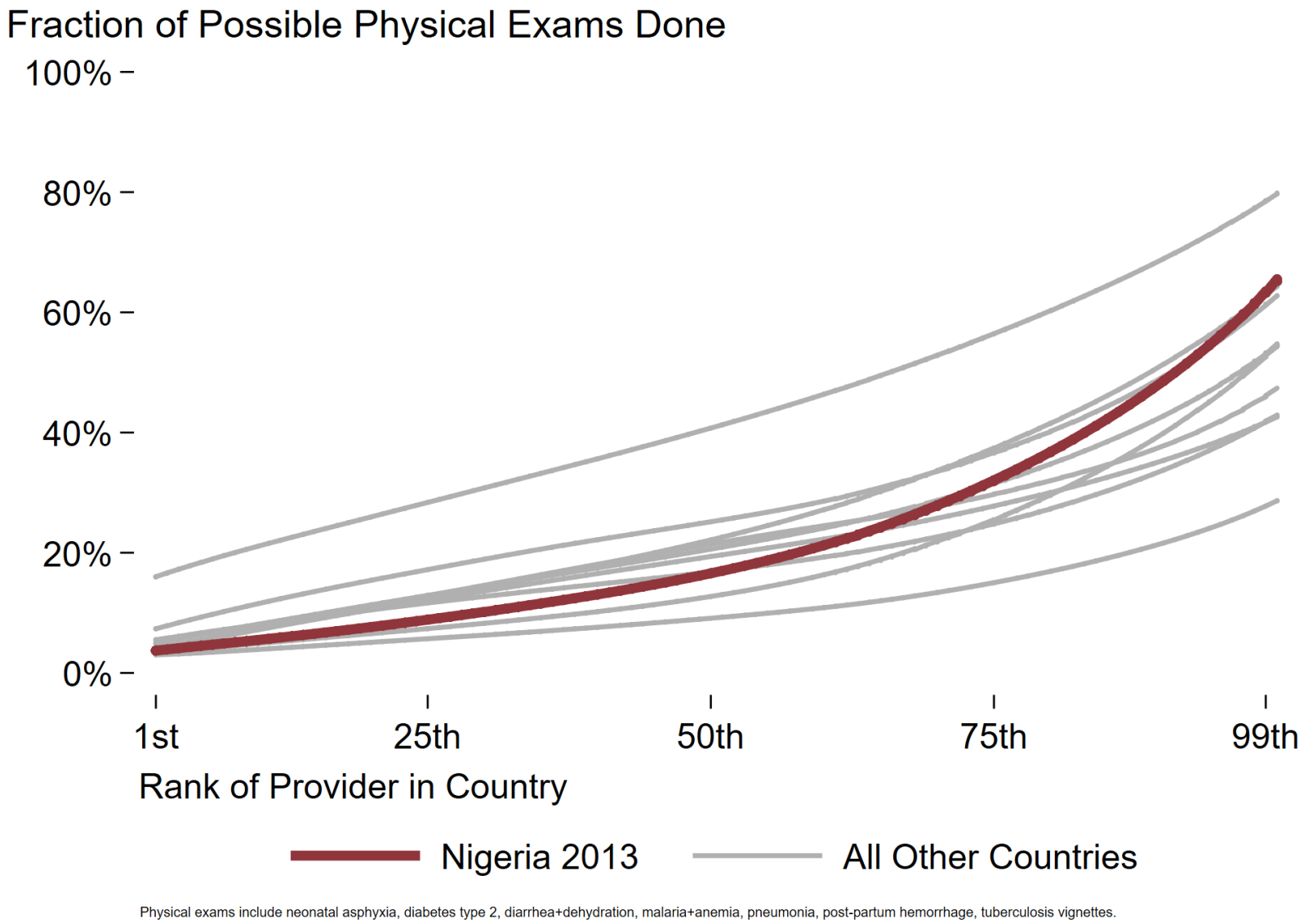
Vignette-Specific History Taking Behavior Compared to Other Countries



Diagnostic Knowledge Assessment

Physical Examination Behavior in Nigeria Compared to Other Countries

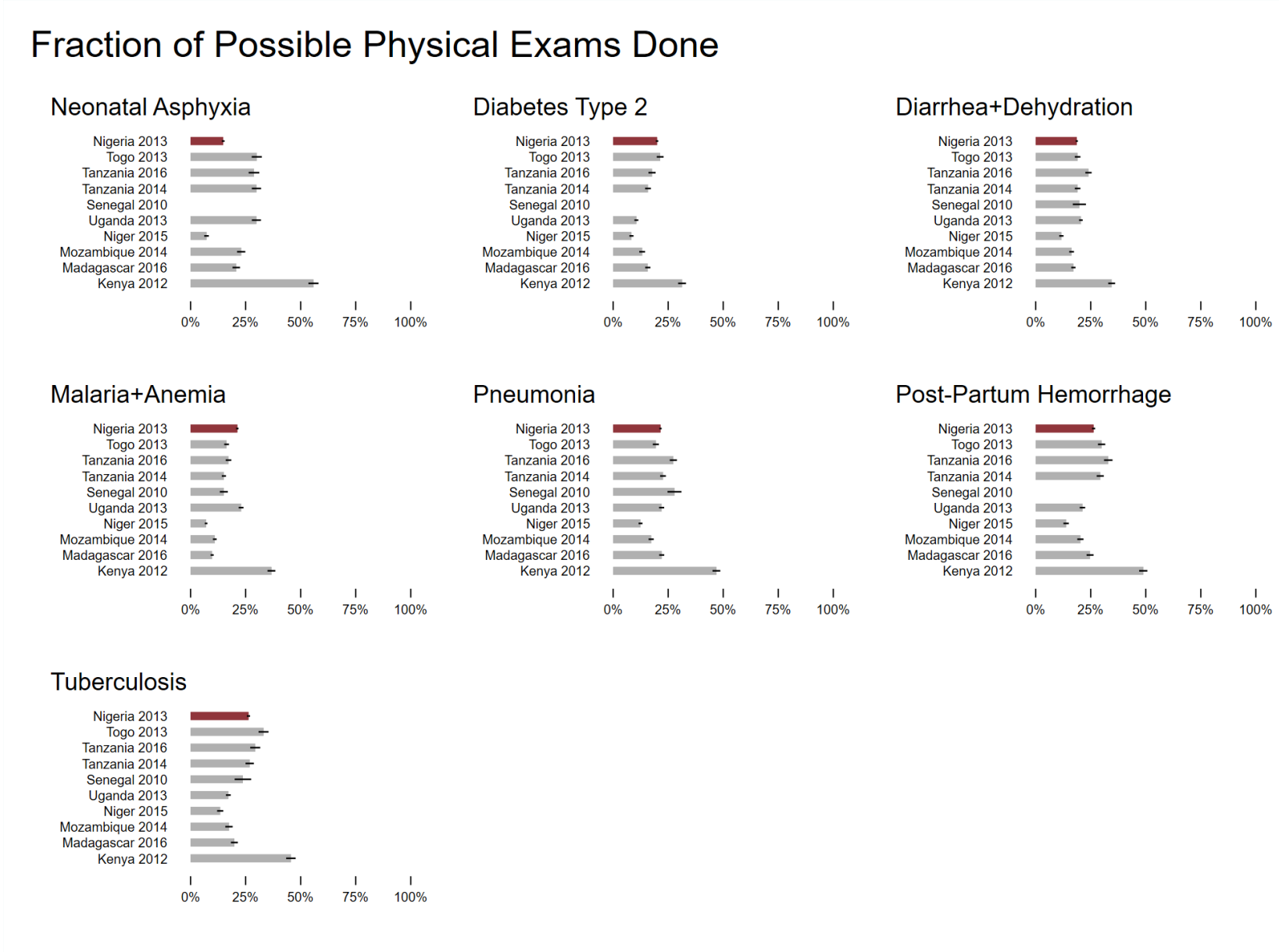
As with history taking, the following figure allows one to compare physical examination choices across the spectrum of provider knowledge. This helps answer the question: do the best performing providers do more physical exams?



Physical exams include neonatal asphyxia, diabetes type 2, diarrhea+dehydration, malaria+anemia, pneumonia, post-partum hemorrhage, tuberculosis vignettes.

Diagnostic Knowledge Assessment

Vignette-Specific Physical Examination Behavior Compared to Other Countries



Diagnostic – Treatment Linkages

SDI – Nigeria

Diagnostic – Treatment Linkages

Summary of Performance Across Vignettes

In the case of vignettes that presented comorbidities, a provider only received credit for a correct diagnosis when he or she specified each morbidity.

Correct management was decided by comparing the providers' choices to international guidelines as much as possible given that the presentation of treatment options varied from country to country.

Several vignettes listed antibiotics as a treatment option although prescribing antibiotics for the particular vignette go against clinical management guidelines. These were identified separately to see whether providers are doing more unnecessary treatment.

	Child Diarrhea + Dehydration	Child Pneumonia	Diabetes (Type II)	Tuberculosis	Child Malaria + Anemia	Post-Partum Hemorrhage	Neonatal Asphyxia
Number Who Did Vignette	5,098	5,087	4,950	5,017	5,069	4,967	4,799
Did Not Do Vignette	12	23	160	93	41	143	311
Identifying Condition Presented							
Correct Diagnosis	1,382 (27%)	2,209 (43%)	1,739 (35%)	3,001 (60%)	737 (14%)	2,651 (53%)	1,623 (34%)
Incorrect Diagnosis	3,716 (73%)	2,878 (57%)	3,211 (65%)	2,016 (40%)	4,332 (86%)	2,316 (47%)	3,176 (66%)
Prescribing Appropriate Treatment							
Correct Treatment	777 (15%)	2,846 (56%)	1,354 (27%)	1,783 (36%)	3,551 (70%)	706 (14%)	937 (20%)
Incorrect Treatment	4,321 (85%)	2,241 (44%)	3,596 (73%)	3,234 (64%)	1,518 (30%)	4,261 (86%)	3,862 (80%)
Inappropriate Antibiotics Usage							
Gave Incorrect Antibiotics	2,377 (47%)	n/a	n/a	903 (18%)	n/a	n/a	n/a
Did Not Give Incorrect Antibiotics	2,721 (53%)	n/a	n/a	4,114 (82%)	n/a	n/a	n/a
Ordering Tests							
Number of Tests Ordered	0.4	0.6	1.3	1.4	1.3	0.5	n/a

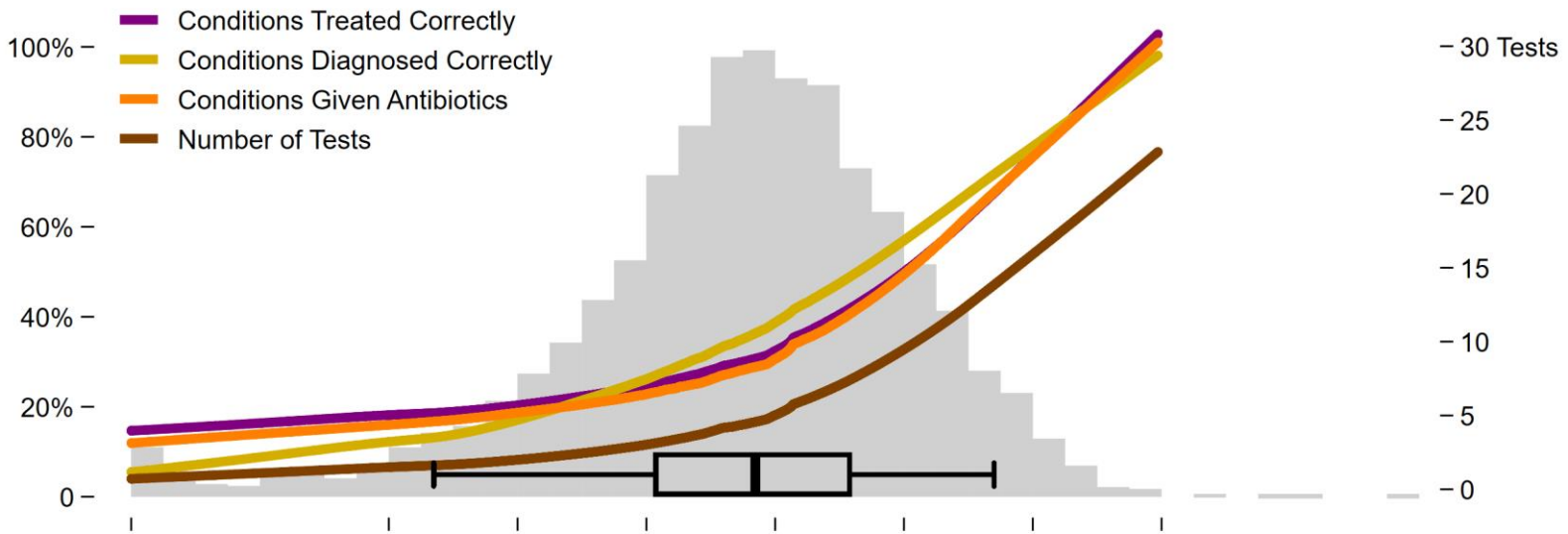
Diagnostic – Treatment Linkages

Knowledge Score Distribution and Measures of Quality

The knowledge score is a good predictor of the whether providers correctly treat the given conditions, correctly diagnose the given conditions, and order more tests.

