Supplementary Materials

Table S1. Characteristics of participants from the 100 healthcare facilities surveyed in Ashanti Region.

Variable	Frequency (N = 285)	Percentage (%)	
Age			
(20-30)	120	42.11	
(31-40)	137	48.07	
(41-50)	27	9.47	
(51-60)	1	0.35	
Sex			
Male	146	51.23	
Female	139	48.77	
Categories of health professional	s		
Medical doctor	44	15.44	
Physician assistant	65	22.81	
Midwife	7	2.46	
General nurse	82	28.7	
Community health nurse	26	9.12	
Laboratory scientist/technicians	31	10.88	
Pharmacist/dispensing technicians	30	10.53	

Type of facility	140	49.12	
District hospital	101	35.44	
Health centre	44	15.44	
Clinic			
	Mean (standard deviation)	95% Confidence Interval	
Total number of health professionals	57.8 ± 30.1	20-98	
Number of patients per week	175.4 ± 68.4	74-372	

Table S2. Availability of mobile health for diagnostics and treatment support in the Ashanti Region.

Variable	Frequency (N = 285)	Percentage (%)

Available healthcare infrastructure

Mobile wireless devices

Yes	276	96.84
No	9	3.16
Mobile intervention availability		
Yes	185	64.91
No	100	35.08
Types of mobile health intervention		
Short Message Service		
Yes	149	80.54
No	36	19.46
Phone calls		
Yes	183	98.92
No	2	1.08
Mobile apps		
Yes	43	23.24
No	142	76.76
Multimedia Service		
Yes	2	1.08
No	183	98.92
Video conferencing		

Yes		
ies		
No	185	100
Toll free lines		
Yes	37	20.00
No	148	80.00
Types of wireless mobile devices		
Mobile phones		
Yes	185	100.00
No	-	-
Smartphones		
Yes	133	71.89
No	52	28.11
Tablets		
Yes	107	57.84
No	78	42.16
Personal digital assistants		
Yes	-	-
No	185	100.00
Handheld devices		
Yes	-	-
No	185	100.00
Patient monitoring devices		

Yes	2	1.08
No	183	98.92
Watches		
Yes	_	-
No	185	100.00
Continuous supply of power		
Yes	149	80.54
No	36	19.46
Available support systems		
Yes	106	57.30
No	79	42.70
Healthcare workforce competency		
Requisite skills for diagnostics		
Yes	132	71.35
No	53	28.65
Competence for treatment		
Yes	164	88.65
No	21	11.35

Not applicable: Frequencies that are not up to the sample size (285) are respondents without access to some mHealth apps.

Table S3. Use of mobile health for diagnostics and treatment support in the Ashanti Region.

Variable	Frequency	Percentage (%)
	(N = 285)	
You and your mobile wireless device		
Have you ever used or currently using mHealth interventions		
Yes	182	98.38
No	3	1.62
Type of diseases mHealth has been used for		
HIV		
Yes	177	95.68
No	8	4.32
TB		
Yes	171	92.43
No	14	7.57
Hypertension		
Yes	99	53.51
No	86	46.49
Diabetes		
Yes	79	42.70
No	106	57.30

Stroke		
Yes	-	-
No	185	100.00
Cancer		
Yes	5	2.70
No	180	97.30
Chronic Respiratory Disease		
Yes	2	1.08
No	183	98.92
Malaria		
Yes	93	50.54
No	91	49.46
Diarrhoea		
Yes	17	9.19
No	168	90.81
Have you ever used smart mobile wireless device		
Health/medical information		
Yes	117	63.24
No	68	36.76
Disease diagnosis		
Yes	182	98.38
No	3	1.62

Treat and manage disease conditions		
Yes	162	87.57
No	23	12.43
Treat and monitor patients' health conditions		
Yes	144	77.84
No	41	22.16
How often are mobile wireless device used for diagnostic purposes		
Once a month	48	25.95
2 or 3 times a month	48	25.95
1 to 6 times a week	57	30.81
Once a day or more	32	17.30
How often are mobile wireless device used for treatment, monitoring, and management of diseases		
Once a month	58	31.35
2 or 3 times a month	48	25.95
1 to 6 times a week	44	23.78
Once a day or more	35	18.92

