



## Health Demographic Surveillance System (HDSS) Mapping Experience and Findings in Manyatta Study Area, Western Kenya, 2017: Case Report

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### Why HDSS-Brief Background

A Health and Demographic Surveillance System (HDSS) is an important platform for generating longitudinal data on population health, demographics, and other socioeconomic factors within a specific geographic area. In settings with a high burden of maternal and child mortality, HDSSs are particularly valuable for tracking key health indicators such as maternal mortality rates, child mortality rates, and immunization coverage (1), ultimately helping to develop strategies to improve outcomes for mothers and children. This potential of the HDSS aligns well with the strategic mandate of the Kenya Medical Research Institute (KEMRI) and US Centers for Disease Control and Prevention (CDC): to generate data that inform public health actions and promote quality of life.

In 2016, the Child Health and Mortality Prevention Surveillance (CHAMPS) network partnered with KEMRI, CDC, and the Kisumu County Department of Health to establish the Kenya CHAMPS site with an aim to better understand the causes of death among children under five years. Kisumu County indeed has one of the highest burdens of under-five mortality in Western Kenya (2), with an estimated rate of 79 deaths per 1000 births (3). Factors contributing to this high burden include a high prevalence of communicable diseases such as malaria, HIV/AIDS, and tuberculosis; malnutrition and food insecurity; and poverty and unemployment.

KEMRI, in collaboration with CDC and the Kenya Ministry of Health (MOH), launched a new integrated HDSS in Manyatta, an informal settlement area within Kisumu County, Western Kenya. The platform collects information for the purposes of research and health program evaluation. These data were initially collected for Kenya CHAMPS and the Kisumu County Department of Health but are now utilized by other local partners with similar objectives.

The HDSS aims to provide general demographic and health information for the population within the study area, including population size, age and sex composition, pregnancies, births, deaths, and migration. With routine data collection over time, the Manyatta HDSS could also provide insight into specific diseases such as malaria, HIV, tuberculosis(4), other respiratory diseases, diarrheal diseases, schistosomiasis, and disease-specific interventions.

## Demographic and health information data capture before HDSS in Manyatta

According to the latest national census conducted in [2009], Manyatta has an estimated total population of 80,000 (5). Despite the age of the census, the Kisumu County Department of Health relies on these estimates to plan their health service delivery activities in Manyatta, as population data reported by their Community Health Volunteers (CHVs) are often limited by undercounting.

In the Community Health Strategy (CHS) developed by the Ministry of Health, Manyatta is geographically divided into community health units (CHUs). Each CHU is supervised by a Community Health Assistant. Under each CHU, one CHV is assigned to serve 100-120 households. CHVs regularly collect demographic and health data from each household and submit these data to the MOH at the sub-county and county levels. Without an adequate monitoring system, the true number of households in a given CHU can exceed expectations based on census estimates. Without proper cover-age, households are likely to miss out on primary healthcare interventions such as bed net distribution, immunization, deworming, and community case management of malaria. If the CHVs are to remain a strategic pillar in universal health coverage, it is imperative to address those factors that impact their performance(4).

In addition, there is no permanent identification system for the households or individuals, and the assigned number of households is at the CHV's discretion, depending on where they work. This makes linkages and future follow-up of individuals very difficult.

## The Manyatta HDSS

The Manyatta HDSS in Kisumu was established by KEMRI in collaboration with the Kisumu County Department of Health and CDC with support from CHAMPS. The purpose of the HDSS was to strengthen the existing MOH surveillance system through more systematic methods, leading to improved denominator data for child mortality estimations, identification and timely notifications of under-five deaths, and documentation.

### **The following activities were undertaken to establish the Manyatta HDSS:**

- Mapping of compounds

After a successful community entry process was conducted, the HDSS started the mapping exercise in November 2016. Mapping activities included capturing geo-coordinates of all compounds using geographic information system (GIS) techniques, assigning unique identification numbers to compounds, and capturing the number of individuals residing in the compounds. This activity was completed in February 2017.