The relationship between whether more knowledgeable providers also prescribe more inappropriate antibiotics is presented in the figure.

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	4%	16%	29%	41%	53%	66%	78%
Correct Treatment	8%	17%	27%	36%	46%	56%	65%
Number of Tests	0.0	1.2	3.6	6.1	8.5	10.9	13.4
Inapprop. Antibiotics	5%	15%	25%	35%	45%	55%	65%

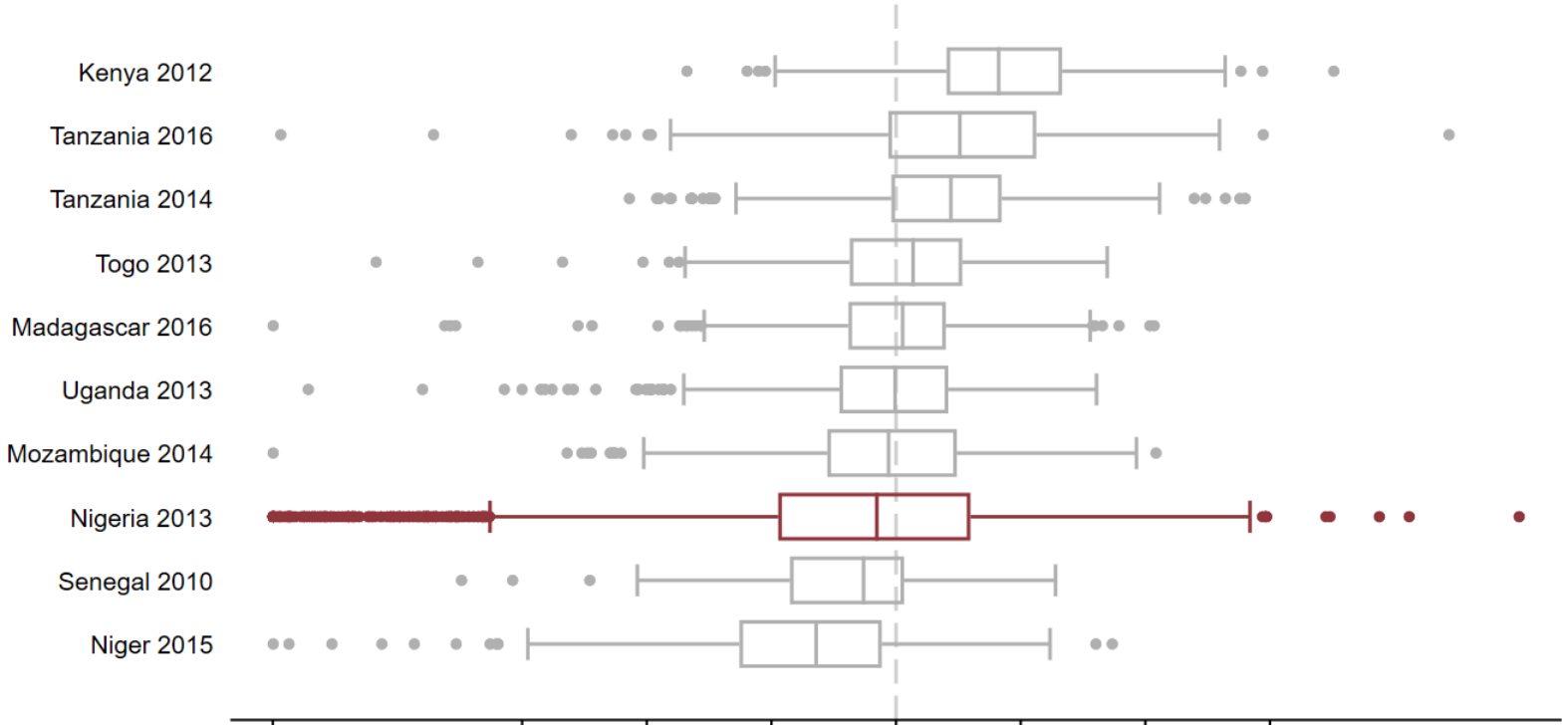
"Correct treatment" includes neonatal asphyxia, diabetes type 2, diarrhea+dehydration, malaria+anemia, pneumonia, post-partum hemorrhage, tuberculosis vignettes.
"Correct diagnoses" includes neonatal asphyxia, diabetes type 2, diarrhea+dehydration, malaria+anemia, pneumonia, post-partum hemorrhage, tuberculosis vignettes.
"Number of tests" includes diabetes type 2, diarrhea+dehydration, malaria+anemia, pneumonia, post-partum hemorrhage, tuberculosis vignettes.
"Prescribed inappropriate antibiotics" includes diarrhea+dehydration, tuberculosis vignettes.

Diagnostic – Treatment Linkages

Knowledge Score Distribution Compared to Other Countries

Again, the distribution of provider knowledge in Nigeria is compared to the distribution of provider knowledge in other countries. The countries are ranked by their median knowledge score.

From the figure, one can also see how many more diagnoses, treatments, and tests are ordered as a provider's knowledge score increases by one standard deviation.



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%

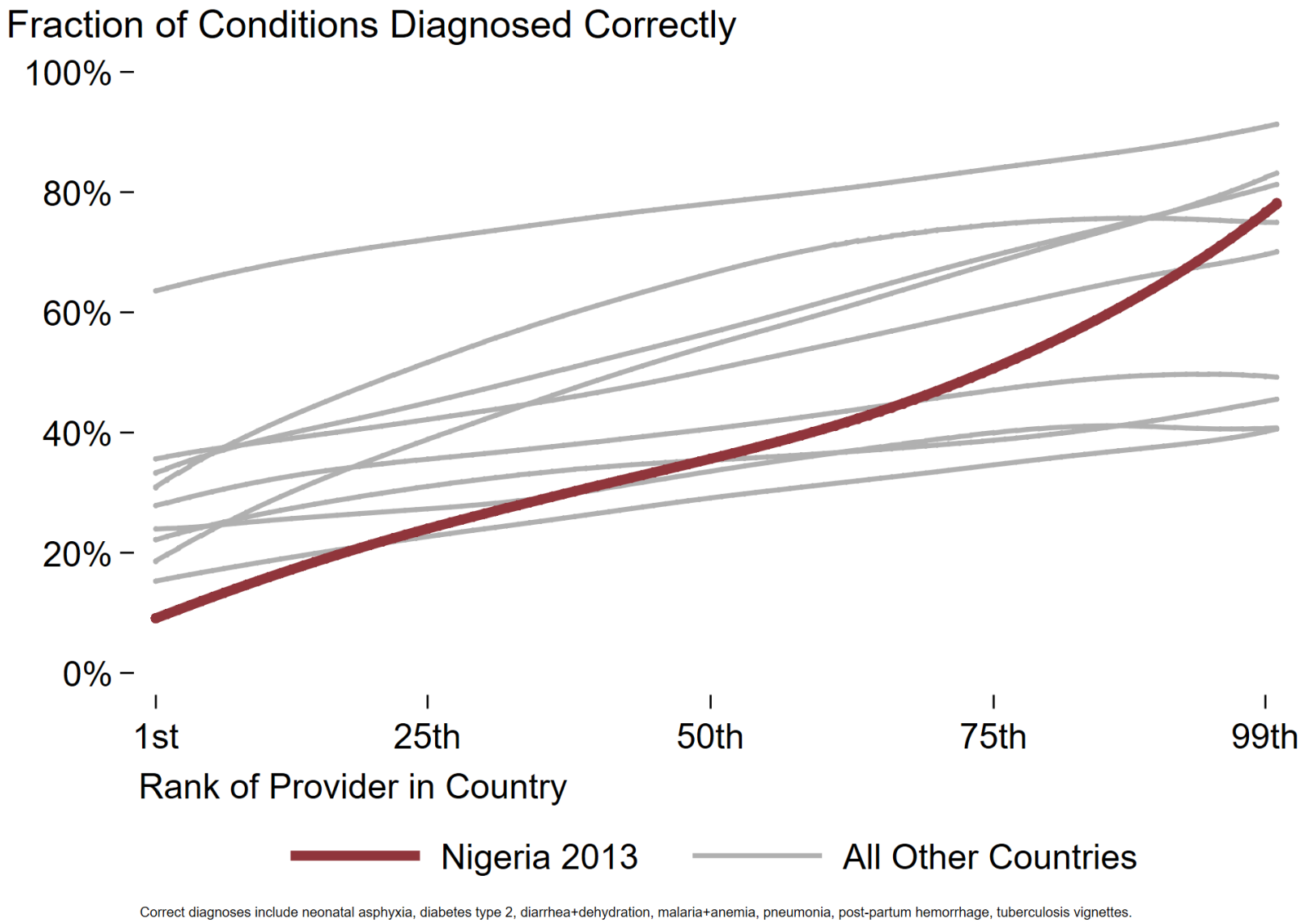
Treatment Outcomes

Diagnostic – Treatment Linkages

Diagnosis Behavior in Nigeria Compared to Other Countries

In the figure, one can determine whether the best performing providers are able to diagnose more conditions correctly compared o the worst providers in Nigeria.

The figure also shows how the diagnostic ability of the best providers in Nigeria compares to that of the best providers in other countries.

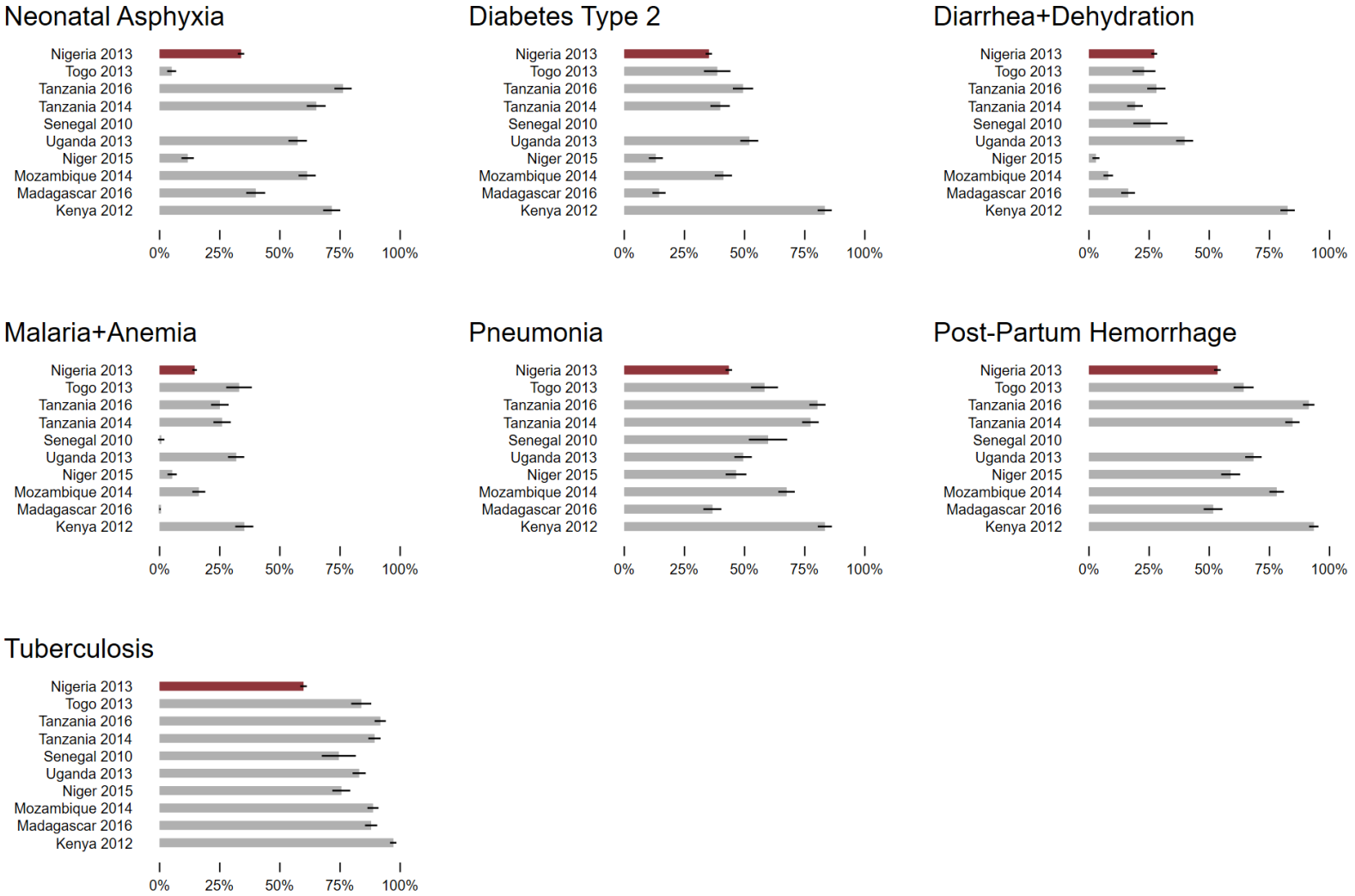


Correct diagnoses include neonatal asphyxia, diabetes type 2, diarrhea+dehydration, malaria+anemia, pneumonia, post-partum hemorrhage, tuberculosis vignettes.