Usefulness of mHealth interventions

For monitoring patients' disease conditions

Yes 248 87.63

No	35	12.37
For managing non-communicable diseases		
Yes	189	66.32
No	96	33.68
For managing communicable diseases		
Yes	239	83.86
No	46	16.14
Reminders for treatment procedures adherence		
Yes	175	61.40
No	110	38.60
Reminders for patients' medication adherence		
Yes	234	82.11
No	51	17.89
Reminders to honour clinic appointments		
Yes	229	80.35
No	56	19.65
Reminders for collection of ART and other drugs on	time	
Yes	247	86.67
No	38	13.33
For follow-ups to promote treatment compliance		
Yes	210	73.68
No	75	26.32

213 74.74 72 25.26 Aking accurate diagnostic decisions 253 88.77 32 11.23 Prease the effectiveness of treatment and management Peases 249 87.37 36 12.63 Ease of use 10 use mHealth to support disease diagnosis 262 91.93 23 8.07 10 use mHealth to support the treatment of patients' se conditions 273 95.79 12 4.21	For supporting patients' test result notifications		
proving treatment and management of disease closs 213 74.74 72 25.26 Eaking accurate diagnostic decisions 253 88.77 32 11.23 Prease the effectiveness of treatment and management seases 249 87.37 36 12.63 Ease of use 100 use mHealth to support disease diagnosis 262 91.93 23 8.07 273 95.79 24 4.21	Yes	187	65.61
213 74.74 72 25.26 Aking accurate diagnostic decisions 253 88.77 32 11.23 Prease the effectiveness of treatment and management Peases 249 87.37 36 12.63 Ease of use 10 use mHealth to support disease diagnosis 262 91.93 23 8.07 10 use mHealth to support the treatment of patients' se conditions 273 95.79 12 4.21	No	98	34.39
72 25.26 aking accurate diagnostic decisions 253 88.77 32 11.23 Prease the effectiveness of treatment and management seases 249 87.37 36 12.63 Ease of use 100 use mHealth to support disease diagnosis 262 91.93 23 8.07 100 use mHealth to support the treatment of patients' seconditions 273 95.79 12 4.21	For improving treatment and management of disease conditions		
Ease of use Co use mHealth to support disease diagnosis 253 88.77 32 11.23 249 87.37 36 12.63 Ease of use Co use mHealth to support disease diagnosis 262 91.93 23 8.07 273 95.79 12 4.21	Yes	213	74.74
253 88.77 32 11.23 Prease the effectiveness of treatment and management seases 249 87.37 36 12.63 Ease of use Co use mHealth to support disease diagnosis 262 91.93 23 8.07 Co use mHealth to support the treatment of patients' see conditions 273 95.79 12 4.21	No	72	25.26
rease the effectiveness of treatment and management seases 249 87.37 36 12.63 Ease of use to use mHealth to support disease diagnosis 262 91.93 23 8.07 to use mHealth to support the treatment of patients' se conditions 273 95.79 12 4.21	For making accurate diagnostic decisions		
Ease of use Co use mHealth to support disease diagnosis 249 87.37 36 12.63 Ease of use 262 91.93 23 8.07 273 95.79 12 4.21	Yes	253	88.77
Ease of use Co use mHealth to support disease diagnosis 262 91.93 23 8.07 Co use mHealth to support the treatment of patients' se conditions 273 95.79 12 4.21	No	32	11.23
Ease of use to use mHealth to support disease diagnosis 262 91.93 23 8.07 to use mHealth to support the treatment of patients' se conditions 273 95.79 12 4.21	To increase the effectiveness of treatment and management of diseases		
Ease of use to use mHealth to support disease diagnosis 262 91.93 23 8.07 to use mHealth to support the treatment of patients' se conditions 273 95.79 12 4.21	Yes	249	87.37
to use mHealth to support disease diagnosis 262 91.93 23 8.07 to use mHealth to support the treatment of patients' se conditions 273 95.79 12 4.21	No	36	12.63
262 91.93 23 8.07 To use mHealth to support the treatment of patients' se conditions 273 95.79 12 4.21	Ease of use		
23 8.07 To use mHealth to support the treatment of patients' se conditions 273 95.79 12 4.21	Easy to use mHealth to support disease diagnosis		
to use mHealth to support the treatment of patients' se conditions 273 95.79 12 4.21	Yes	262	91.93
273 95.79 12 4.21	No	23	8.07
12 4.21	Easy to use mHealth to support the treatment of patients' disease conditions		
	Yes	273	95.79
ple to interact with mHealth interventions	No	12	4.21
	Flexible to interact with mHealth interventions		