- Enumeration of individuals (baseline survey)

After mapping the compounds, the baseline survey began in May 2017 and remains ongoing. In this stage of the survey all individuals are registered after the compound head provides consent, and every individual is assigned a unique individual identifier. Compound heads are the owners of the compound, typically the individual who built the structure, similar to a landlord. Compound heads are identified to help locate the compound, but they are not necessarily residents within the HDSS mapping area.

- HDSS successive rounds of data collection

After enumeration, registered households/individuals received follow-up visits from the CHV twice yearly.

## Findings from the Mapping

Below provides a summary of findings from the mapping exercise and lessons learned. These data will assist the MOH to improve their knowledge of the community and will help inform the planning of interventions in Manyatta.

1. According to the MOH, every CHV was believed to have between 100 to 120 households in their assigned villages, however, the outcomes from mapping revealed a significant undercount by the MOH (Table 1). It came out that almost 90% of villages have more than 120 households and did not meet the CHS criteria, and considering CHVs were only visiting the required number, a vast majority of households went unvisited.

The mapping exercise revealed the majority of CHVs in Manyatta covered areas with over 221 households, with the highest being 807 households. One CHV confirmed that they only visit 100 to 120 households and continue visiting same households on subsequent visits, implying the rest of the households, in some cases up to 700, are never visited and missed.

2. The planning of interventions by MOH was based on underestimated figures reported by the CHVs; in general, this diminishes the impact of any efforts undertaken, as only a fraction of the population is reached.

**Table 1. Number of households per CHV area, Manyatta HDSS, 2017**

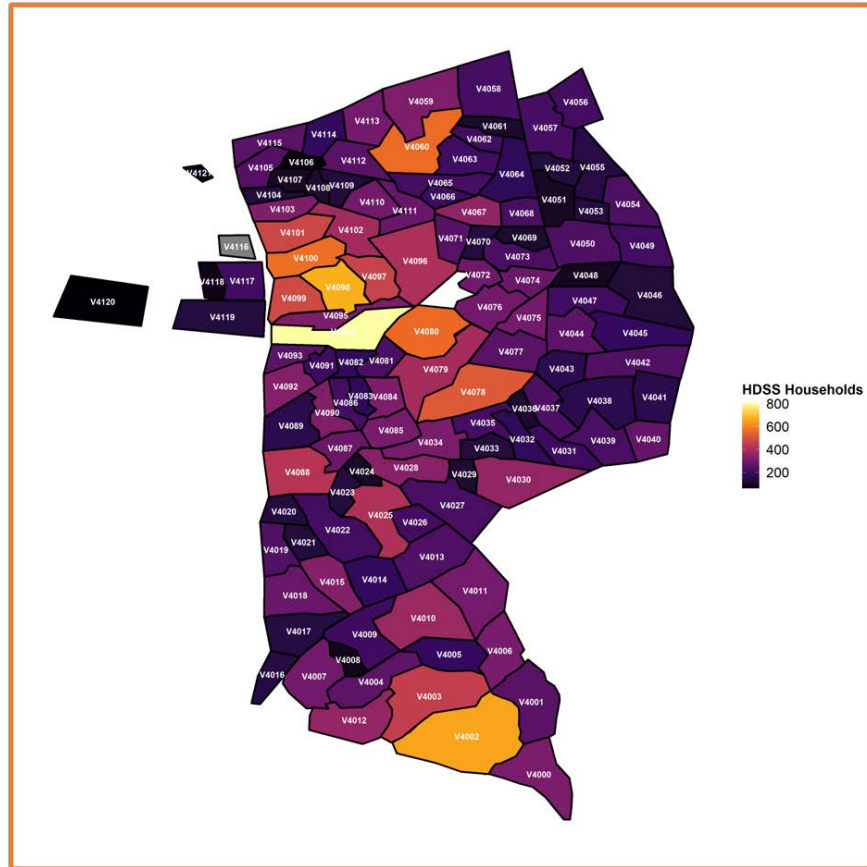
Household size	N (%)	Mean	Standard Deviation	Minimum	Maximum
0-120	12 (9.9)	94	19	59	118
121-220	45 (37.2)	176	32	122	219
221-320	38 (31.4)	268	33	221	320
321-420	14 (11.6)	357	32	321	411
421-520	6 (5.0)	469	32	424	520
521-620	3 (2.5)	561	5	557	566
621-720	2 (1.7)	664	14	654	674
721+	1 (0.3)	807		807	807

3. The existing MOH system did not allow accurate tracing of individuals in their permanent residence since there was no permanent unique identifier.

