

## Supplementary Online Content

Mohanan M, Vera-Hernández M, Das V, et al. The know-do gap in quality of health care for childhood diarrhea and pneumonia in rural India. *JAMA Pediatr*. Published online February 16, 2015. doi: 10.1001/jamapediatrics.2014.3445

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This supplementary material has been provided by the authors to give readers additional information about their work.

## **eMethods. Comparison of findings from restricted sample used in text with findings from full sample where possible.**

In our paper (The Know-Do Gap in Quality of Care for Childhood Diarrhea and Pneumonia in India), we rely on data from 340 providers for whom we have complete data for the analysis. The original sample included 396 providers from 80 study clusters. We selected the five most frequently visited providers in each cluster for inclusion in the present study. One cluster had only four providers and another had only one provider, all of whom were included.

This is primarily because our analysis of know-do gap requires us to have data on treatment provided/prescribed by the providers to the SPs. In approximately 14% of cases (from a total of 396), we do not observe this treatment when providers asked the SP to return with the child. Note that – as mentioned in the paper - while many providers asked the SP to bring the child, most of them prescribed treatments anyway: (From the paper: “Although 23.6% asked the SP to return with the child for diarrhea, 92.7% still prescribed treatment (for pneumonia, 32.7% and 79.0%, respectively”).

Using data whenever available would lead to sample sizes that are not consistent through out the paper, so we rely on a restricted sample (340) where we have complete data from both instruments (vignettes and SP). However, such a restriction raises a potential concern that the two samples might not be comparable.

In this document, we compare findings from two key sets of analyses that uses the full sample whenever possible with the findings reported in the paper to document that **none of our key findings change with using the restricted sample and it enables us to use a consistent sample through out the paper.** (eTables using the full sample are attached at the end of this document: eTable 1 and eTable 2).

Compare, for example, the following results. In each case, we report results from the full sample and then results from the restricted sample in parenthesis:

### **Comparing eTable 1 with Table 2 in article:**

- Questions asked on diarrhea & pneumonia vignettes
  - i. Fever: 20.4% with 396 providers (20% with 340 providers)
  - ii. Blood in stools: 12.8% with 396 providers (13.2% with 340)
  - iii. Worms in stools: 6.06% with 396 providers (6.2% with 340)
  - iv. Correct treatment for diarrhea, if any: 3.8% for 396 providers, 3.6% for 340.
  - v. Rapid breathing: 24.2% with 396 providers (24.1% with 340)
  - vi. Skin between ribs moving: 14.4% with 396 providers (13.8% with 340)
  - vii. Correct treatment for pneumonia, if any: 9.09% for 396 providers; 9.3% for 340 providers
- The visit length and number of medicines for SP interactions was similar for both samples: Mean visit length was 1.54 minutes (1.6 min with 340 providers) for diarrhea, and 2.73 minutes (2.9 using 340 providers). Similarly, number of medicines was 1.72 and 2.03 (1.8 and 2.2 using 340 providers).

### **Comparing eTable 2 with Table 5 in article:**

- All of the key findings from regressions in the paper remain unchanged with the restriction as well.

Provider Charc.	396 providers coeff (*, **, ***)	340 providers coeff (*, **, ***)
Public facility (diarr)	-0.116 *	-0.161 ***
Public facility (pneum)	-0.214 ***	-0.249 ***
Working hours (diarr)	-0.001*	-0.002 ***
Working hours (pneum)	-0.002**	-0.003 **
No Medical Qual (diarr)	0.050	0.060
No Medical Qual (pneum)	0.084**	-0.084 **

Since regressions in last two columns in table 5 (OR for logistic regression of harmful treatments provided), the analysis can only include 340 providers for whom we have data on treatment provided.