Diagnostic – Treatment Linkages

Vignette-Specific Diagnosis Behavior Compared to Other Countries

Fraction Who Correctly Diagnosed Condition

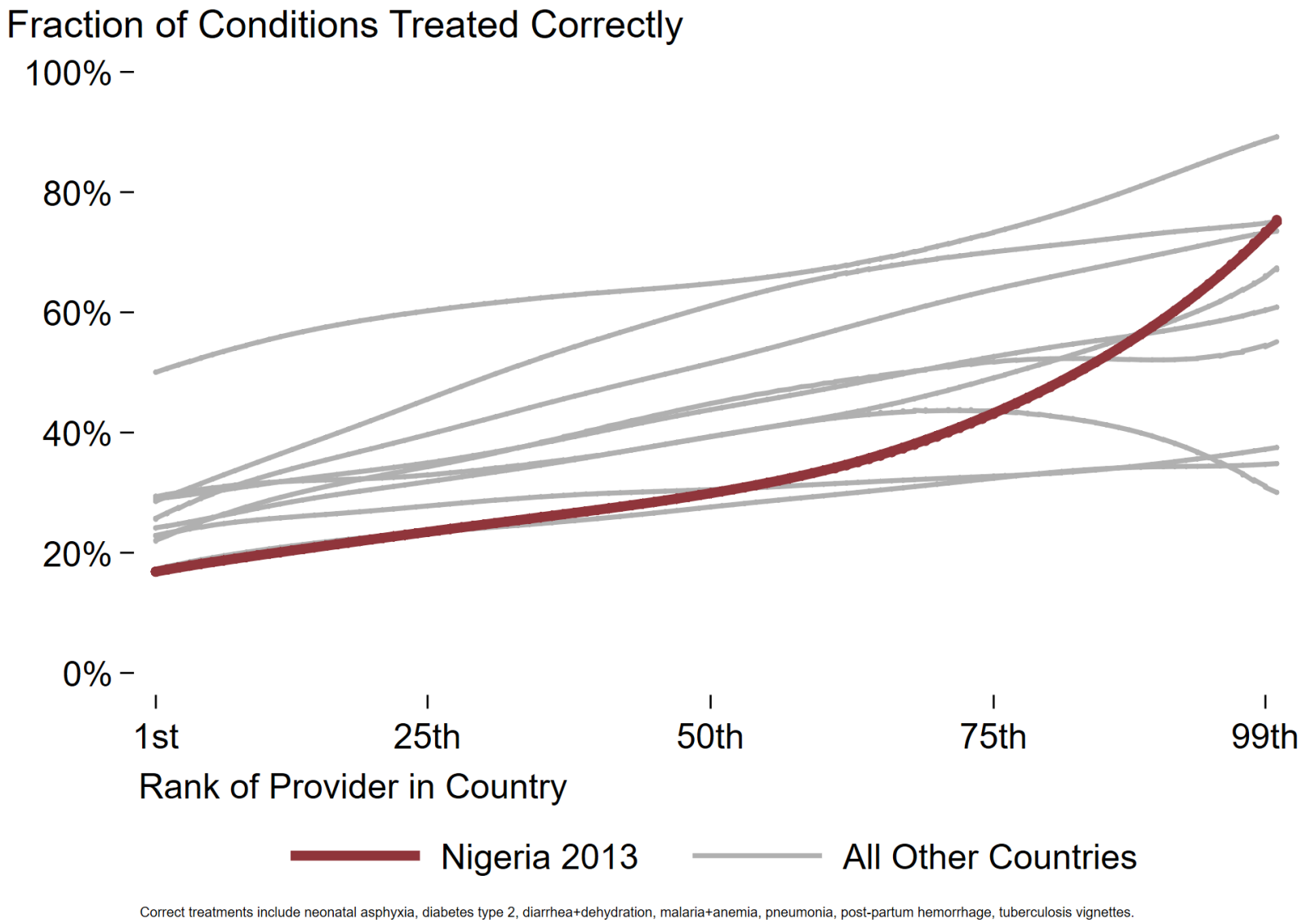


Diagnostic – Treatment Linkages

Treatment Behavior in Nigeria Compared to Other Countries

Here, one can see how a provider's ability to manage the vignette conditions correctly changes as the provider's knowledge increases.

In addition, one can see whether the difference in treatment accuracy between the best and worst provider in Nigeria is comparable to the differences observed in other countries.

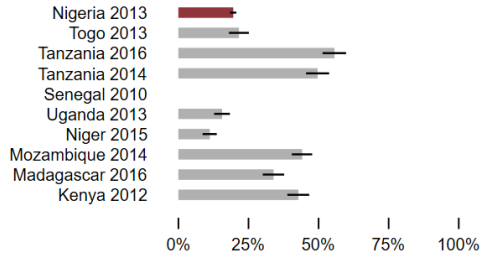


Diagnostic – Treatment Linkages

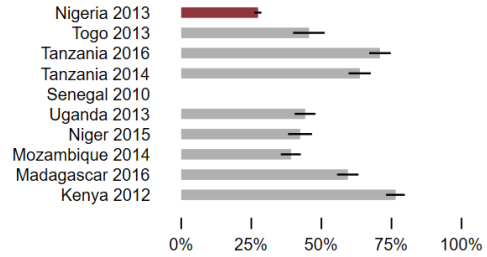
Vignette-Specific Treatment Behavior Compared to Other Countries