Yes	273	95.79
No	12	4.21
Frustrating to interact with mHealth applications		
Yes	9	3.16
No	276	96.84
Easy to become skillful in using mHealth		
Yes	267	93.68
No	18	6.32
Easy to learn how to use mHealth devices for diagnosis and treatment		
Yes	267	93.68
No	18	6.32
User satisfaction		
Comfortable in using mHealth		
Yes	266	93.33
No	19	6.67
Confident in using mHealth		
Yes	254	89.12
No	31	10.88
Completely satisfied with using mHealth		
Yes	218	76.49
No	67	23.51

Using mHealth will increase the quality of healthcare delivery		
Yes	268	94.04
No	17	5.96
Behavioural intention to use		
Would you use mHealth for the treatment and management of patients' disease conditions		
Yes	254	89.12
No	31	10.88
Would you always use mHealth for disease diagnosis and treatment support		
Yes	224	78.60
No	61	21.40
Intend to use mHealth for disease diagnosis and treatment support		
Yes	279	97.89
No	6	2.11

Not applicable: Frequencies that are not up to the sample size (285) are respondents without access to some mHealth apps.

Table S4. Chi-square test results of the relationship between the available health infrastructure or healthcare workforce competency and ownership of mobile wireless devices.

Availability of Health Infrastructure	Ownersh	ip of mobile	wireless d	evices														
	Ever used currently mHealth	using	Malaria		Hypertension		Tubercul (TB)	osis	Diabetes		HIV		Cancer		Disease diagnosis	S	Monitor p conditions	
	Chi- Square	p-value	Chi- Square	p- value	Chi-Square	p-value	Chi- Square	p- value	Chi- Square	p- value	Chi- Square	p- value	Chi- Square	p- value	Chi- Square	p- value	Chi- Square	p-value
Availability of mobile wireless devices	10.88	0.001	4.12	0.041	-	-	-	-	-	-	-	-	-	-	-	-	-	-

mHealth intervention availability	-	-	6.34	0.012	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SMS	-	-	-	-	6.29	0.012	-	-	-	-	-	-	-	-	-	-	-	-
Mobile apps	-	-	-	-	-	-	4.59	0.032	11.5	0.001			-	-	10.1	0.002	-	-
Toll-free	-	-	-	-	-	-	4.95	0.026	-	-	9.44	0.002	-	-	-	-		
Smartphones	-	-	-	-	-	-	9.81	0.002	11.4	0.001	9.09	0.003	-	-	-	-	4.65	0.031
Supply of power	4.34	0.037	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.25	0.007
Support systems	-	-	-	-	-	-	5.11	0.024	-	-	-	-	6.89	0.009	4.09	0.043	-	-
Requisite skills for diagnostic purposes	-	-	-	-	-	-	6.02	0.014	-	-	4.69	0.030	-	-	-	-	-	-
Competence to use mHealth for treatment	-	-	-	-	-	-	8.93	0.003	-	-	-	-	12.1	0.001	-	-	-	-

Table S5. Chi-square test results of the relationship between the available health infrastructure or healthcare workforce competency and usefulness of mHealth applications.

Availability of Health Infrastructure	Usefulness o	f mHealth a	pplications	•												
	Manage non- communicab		Manage commun diseases	icable	Reminde treatmer adherend procedur	nt ce	Reminde appointr	ers for clinic nents	Reminde	ers for drugs n	Follow-up promote t complianc	reatment	Treating managin disease o		Test resu notificat	
	Chi-Square	p-value	Chi- Square	p-value	Chi- Square	p-value	Chi- Square	p-value	Chi- Square	p-value	Chi- Square	p-value	Chi- Square	p-value	Chi- Square	p-value
Availability of mobile wireless devices	36.99	0.001	8.09	0.004	17.53	0.001	4.46	0.035	7.59	0.006	7.78	0.005	7.76	0.005	-	-
mHealth intervention availability	-	-	-	-	4.14	0.042	8.22	0.004	-	-	10.84	0.001	-	-	4.83	0.028
SMS	4.80	0.028	-	-	-	-	-	-	-	-	3.95	0.047	-	-	-	-
Phone calls	-	-	4.21	0.040	7.57	0.006	6.68	0.010	7.10	0.008	8.67	0.003	-	-	4.56	0.033
Mobile apps	6.00	0.014	-	-	-	-	-	-	-	-	10.05	0.002	-	-	-	-
Toll-free	-	-	-	-	-	-	5.52	0.019	9.06	0.003	14.60	0.001	7.49	0.006	-	-
Supply of power	-	-	6.29	0.012	-	-	-	-	8.61	0.003-	-	-	-	-	-	-

Support	14.07	0.001	7.08	0.008	-	-	3.94	0.047	5.28	0.022	-	-	-	-	-	-
systems																
Requisite skills for diagnostic purposes	19.54	0.001	9.37	0.002	-	-	-	-	-	-	-	-	-	-	-	-
Competence to use mHealth for treatment	7.12	0.008	6.60	0.010	-	-	-	-	-	-	-	-	-	-	-	-

Table S6: Chi-square test results of the relationship between the available health infrastructure or healthcare workforce competency and ease of use of mHealth applications.

