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Opportunities to catalyse improved healthcare access in pluralistic systems: a cross-sectional study in Haiti

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ABSTRACT

Objective To identify determinants of intended versus actual care-seeking behaviours in a pluralistic healthcare system that is reliant on both conventional and non-conventional providers and discover opportunities to catalyse improved healthcare access.

Design Cross-sectional study.

Setting and participants In Haiti 568 households (incorporating 2900 members) with children less than 5 years of age were randomly sampled geographically with stratifications for population density. These households identified the healthcare providers they frequented. Among 140 providers, 65 were located and enrolled.

Outcome measures Household questionnaires with standardised cases (intentions) were compared with self-recall of health events (behaviours). The connectedness of households and their providers was determined by network analysis.

Results Households reported 636 health events in the prior month. Households sought care for 35% (n=220) and treated with home remedies for 44% (n=277). The odds of seeking care increased 217% for severe events (adjusted OR (aOR)=3.17; 95% CI 1.99 to 5.05; p<0.001). The odds of seeking care from a conventional provider increased by 37% with increasing distance (aOR=1.37; 95% CI 1.06 to 1.79; p=0.016). Despite stating an intention to seek care from conventional providers, there was a lack of congruence in practice that favoured non-conventional providers (McNemar's χ^2 test p<0.001). Care was sought from primary providers for 68% (n=150) of cases within a three-tiered network; 25% (n=38/150) were non-conventional.

Conclusion Addressing geographic barriers, possibly with technology solutions, should be prioritised to meet healthcare seeking intentions while developing approaches to connect non-conventional providers into healthcare networks when geographic barriers cannot be overcome.

Strengths and limitations of this study

- Inclusive of both conventional and non-conventional healthcare providers, reflecting pluralistic healthcare systems in resource-limited settings.
- Uses randomised geospatial sampling methods to minimise the risk of sampling bias that results from logistical constraints to contact isolated and remote households.
- Employs a unique application of network-analysis visualisations to quantify relationships between families and their healthcare providers.
- A limitation was that comparisons between healthcare seeking intentions ('would do') versus healthcare seeking behaviours ('did do') were not drawn from exactly equivalent illness scenarios.
- A limitation was that non-conventional healthcare providers were more difficult to locate and enrol than conventional, and therefore generated missingness in the dataset. In addition, provider missingness (conventional and non-conventional) may have resulted in an underestimation of households referred from the periphery of the healthcare network.

INTRODUCTION

Improving access to healthcare is one of the highest global health priorities set by the Sustainable Development Goals (SDG) (2015).[1] SDG 3.8 seeks to 'achieve universal health coverage (UHC)', however, the current rate of progress is insufficient to reach this target by 2030. Low/middle-income countries (LMICs) are the furthest off track,[2 3] and UHC tracking indicators show no significant gains for children between 2010 and 2020.[4] The COVID-19 pandemic will exacerbate the limited progress.[5] Innovative approaches are needed to overcome persistent barriers to catalyse progress to achieve universal healthcare access.

Common barriers are accessibility, availability and acceptability.[6] Determinants inside and outside of households influence when a potential barrier manifests as an actual barrier. One method to prioritise determinants for action is to investigate healthcare seeking behaviours starting with illness recognition ('is the family member sick?') and response ('what should the family do?'). Determinants associated with 'recognition' and 'response' include biomedical understanding of illness,[7] ability to recognise danger signs,[8] caregiver's perception of illness severity,[9–11] age,[12] level of education[7 8] and marriage status,[11] number of symptoms,[11] gender,[13 14] rural/urban location,[7 15] intra-household relationships,[16 17] distance,[15 18 19] finances[10 17 19] and wait times.[18]

Once a decision is made to seek care, factors that influence provider selection reveal additional barriers. LMIC healthcare systems are poorly defined with a range of conventional and non-conventional providers; alternative terminologies are qualified/unqualified or formal/informal.[20] Parallel and differential access to conventional and non-conventional providers manifests in chaotic systems.[21] Conventional providers can be defined as licensed doctors and nurse practitioners at governmentally recognised public, non-governmental organisation (NGO) or private facilities. Non-conventional providers can be defined as traditional healers, medication vendors, unlicensed practitioners and pharmacists unlicensed to independently write prescriptions. Provider selection exposes conflicts between a patient's intention ('would do') and behaviour ('did do').[22 23] These conflicts represent an opportunity to reveal unanticipated solutions to improve access to care.

The associated networks within pluralistic healthcare systems rely on the relationships among and between conventional and non-conventional providers.[24 25] Conventional primary care providers, including community health workers, are assumed to be the first access point into healthcare systems,[26] however, non-conventional providers have an important and underappreciated role.[27] Non-conventional providers often practice in parallel without disclosure to conventional providers which creates alternative pathways for seeking care.[28] These complex relationships are not adequately understood, yet are essential to improving healthcare access.[25 29 30]

To address these knowledge gaps Haiti was chosen as a setting generalisable to areas with healthcare systems stressed by factors such as high rates of poverty, volatile political leadership, economic instability, security concerns and limited investment in physical infrastructure. Access to high-quality healthcare in Haiti is low at 23% nationwide and 5% among the rural population.[31] Non-conventional healthcare services and traditional medicine are common.[25 32–34] Child health and wellness is substandard with Haiti ranking 150 out of 180 countries.[35] The under 5-year mortality rate is 67/1000 live births compared with 41/1000 live births globally.[36] Healthcare seeking behaviour in Haiti has been evaluated for mental health,[37] prenatal care,[38] childbirth location[39] and cost.[40 41] Our objective was to identify actionable knowledge gaps on how to improve access to quality healthcare by identifying determinants of intended versus actual care-seeking behaviours in a pluralistic healthcare system that is reliant on both conventional and non-conventional providers.