Fraction Who Correctly Treated Condition

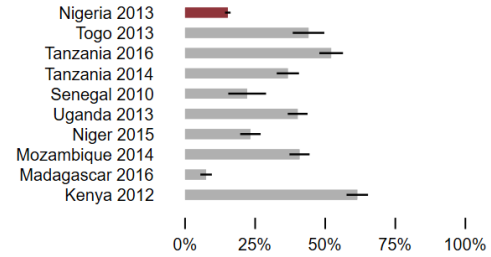
Neonatal Asphyxia



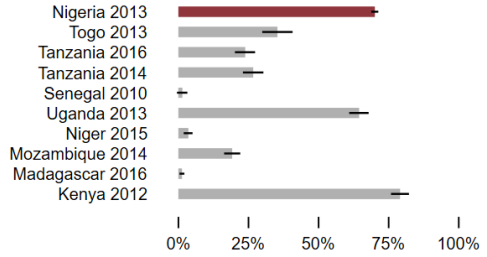
Diabetes Type 2



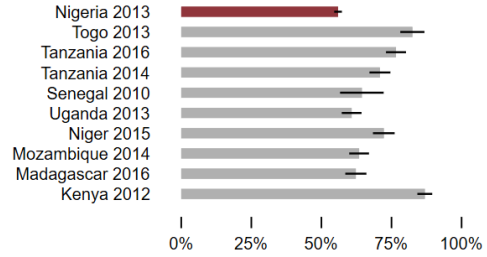
Diarrhea+Dehydration



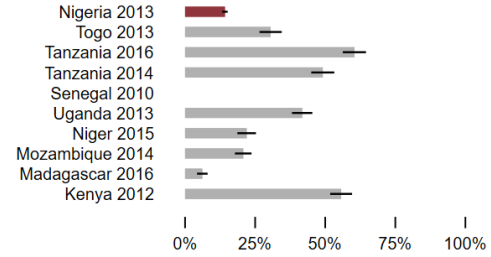
Malaria+Anemia



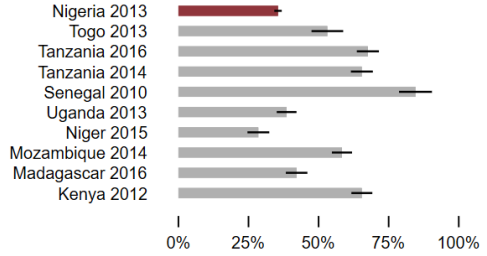
Pneumonia



Post-Partum Hemorrhage



Tuberculosis

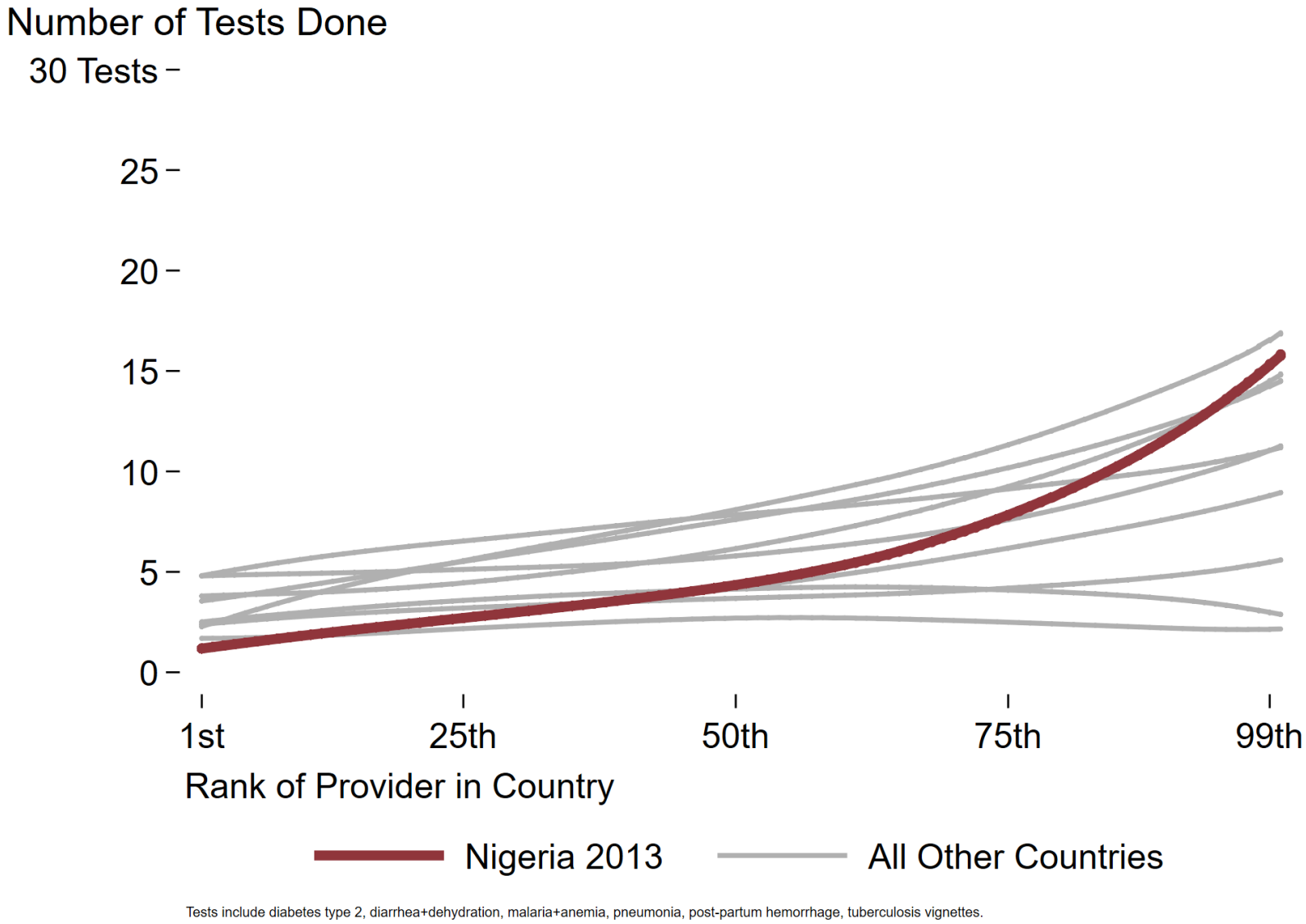


Diagnostic – Treatment Linkages

Test Ordering Behavior in Nigeria Compared to Other Countries

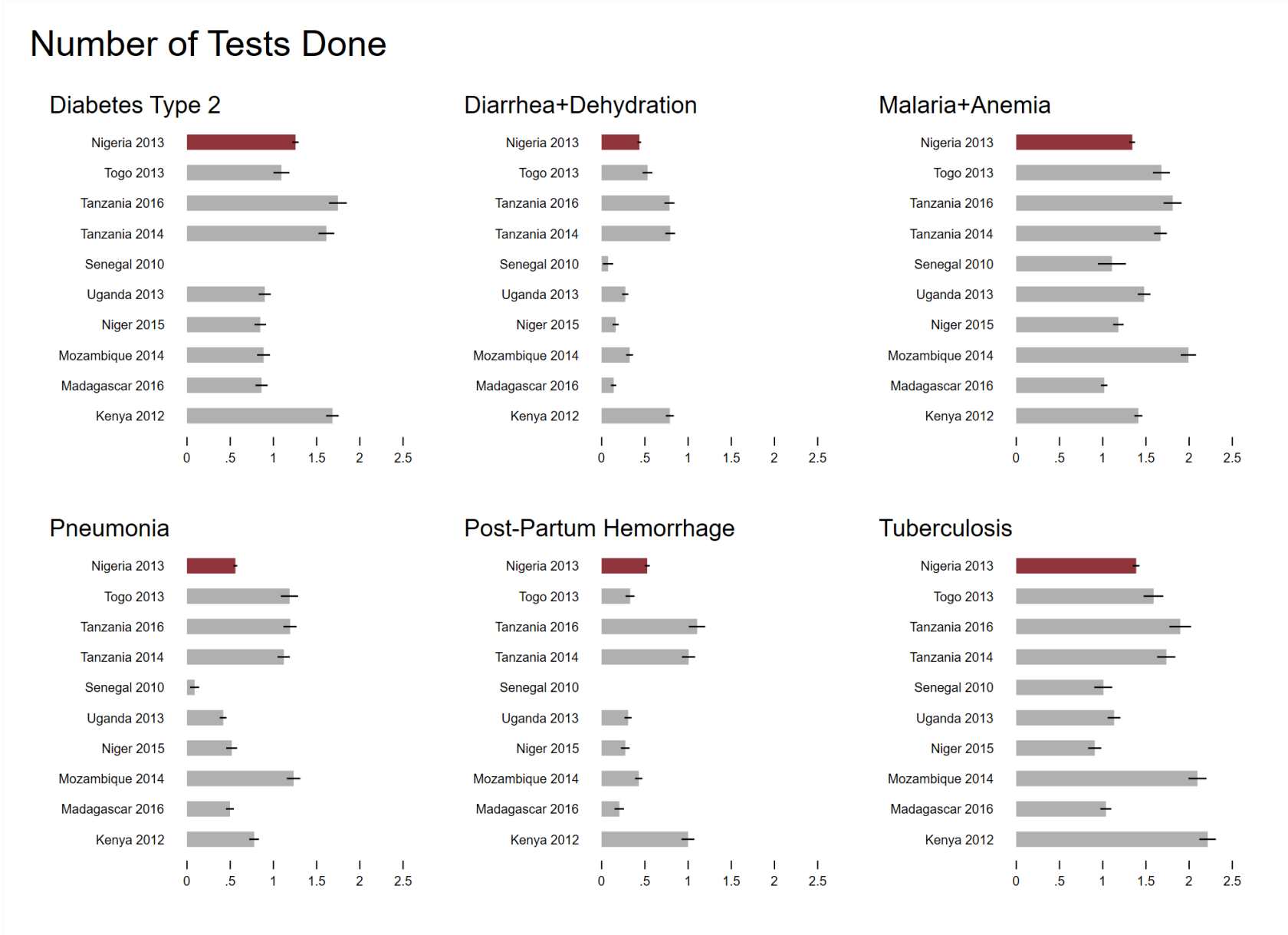
In the figure, one is able to determine the average number of tests ordered by a given provider as he or she moved from the lowest rank in the country to the highest rank.

The figure also allows one to see how providers in Nigeria compare to providers in other countries with regard to the number of tests they order, on average.



Diagnostic – Treatment Linkages

Vignette-Specific Test Ordering Behavior Compared to Other Countries

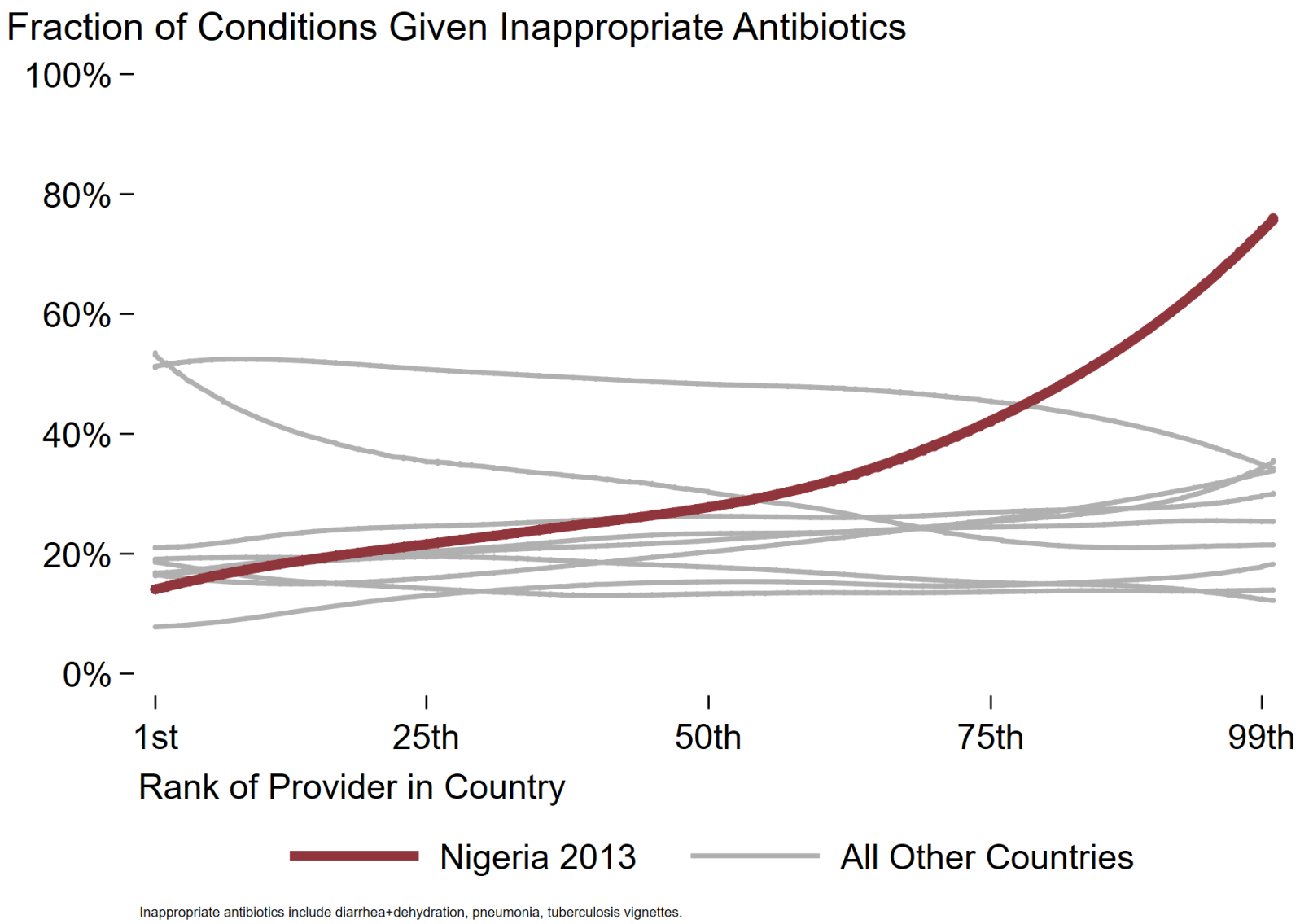


Diagnostic – Treatment Linkages

Antibiotic Prescription Behavior in Nigeria Compared to Other Countries

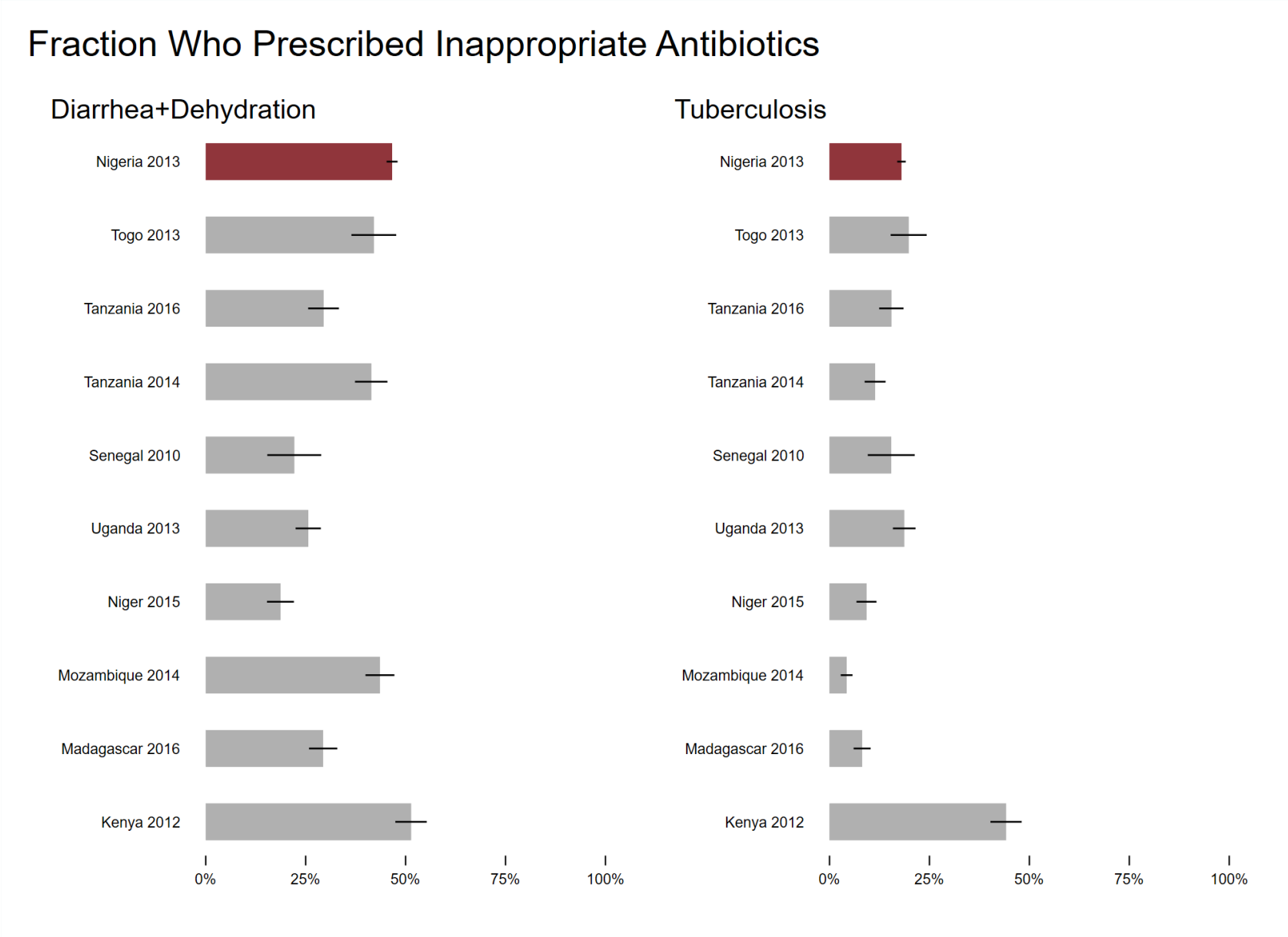
Finally, it is important to determine whether more knowledgeable providers are then more likely to prescribe unnecessary antibiotics.

In the given figure, one can address that question, and additionally compare the antibiotics prescription behavior in Nigeria to that in other countries across the knowledge spectrum.



