ITN ACCESS AMONG MALE- AND FEMALE-HEADED HOUSEHOLDS

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APRIL 2023



Expanding the ownership and use of mosquito nets



BACKGROUND

Gender dynamics are important for malaria prevention and control: both men and women experience varying degrees of risk of malaria related to their household duties, income-generating activities and other vulnerabilities, intersecting with their age, social status and geographic location.

Access to ITNs in most countries has been determined by mass campaign schedules and the completeness of household registration and distribution activities. We wished to assess whether there were differences in the proportion of the population with access to an ITN within the household between male- and female-headed households. This information could be used to identify gender disparities in ITN distribution activities, and/or signal potential differences in ITN retention and care behaviours.

METHODS

A total of 122 Malaria Indicator Surveys (MIS) and Demographic and Health Surveys (DHS) were downloaded with permission from dhsprogram.com. The proportion of the population with access to an ITN was calculated following guidelines from the RBM Partnership to End Malaria and calculated separately within male- and female-headed households. To account for differential targeting of ITNs to women and children prior to the advent of universal coverage campaigns around 2010, we stratified results into pre- and post-2011. The "meta forestplot" command in Stata 17 (StataCorp, College Station, Texas) was used to conduct a meta-analysis of the results, presenting point estimates from each survey and the difference in population ITN access between male- and female-headed households. Appropriate survey weights were applied using the svyset command in Stata.



The proportion of households headed by women ranged from 5 per cent to 48 per cent with a mean of 26 per cent (Figure 1) and varied by country, with Haiti, Swaziland, Namibia and Zimbabwe having the highest rates of female-headed households, and Burkina Faso and Mali the lowest rates.





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The proportion of the population with access to an ITN within their household (assuming one ITN protects up to two people) for male- and female-headed households is plotted in Figure 2, with a line indicating where the two values are equal. Green points highlight the 72 surveys where there was no statistical difference in ITN access between male- and female-headed households. Orange points highlight 12 surveys where ITN access was higher (p<0.05) among female-headed households (in five of five surveys in Madagascar, two of two surveys in Namibia, and two of six surveys in Mali, along with Benin 2018, Niger 2006 and Comoros 2012). A total of 38 surveys showed statistically higher (p<0.05) population ITN access among households headed by men (blue points). ITN access was not influenced by the prevalence of female-headed households: linear regression indicated that there was no association at the country level between the two indicators.

Figure 2: ITN access among male- and female-headed households in 122 MIS and DHS surveys



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Figure 3 presents the results of the meta-analysis among surveys conducted from 2011 onwards. There was a very small overall difference of one percentage point (95% CI 0%-2%) in population ITN access in favour of male-headed households, but we do not consider this to be a programmatically significant finding.

Figure 3: Forest plot of ITN access among male- and female-headed households, restricted to surveys conducted 2011-2021