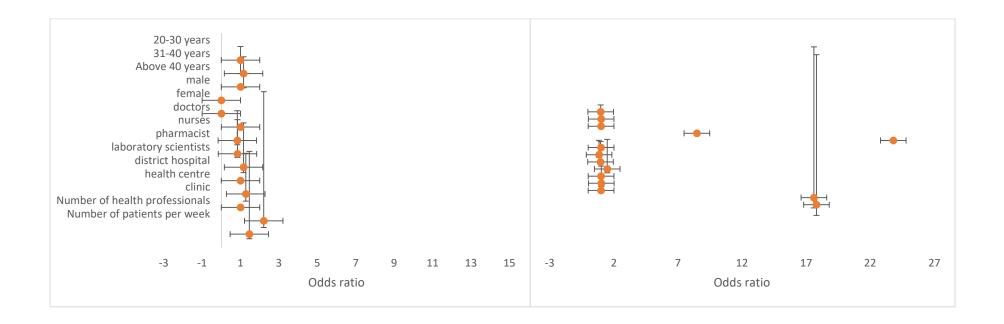
Availability of Health Infrastructure	Ease of use	of mHealth	applications									
	Easy to use for disease		Easy to use n support treat		Flexible to intermediate mHealth app		Frustrating to with mHealth applications		Easy to become s mHealth applicat	•	Easy to learn mHealth dev	
	Chi- Square	p-value	Chi-Square	p-value	Chi-Square	p-value	Chi-Square	p-value	Chi-Square	p-value	Chi-Square	p-value
Availability of mobile wireless devices	2.78	0.037	3.82	0.036	2.41	0.052	-	-	-	-	-	-

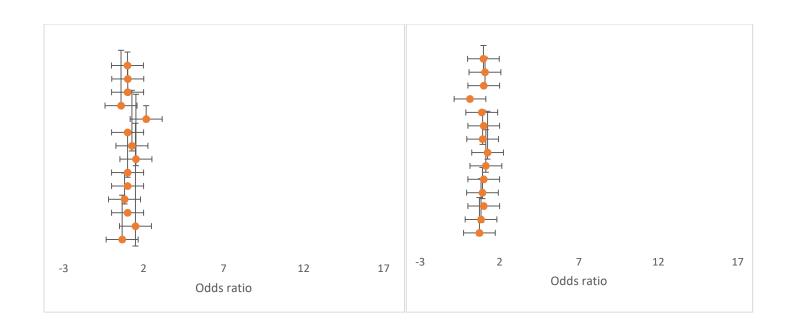
mHealth intervention availability	-	-	4.20	0.040	4.47	0.035	-	-	-	-	-	-
SMS	-	-	4.08	0.043	5.04	0.025	-	-	-	-	-	-
Phone calls	11.34	0.001	17.66	0.001	31.98	0.001	-	-	11.86	0.001	24.69	0.001
Mobile apps	-	-	-	-	-	-	-	-	2.20	0.013	-	-
Toll-free	-	-	-	-	4.74	0.030	-	-	-	-	-	-
Supply of power	-	-	-	-	-	-	-	-	2.54	0.011	-	-
Support systems	11.13	0.001	3.62	0.050	-	-	-	-	-	-	2.88	0.049
Requisite skills for diagnostic purposes	2.80	0.036	5.96	0.015	-	-	-	-	2.73	0.032	-	-
Competence to use mHealth for treatment	3.33	0.050	-	-	1.49	0.021	-	-	2.06	0.003	-	-