**eTable 1. Recreating Table 2 in text with all 396 practitioners**

<b>Diarrhea</b>	<b>Share of providers (%)</b>	<b>Pneumonia</b>	<b>Share of providers (%)</b>
<b>Questions and Examinations</b>		<b>Questions and Examinations</b>	
Does the child have fever/Is the child warm	20.45	Is it a high fever	32.32
Is the urine normal /urine color	7.32	Is the cough continuous	17.17
When did the child last urinate	6.82	Does the cough increase at night	8.84
Nature of stool	58.08	Did both fever and cough start five days ago	10.1
Frequency of stool	44.95	Does he have a runny nose/is his nose blocked	7.32
Quantity of stool	12.63	Does he have any vomiting	11.11
Blood or mucus in the stools	12.88	Has he been breathing rapidly	24.24
Worms in stools	6.06	Does his nostrils appear to be flaring when he is breathing	9.85
Foul smelling	10.61	Noticed skin between his ribs, or his/her tummy move inwards when he breathes	14.39
Does he complain of stomach ache	16.16	Any particular sounds that he made since he started having difficulty breathing	1.26
Does he cry while passing stools	6.06	Has he had breathlessness in the past	5.56
Is the child weak now	8.08	Weight of child	6.57
Vomiting	51.52	Respiration rate	5.05
Is the child drinking a lot of water - how many glasses	20.96	Auscultation of chest and heart	12.37
Is the child teething	6.82	Pulse rate	5.81
Weight of child	7.32	Temperature	19.44
Temperature	7.83	Examination of chest	10.1
Mucous membranes for moistness	4.8	Chest x-ray	8.33
Skin color and turgor	5.81	TLC	8.33
Palpation of the abdomen	7.07	WBC differential (neutrophils, basophils, eosinophils, lymphocytes and monocytes)	10.35
<b>Other questions</b>		<b>Other questions</b>	
Has expressed not to give antibiotics when s/he did	13.46	Has expressed not to give antibiotics when s/he did	0.9
<b>Diagnosis</b>		<b>Diagnosis</b>	
Gave any diagnosis	98.74	Gave any diagnosis	97.22
Correct diagnosis	73.23	Correct diagnosis	57.07
Correct diagnosis, if any	74.17	Correct diagnosis, if any	58.7
<b>Treatment</b>		<b>Treatment</b>	
Gave any treatment	98.99	Gave any treatment	94.44
Correct treatment	3.79	Correct treatment	8.59
Correct Treatment, if any	3.83	Correct Treatment, if any	9.09
Source: Vignette survey. Observations: 396			

Indicates fraction of providers who asked or performed key diagnostic questions and examinations, diagnosis and treatment - vignette

**eTable 2. Recreating Table 5 in text with all 396 practitioners**

Variables	Diarrhea		Pneumonia	
Age [20,29]	0.078	0.064	-0.099**	-0.091*
	(0.061)	(0.054)	(0.045)	(0.046)
Age [40,49]	-0.010	-0.012	0.021	0.016
	(0.036)	(0.035)	(0.034)	(0.034)
Age [50,59]	-0.009	-0.015	0.044	0.034
	(0.047)	(0.047)	(0.051)	(0.057)
Age [60+]	0.053	0.037	0.119*	0.076
	(0.074)	(0.076)	(0.061)	(0.072)
Experience	0.000	0.000	-0.004**	-0.004*
	(0.002)	(0.002)	(0.002)	(0.002)
Medical Qualification	0.028	0.050	-0.089**	-0.084**
	(0.033)	(0.035)	(0.036)	(0.036)
Working hours		-0.001*		-0.002**
		(0.001)		(0.001)
Avg. patient caseload		-0.002*		0.000
		(0.001)		(0.002)
Run camps		-0.010		0.039
		(0.059)		(0.053)
Public Health facility		-0.116*		-0.214***
		(0.060)		(0.039)
Clinic's level of cleanliness		-0.013		0.054**
		(0.021)		(0.021)
Knowledge Score		0.016**		0.010
		(0.007)		(0.008)
Observations	191	185	179	171
R2	0.049	0.122	0.118	0.195
<p><b>Indicates regression analysis of provider characteristics on percentage of diagnostic questions.</b>  <b>Notes:</b> Experience variable accounts for the years of experience of the provider as a medical practitioner. Medically Qualified providers include those with any formal medical degree (MBBS, BAMS, BUMS, BHMS degrees as well as Diploma in Ayurvedic and some others MD degrees). Working hours is the total number of hours the provider works in the facility in a week. Average patient caseload is the average of the number of patients the providers report to attend in a day in winter, summer and post-monsoon period. Knowledge score is based on providers' responses to 12 key questions listed in eTable 1. Estimations adjusted by the time and day of the week of the consultation. Sources: SPP Exit Interview, Vignette and Provider Questionnaire. Observations: 396.</p>				