METHODS

Study design and participants

In this cross-sectional study, consenting participants were enrolled at the household and healthcare provider levels. Household inclusion criteria were households with an adult (18 years or older) head-of-household (HoH) and at least one child under 5 years. Provider inclusion criteria were adult healthcare providers identified by an enrolled household and located within the study area. The 477 km^2 study area, encompassing the communes of Gressier and Leogane Haiti, was divided into 2 km^2 grid-cells (figure 1A). Population density was determined by approximating the number of structures within the grid cell using satellite data from the Oak Ridge National Laboratory (USA). Density per grid cell was categorised by structure quartiles; low (0–112 structures), medium (113–397 structures) and high (398–4664 structures). Each grid cell was divided into Thiessen polygons using ArcGIS Online (Esri V.18.0.3) with divisions that reflected the number of households targeted for enrolment; low=18, medium=24 and high=53 per grid cell. The first house encountered in a polygon was recruited. Grid-cells were surveyed sequentially (eg, low, medium, high) and randomly ordered within each category across a 12-month study period (August 2018–July 2019). Although ten

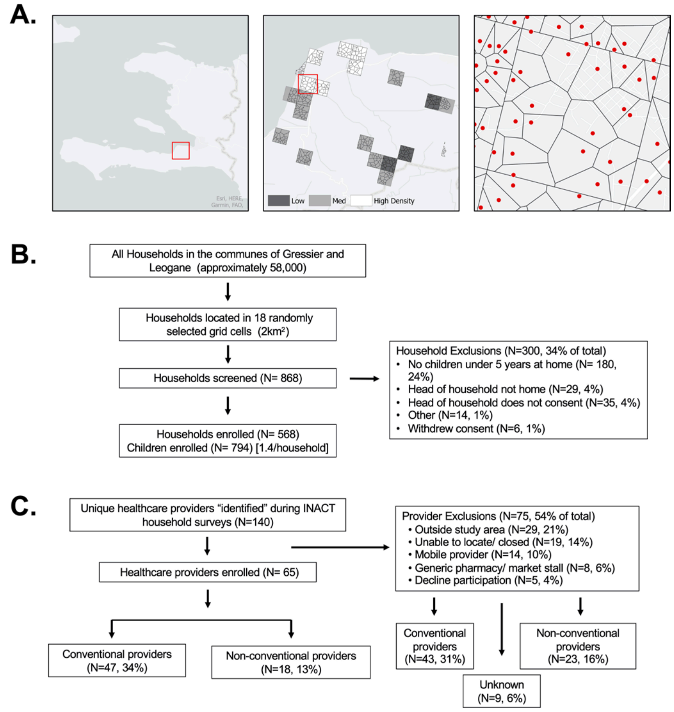

Figure 1 Recruitment area and participant enrolment for the Improving Nighttime Access to Care and Treatment (INACT) study. (A) Recruitment area. Region of Haiti sampled (left), randomly selected 2 km^2 grid cells with low, medium and high population densities with Thiessen/Voronoi polygons (middle), and an individual 2 km^2 grid cell with red centroids within each polygon (right); no households are represented. (B) The study enrolled 568 households representing 2900 household members out of 868 households screened. (C) The study enrolled 65 providers out of 140 identified by households using both standardised case and health event questionnaires; percentages are of those identified by households.

grid-cells of each density were designated for survey, six of each were sampled because of logistical limitations.

Data collection

Data were collected by one Haitian enumerator and one Haitian nurse. Survey instruments included two 30-minute in-person questionnaires administered with REDCap mobile V.9.1.1 and were piloted with non-participant households. A household questionnaire collected GPS coordinates, demographic and socioeconomic data and healthcare seeking behaviour for both standardised cases and health events (online supplemental file). The standardised respiratory and diarrhoeal cases consisted of hypothetical scenarios involving an ill child at 22:00 with typical symptoms of acute respiratory infection or diarrhoea, illnesses chosen for their commonality in this population. A health event was defined as any illness a household member experienced in the previous month, regardless of whether care was sought. A provider questionnaire captured GPS location, details about the facility/business, personnel qualifications and resources available (online supplemental file). Conventional providers were licensed persons who worked at a licensed facility. For large facilities with greater than 200 patients per month, the facility itself was defined as a 'provider'. Non-conventional providers were licensed or non-licensed providers at non-licensed facilities, or mobile non-licensed providers; the definitions for conventional and non-conventional were established a priori.

Statistical analysis

Household demographics and health event characteristics were described by proportions for categorical variables and medians with IQRs for continuous variables. Socioeconomic status (SES) index was generated using a summative score of the following components: land, animal, bank account and phone ownership, HoH education level, household electricity source, fuel source, water source, primary source of income, primary transportation method, sanitation type, household floor, wall and roof type, and grid cell density. Provider characteristics were described similarly. The two primary analyses compared (i) households that did and did not seek care for health events and (ii) households that did and did not seek care from a conventional provider. For care-seeking, we used bivariate and multivariate logistic regression models with seeking care as the dependent variable and expressed the results as ORs and adjusted ORs (aORs) for care sought. Similar methods were used to compare the selection of seeking care from a conventional versus non-conventional provider. Health events were analysed as discrete variables. Two-mode whole networks[42 43] of households and providers compared provider types identified/sought in standardised cases to health events; subanalyses were performed for respiratory infection ('cough' or 'cold' with fever), diarrhoeal illness ('diarrhoea' with/without blood) and 'other' cases (all other illness types not categorised as respiratory or diarrhoea). Ego networks[42 44] were generated for commonly identified providers in the whole-network analysis. One-mode provider referral networks[42] were generated. Statistical significance was defined at α=0.05% and 95% CIs are provided. Missingness that was not excluded was for provider types identified by households but not located and enrolled; for regression models, case-wise deletion was used. We chose not to use imputation because we did not want to risk introducing new bias into the analysis.[45 46] Analyses were completed in Stata (V.11) and the igraph, and in R (R Foundation for Statistical Computing; packages included 'sf' by E. Pebesma and R. Bivand 2018).[47 48] The deidentified data are available in online supplemental file 1 "Providers_networks_DI.csv" and "Household_DI.csv".