Diagnostic – Treatment Linkages

Vignette-Specific Antibiotic Prescription Behavior Compared to Other Countries



Demographic Variation in Diagnostics & Treatment

SDI – Nigeria

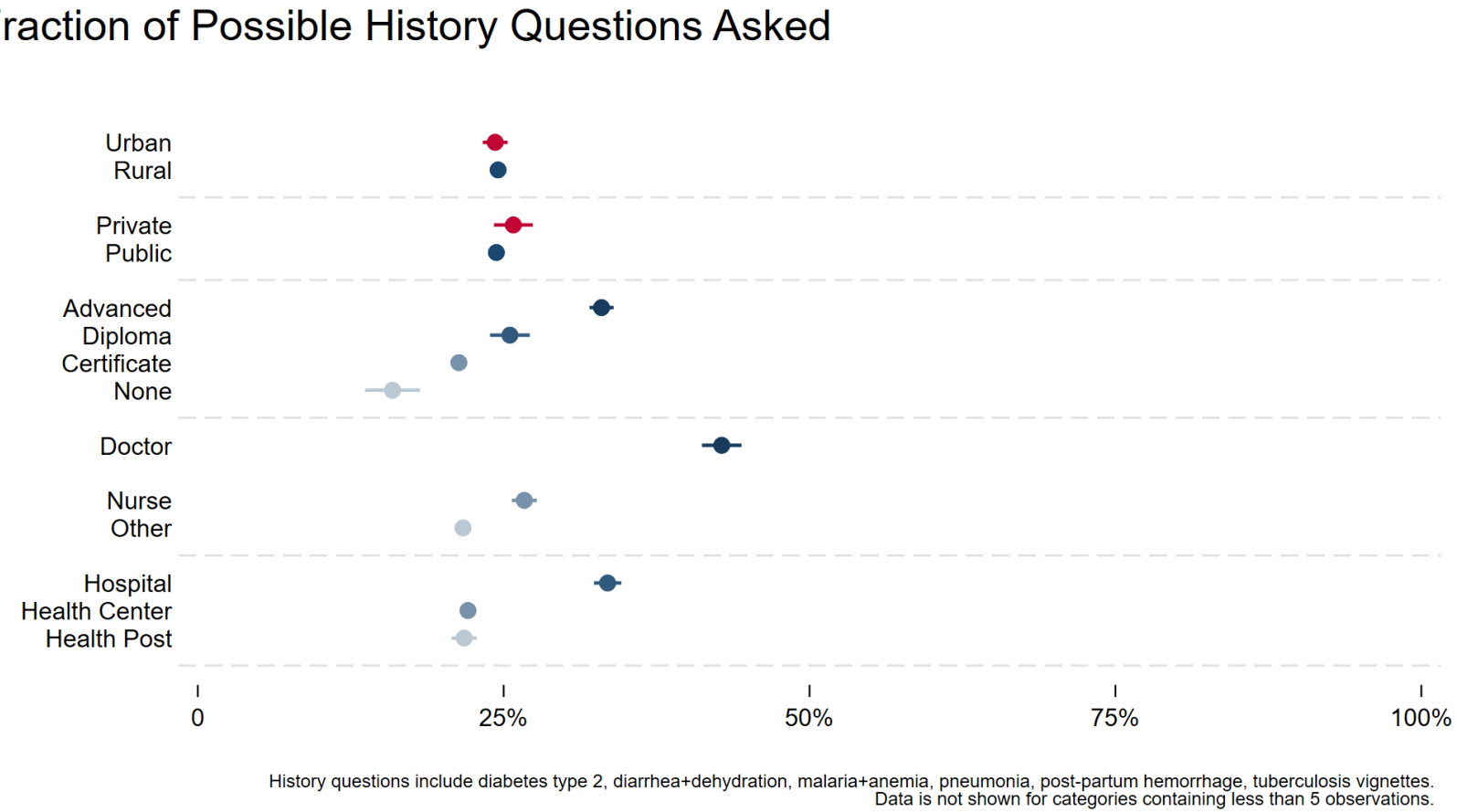
Demographic Variation

History Taking Behavior Across Different Provider Characteristics

In the figure, the variation among different groups of providers in the fraction of the history checklist completed is shown.

Thus, one can compare whether providers in one type of facility ask more or less questions. In addition, one can compare whether providers of different medical backgrounds ask more or less questions.

The mean values with a 95% confidence interval are shown.



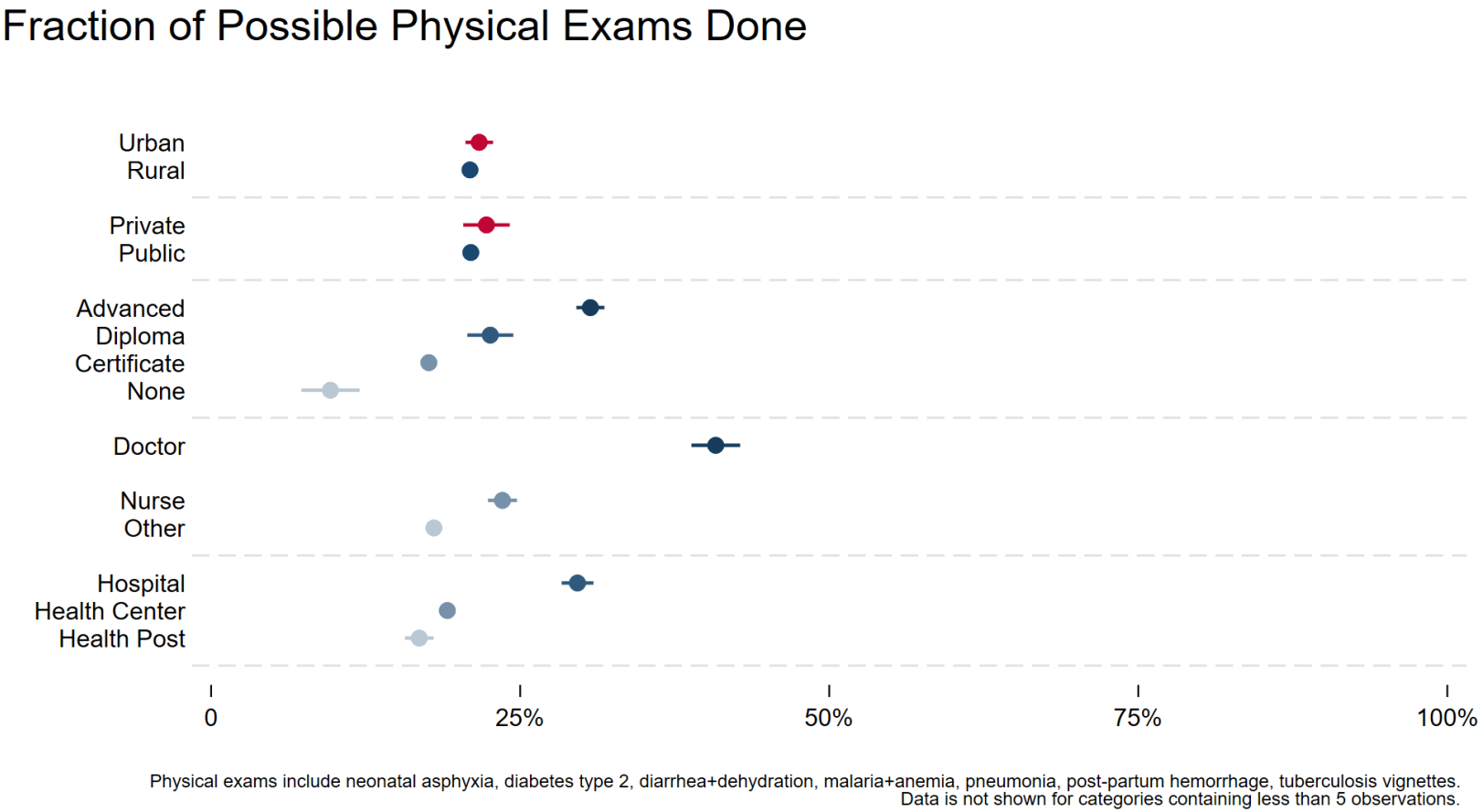
Demographic Variation

Physical Examination Behavior Across Different Provider Characteristics

Here, one can see whether providers in particular groups complete more physical examinations than others.

Specifically, providers who work in urban versus rural and public versus private are compared. In addition, providers who work in different tiers of the healthcare system are compared. Finally, providers with different medical backgrounds are compared to see if those with more training perform more exams than their less-trained colleagues.

The mean values with a 95% confidence interval are shown.



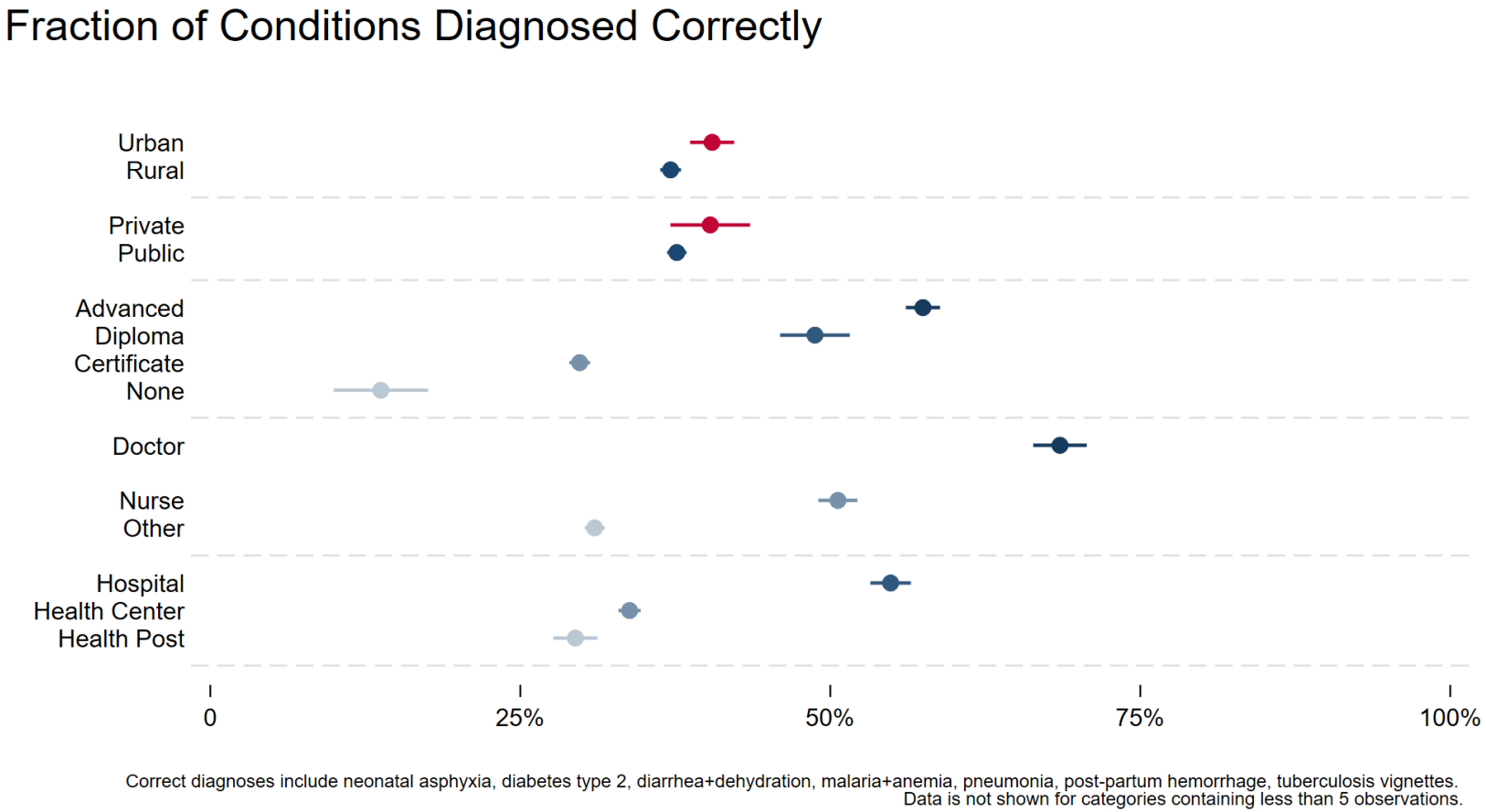
Demographic Variation

Diagnosis Behavior Across Different Provider Characteristics

Among other categorizations, the figure shows whether doctors diagnose more conditions accurately as compared to nurses.

In addition, the figure shows whether providers in urban settings are able to identify more of the vignette conditions compared to rural providers.

The mean values with a 95% confidence interval are shown.