**eTable 3. List of questions that are common in the standardized patients (SPs) and vignettes**

	Question in SP	Question(s) in Vignettes
<b>Panel A: Diarrhea</b>		
1	Qualities of stool	Nature of stool
		Blood/mucus in the stools
		Worms in stools
		Foul smelling
2	Frequency	Frequency of stool
3	Quantity of stool	Quantity of stool
4	Questions about urination	Is the urine normal/urine color?
		When did the child last urinate?
5	Is the child active/playful?	Is the child weak now?
6	Fever	Does the child have fever? Is the child? warm
7	Abdominal pain	Does he complain of stomach ache?
8	Vomiting	Vomiting?
9	Source of drinking water? Boiling water? From tap? How is it stored?	Where do you get your drinking water from?
		Do you boil drinking water?
10	What has the child eaten?	What are his feeding habits?
		Is the child eating normally?
11	Taking fluids	Is the child drinking a lot of water? How many glasses of water does he drink?
12	Physical Environment	Do you have a toilet in your house or do you go to the fields?
		Is your house a pucca or kachha house?
		Does the child eat mud or does the child play in the mud?
<b>Panel B: Pneumonia</b>		
1	Fever	Is it a high fever?
		Did both fever and cough start five days ago?
2	Breathing is rapid	Has he been breathing rapidly?
3	Difficulty in breathing/nostrils flaring/skin between ribs moves inwards/neck muscles are strained	Does his nostrils appear to be flaring when he is breathing?
		Have you noticed if skin between his ribs, or his/her tummy move inwards when he breathes?
		Have you noticed if his neck muscles are straining or standing out more
		You mentioned he had difficulty in breathing has that been getting progressively worse over the past 5 days?
4	Type of cough	Is the cough continuous?
		Does the cough increase at night?
5	Runny nose or nose blocked	Does he have a runny nose or is his nose blocked?
6	Sounds while breathing	Any particular sounds that he made since he started having difficulty breathing?
7	Change in color of fingernails, hand, toes	Did you notice if his fingernails, hands or toes changed color?
8	Child is weak	Is the child weak now?
9	Breastfeeding/immunization history	Has he had breathlessness in the past?
		How long was he breastfed?
		Was he fully immunized. Did he get his mmr vaccine?
10	History of asthma/allergies	Does he have any allergies?
		Does anyone in your family suffer from asthma?
11	Have a chula at home	Do you have a chula at home?
12	Other children have similar fever/cough	Did the children he plays with have similar fever and cough?
Source: SSP Exit Interview and Vignettes Survey. Observation: 178 for diarrhea case and 162 for Pneumonia.		