Patient and public involvement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

RESULTS

Household characteristics

A total of 868 households were randomly screened and 568 (65%) were enrolled with a distribution of 112, 144 and 312 between low, medium and high-density grid-cells (figure 1A); 24% were excluded because the household had no children under 5 years (figure 1B, table 1). The average household had 5.2 members, and among the 2900 household members, 58% were under 21 years. The sampling distributions per grid cell density were as follows: (i) 70% of households in the population were in high-density areas and 56% of the households surveyed were in a high-density area; within a high-density grid cell the goal was to sample 5% of households, (ii) 26% of households in the population were in medium-density areas and 25% of the households surveyed were in a medium-density area; within a grid cell the goal was to sample 10% of households, (iii) 4% of households in the population were in low-density areas and 19% of the households surveyed were in a low-density area; within a grid cell the goal was to sample 20% of households. These varied distributions were intentional to enable networks to be identified within grid cells of different densities.

Health event characteristics

A total of 636 health events were identified (table 2 and online supplemental tables S1 and S2); 22%, 50% and 28% of households reported 0, 1 or at least 2 health events in the previous month, respectively. The most common symptoms were congestion, fever and cough, present in 61%, 52% and 49% of health events, respectively. The most common perceived cause of health events was humoral pathology[49] (41%), considered an imbalance of

Table 1 Household characteristics

Grid cell density	All N=568; n (%)*	Low n=112; n (%)*	Medium n=144; n (%)*	High n=312; n (%)*
Household members				
0–1 year	322 (11)	63 (11)	79 (11)	180 (11)
2–4 years	436 (15)	76 (14)	115 (16)	245 (15)
5–10 years	440 (15)	78 (14)	106 (15)	256 (16)
11–20 years	481 (17)	89 (16)	141 (19)	251 (16)
≥21 years	1221 (42)	253 (45)	284 (39)	684 (42)
Total members	2900†	559†	725†	1616†
Highest-education level (HoH)				
None	89 (16)	26 (23)	38 (26)	25 (8)
Below secondary	247 (43)	42 (38)	62 (43)	143 (46)
Secondary and above	232 (41)	44 (39)	23 (31)	144 (46)
Transportation				
Informal (foot/bike/donkey)	176 (31)	52 (46)	64 (44)	60 (19)
Public	74 (13)	0 (0)	1 (1)	73 (23)
Motorcycle taxi	295 (52)	55 (49)	78 (54)	162 (52)
Private car/motorcycle	19 (3)	2 (2)	1 (1)	16 (5)
Primary source of income				
Agriculture/animal husbandry	266 (47)	92 (82)	105 (73)	69 (22)
Vendor (commerce)	165 (29)	11 (10)	24 (17)	130 (42)
Tradesperson	61 (11)	5 (4)	7 (5)	49 (16)
Salaried employment	35 (6)	2 (2)	2 (1)	31 (10)
None	11 (2)	0 (0)	1 (1)	10 (3)
Other	30 (5)	2 (2)	5 (3)	23 (7)
SES index‡				
First quintile	116	59 (53)	53 (37)	4 (1)
Second quintile	112	29 (26)	40 (28)	43 (14)
Third quintile	113	20 (18)	34 (24)	59 (19)
Fourth quintile	115	2 (2)	12 (8)	101 (32)
Fifth quintile	112	2 (2)	5 (3)	105 (34)

*Percentages calculated vertically.
†Percentage distribution of household members (n=2900) by grid cell density: low=19% (n=559), medium=25% (n=725), high=56% (n=1616).
‡See methods for SES index components.
HoH, head-of-household; SES, socioeconomic status.

'hot' and 'cold' within the body caused by environmental exposures. Forty per cent of health events were considered severe. Half of all health events started at nighttime (55%), of these, 36% were severe (online supplemental table S1). Respiratory infection symptoms started more often at night-time (66%) compared with diarrhoea that more often started during the daytime (65%) (online supplemental table S2).

Determinants to seek care for health events

Healthcare was sought outside the household for 35% (n=220/636) of health events, and most often for children between 0 and 4 years (65%) (table 3). The most common reason cited for not seeking care was preference to treat at the household with home remedies (67%; n=277/416) followed by the health event did not necessitate treatment (24%; n=99/416). The majority of households delayed seeking care (67%; n=138/201), most commonly citing monetary and transportation (46%; n=63/138) barriers. Among those who sought care without delay, 68% (n=43/63) chose to do so because of severity. In the bivariate analysis, decreased odds of seeking care was associated with nighttime events (OR=0.69; 95% CI 0.50 to 0.96; p=0.029) and informal transport (foot, bicycle or donkey) (OR=0.53; 95% CI 0.36 to 0.79; p=0.002). Increased odds of seeking care were associated with illness severity (OR=3.20; 95% CI 2.28 to 4.50; p<0.001), high-density grid-cells (OR=1.66; 95% CI 1.18 to 2.34; p=0.004) and high SES (OR=1.45; 95% CI 1.03 to 2.03;

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Table 2 Health event characteristics