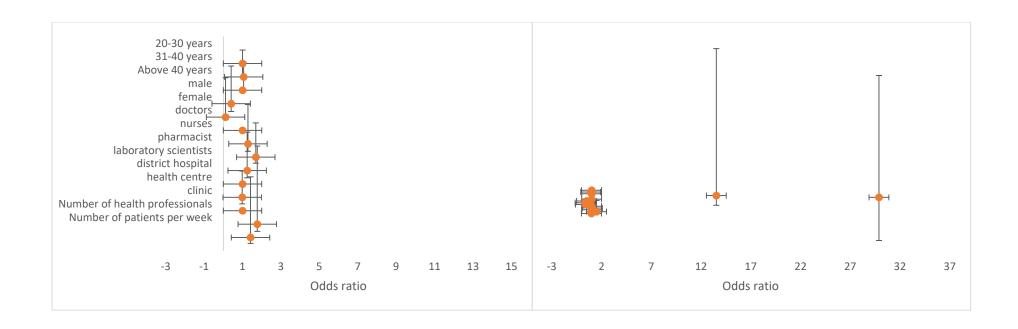
Table S7. Chi-square test results of the relationship between the available health infrastructure or healthcare workforce competency and user satisfaction and behavioural intention to use mHealth.

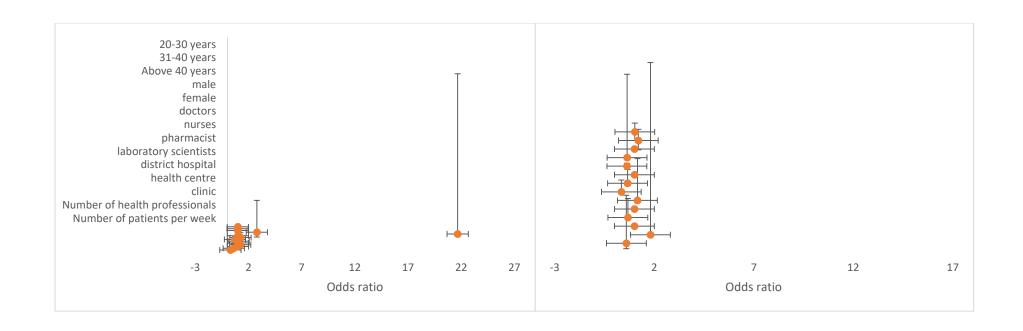
Availability of Health Infrastructure	User satisfact	tion of mHea	alth application	s					Behavioural i	intention to u	use mHealth ap	plications		
	Comfortable mHealth	using	Confident in mHealth	using	Completely s with mHealth		mHealth can quality healt		Able to use m treat and man patients' cond	nage	Always use n disease diagr treatment su	nosis and	Intend to use disease diagr treatment su	osis and
	Chi-Square	p-value	Chi-Square	p-value	Chi-Square	p-value	Chi-Square	p-value	Chi-Square	p-value	Chi-Square	p-value	Chi-Square	p-value
Availability of mobile wireless devices	-	-	3.61	0.053	4.83	0.028	-	-	-	-	1.23	0.026	-	-
mHealth intervention availability	1.84	0.015	1.03	0.031	-	-	1.39	0.023	-	-	3.18	0.045	-	-
SMS	-	-	-	-	3.27	0.051	-	-	1.14	0.028	-	-	-	-
Phone calls	5.20	0.023	-	-	-	-	7.10	0.008	-	-	-	-	7.57	0.006
Mobile apps	-	-	-	-	2.49	0.011	-	-	-	-	1.78	0.018	-	-
Toll-free	2.69	0.040	-	-	-	-	-	-	1.32	0.025	-	-	-	-
Supply of power	2.55	0.011	2.01	0.015	-	-	-	-	-	-	-	-	1.52	0.046
Support systems	7.96	0.005	-	-	5.56	0.018	-	-	-	-	2.75	0.037	-	-
Requisite skills for diagnostic purposes	6.02	0.014	-	-	-	-	15.9	0.001	4.34	0.037	-	-	-	-
Competence to use	4.46	0.035	-	-	8.89	0.003	-	-	-	-	13.2	0.001	-	-