In one example, the MOH distributed bed nets for malaria prevention to households in Manyatta, but because of CHV undercounting, many households did not receive bed nets. Therefore, when the KEMRI HDSS enumeration team began reaching out to locals to begin their surveillance work, many households refused to participate because they felt excluded from some previous health interventions and mistrusted CHVs.

Evidence from the baseline survey informed the need for mapped households to be assigned a permanent number that is visibly labeled above the front door. This method allows better management for CHV follow up visits and improves the efficiency of MOH intervention planning.

**Figure 1. Village locations and household counts, Manyatta HDSS2017**



The majority of villages in Manyatta had over 200 households compared to 100 to 120 households expected by the Kisumu County Department of Health (Figure 1).

4. The previous population estimates as per 2009 census showed there were 80,000 households in Manyatta, however, the mapping findings reported the number exceeds 88,000 and it is estimated the number may go up when the actual enumeration is completed for Manyatta residents

**Figure 2. Comparison of HDSS and previous household counts by Community Health Unit**

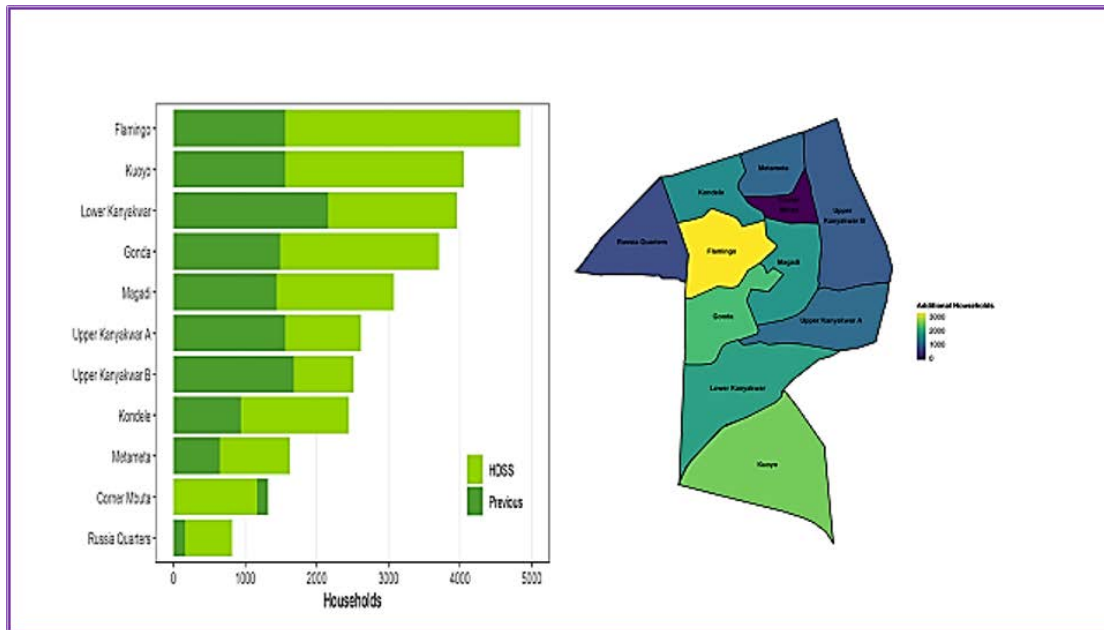


Figure 2 shows the households' counts previously recorded by County Department of Health and the findings from HDSS mapping. Results show a large undercount in earlier counts and hence a lack of CHV services by majority of the households. Most of the CHUs had more households counts except Flamingo and this implied they needed more CHVs to effectively cover the households.

## Recommendations

Based on the mapping findings, the following recommendations were proposed, and to date, most recommendations have been put into action by the county department of health.