Grid cell density	All N=636; N (%)*	Low n=122 (19); n (%)*	Medium n=136 (21); n (%)*	High n=378 (59); n (%)*
Patient age				
0–4 years	411 (65)	78 (64)	96 (71)	237 (63)
5–10 years	26 (4)	3 (2)	8 (6)	15 (4)
11+ years	199 (31)	41 (34)	32 (24)	126 (33)
Symptom†				
Congestion (cold)	385 (61)	82 (67)	92 (68)	211 (56)
Fever	330 (52)	60 (49)	73 (54)	197 (52)
Cough	313 (49)	66 (54)	79 (58)	168 (44)
Diarrhoea	133 (21)	23 (19)	36 (26)	74 (20)
Headache	66 (10)	14 (11)	10 (7)	42 (11)
Abdominal pain	39 (6)	7 (6)	9 (7)	23 (6)
Vomiting	31 (5)	4 (3)	8 (6)	19 (5)
Chest pain	22 (3)	6 (5)	7 (5)	9 (2)
Skin problem	16 (3)	3 (2)	4 (3)	9 (2)
Infection	10 (2)	2 (2)	0 (0)	8 (2)
Other symptoms‡	80 (13)	12 (10)	14 (10)	54 (14)
Cause (perceived)				
Temperature exposure§	258 (41)	52 (43)	59 (43)	147 (39)
Medical/epidemiological/environmental	130 (20)	16 (13)	26 (19)	88 (23)
Cultural (eg, teething)	56 (9)	10 (8)	14 (10)	32 (8)
Stress/fatigue	45 (7)	9 (7)	11 (8)	25 (7)
Unknown	136 (21)	31 (25)	26 (19)	79 (21)
Severity (perceived)				
Not severe	382 (60)	66 (55)	85 (63)	231 (61)
Severe	252 (40)	55 (45)	51 (38)	146 (39)
Sought care				
Yes	220 (35)	39 (32)	33 (24)	148 (39)
No	416 (65)	83 (68)	103 (76)	230 (61)

*Percentages calculated vertically.
†Percentage of health events that include listed symptoms; median symptoms/health event=2.
‡'Other' included anaemia, back, diabetes, ear, hypertension, joint, mouth, pregnancy, seizure, throat, trauma, vaginal and vision problems.
§A perceived imbalance of 'hot' and 'cold' within the body caused by environmental exposures (humoral pathology).

p=0.034). In the multivariate analysis, the odds of seeking care increased by 217% with severe illness (aOR=3.17; 95% CI 1.99 to 5.05; p<0.001).

Provider characteristics

Households identified 140 providers and 65 (46%) were located and enrolled (figure 1C; online supplemental table S3). Failure to enrol providers was most commonly due to the provider being located outside the study area (21%; n=29) or an inability to locate the provider/had ceased operation (14%; n=19). Details from the household surveys enabled the determination of provider type and setting (online supplemental table S3). Among surveyed providers, 68% (n=44) had a business license. Variation was observed by grid cell density; only four providers were identified in the low-density grid-cells and none were available after 20:00 (online supplemental table S3).

Determinants to seek care from a conventional provider

Care was sought from a conventional provider for 83% (n=180/218) and a non-conventional provider for 17% (n=38/218) of health events (online supplemental table S4). For 24% (52) of health events, households prioritised quality of care/trust/reputation in provider selection, among these 92% were conventional and 8% were non-conventional. Bivariate analysis found decreased odds of seeking care from a conventional provider was associated with informal transport (OR=0.33; 95% CI 0.15 to 0.71; p=0.005) and HoH with no formal education

Table 3 Determinants to seek care for health events

	Care sought n=220	Care not sought n=416	OR (CI)	P value	aOR (CI)	P value
Patient age n (%)*						
0–4 years	131 (32)	280 (68)	0.71 (0.51 to 1.00)	0.052	Ref	Ref
5–10 years	10 (38)	16 (62)	1.19 (0.53 to 2.67)	0.672	0.77 (0.22 to 2.63)	0.675
11+ years	79 (40)	119 (60)	1.38 (0.98 to 1.96)	0.068	0.75 (0.40 to 1.38)	0.355
Illness† n (%)*						
Respiratory	96 (30)	222 (70)	0.67 (0.48 to 0.94)	0.018	0.75 (0.40 to 1.42)	0.378
Diarrhoea	17 (33)	35 (67)	0.91 (0.50 to 1.66)	0.757	0.69 (0.27 to 1.73)	0.426
Respiratory and diarrhoea	19 (23)	62 (77)	0.54 (0.31 to 0.93)	0.025	0.99 (0.37 to 2.65)	0.980
Other	88 (48)	96 (52)	2.22 (1.56 to 3.15)	<0.001	Ref	Ref
Distance (km)‡ median (IQR)	3.2 (1.3–5.5)	3.5 (1.5–6.1)	0.97 (0.93 to 1.02)	0.239	0.96 (0.91 to 1.01)	0.135
Severity (perceived) n (%)*						
Not-severe	92 (24)	290 (76)	Ref	Ref	Ref	Ref
Severe	127 (50)	125 (50)	3.20 (2.28 to 4.50)	<0.001	3.17 (1.99 to 5.05)	<0.001
Time of health event§ n (%)*						
Day	101 (42)	138 (58)	Ref	Ref	Ref	Ref
Night	108 (31)	242 (69)	0.69 (0.50 to 0.96)	0.029	0.80 (0.49 to 1.29)	0.359
Transportation n (%)*						
Informal (foot/bike/donkey)	43 (25)	130 (75)	0.53 (0.36 to 0.79)	0.002	0.78 (0.28 to 2.19)	0.638
Public/motorcycle taxi	166 (38)	267 (62)	1.72 (1.19 to 2.49)	0.004	Ref	Ref
Private car/motorcycle	10 (37)	17 (63)	1.12 (0.50 to 2.48)	0.785	0.49 (0.15 to 1.58)	0.235
Highest-education level (HoH) n (%)*						
None	22 (25)	66 (75)	0.59 (0.35 to 0.98)	0.043	Ref	Ref
Below secondary	88 (33)	181 (67)	0.87 (0.62 to 1.21)	0.394	1.34 (0.60 to 3.02)	0.475
Secondary and above	110 (39)	169 (61)	1.46 (1.05 to 2.03)	0.024	1.61 (0.68 to 3.77)	0.277
Primary source of income n (%)*						
Agriculture/animal husbandry	87 (32)	182 (68)	0.85 (0.61 to 1.20)	0.364	5.04 (0.57 to 44.51)	0.146
Vendor (commerce)	71 (35)	134 (65)	1.02 (0.72 to 1.46)	0.897	2.56 (0.29 to 22.67)	0.398
Tradesperson	33 (41)	47 (59)	1.41 (0.87 to 2.29)	0.160	2.68 (0.29 to 25.18)	0.388
Salaried employment	16 (39)	25 (61)	1.24 (0.65 to 2.38)	0.512	2.95 (0.30 to 28.67)	0.351
Grid cell population density n (%)*						
Low	84 (68)	39 (32)	0.86 (0.57 to 1.32)	0.498	Ref	Ref
Medium	33 (24)	103 (76)	0.54 (0.35 to 0.83)	0.005	1.11 (0.52 to 2.35)	0.783
High	148 (39)	230 (61)	1.66 (1.18 to 2.34)	0.004	1.69 (0.82 to 3.47)	0.154
Health events per prior month median (IQR)	1 (1–2)	1 (1–2)	1.08 (0.88 to 1.32)	0.458	0.94 (0.72 to 1.23)	0.666
SES index¶ median (IQR)	3 (2–4)	3 (2–4)	1.45 (1.03 to 2.03)	0.034	(omitted)	(omitted)