mHealth for							
treatment							









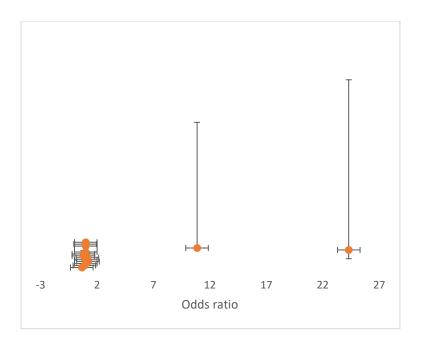
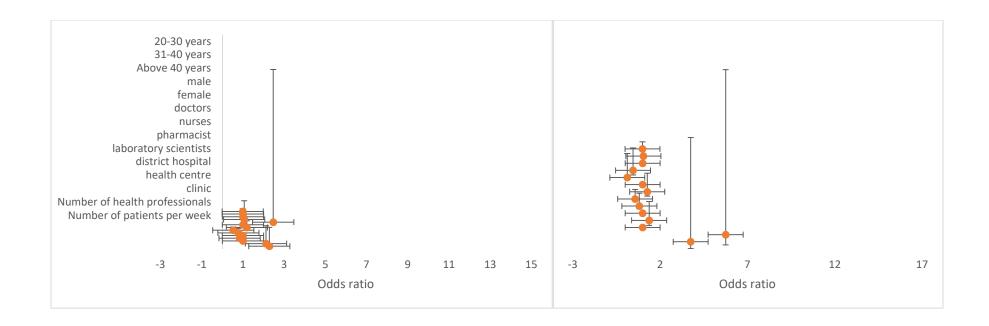
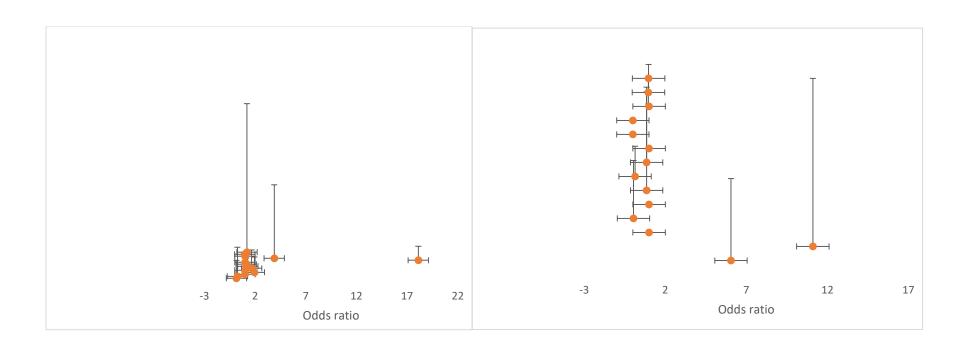
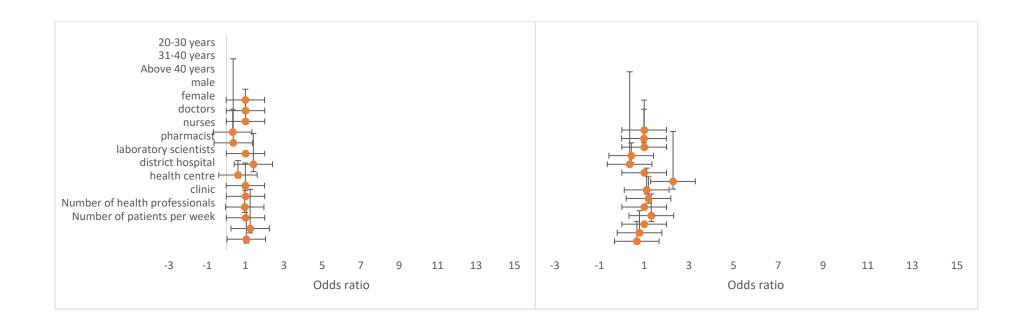
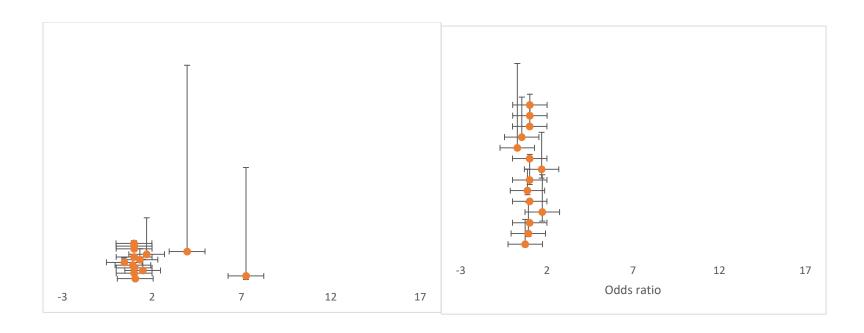


Figure S1. Odds ratio showing the association on the availability of mobile apps, toll-free, supply of power, support systems and others for disease diagnosis and treatment support by health workers in Ashanti Region, Ghana.