**eTable 4. Practitioner characteristics and percentage of diagnostic questions asked (vignettes)**

	Estimated effect (95% CI) <sup>a</sup>	p value		Estimated effect (95% CI) <sup>a</sup>	p value
<b>Panel A: Diarrhea</b>					
Age [20,29]	0.032 (-0.059,0.124)	0.487		0.046 (-0.005,0.098)	0.079
Age [40,49]	-0.003 (-0.068,0.061)	0.922		-0.002 (-0.037,0.033)	0.908
Age [50,59]	-0.048 (-0.121,0.025)	0.194		-0.017 (-0.065,0.031)	0.478
Age [60+]	-0.096 (-0.193,0.002)	0.055		-0.051 (-0.116,0.015)	0.129
Experience	0.001 (-0.003,0.004)	0.739		0.001 (-0.001,0.004)	0.202
Medical Qualification	0.007 (-0.029,0.043)	0.684		-0.020 (-0.048,0.008)	0.151
Working hours				0.001 (-0.000,0.001)	0.152
Avg. patient caseload				0.002 (0.000,0.003)	0.018
Run camps				-0.017 (-0.059,0.025)	0.413
Public Health facility				-0.014 (-0.084,0.055)	0.686
Clinic's level of cleanliness				0.022 (0.000,0.045)	0.049
Knowledge Score				0.105 (0.094,0.115)	0.000
<b>Panel B: Pneumonia</b>					
Age [20,29]	-0.130 (-0.184,-0.076)	0.000		0.006 (-0.026,0.039)	0.704
Age [40,49]	0.004 (-0.060,0.069)	0.897		-0.011 (-0.046,0.024)	0.531
Age [50,59]	0.024 (-0.086,0.133)	0.669		0.003 (-0.052,0.058)	0.925
Age [60+]	-0.013 (-0.124,0.098)	0.815		-0.016 (-0.078,0.045)	0.599
Experience	-0.002 (-0.005,0.002)	0.391		0.000 (-0.002,0.002)	0.929
Medical Qualification	0.023 (-0.034,0.080)	0.417		0.011 (-0.019,0.041)	0.461
Working hours				0.000 (-0.001,0.001)	0.579
Avg. patient caseload				0.000 (-0.002,0.002)	0.971
Run camps				-0.032 (-0.087,0.023)	0.247
Public Health facility				0.094 (-0.015,0.203)	0.089
Clinic's level of cleanliness				0.006 (-0.018,0.029)	0.633
Knowledge Score				0.125 (0.113,0.137)	0.000
<p><b>Notes:</b> Experience variable accounts for the years of experience of the provider as a medical practitioner. Medically Qualified providers include those with any formal medical degree (MBBS, BAMS, BUMS, BHMS degrees as well as Diploma in Ayurvedic and some others MD degrees). Working hours is the total number of hours the provider works in the facility in a week. Average patient caseload is the average of the number of patients the providers report to attend in a day in winter, summer and post- monsoon period. Knowledge score is based on providers' responses to 12 key questions listed in eTable 1.</p> <p><sup>a</sup> Adjusted for the time and day of the week of the consultation.</p> <p>Sources: SPP Exit Interview, Vignette and Provider Questionnaire.</p>					

**eTable 5. Fractional logit of practitioner characteristics on percentage of diagnostic questions asked (standardized patient)**