*Percentages are calculated horizontally. For categorical variables, the multivariate analysis exclude one of the levels as a reference level. The univariate analysis, shows the results for each level of the categorical variable.
†Respiratory is defined as 'cough' or 'cold' with fever and no diarrhoea, diarrhoea is with or without blood in the stool and no respiratory infection, 'other' included anaemia, back, diabetes, ear, hypertension, joint, mouth, pregnancy, seizure, throat, trauma, vaginal and vision medical problems.
‡Calculated using straight-line distance between a house and the chosen provider for respiratory standardised case.
§Day is between 06:00 and 18:00 and night is between 18:00 and 06:00.
¶See methods for variables included in the SES index.
aOR, adjusted OR; HoH, head-of-household; SES, socioeconomic status.

(OR=0.32; 95% CI 0.12 to 0.82; p=0.018). The odds increased in association with SES (OR=2.78; 95% CI 1.25 to 6.25; p=0.12). In multivariate analysis, increased odds of seeking care from a conventional provider was associated with increased travel distance (aOR=1.37; 95% CI 1.06 to 1.79; p=0.016) and HoH education at or above secondary school (aOR=5.00; 95% CI 1.05 to 25.00; p=0.044). These findings are consistent with responses that 53% of families (n=116/220) cited distance as the most important factor in provider selection. Households that cited distance travelled a median of 1.5 km (IQR 0.7 km–3.9km) in comparison to 3.6 km (IQR 1.5 km–7.8km) for households that did not cite distance. Households travelled further (Mann-Whitney, p<0.0001) to seek care from conventional providers (median 2.6 km, IQR 1.1 km–5.9km) than non-conventional providers (median 0.9 km, IQR 0.0 km–2.3km). The difference in cost was less when households sought care from non-conventional providers (median US$1.28, IQR US$0.16–US$2.56) compared with when households sought care from conventional providers (median US$4.49, IQR US$1.92–US$7.85; Mann-Whitney, p<0.0001).

Congruence between care seeking intentions and behaviours by provider type

Comparisons of intentions versus behaviours for the type of provider sought was conducted using data from the household standardised cases ('where would you go?') and the household health events ('where did you go?'). Among all health event types, there was a lack of congruence between intentions and behaviours (OR=0.15; 95% CI 0.04 to 0.43; p<0.001); 27 of the 31 non-congruent events were attributed to households that intended to seek care from a conventional provider but switched to non-conventional (online supplemental table S5). In bivariate analysis, respiratory infection with diarrhoea and informal transportation were associated with increased non-congruence. In contrast, HoH education level of secondary and above and high-density grid-cells were associated with congruence. Multivariate analysis found no significant factors (online supplemental table S6).

Network analysis of care-seeking intentions versus behaviors

Two-mode whole networks were used to evaluate the relationships between households and providers identified through standardised cases and health events (figure 2A–C). The number of households linked to each provider per health event was statistically different compared with standardised respiratory (Mann-Whitney, p=0.014) and diarrhoeal (Mann-Whitney, p=0.007) cases; distance travelled was statistically different compared with diarrhoeal cases (Wilcoxon, p=0.001). Subanalysis comparisons for respiratory (online supplemental figure S1A,B) and diarrhoeal (online supplemental figure S1C,D) specific health events were similar. Two-mode ego network analyses focused on a public clinic (C1) and a private hospital (H1) commonly identified in the whole-network analysis as the intended provider (figure 2D–I). However in practice, households sought care from these providers less often (Student's t-test; both p<0.001). To analyse relationships among providers, we used one-mode network analysis to examine provider referral networks. Providers identified 33 conventional and 0 non-conventional referral providers that formed a three-tiered network (online supplemental figure S2A); 45% (n=15) received one referral at the lowest tier, 42% (n=14) received between 2 and 10 referrals at the middle tier and 12% (n=4) received 10 or more referrals at the highest tier. Sixty-eight per cent of households sought care from providers receiving zero referrals. Referral networks from standardised respiratory and diarrhoeal cases were similar (online supplemental figure S2B,C).