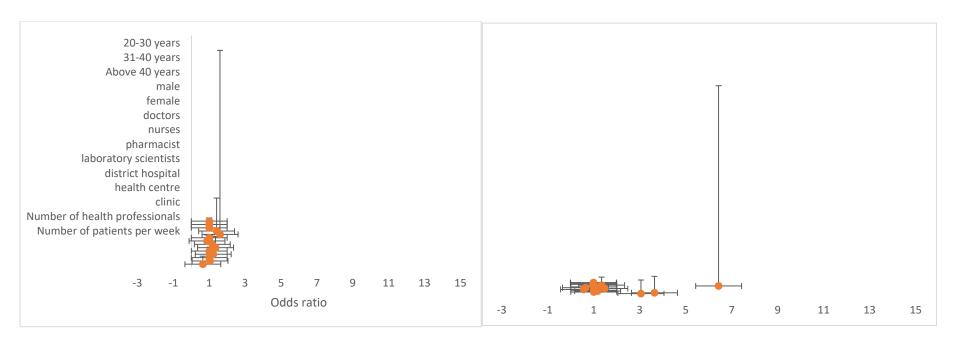
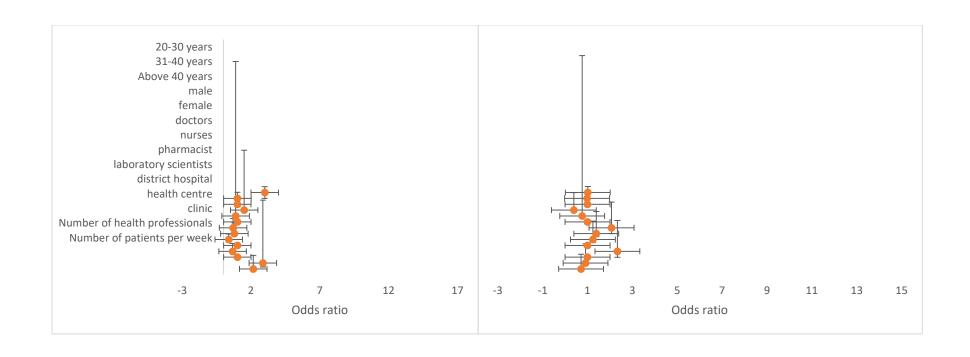


Figure S2. Odds ratio showing the association on the use of mHealth applications for the management and treatment of hypertension, diabetes, cancer, malaria, monitor patients' conditions and others by health workers in Ashanti Region, Ghana.



File S1. Distribution of primary healthcare facilities sampled in the Ashanti Region.

Name of stratum (District) (N=43)	Number (N=100)
Adansi Asokwa	1
Adansi Akrofroum	2
Adansi North	2
Adansi South	2

2
2
3
2
2
2
2
2
3
2
2
3
4
2
2
3
2

4
4
2
2
3
2
1
2
2
2
1
2
2
1
4
2
1

Kumasi Metro	5
Kwadaso Municipal	2
Old Tafo Municipal	2
Suame Municipal	2
Oforikrom Municipal	3

Survey tool

University of Kwazulu-Natal, Durban, School of Nursing and Public Health, Discipline of Public Health Medicine

Title: Mobile health (mHealth) technology for disease diagnosis and treatment support by health professionals in Ghana

Thank you for accepting to participate in this study. This questionnaire has three sections:

Part I: Demographic information

Part II: Availability of mHealth for diagnostics and treatment support

Part III: Use of mHealth for diagnostics and treatment support

Mark with an X in the appropriate box

PART I: DEMOGRAPHIC INFORMATION

Number	Question	Response
1.	Age	20-30 years
		31-40 years
		41-50 years
		51-60 years
		26.1
2.	Sex	Male
		Female
3.	Categories of health professionals	Medical Doctor

		Physician Assistant
		Midwife
		General Nurse
		Community Health Nurse
		Laboratory Scientist/technician
		Pharmacist/Dispensary technicians
		Others (Specify)
4.	Type of facility	

		District Hospital
		Sub-district health center
		Clinic
		CHPS
5.	Total number of healthcare professionals	
6.	How many patients do you see per week?	

PART II: AVAILABILITY OF MOBILE HEALTH FOR DIAGNOSTICS AND TREATMENT SUPPORT

Section A: Available Health Infrastructure Number Question Response Do you or your facility have mobile wireless 7. Yes devices to support the provision of healthcare? No Are there mobile health (mHealth) interventions Yes 8. available in this facility to support healthcare delivery? No

If No (Go to Section D)

9.	What are the various types of mobile health	Text message
	interventions available to health professionals in	
	this facility?	
	Tick all that apply	Voice/phone calls
		Mobile apps
		Multimedia messaging
		Video conferencing
		Emergency toll-free lines
		Others (Specify)