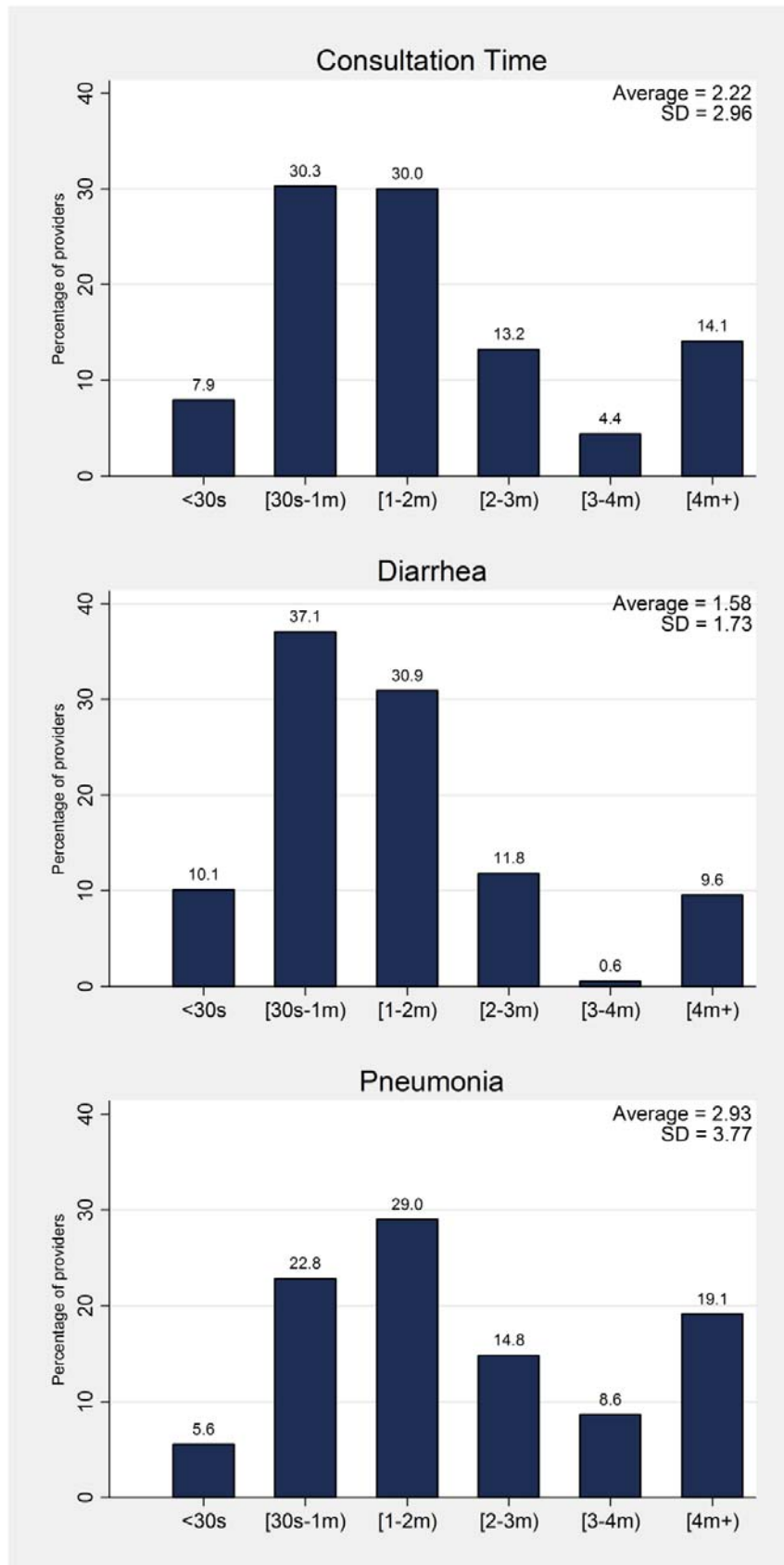
	Marginal effects (95% CI)†	p value		Marginal effects (95% CI)†	p value
<b>Panel A: Diarrhea</b>					
Age [20,29]	0.076 (-0.052,0.205)	0.245		0.060 (-0.046,0.166)	0.266
Age [40,49]	-0.008 (-0.087,0.071)	0.844		0.003 (-0.067,0.074)	0.929
Age [50,59]	-0.011 (-0.103,0.081)	0.814		-0.013 (-0.095,0.069)	0.760
Age [60+]	0.078 (-0.082,0.238)	0.340		0.056 (-0.092,0.204)	0.457
Experience	-0.000 (-0.004,0.004)	0.920		0.000 (-0.003,0.004)	0.839
Medical Qualification	0.041 (-0.027,0.109)	0.238		0.063 (-0.010,0.135)	0.090
Working hours				-0.002 (-0.004,-0.001)	0.001
Avg. patient caseload				-0.002 (-0.005,0.001)	0.124
Run camps				0.038 (-0.083,0.158)	0.540
Public Health facility				-0.131 (-0.190,-0.072)	0.000
Clinic's level of cleanliness				-0.011 (-0.053,0.031)	0.594
Knowledge Score				0.034 (0.012,0.056)	0.003
<b>Panel B: Pneumonia</b>					
Age [20,29]	-0.104 (-0.175,-0.033)	0.004		-0.101 (-0.178,-0.025)	0.010
Age [40,49]	-0.005 (-0.076,0.065)	0.881		0.004 (-0.068,0.076)	0.910
Age [50,59]	0.031 (-0.070,0.131)	0.549		0.040 (-0.071,0.151)	0.481
Age [60+]	0.104 (-0.023,0.231)	0.107		0.077 (-0.069,0.223)	0.303
Experience	-0.004 (-0.008,-0.000)	0.030		-0.004 (-0.008,-0.000)	0.047
Medical Qualification	-0.094 (-0.167,-0.021)	0.012		-0.085 (-0.153,-0.017)	0.015
Working hours				-0.003 (-0.005,-0.001)	0.007
Avg. patient caseload				0.000 (-0.004,0.004)	0.984
Run camps				0.015 (-0.083,0.113)	0.758
Public Health facility				-0.219 (-0.261,-0.176)	0.000
Clinic's level of cleanliness				0.052 (0.008,0.096)	0.021
Knowledge Score				0.007 (-0.020,0.034)	0.625
<p><b>Notes:</b> Experience variable accounts for the years of experience of the provider as a medical practitioner. Medically Qualified providers include those with any formal medical degree (MBBS, BAMS, BUMS, BHMS degrees as well as Diploma in Ayurvedic and some others MD degrees). Working hours is the total number of hours the provider works in the facility in a week. Average patient caseload is the average of the number of patients the providers report to attend in a day in winter, summer and post- monsoon period. Knowledge score is based on providers' responses to 12 key questions listed in eTable 1. †Adjusted for the time and day of the week of the consultation. Sources: SPP Exit Interview, Vignette and Provider Questionnaire.</p>					