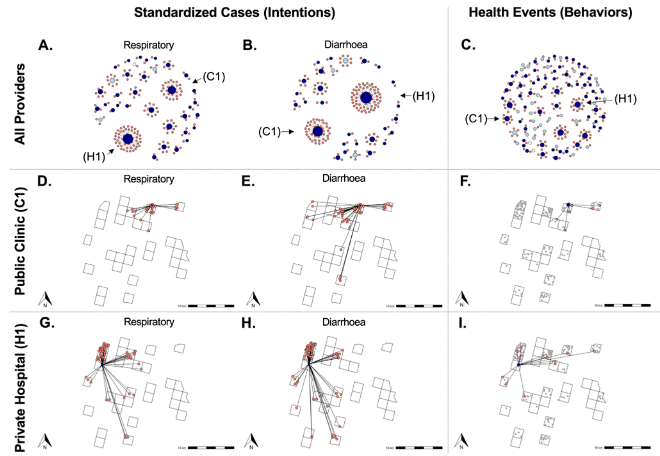

Figure 2 Provider selection. Among households with health events in which care was sought (n=180), two-mode whole network analysis was used to elicit care-seeking intentions for standardised respiratory cases (A, D, G), standardised diarrhoeal cases (B, E, H) and health events (C, F, I). The median number of household-provider linkages per provider and distance travelled were 2 (IQR=1–5) and 3.2 km (IQR=1.3 km–5.6 km), 2.5 (IQR=1–5) and 4.0 km (IQR=1.9 km–6.4 km) and 1 (IQR=1–2) and 2.1 km (IQR=1.0 km–5.4 km) for respiratory standardised cases (A), diarrhoeal standardised cases (B) and health events (C), respectively. Ego network analysis of the two most commonly identified providers. Households that selected public clinic C1 in the respiratory standardised case (n=26; D), the diarrhoeal standardised case (n=50; E) and/or sought care at C1 for a health event (n=9; F). Households that selected private hospital H1 in the respiratory standardised case (n=51; G), the diarrhoeal standardised case (n=64; H) and/or sought care at H1 for a health event (n=13; I).

DISCUSSION

Should care be sought, and from whom, are fundamental questions when medical problems arise in households. The decisions may trigger entry into a linear healthcare system with primary, secondary and tertiary conventional providers or a pluralistic system that includes non-conventional providers. In this cross-sectional study, we found that approximately one-third of household health events were not treated, one-third were treated at the household and one-third sought care. When care was sought, it was for severe illnesses and from a mixture of conventional and non-conventional providers, largely disconnected from healthcare networks, despite intentions to seek care from connected conventional providers. The findings reveal insights on how to catalyse improved healthcare access in seemingly change resistant healthcare settings.

Households living in low population density regions had the lowest SES compared with those in high population density regions. Households approached health events with a pragmatic mindset aware of healthcare access barriers. Barriers to seeking care included night-time presentation, limited access to motorised transport and poverty. Disease severity was the major determinant to seek care. Families delayed seeking care because of financial and transport barriers, unless the event was severe or not resolving. These data document that poverty and geographic isolation in rural communities are barriers to seek care.

Providers were identified by households in both the standardised cases and the health events. Increased SES correlated with seeking care from a conventional provider. Multivariate analysis identified increased distance, education and higher population density as correlates of seeking care from a conventional provider. These findings highlight that once a household decides to seek care, poverty and geographic isolation again influence the decision to seek care from a conventional versus non-conventional provider.

Intentions ('would do') and behaviours ('did do') for care-seeking and provider selection were compared by analysing standardised cases against the health events. Conflict between household intentions and behaviours for seeking care from a conventional provider was found. The directionality was from an intention to seek care from a conventional provider to care sought from a non-conventional provider. These analyses highlight the conflict that both poor and geographically isolated households confront between intentions and behaviours. In addition, households that prioritised quality of care were more likely to seek a conventional provider. The data suggest that poor and isolated households are not content with the choice they are forced to make. Network analysis compared intentions versus behaviours for provider selection. A stark contrast was revealed between an intention to seek care from commonly shared providers yet a behaviour to seek care from providers that were less commonly shared. The care sought from these disconnected providers was likely lower quality because it is more difficult to standardise care, train providers, enforce regulations and disseminate healthcare resources to disconnected providers. Access to information about provider types, costs and methods to contact the provider are likely additional barriers to seeking care from intended providers.

Disparity between intentions and behaviours can be found broadly across the domain of healthcare. However, this study provides insight that when faced with poverty and isolation, households are forced to turn to nearby providers that are often non-conventional. Methods to reduce non-congruence between intentions and behaviours are needed. We advocate that governments and NGOs develop initiatives to investigate how to link disconnected non-conventional providers into the healthcare networks with conventional providers. The main barrier to integration is the resources needed to standardise quality of care. Non-conventional providers, by

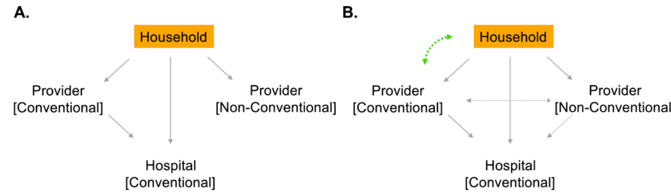

Figure 3 Model to improve access to healthcare in a pluralistic system. (A) Current relationships between households and providers. (B) Opportunities to improve access to care by better connecting households to conventional providers, and non-conventional providers to the healthcare network. Solid grey arrows represent current connections. Dashed green curved arrow represents a bypass mechanism to improve access to conventional primary providers by innovative mechanisms (eg, dedicated transport/assistance, mobile outreach clinics, telemedicine). Dashed grey arrows represent connections to link conventional/non-conventional providers.

definition, do not have the formal education/training or facilities that are associated with conventional healthcare providers.

At the household-provider level, our recommendation is that with a careful strategy providers should be connected into the network through training and referral mechanisms, which might also create an opportunity to professionalise non-conventional providers that carry a significant portion of the healthcare case-load. Continuing marginalisation will likely continue to fail to improve healthcare access (figure 3A). In parallel, households may desire and need an innovative alternative mechanism to 'bypass' barriers they face when attempting to seek care from a conventional provider (figure 3B). A new model may include improved access to centralised services, or extending access to/near households by mobile healthcare services either physically or electronically through telemedicine.

At the systems level, improvement and regulation strategies for connected versus non-connected providers will likely be different. The finding that a majority of households seek care from providers who received zero referrals reveals that households commonly seek care from front-line providers. However, there is a diversity of these 'primary providers', including those that consult very few patients per week and are disconnected from the healthcare network. While conventional and non-conventional providers were identified in the network, conventional providers were more central in the network. This distinction between non-conventional providers tending to be first-line providers, whereas conventional providers are sought when a referral is required, is a crucial systems level insight and suggests multi-dimensional strategies are needed to improve access and quality in pluralistic healthcare systems like the one studied herein.