Study	N	Treatment Mean	SD	N	Control Mean	SD	difference in mea with 959	in ITN access % Cl	Weight (%)
Angola 2011	32,221	.18928452	.28495053	7,730	.19494859	.3058472	-0.01 [-0.0	1, 0.00]	1.15
Angola 2015–16	47,919	.19969819	.32395401	24,951	.19198421	.33025988	0.01 [0.0	0, 0.01]	1.15
Benin 2011–12	71,669	.64138754	.36068718	14,229	.63490853	.40135034	0.01 [-0.0	0, 0.01]	1.15
Benin 2017–18	59,345	.7677006	.30050302	13,991	.79013742	.30292791	-0.02 [-0.02	3, -0.02]	1.15
Burkina Faso 2014	35,183	.7112942	.30490615	3,210	.71722695	.34417036	-0.01 [-0.0	2, 0.01]	1.12
Burkina Faso 2017-18	33,919	.54589095	.37351409	2,388	.52524117	.412464	- 0.02 [0.0	1, 0.04]	1.08
Burundi 2010	32,303	.40476063	.39895869	8,680	.3405435	.41862571	· 0.06 [0.04	5, 0.07]	1.13
Burundi 2016–17	59,202	.33313011	.37626513	17,326	.28748046	.39169338	0.05 [0.04	4, 0.05]	1.15
Burundi 2012	18,384	.46695034	.37936736	4,222	.43136113	.43076221	- 0.04 [0.02	2, 0.05]	1.11
DRC 2013-14	74,155	.46677865	.35426018	18,992	.45909356	.38772291	0.01 [0.0	0, 0.01]	1.15
Congo 2011	38,995	.22713013	.3299146	9,831	.223018	.341482	0.00 [-0.0	0, 0.01]	1.14
Cote d'Ivoire 2012	41,296	.48874688	.37627028	7,982	.49438824	.39127943	-0.01 [-0.0	1, 0.00]	1.13
Cameroon 2011	55,130	.11214996	.2380627	15,164	.09020004	.22646515	0.02 [0.02	2, 0.03]	1.16
Cameroon 2018	44,900	.58347769	.37958802	13,574	.59032751	.39698202	-0.01 [-0.0	1, 0.00]	1.14
Gabon 2012	28,364	.26718257	.34863372	12,233	.27229083	.35924806	-0.01 [-0.0	1, 0.00]	1.14
Ghana 2014	30,985	.58961867	.39489584	11,307	.59199328	.42360958	-0.00 [-0.0	1, 0.01]	1.14
Ghana 2016	16,507	.66646796	.38785743	5,825	.63744512	.40847287	- 0.03 [0.03	2, 0.04]	1.12
Ghana 2019	16,239	.66467365	.38962842	6,761	.67318856	.39359927	-0.01 [-0.02	2, 0.00]	1.12
Gambia 2013	40,969	.45821322	.34755872	9,378	.42875118	.36699068	0.03 [0.03	2, 0.04]	1.14
Gambia 2019	45,074	.61178052	.33271013	8,386	.59366679	.3802437	0.02 [0.0	1, 0.03]	1.14
Guinea 2012	37,784	.25266779	.30697345	6,092	.25783645	.33275709	-0.01 [-0.0	1, 0.00]	1.14
Guinea 2018	41,485	.30795231	.37931903	7,471	.29974233	.39394329	0.01 [-0.0	0, 0.02]	1.13
Guinea 2021	21,532	.4223653	.37109984	3,843	.40241502	.38521782	- 0.02 [0.0	1, 0.03]	1.11
Haiti 2012	35,812	.10463129	.24037236	22,857	.11370434	.25215454	-0.01 [-0.0	1, –0.01]	1.16
Haiti 2016–17	33,243	.20201699	.32771754	25,502	.19551889	.3346687	0.01 [0.0	0, 0.01]	1.15
Kenya 2015	16,995	.52362567	.41740051	7,994	.52862516	.43586069	-0.00 [-0.0	2, 0.01]	1.12
Kenya 2014	98,534	.48990306	.41378507	46,906	.46274943	.4233866	0.03 [0.03	2, 0.03]	1.16
Kenya 2020	20,886	.39992076	.41662587	9,474	.38746192	.42662256	· 0.01 [0.0	0, 0.02]	1.13
Comoros 2012	14,760	.39199852	.38220876	8,820	.4466051	.4068208	-0.05 [-0.0	6, –0.04]	1.13
Liberia 2013	31,318	.38417171	.38115709	14,677	.3446531	.37263075	0.04 [0.03	3, 0.05]	1.14
Liberia 2011	12,797	.31497249	.34554676	5,835	.29150022	.34732459	· 0.02 [0.0	1, 0.03]	1.12
Liberia 2016	14,725	.42426229	.37528705	6,134	.39484094	.37698081	- 0.03 [0.03	2, 0.04]	1.12
Liberia 2019	27,455	.4219386	.39632784	12,643	.34717208	.38813496	0.07 [0.0	7, 0.08]	1.14
Madagascar 2011	30,410	.55966202	.34811267	8,927	.6274919	.3597952	-0.07 [-0.07	8, –0.06]	1.14
Madagascar 2013	29,311	.46397839	.37399032	8,260	.53260137	.4030446	-0.07 [-0.07	8, –0.06]	1.13
Madagascar 2016	35,672	.60870089	.37724082	11,968	.66108256	.37898916	-0.05 [-0.0	6, –0.04]	1.14
Madagascar 2021	68,361	.47821574	.37416072	17,694	.50617519	.40285264	-0.03 [-0.03	3, –0.02]	1.15
Mali 2012–13	51,679	.65142692	.34528286	3,979	.63779686	.38782295	- 0.01 [0.0	0, 0.02]	1.12
Mali 2015	37,166	.69292344	.28969736	1,539	.7511313	.29226255		7, –0.04]	1.09
Mali 2018	45,753	.75516666	.31315452	7,724	.73192027	.33889569	0.02 [0.02	2, 0.03]	1.14