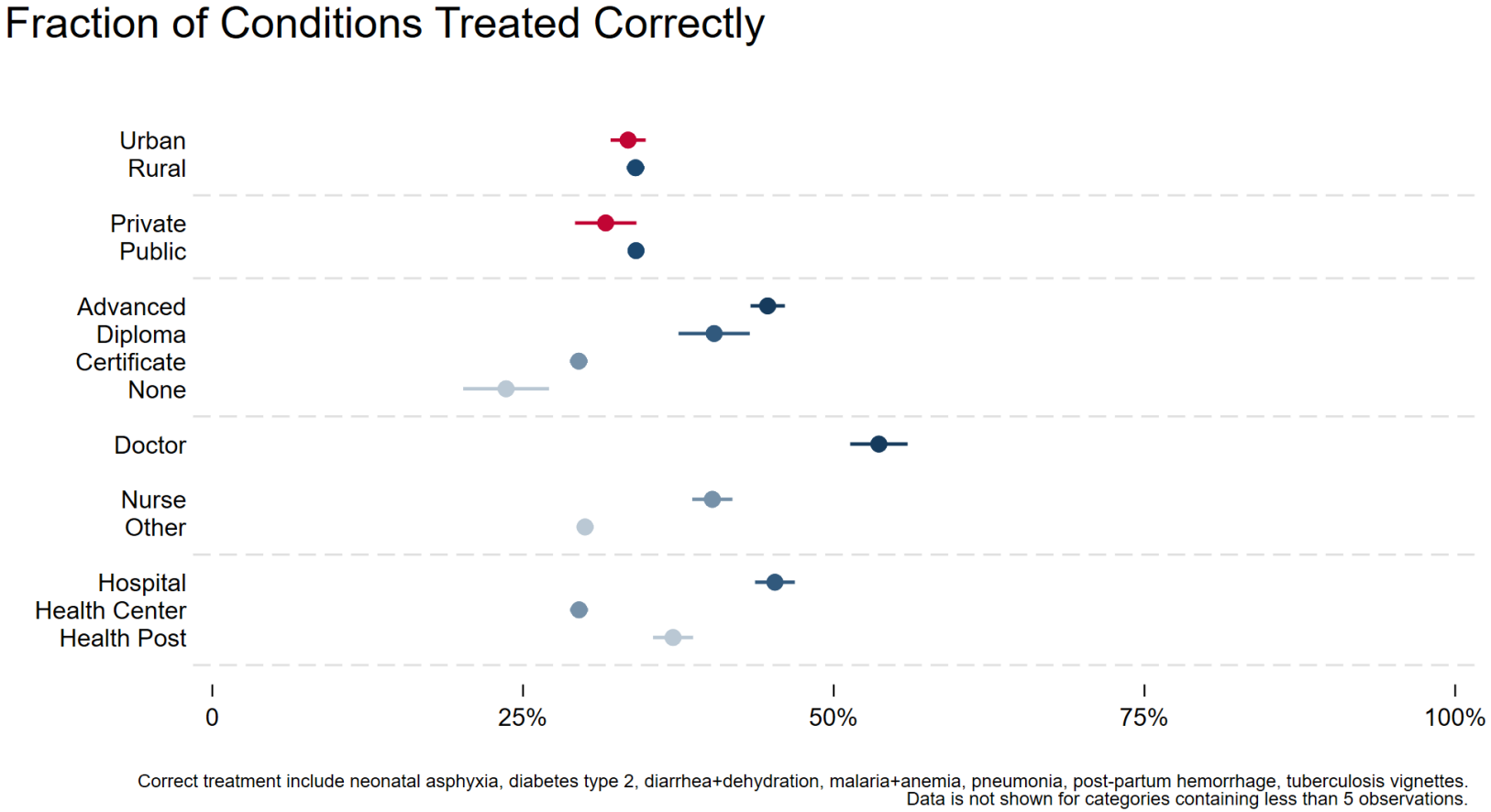
Correct diagnoses include neonatal asphyxia, diabetes type 2, diarrhea+dehydration, malaria+anemia, pneumonia, post-partum hemorrhage, tuberculosis vignettes.
Data is not shown for categories containing less than 5 observations.

Demographic Variation

Treatment Behavior Across Different Provider Characteristics

Here, one can see whether a provider's ability to correctly management the clinical conditions varies when comparing different subsets of providers: urban versus rural, doctors versus nurses, public versus private, for example.

The mean values with a 95% confidence interval are shown.



Correct treatment include neonatal asphyxia, diabetes type 2, diarrhea+dehydration, malaria+anemia, pneumonia, post-partum hemorrhage, tuberculosis vignettes.
Data is not shown for categories containing less than 5 observations.

Demographic Variation

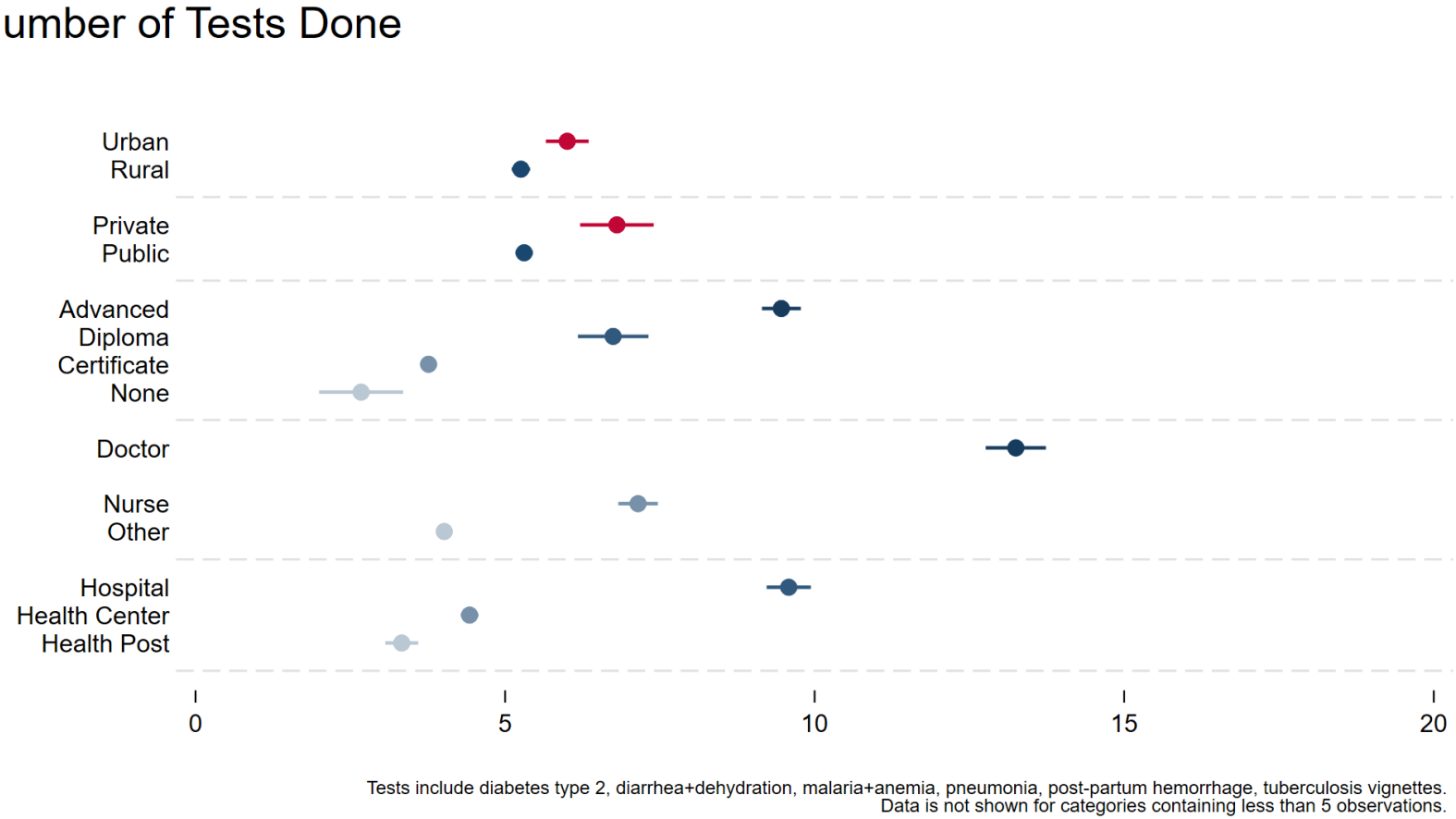
Test Ordering Behavior Across Different Provider Characteristics

In addition, we can see whether practices around ordering tests change when comparing different types of providers.

For instance, do providers who work in hospitals order more tests than those in health posts?

Or, do providers in private facilities order more tests than those in public facilities?

The mean values with a 95% confidence interval are shown.

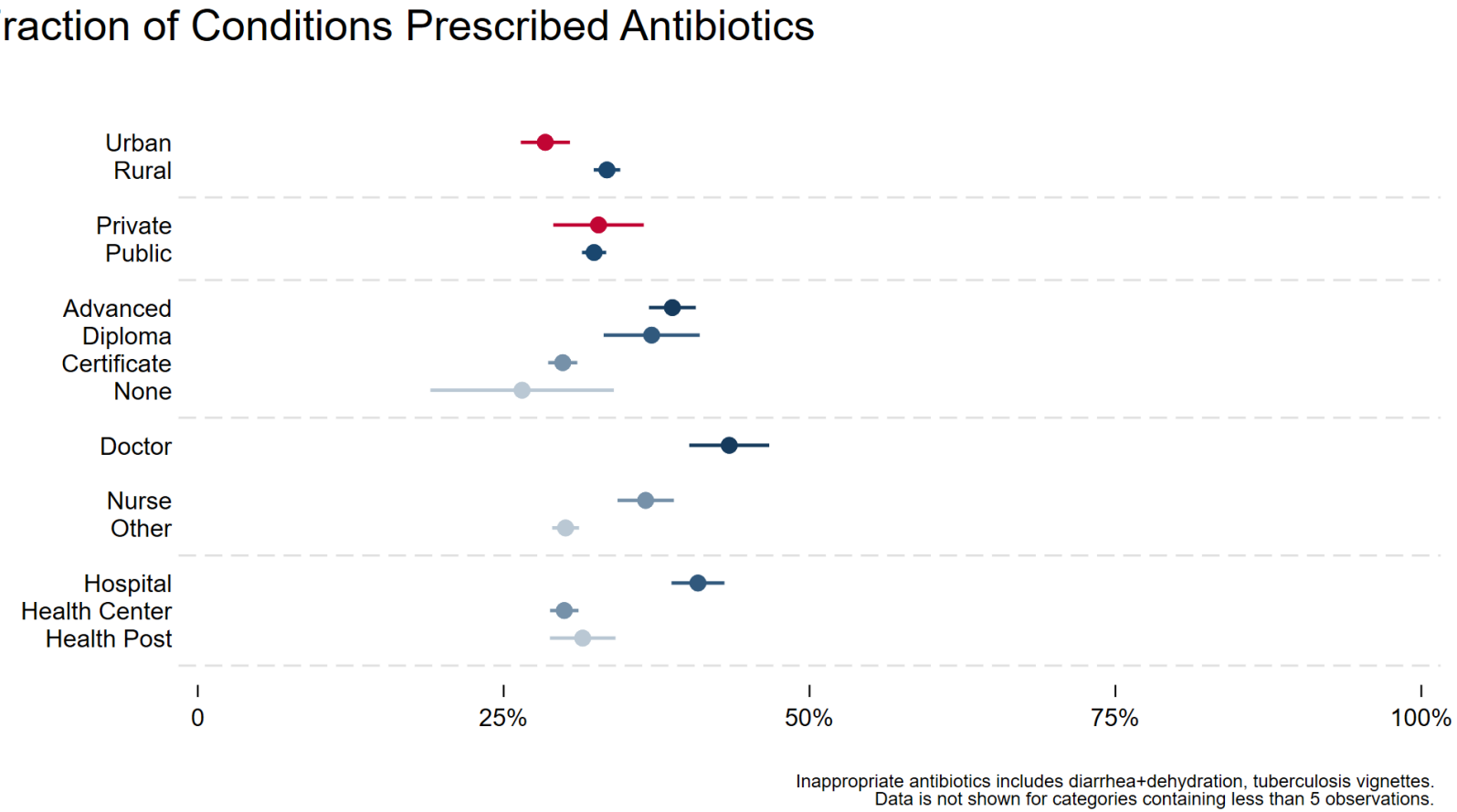


Demographic Variation

Antibiotics Prescription Behavior Across Different Provider Characteristics

Finally, we can determine whether providers with a particular set of characteristics are more likely to know when not to prescribe antibiotics.