10.	What are the various types of wireless devices available to health professionals for mobile health interventions in this facility?	Mobile phones
	Tick all that apply	Smartphones
		Tablets
		Personal digital assistants
		Handheld devices
		Patient monitoring devices
		Watches
11.	Do you have continuous supply of power supply to support mobile health interventions in this facility?	Yes

12.	Are there support systems available for the	No Yes
12.	existence of mHealth for diagnostics and treatment support?	No
		If Yes list them

	Section B: Healthcare Workforce Competency	
13.	Do you have the requisite skills to use mHealth interventions for diagnostic purposes?	No If Yes list the skills

14.	Do you have the competence to use mHealth interventions to treat, monitor and manage diseases?	Yes

PART III: USE OF MOBILE HEALTH FOR DIAGNOSTICS AND TREATMENT SUPPORT

	Section C: You and Your Mobile Wireless Device			
15.	Have you ever used or currently using mHealth interventions to support healthcare delivery?	Yes		

16.	What type of disease(s) has mHealth been used or is currently being used for in this facility?	HIV
	Tick all that apply.	ТВ
		Hypertension
		Diabetes
		Stroke
		Cancer
		Chronic Respiratory disease
		Malaria
		Diarrhoea

		Others (Specify)
17.	Have you ever used smart mobile wireless device	Find health or medical
	to: Tick all that apply.	information
		Disease diagnosis
		Treat and manage disease conditions
		Treat and monitor patients' health conditions
18.	How often do you use mobile wireless device for diagnostic purposes?	Once a month

		2 or 3 times a month 1 to 6 times a week
		Once a day or more
19.	How often do you use mobile wireless device for treatment, monitoring and management of diseases?	Once a month
		2 or 3 times a month
		1 to 6 times a week
		Once a day or more
	Section D: Usefulness of mobile health interv	l entions

20.	Do health professionals use mHealth to monitor patients' disease conditions?	Yes	
21.	Do health professionals use mHealth to manage non-communicable diseases like diabetes, hypertension etc?	Yes	
		No	
22.	Do health professionals use mHealth to manage communicable diseases such as HIV, TB etc?	Yes	
		No	

23.	Do health professionals use mHealth as reminders to improve their treatment adherence procedures?	Yes	
		No	
24.	Do health professionals use mHealth as reminders to promote patients' medication adherence?	Yes	
		No	
25.	Do health professionals use mHealth to remind patients to honour their clinic appointments?	Yes	
		No	

26.	Do health professionals use mHealth to remind	Yes	
20.	patients to collect their ART and other drugs on time?	No	
27.	Do health professionals use mHealth for follow-ups to promote treatment compliance?	Yes	
	ups to promote treatment compnance.	No	
28.	Do health professionals use mHealth to support	Yes	
	patients test result notifications?	No	

29.	Does the use of mHealth improve the treatment and management of disease conditions?	Yes	
		No	
30.	Do health professionals use mHealth for making accurate diagnostic decisions?	Yes	
		No	
31.	Does the use of mHealth intervention increase the effectiveness of treatment and management of diseases?	Yes	

		No	
	Section E: Ease of Use		
32.	Is it easy to use mobile health interventions to support disease diagnosis?	Yes	
		No	
33.	Is it easy to use mobile health interventions to support the treatment of patients' disease conditions?	Yes	
		No	

34.	Is it flexible to interact with mobile health devices for disease diagnosis and treatment support?	Yes	
		No	
35.	Is it frustrating to interact with mobile health devices for disease diagnosis and treatment support?	Yes	
		No	
36.	Is it easy for me to become skilful in using mHealth for disease diagnosis and treatment support?	Yes	
		No	

37.	Is it easy for me to learn how to use mobile health devices for diagnosis and treatment support would be easy for me?	Yes	
		No	
	Section F: User Satisfaction		
38.	Do you feel comfortable in using mobile health for disease diagnosis and treatment procedures?	Yes	
		No	

39.	Are you confident in using mobile health for disease diagnosis and treatment procedures?	Yes	
		No	
40.	Are you completely satisfied in using mobile health for disease diagnosis and treatment procedures?	Yes	
		No	
41.	Do you believe that using mHealth for disease diagnosis and treatment support will increase the quality of healthcare delivery?	Yes	
		No	

	Section G: Behavioural Intention to Use		
42.	Would you use mHealth for the treatment and management of patients' disease conditions?	Yes	
		No	
43.	Would you as a health professional, always use mHealth for disease diagnosis and treatment support?	Yes	
		No	

44.	If you have access to mHealth, do you intend to use it for disease diagnosis and treatment support?	Yes	
		No	

Thank you for your cooperation