### 1. Re-align community units to ensure adequate coverage by CHVs

189 additional CHVs were required to ensure adequate and complete coverage. To date 164 out of 189 have been recruited and assigned to their households, and recruitment remains ongoing. The hiring of additional CHVs has improved the team's ability to capture events and ensure that the majority of households are visited. Likewise, the newly recruited CHVs have helped to offload the overburdened CHVs, and the community health strategy requirement of 100 to 120 households is being met. As a result, the MOH and other partners now have improved accuracy on the number of households and population data that guides any sort of intervention in the community.

### 2. Population data to guide planning of health services and interventions

The MOH and other partners now have evidence on the accurate number of households and population that guides any sort of intervention in the community.

### 3. Distribution of Long Lasting Insecticide Treated Nets (LLITNs)

As reported earlier during baseline, a good number of households refused to participate in this HDSS project because they were previously left out of MOH's distribution of long-lasting insecticide treated nets (LLITNs). The MOH recognized this issue with the help of CHAMPS and KEMRI. Currently, there is ongoing MOH net distribution, and this time, all households will receive LLITNs. This project is rebuilding trust among community members while providing basic malaria prevention support to save lives. It would not have been easy to address this issue without the complete demographic coverage realized as part of these HDSS mapping efforts.

## Conclusion

As observed, re-assessing census figures for urban area catchments is of paramount importance since CHVs are recruited and allocated duties on the basis of household counts. The ratio between CHVs and households assigned has important implications for service delivery and health outcomes in Manyatta.

## References

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3. KNBS and ICF. Kenya Demographic and Health Survey 2022. Key Indicators Report. Nairobi, Kenya, and Rockville, Maryland, USA: KNBS and ICF; 2023.
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5. Kenya National Bureau Statistics 2009.

## Appendix 1. Number of households (HH) registered during the Manyatta Mapping

Obs	Admin Village	Village Code	# of Households	>=5 Residents	<5 Residents
1	Kuoyo	V4000	315	747	124
2	Kuoyo	V4001	253	564	111
3	Kuoyo	V4002	654	1507	246
4	Kuoyo	V4003	453	1053	248
5	Kuoyo	V4004	261	551	118
6	Kuoyo	V4005	185	411	84
7	Kuoyo	V4006	311	721	139
8	Kuoyo	V4007	298	631	136
9	Kuoyo	V4008	88	242	54
10	Kuoyo	V4009	205	515	84
11	Kuoyo	V4010	371	878	170
12	Kuoyo	V4011	303	655	130
13	Kuoyo	V4012	358	937	163
14	Lower Kanyakwar	V4013	233	638	123
15	Lower Kanyakwar	V4014	183	432	86
16	Lower Kanyakwar	V4015	329	734	136
17	Lower Kanyakwar	V4016	148	231	53
18	Lower Kanyakwar	V4017	145	300	49
19	Lower Kanyakwar	V4018	281	682	100
20	Lower Kanyakwar	V4019	237	520	78
21	Lower Kanyakwar	V4020	141	360	68
22	Lower Kanyakwar	V4021	139	337	48
23	Lower Kanyakwar	V4022	211	541	70
24	Lower Kanyakwar	V4023	143	357	56
25	Lower Kanyakwar	V4024	107	298	48
26	Lower Kanyakwar	V4025	411	1034	149
27	Lower Kanyakwar	V4026	213	581	128
28	Lower Kanyakwar	V4027	221	598	84
29	Lower Kanyakwar	V4028	337	922	151
30	Lower Kanyakwar	V4029	122	264	57
31	Lower Kanyakwar	V4030	358	765	157
32	Upper Kanyakwar A	V4031	201	495	105
33	Upper Kanyakwar A	V4032	183	490	101
34	Upper Kanyakwar A	V4033	138	389	47
35	Upper Kanyakwar A	V4034	312	807	134
36	Upper Kanyakwar A	V4035	217	592	104
37	Upper Kanyakwar A	V4036	118	330	65
38	Upper Kanyakwar A	V4037	230	675	148
39	Upper Kanyakwar A	V4038	161	476	67
40	Upper Kanyakwar A	V4039	223	569	145
41	Upper Kanyakwar A	V4040	273	653	152
42	Upper Kanyakwar A	V4041	161	385	65