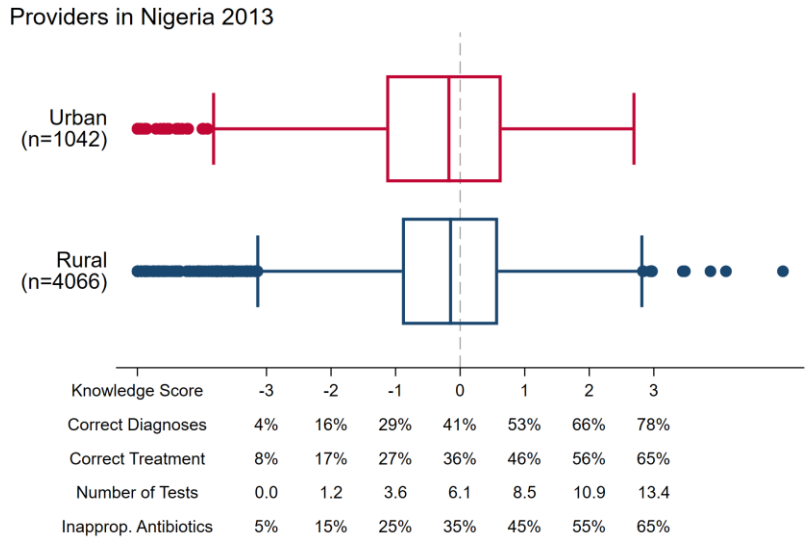
The mean values with a 95% confidence interval are shown.

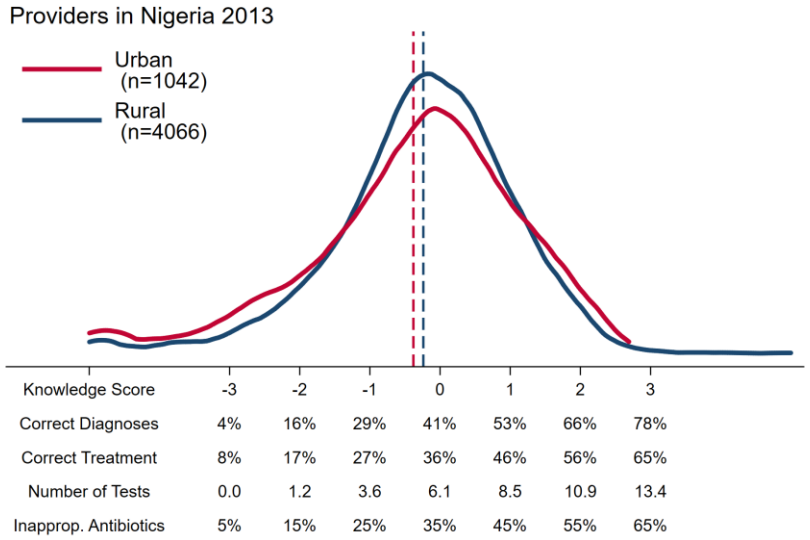


Demographic Variation

Rural vs. Urban Providers

The knowledge distribution of health care providers who work in urban facilities is compared to the knowledge distribution of health care providers who work in rural facilities.

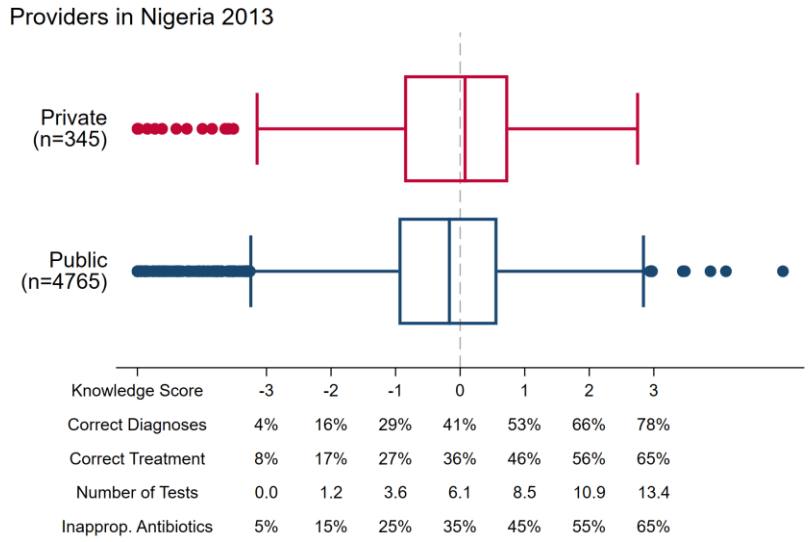


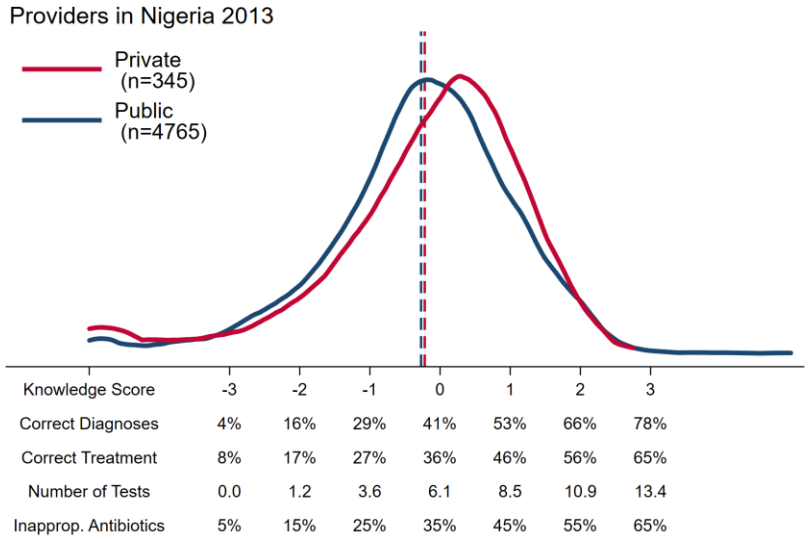


Demographic Variation

Public vs. Private Providers

In this figure, one can see how the distribution in provider knowledge for providers who work in private facilities compare to those who work in public facilities.



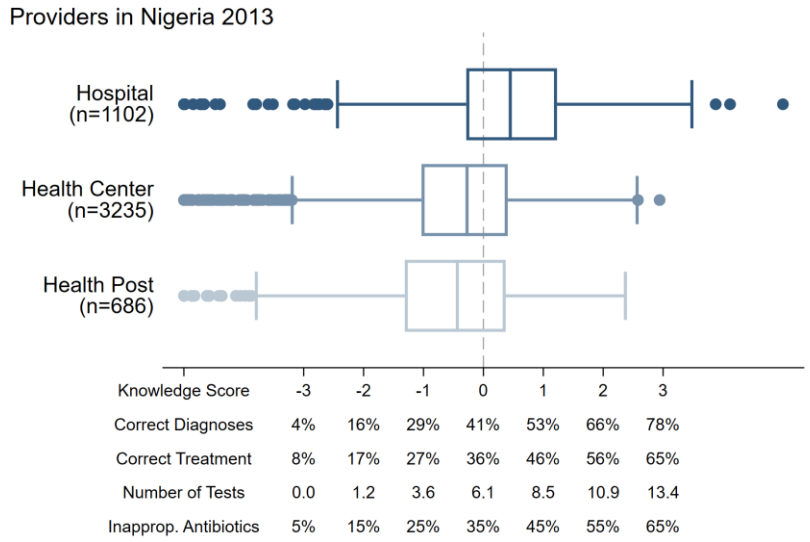


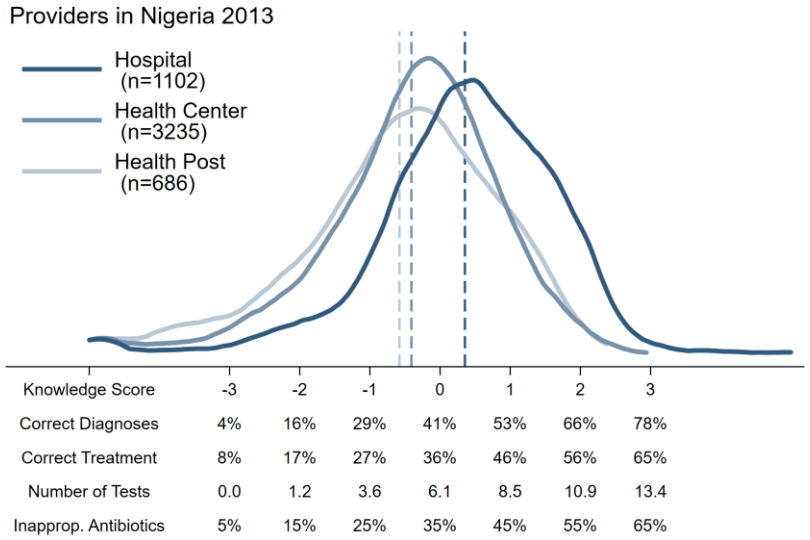
Demographic Variation

Comparing Providers at Different Facility Types

The distributions of knowledge for providers working in different tiers of the health care system are shown here.

Providers employed in hospitals tend to have a higher median knowledge score, while those in health posts have a lower median knowledge score. Providers in health posts are mainly nurses while those in hospitals span different professions.



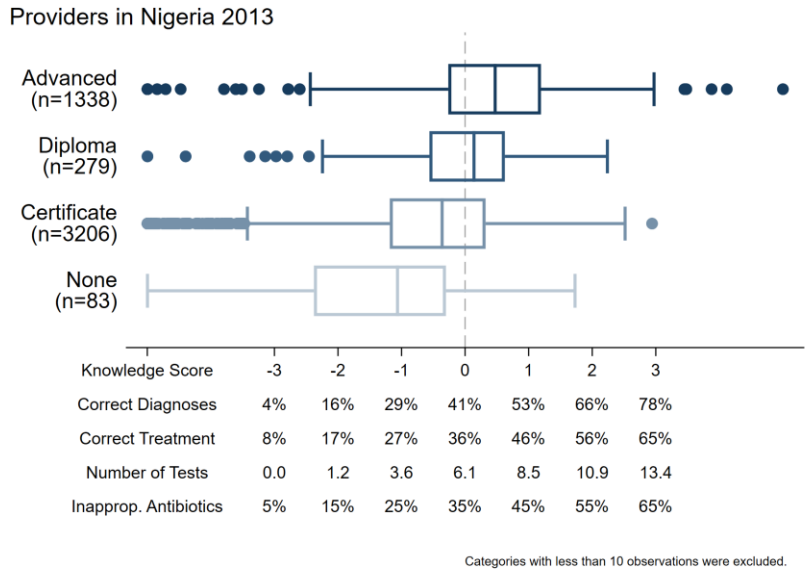


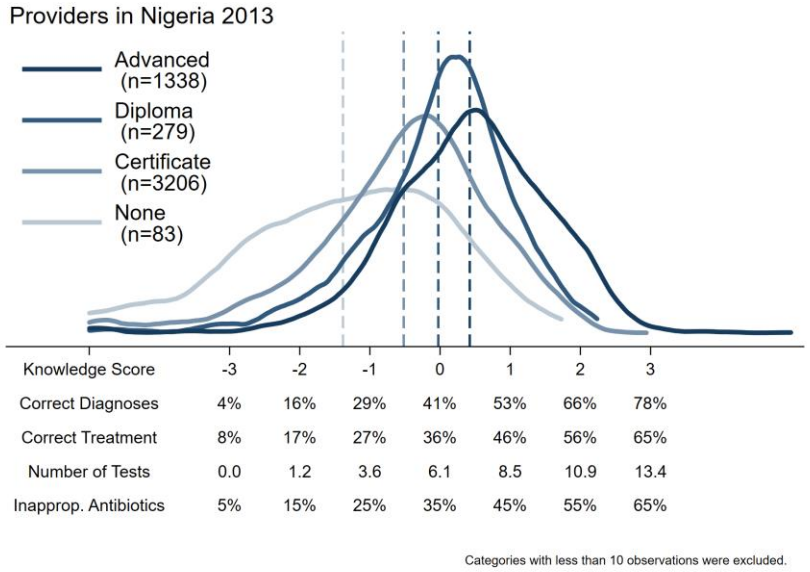
Demographic Variation

Comparing Providers of Varying Levels of Medical Education

In the figures, the distributions of provider knowledge based on different levels of medical education are shown.

Providers with advanced degrees have the highest median knowledge while those with no medical education, if surveyed, have the least medical knowledge. However, there is a wide distribution in knowledge in every category of medical education.