Study	N	Treatment Mean	SD	Ν	Control Mean	SD	difference in mean ITN access with 95% Cl	Weight (%)		
Mali 2021	49,842	.72441096	.30001147	3,208	.67584793	.35298673	0.05 [0.04, 0.06]	1.12		
Myanmar 2016	41,971	.21340268	.36236313	10,214	.20700831	.36729769	0.01 [-0.00, 0.01]	1.14		
Mauritania 2019–21	46,833	.19348313	.30064102	25,280	.19828536	.31709753	-0.00 [-0.01, -0.00]	1.16		
Malawi 2012	10,610	.38053481	.36103016	3,481	.34502331	.38745528	- 0.04 [0.02, 0.05]	1.10		
Malawi 2015–16	85,810	.39993452	.38622418	32,023	.35663381	.39544533	0.04 [0.04, 0.05]	1.15		
Malawi 2014	11,383	.51807672	.3763924	2,758	.51926058	.39348613	-0.00 [-0.02, 0.01]	1.08		
Malawi 2017	12,622	.6370034	.35541213	3,708	.61132326	.37632461	- 0.03 [0.01, 0.04]	1.10		
Mozambique 2011	40,676	.38146176	.38407889	20,483	.3438057	.40485983	0.04 [0.03, 0.04]	1.15		
Mozambique 2015	20,708	.54353418	.41062511	11,343	.52824335	.43394205	0.02 [0.01, 0.02]	1.13		
Mozambique 2018	19,462	.67682987	.36110897	8,664	.70304803	.37362018	-0.03 [-0.04, -0.02]	1.13		
Nigeria 2013	151,596	.35979527	.37453648	25,353	.36618999	.414886	-0.01 [-0.01, -0.00]	1.15		
Nigeria 2015	33,877	.54936716	.38348108	3,899	.52763907	.41980457	- 0.02 [0.01, 0.03]	1.11		
Nigeria 2018	161,936	.47745096	.39308658	24,391	.45423753	.4284643	0.02 [0.02, 0.03]	1.15		
Niger 2012	54,579	.37498376	.33610253	7,101	.35486252	.36516961	0.02 [0.01, 0.03]	1.14		
Namibia 2013	21,768	.16477259	.31663477	18,469	.2002834	.34086069	-0.04 [-0.04, -0.03]	1.15		
Pakistan 2017–18	88,832	.02164597	.11327482	9,103	.00973841	.08087149	0.01 [0.01, 0.01]	1.16		
Papua New Guinea 2016-18	69,383	.57915341	.42374821	12,433	.57713584	.44112503	0.00 [-0.01, 0.01]	1.14		
Rwanda 2010	39.655	.64938532	.32792916	15.625	.62375224	.38267478	0.03 [0.02. 0.03]	1.15		
Rwanda 2013	15.476	.67136411	.33044763	4.974	.61999383	.38067279	0.05 [0.04, 0.06]	1.12		
Rwanda 2014-15	39,586	.63504671	.35094644	14,190	.64728668	.38941639	-0.01 [-0.02, -0.01]	1.15		
Rwanda 2017	13.551	.71150878	.34156276	6.350	.73557179	.36968813	-0.02 [-0.03, -0.01]	1.13		
Rwanda 2019–20	40.453	.5057297	.40117343	14.834	.51303719	.43220427	-0.01 [-0.02, 0.00]	1.14		
Sierra Leone 2013	52.888	.38346265	.33650902	21,402	.35907314	.33896479	0.02 [0.02. 0.03]	1.15		
Sierra Leone 2016	30.096	37355716	35966143	9.484	.36497011	36468875	0.01 [0.00, 0.02]	1.14		
Sierra Leone 2019	52,723	.480212	.37294144	17.879	.43298488	.37894012		1.15		
Senegal 2012–13	31.876	.5807827	.36610512	7.880	.55065007	.39800357		1.13		
Senegal 2015	31,336	.65823849	.36983259	9.706	.66389629	.38676921		1.14		
Senegal 2010–11	61.026	.39227404	.35172832	13.915	.33944308	.36269803		1.15		
Senegal 2014	30.654	.58180313	.38671537	8,793	.58918655	.39517508		1.13		
Senegal 2016	30.574	.77168943	.33787418	9.999	.72053553	.38136592	0.05 [0.04. 0.06]	1.14		
Senegal 2017	58.375	.72855886	.34274335	18,709	.72551813	.34979073	0.00 [-0.00, 0.01]	1.15		
Senegal 2018	32.544	.63373561	.3795223	9.974	.59203345	.40259763	0.04 [0.03. 0.05]	1.14		
Senegal 2019	30.753	.764659	.3513806	9.488	.67953759	.40781943	0.09 [0.08. 0.09]	1.14		
Senegal 2020-21	41.195	.58505733	.36258998	7.098	.55233641	.4097287	0.03 [0.02. 0.04]	1.13		
Chad 2014	78,751	.41048929	.42081455	17.254	.34658277	.42156254		1.15		
Togo 2013	36.689	48892855	.38683916	8.743	.48306552	.41709474		1.13		
Togo 2017	18 214	83475336	32225058	4 264	7802587	.36662095		1.12		
Fast Timor 2016	52 733	48193865	40781439	7 674	49252121	43262739		1 13		
Tanzania 2011–12	41.043	.74115993	29970455	9.953	.75851406	.31042743	-0.02 [-0.02, -0.01]	1.15		
Tanzania 2015–16	48.563	.56346256	40956524	12,467	.54091954	43219129		1.14		
Tanzania 2017	36,444	.62081938	.37579369	9.370	.64105427	.38954705		1.14		
Uganda 2011	31.075	.44921385	.39202884	12,238	.44001176	40636984		1.14		
Uganda 2014–15	20.104	.79190466	.28836787	6.360	.77540442	.32271203		1.14		
Uganda 2016	63 415	64507525	.38279143	24 759	64663063	.40098607		1.15		
Uganda 2018–19	31 537	71162411	34373692	12 952	69540722	3712133		1 15		
Zambia 2013–14	61 086	46548352	36824792	17 400	46703453	39999839		1 15		
Zambia 2018	47 580	.60051504	.36980463	14,762	.59409162	.39009088		1.15		
Zimbabwe 2015	25 830	.37662466	.40821911	16.064	.36562494	.4242026		1.14		
Overall	20,000			. 0,004		/2020				
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Test of $\theta = 0; z = 3.36, n = 0.00$										
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Random-effects REML model										