These findings should be viewed within the context of the study limitations. First, the standardised case questionnaires were designed a priori to investigate the decision-making process to seek care for children with respiratory or diarrhoeal disease at night. The analytic strategy to compare standardised cases as intentions and health events as behaviours was established post-hoc. The limitation is that the specific standardised cases were limited to children who developed symptoms at night which reduced the strength of comparison to the diversity of health events despite subanalysis to compare cases by chief complaint. The sample size of health events with only respiratory or diarrhoeal complaints alone also limited the strength of comparisons with standardised cases. Second, adjustments for household clustering were not performed because 72% of households had zero or one health event. Third, providers identified by households were difficult to locate and only a portion of providers were located. This resulted in missingness and an information bias such that mobile drug vendors were interviewed less frequently. To address this limitation, key provider data (eg, type and distance) used in the analysis were obtained for many unlocated providers by leveraging the household surveys. However, the remaining missingness for providers in the study area that we could not contact may have resulted in an underestimation of households referred from the periphery of the healthcare network, and for providers outside the study area, this missingness represents an element of mobility of household member(s) leaving the area to seek care which we feel is incorporated in the analysis. Finally, there was risk of recall and response biases. The questionnaires relied on 1 month and 1 week recall by households and providers, respectively, and families may have favoured providing socially acceptable responses. Despite these limitations, the approach and findings represent a meaningful contribution.

CONCLUSION

The study supports a model that households are likely to treat illnesses at home without assistance. When care is sought, it is for severe illnesses and often from a mixture of disconnected conventional and non-conventional providers despite an intention to seek care from a conventional provider. The findings support bridging geographic barriers, possibly with technology solutions, to meet healthcare seeking intentions, while developing approaches to connect non-conventional providers into healthcare networks through training and supervision when geographic barriers cannot be overcome.

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Contributors EN and MK conducted the literature search. The study was designed by EN and MK. MK and YC implemented the study and collected data with guidance from SM. SM provided the approach and tools for geospatial mapping. Data analysis, interpretation, figure design and writing was conducted by JS, MK and EN. Clinical oversight in Haiti was governed by CB with assistance by VMBdR. Communication with IRBs was performed by CB, VMBdR and EN. IRB documentation was written and managed by MK and EN. EN is the guarantor of the study.

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REFERENCES

1 Programme UND. Sustainable Development Goals: @undp, 2020. Available: https://www.undp.org/content/undp/en/home/sustainable-development-goals.html [Accessed 20 Mar 2020].
2 GBD 2017 SDG Collaborators. Measuring progress from 1990 to 2017 and projecting attainment to 2030 of the health-related sustainable development goals for 195 countries and territories: a systematic analysis for the global burden of disease study 2017. *Lancet* 2018;392:2091–138.
3 The World Health Organization. *The world bank. tracking universal health coverage: 2017 global monitoring report*. Washington, D.C, 2017.
4 Amouzou A, Jiwani SS, da Silva ICM, *et al*. Closing the inequality gaps in reproductive, maternal, newborn and child health coverage: slow and fast progressors. *BMJ Glob Health* 2020;5:e002230.
5 Roberton T, Carter ED, Chou VB, *et al*. Early estimates of the indirect effects of the COVID-19 pandemic on maternal and child mortality in low-income and middle-income countries: a modelling study. *Lancet Glob Health* 2020;8:e901–8.
6 Poverty and Access to Health Care in Developing Countries - Peters - 2008 - Annals of the New York Academy of Sciences - Wiley Online Library 2020.
7 Do M, Babalola S, Awantang G, *et al*. Associations between malaria-related ideational factors and care-seeking behavior for fever among children under five in Mali, Nigeria, and Madagascar. *PLoS One* 2018;13:e0191079.
8 Manna B, Nasrin D, Kanungo S, *et al*. Determinants of health care seeking for diarrheal illness in young children in urban slums of Kolkata, India. *Am J Trop Med Hyg* 2013;89:56–61.
9 D'Souza RM. Role of health-seeking behaviour in child mortality in the slums of Karachi, Pakistan. *J Biosoc Sci* 2003;35:131–44.
10 Amuyunzu-Nyamongo M, Nyamongo IK. Health seeking behaviour of mothers of Under-Five-Year-Old children in the slum communities of Nairobi, Kenya. *Anthropol Med* 2006;13:25–40.
11 Kolola T, Gezahegn T, Addisie M. Health care seeking behavior for common childhood illnesses in Jeldu district, Oromia regional state, Ethiopia. *PLoS One* 2016;11:e0164534.