**eTable 6. Knowledge score and practitioner characteristics on item response theory (IRT) performance score**

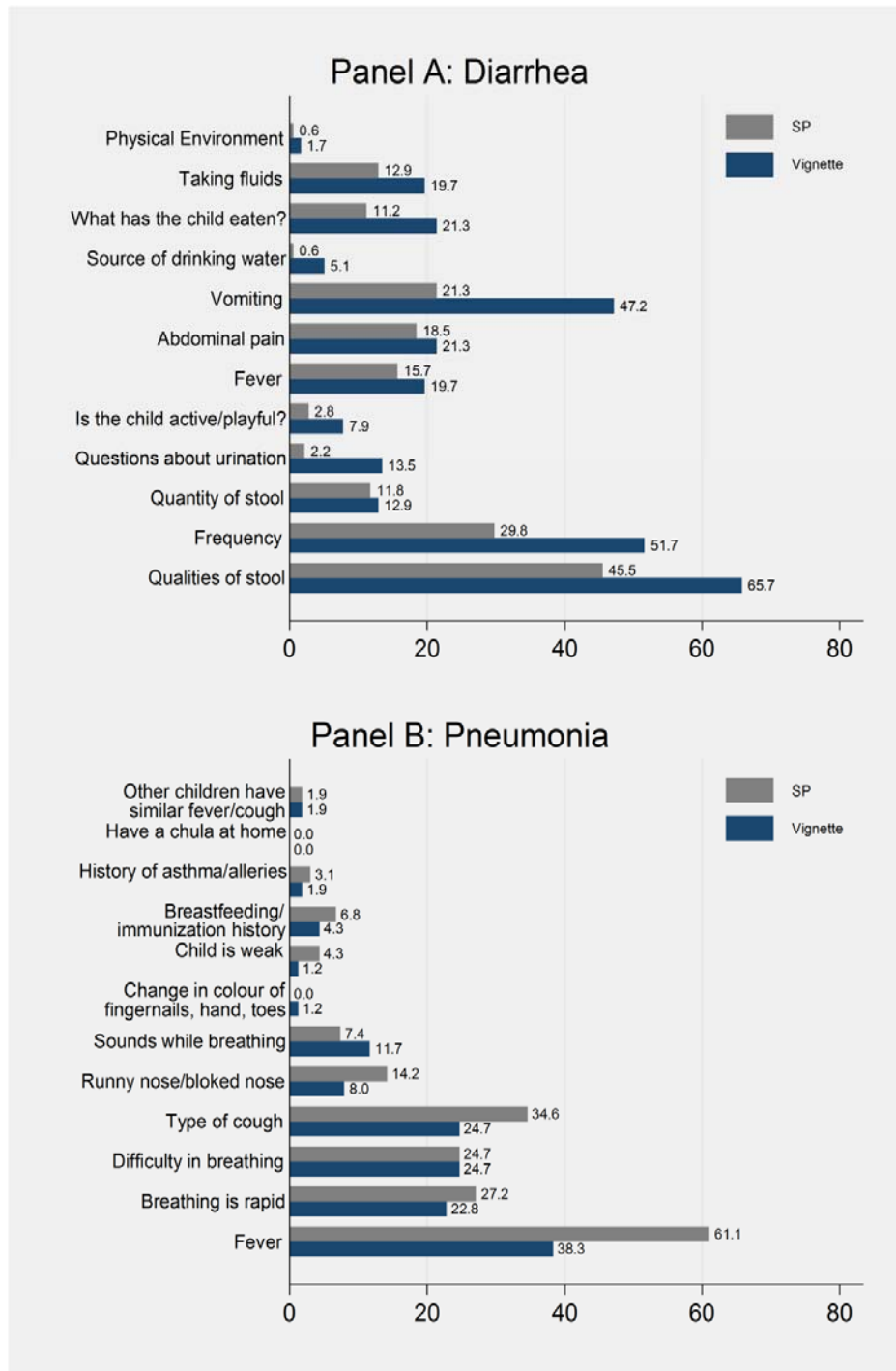
	Estimated effect (95% CI)†	p value	Estimated effect (95% CI)†	p value
<b>Panel A: Diarrhea</b>				
Age [20,29]	0.483 (-0.118,1.084)	0.114	0.399 (-0.189,0.987)	0.181
Age [40,49]	0.133 (-0.343,0.608)	0.580	0.152 (-0.292,0.595)	0.498
Age [50,59]	0.175 (-0.378,0.728)	0.530	0.127 (-0.426,0.679)	0.649
Age [60+]	0.490 (-0.252,1.233)	0.192	0.313 (-0.419,1.045)	0.397
Experience	-0.007 (-0.028,0.014)	0.508	-0.003 (-0.024,0.018)	0.767
Medical Qualification	0.226 (-0.148,0.601)	0.233	0.327 (-0.106,0.759)	0.137
Working hours			-0.012 (-0.021,-0.004)	0.004
Avg. patient caseload			-0.019 (-0.036,-0.002)	0.030
Run camps			0.229 (-0.461,0.920)	0.510
Public Health facility			-0.601 (-1.467,0.265)	0.171
Clinic's level of cleanliness			-0.038 (-0.285,0.210)	0.762
Knowledge Score			0.137 (-0.010,0.283)	0.066
<b>Panel B: Pneumonia</b>				
Age [20,29]	-0.553 (-1.180,0.074)	0.083	-0.519 (-1.200,0.163)	0.134
Age [40,49]	0.010 (-0.433,0.452)	0.965	0.036 (-0.416,0.487)	0.876
Age [50,59]	0.270 (-0.390,0.931)	0.418	0.338 (-0.347,1.022)	0.329
Age [60+]	0.358 (-0.355,1.072)	0.320	0.231 (-0.575,1.038)	0.569
Experience	-0.019 (-0.044,0.006)	0.135	-0.020 (-0.047,0.006)	0.133
Medical Qualification	-0.592 (-1.121,-0.063)	0.029	-0.519 (-1.048,0.011)	0.055
Working hours			-0.015 (-0.025,-0.004)	0.009