DISCUSSION

While the meta-analysis indicated a small but statistically significant difference in ITN access in favor of male-headed households, we do not consider a one-percentage-point difference to indicate any significant global issues in reaching male and female-headed households with ITNs, nor do we consider this evidence of differential ITN retention behaviours between male- and female-headed households. There are many other factors that determine which households receive nets, including proximity to campaign registration activities and distribution points, frequency of ITN distributions, eligibility for antenatal care (ANC), Expanded Programme on Immunization (EPI) and other continuous distribution channels, and availability of ITNs from other sources, including family and retail or black markets. Likewise, ITN retention behaviours are highly variable by location, environment and ITN handling habits, and are influenced by scarcity or availability of other ITNs. It is not implausible that the gender of the head of household may have an influence on net care behaviours, but when aggregating data across countries, there is no evidence to signal this has global implications. Nonetheless we would recommend durability monitoring and malaria behavioural surveys assess net care practices by gender to inform countryspecific recommendations.

Only one country, Madagascar, had consistent results favoring one type of household. It is notable that female-headed households had ITN access rates that were three to seven percentage points higher than male-headed households across surveys conducted between 2008 and 2021. Madagascar's ITN distribution modalities (primarily mass campaigns and ANC/EPI) may intentionally or unintentionally prioritize or favour female-headed households, or these households may have different approaches to caring for and retaining ITNs than male-headed households.

CONCLUSION

There was no evidence to conclude that there are programmatically significant gender disparities in ITN access between male- and female-headed households at a global level. Country-specific analyses and ITN studies, including durability monitoring and behavioural surveys, should continue to examine the role of gender in ITN-related behaviours.



To join the weekly AMP conference call each Wednesday at 10:00 AM Eastern time (16.00 PM CET) use the following Zoom meeting line: https://us06web.zoom.us/j/2367777867?pwd=allhZk9KQmcxMXNaWnRaN1JCUTQ3dz09 You can find your local number to join the weekly call: https://zoom.us/u/acyOjklJj4 To be added to the AMP mailing list visit: https://allianceformalariaprevention.com/weekly-conference-call/signup-for-our-mailing-list/

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