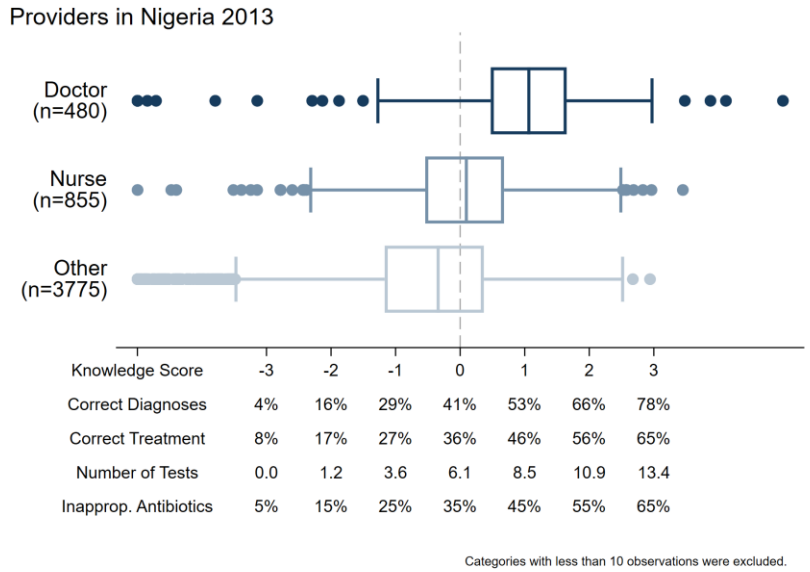


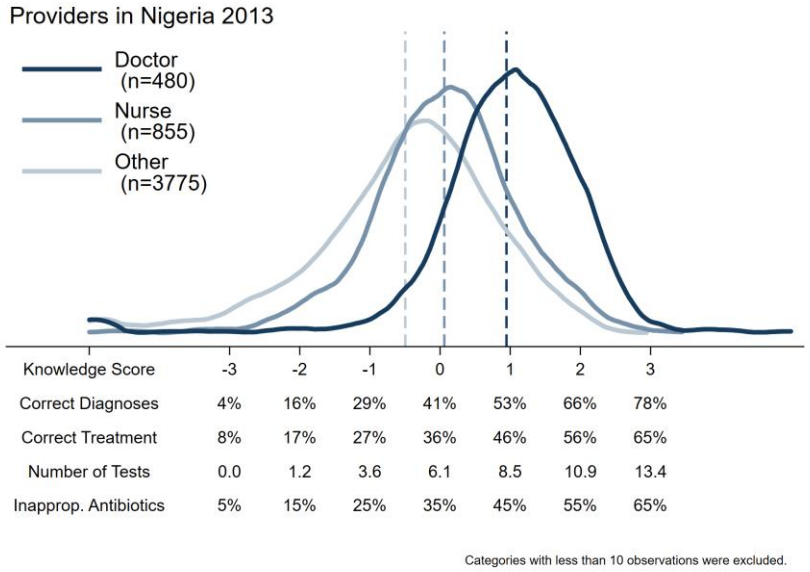
Demographic Variation

Comparing Providers of Different Professions

These figures allow one to compare the overall distribution in provider knowledge across different professional cadres.

Typically, doctors are the most knowledgeable and the “other” category, which captures nursing assistants and various other auxiliary health care workers, are the least knowledgeable.





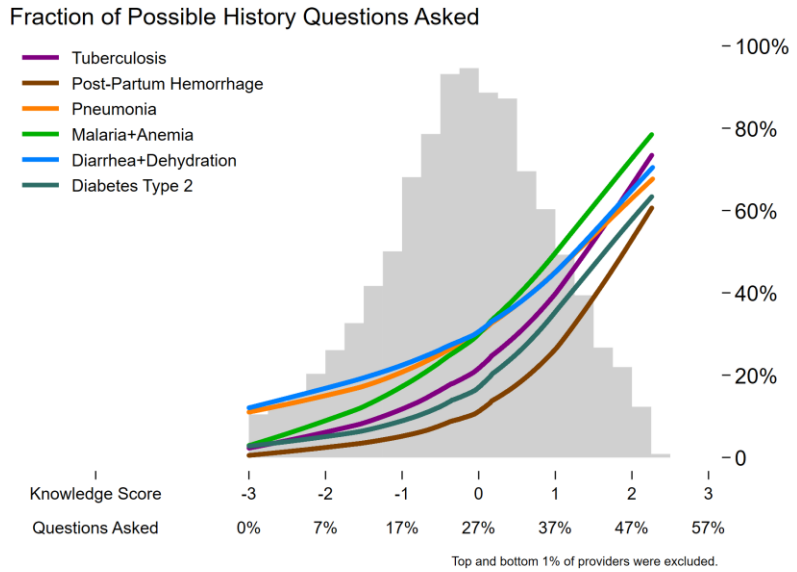
Appendix - Knowledge Score vs. Vignette-Specific Behavior

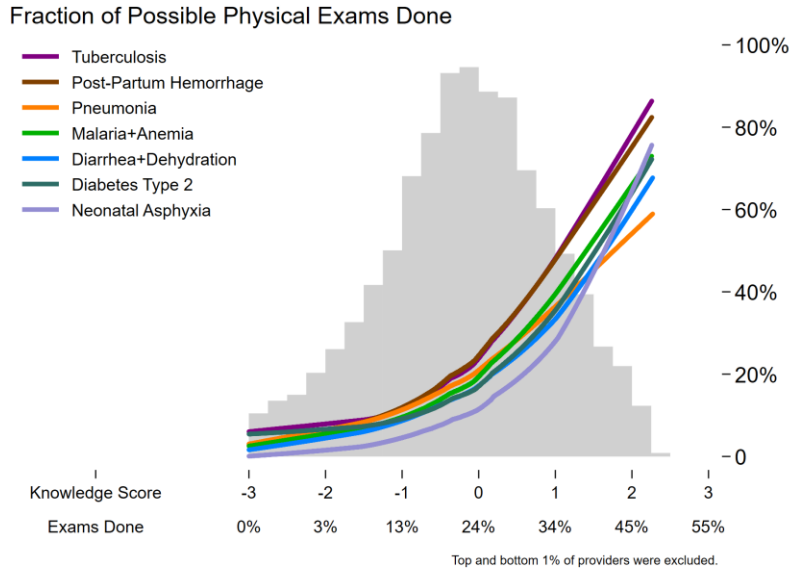
SDI – Nigeria

Diagnostic Knowledge Assessment

Vignette-Specific History Taking and Physical Examination Behavior

Here, one can see whether and how the history taking and physical examination behaviors vary over the knowledge distribution, allowing one to compare the behavior of the most and least knowledgeable provider for specific vignettes.



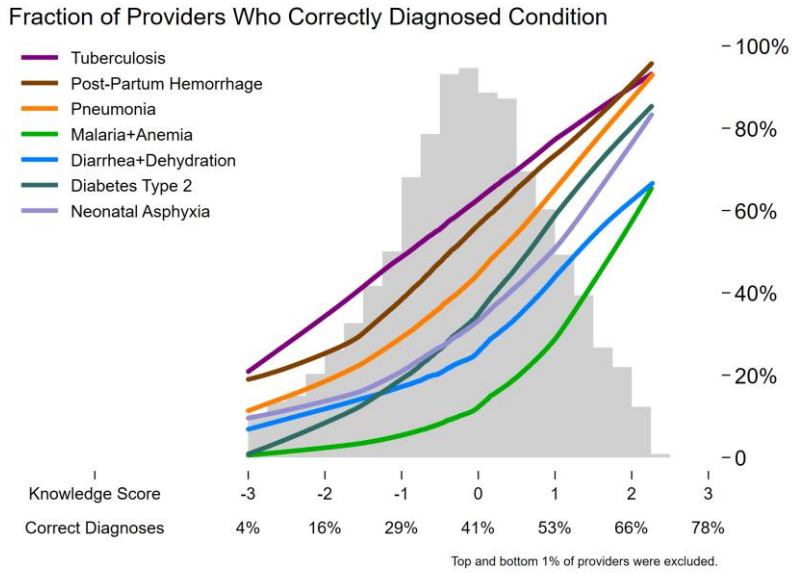


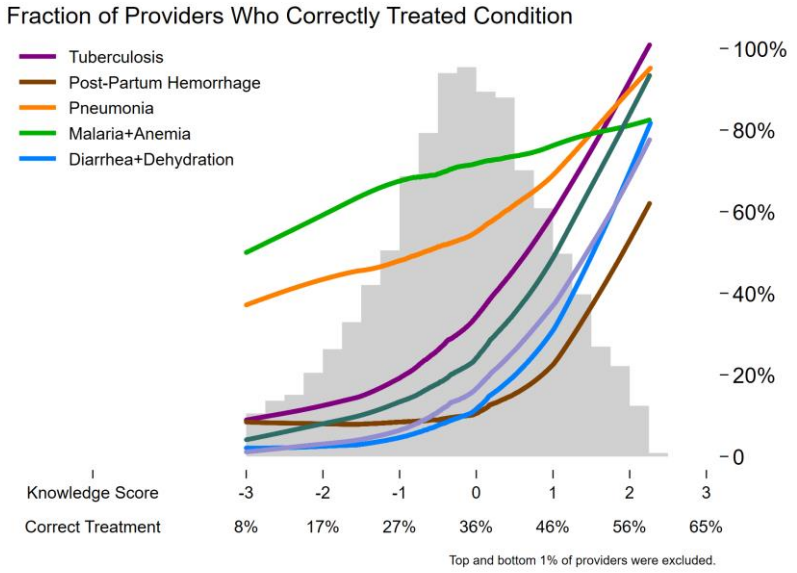
Diagnostic – Treatment Linkages

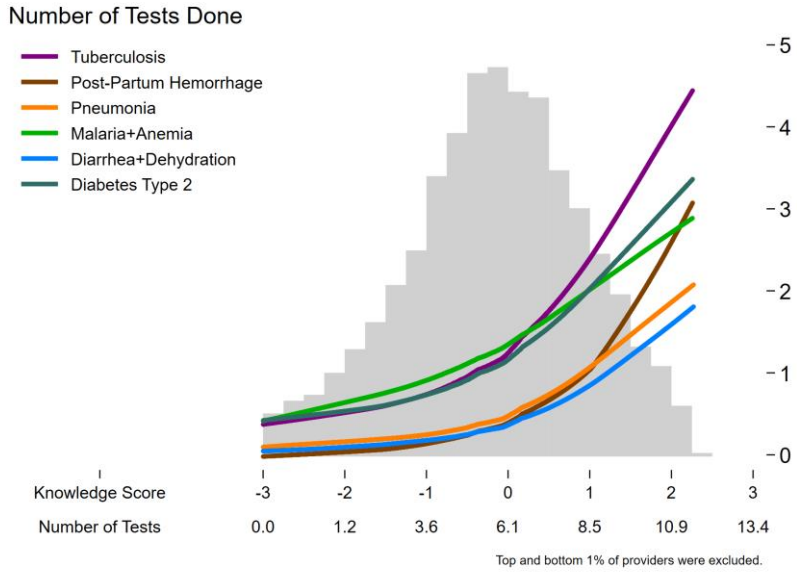
Vignette-Specific Treatment Indicators, By Knowledge Score

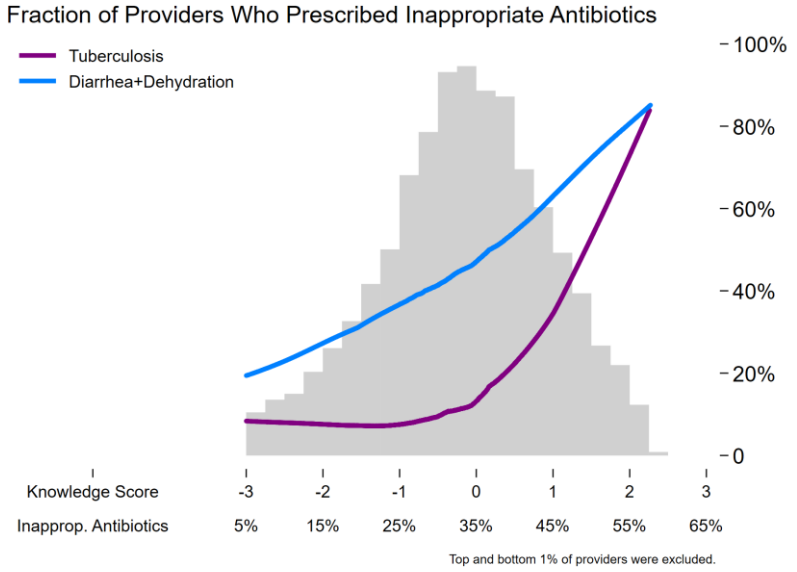
In these figures, one can look at the degree to which correct diagnosis and treatment for the different vignettes vary across the spectrum of provider knowledge.

Similarly, one can look at how the number of tests ordered for each vignette and whether inappropriate antibiotics were prescribed varies over the provider knowledge distribution.









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/.