43	Upper Kanyakwar A	V4042	235	570	94
44	Upper Kanyakwar A	V4043	165	392	85
45	Upper Kanyakwar B	V4044	259	734	139
46	Upper Kanyakwar B	V4045	186	417	69
47	Upper Kanyakwar B	V4046	131	314	48
48	Upper Kanyakwar B	V4047	207	449	97
49	Upper Kanyakwar B	V4048	96	265	52
50	Upper Kanyakwar B	V4049	210	487	132
51	Upper Kanyakwar B	V4050	231	592	121
52	Upper Kanyakwar B	V4051	102	275	39
53	Upper Kanyakwar B	V4052	140	356	59
54	Upper Kanyakwar B	V4053	139	422	60
55	Upper Kanyakwar B	V4054	230	550	103
56	Upper Kanyakwar B	V4055	151	330	65
57	Upper Kanyakwar B	V4056	211	554	114
58	Upper Kanyakwar B	V4057	219	452	63
59	Metameta	V4058	217	602	102
60	Metameta	V4059	320	884	132
61	Metameta	V4060	560	1359	262
62	Metameta	V4061	113	350	69
63	Metameta	V4062	210	598	109
64	Metameta	V4063	207	589	89
65	Corner Mbuta	V4064	176	563	76
66	Corner Mbuta	V4065	216	590	93
67	Corner Mbuta	V4066	203	601	64
68	Corner Mbuta	V4067	351	949	162
69	Corner Mbuta	V4068	221	629	114
70	Magadi	V4069	115	334	61
71	Magadi	V4070	148	373	65
72	Magadi	V4071	245	653	101
73	Magadi	V4072	297	741	118
74	Magadi	V4073	226	639	123
75	Magadi	V4074	284	772	151
76	Magadi	V4075	303	781	216
77	Magadi	V4076	298	811	134
78	Magadi	V4077	252	713	133
79	Magadi	V4078	520	1201	218
80	Magadi	V4079	390	1061	186
81	Gonda	V4080	557	1267	235
82	Gonda	V4081	227	570	101
83	Gonda	V4082	182	444	78
84	Gonda	V4083	177	494	93
85	Gonda	V4084	318	847	163
86	Gonda	V4085	308	688	133
87	Gonda	V4086	216	568	97
88	Gonda	V4087	284	571	99
89	Gonda	V4088	424	1004	127
90	Gonda	V4089	161	413	66



<b>91</b>	Gonda	V4090	324	852	118
<b>92</b>	Gonda	V4091	199	519	81
<b>93</b>	Gonda	V4092	331	771	173
<b>94</b>	Flamingo	V4093	258	651	73
<b>95</b>	Flamingo	V4094	807	2118	361
<b>96</b>	Flamingo	V4095	321	666	109
<b>97</b>	Flamingo	V4096	407	1108	199
<b>98</b>	Flamingo	V4097	463	216	1240
<b>99</b>	Flamingo	V4098	674	1638	340
<b>100</b>	Flamingo	V4099	482	1107	149
<b>101</b>	Flamingo	V4100	566	1425	275
<b>102</b>	Flamingo	V4101	473	1128	241
<b>103</b>	Flamingo	V4102	387	1006	161
<b>104</b>	Kondele	V4103	322	747	93
<b>105</b>	Kondele	V4104	140	340	71
<b>106</b>	Kondele	V4105	242	539	85
<b>107</b>	Kondele	V4106	69	174	32
<b>108</b>	Kondele	V4107	102	249	37
<b>109</b>	Kondele	V4108	123	303	50
<b>110</b>	Kondele	V4109	138	370	76
<b>111</b>	Kondele	V4110	297	813	155
<b>112</b>	Kondele	V4111	281	672	135
<b>113</b>	Kondele	V4112	254	554	85
<b>114</b>	Kondele	V4113	300	684	128
<b>115</b>	Kondele	V4114	182	552	77
<b>116</b>	Russia Quarters	V4115	252	453	84
<b>117</b>	Russia Quarters	V4117	208	45	296
<b>118</b>	Russia Quarters	V4118	85	132	14
<b>119</b>	Russia Quarters	V4119	142	280	38
<b>120</b>	Russia Quarters	V4120	59	115	16
<b>121</b>	Russia Quarters	V4121	72	7	112