12 Sarker AR, Sultana M, Mahumud RA, *et al*. Prevalence and health Care-Seeking behavior for childhood diarrheal disease in Bangladesh. *Glob Pediatr Health* 2016;3:2333794X1668090.
13 Ismail SA, McCullough A, Guo S, *et al*. Gender-related differences in care-seeking behaviour for newborns: a systematic review of the evidence in South Asia. *BMJ Glob Health* 2019;4:e001309.
14 Sultana M, Sarker AR, Sheikh N, *et al*. Prevalence, determinants and health care-seeking behavior of childhood acute respiratory tract infections in Bangladesh. *PLoS One* 2019;14:e0210433.
15 Wambui WM, Kimani S, Odhiambo E. Determinants of health seeking behavior among caregivers of infants admitted with acute childhood illnesses at Kenyatta national Hospital, Nairobi, Kenya. *Int J Pediatr* 2018;2018:1–11.
16 Akinyemi JO, Banda P, De Wet N, *et al*. Household relationships and healthcare seeking behaviour for common childhood illnesses in sub-Saharan Africa: a cross-national mixed effects analysis. *BMC Health Serv Res* 2019;19:1–11.
17 Ellis AA, Winch P, Daou Z, *et al*. Home management of childhood diarrhoea in southern Mali--implications for the introduction of zinc treatment. *Soc Sci Med* 2007;64:701–12.
18 Rutebemberwa E, Nsabagasani X, Pariyo G, *et al*. Use of drugs, perceived drug efficacy and preferred providers for febrile children: implications for home management of fever. *Malar J* 2009;8:1–10.
19 Tsukahara T, Sugahara T, Ogura S, *et al*. Effect of pecuniary costs and time costs on choice of healthcare providers among caregivers of febrile children in rural Papua New Guinea. *Health Econ Rev* 2019;9:33.
20 Cross J, MacGregor HN. Knowledge, legitimacy and economic practice in informal markets for medicine: a critical review of research. *Soc Sci Med* 2010;71:1593–600.
21 Peters DH, Bloom G. Developing world: bring order to unregulated health markets. *Nature* 2012;487:163–5.
22 Yao J, Agadjanian V. Bypassing health facilities in rural Mozambique: spatial, institutional, and individual determinants. *BMC Health Serv Res* 2018;18:1006.
23 Rao KD, Sheffel A. Quality of clinical care and bypassing of primary health centers in India. *Soc Sci Med* 2018;207:80–8.
24 Mackintosh M, Channon A, Karan A, *et al*. What is the private sector? understanding private provision in the health systems of low-income and middle-income countries. *The Lancet* 2016;388:596–605.
25 Durham J, Michael M, Hill PS, *et al*. Haïti and the health marketplace: the role of the private, informal market in filling the gaps left by the state. *BMC Health Serv Res* 2015;15:1–10.
26 World Health Organization, United Nations Children's Fund (UNICEF). A vision for primary health care in the 21st century: towards universal health coverage and the sustainable development goals, 2018. Available: https://apps.who.int/iris/bitstream/handle/10665/328065/WHO-HIS-SDS-2018.15-eng.pdf?sequence=1&isAllowed=y [Accessed 28 Sep 2020].
27 Geldsetzer P, Williams TC, Kirolos A, *et al*. The recognition of and care seeking behaviour for childhood illness in developing countries: a systematic review. *PLoS One* 2014;9:e93427.
28 Colvin CJ, Smith HJ, Swartz A, *et al*. Understanding careseeking for child illness in sub-Saharan Africa: a systematic review and conceptual framework based on qualitative research of household recognition and response to child diarrhoea, pneumonia and malaria. *Soc Sci Med* 2013;86:66–78.
29 McPake B, Hanson K. Managing the public–private mix to achieve universal health coverage. *The Lancet* 2016;388:622–30.
30 Bennett S, Bloom G, Knezovich J, *et al*. The future of health markets. *Global Health* 2014;10:51.
31 Gage AD, Leslie HH, Bitton A, *et al*. Assessing the quality of primary care in Haiti. *Bull World Health Organ* 2017;95:182–90.
32 Moise K, Bernard JJ, Henrys JH. Evaluation of antibiotic self-medication among outpatients of the state university hospital of Port-au-Prince, Haiti: a cross-sectional study. *Pan Afr Med J* 2017;28:4.
33 Hill PS, Pavignani E, Michael M, *et al*. The "empty void" is a crowded space: health service provision at the margins of fragile and conflict affected states. *Confl Health* 2014;8:1–10.
34 Kohler JC, Pavignani E, Michael M, *et al*. An examination of pharmaceutical systems in severely disrupted countries. *BMC Int Health Hum Rights* 2012;12:1–11.
35 Clark H, Coll-Seck AM, Banerjee A, *et al*. A future for the world's children? A WHO–UNICEF–Lancet Commission. *The Lancet* 2020;395:605–58.
36 United Nations Interagency Group for Child Mortality Estimation. *Levels and trends in child mortality*. New York: United Nations Children's Fund, 2017.
37 Wagenaar BH, Kohrt BA, Hagaman AK, *et al*. Determinants of care seeking for mental health problems in rural Haiti: culture, cost, or competency. *PS* 2013;64:366–72.
38 White K, Small M, Frederic R, *et al*. Health seeking behavior among pregnant women in rural Haiti. *Health Care Women Int* 2006;27:822–38.
39 Raymondville M, Rodriguez CA, Richterman A, *et al*. Barriers and facilitators influencing facility-based childbirth in rural Haiti: a mixed method study with a convergent design. *BMJ Glob Health* 2020;5:e002526.
40 Cros M, Cavagnero E, Alfred JP, *et al*. Equitable realization of the right to health in Haiti: how household data inform health seeking behavior and financial risk protection. *Int J Equity Health* 2019;18:1–16.
41 Ponsar F, Tayler-Smith K, Philips M, *et al*. No cash, no care: how user fees endanger health--lessons learnt regarding financial barriers to healthcare services in Burundi, Sierra Leone, Democratic Republic of Congo, Chad, Haiti and Mali. *Int Health* 2011;3:91–100.
42 Borgatti SP, Johnson MG, Jeffrey C. *Analyzing social networks*. SAGE Publications Ltd, 2018.
43 Davis A, Gardner BB, Gardner MR. *Deep South; a social anthropological study of caste and class*. Chicago, Ill.: The University of Chicago Press, 1941.
44 Vacca R, Solano G, Lubbers MJ, *et al*. A personal network approach to the study of immigrant structural assimilation and transnationalism. *Soc Networks* 2018;53:72–89.
45 Pepinsky TB. A Note on Listwise Deletion versus Multiple Imputation. *Political Analysis* 2018;26:480–8.
46 Arel-Bundock V, Pelc KJ. When can multiple imputation improve regression estimates? *Political Analysis* 2018;26:240–5.
47 Team RC. *R: a language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing, 2014. http://www.R-project.org/
48 Pebesma E, Bivand R. *Simple features for R. R package version 0.6-3*, 2018.
49 World Health Organization, Pan American Health Organization. *Culture and mental health in Haiti: a literature review*, 2010.