Avg. patient caseload			0.003 (-0.022,0.028)	0.795
Run camps			-0.028 (-0.679,0.622)	0.931
Public Health facility			-1.867 (-2.603,-1.132)	0.000
Clinic's level of cleanliness			0.301 (0.052,0.550)	0.019
Knowledge Score			0.050 (-0.110,0.210)	0.535
<p><b>Notes:</b> Experience variable accounts for the years of experience of the provider as a medical practitioner. Medically Qualified providers include those with any formal medical degree (MBBS, BAMS, BUMS, BHMS degrees as well as Diploma in Ayurvedic and some others MD degrees). Working hours is the total number of hours the provider works in the facility in a week. Average patient caseload is the average of the number of patients the providers report to attend in a day in winter, summer and post-monsoon period. Knowledge score is based on providers' responses to 12 key questions listed in eTable 1. †Adjusted for the time and day of the week of the consultation. Sources: SPP Exit Interview, Vignette and Provider Questionnaire.</p>				



**eFigure 1. Consultation time**



**eFigure 2. Know-do gap: share of practitioners who asked key diagnostic questions on the standardized patients (SPs) and vignettes**



**Notes:** Panel A includes those providers in vignette that were also observed in the SP instrument for the diarrhea case (obs. 178). Panel B includes those providers in vignette that were also observed in the SP instrument for the pneumonia case (obs. 162).