

Comparison of Reported and Survey-Based Coverage in Onchocerciasis Programs over a Period of 8 Years in Cameroon and Uganda

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Abstract. Mass drug administration (MDA) with ivermectin must reach a high treatment coverage (90% of the eligible population) if onchocerciasis is to be eliminated. Questions have been raised as to whether reported treatment figures reaching such high coverage are reliable. Sample surveys are proposed as the method of choice for “validating” reported coverage figures. The purpose of this study was to compare the district-level MDA coverage reported by programs with contemporaneous surveys of randomly selected respondents living in those same districts. Over an 8-year period, 19,219

that community. The MOH worker in turn completed the next level of summary reporting forms for those communities under his/her jurisdiction. The “roll-up” process thus continued for subdistrict, district, region (in Cameroon), and national levels. Each of these levels offered opportunities for inconsistencies or errors to occur.

We collected district-level treatment coverage figures for the years 2003–2011 for the districts and years that corresponded to the Carter Center–supported random monitoring surveys.^{9,11} District-reported coverage was calculated as a percentage: (the number of persons treated divided by the number of eligible people to be treated) × 100.¹²

All Carter Center–assisted districts were eligible to be sampled at random each year. A multistage random sampling process was used as described in previous published reports.^{2,9,11,13} Surveys were conducted a month after the submission of district reports, which was no more than 2 months after MDA completion. Communities were randomly sampled as follows: The district health services provided a list of all communities targeted for MDA with their corresponding population size. Communities then were randomly selected by the program statistician, and the number of persons to be interviewed in each was determined using the table for sample sizes.

MDA coverage to be relatively homogenous within communities.¹⁸ CIs were adjusted to a maximum limit of 100% and a minimum limit of 0%. CIs were not calculated around the reported treatments because these data were not the result of a sample.

Coverage surveys and their 95% CI results were matched with their corresponding reported coverage by district and year. The key outcome was to determine if the CIs from the coverage survey included the district's reported coverage; if so,

TABLE 2
Annually reported and surveyed treatment coverage by district in Cameroon (2004–2011) (n = 60)

Year	District	Reports				Surveys				Statistically significant from reports	Estimate above (↗) or below (↘) reported coverage
		Population	Treatment goal	Treated	Coverage (%)	Sample size	Treated	Coverage (95% CI)			
2004	Bamendjou	28,600	24,024	21,622	90.0	484	462	95.5% (90.9–100%)	*	↗	
	Batcham	60,676	50,968	49,439	97.0	476	458	96.2% (92.6–100%)	NS	–	
	Dschang	72,910	61,244	61,244	100.0	431	421	97.7% (94.2–100%)	NS	–	
	Kekem	27,325	22,953	22,494	98.0	490	470	95.9% (91.6–100%)	NS	–	
	Lagdo	56,987	47,869	46,912	98.0	505	463	91.7% (85.8–97.6%)	*	↘	
	Penka Michel	63,099	53,003	46,113	87.0	488	459	94.1% (88.9–99.2%)	*	↗	
	Poli	40,145	33,722	31,698	94.0	499	393	78.8% (70–87.5%)	*	↘	
	Tcholliré	61,728	51,852	51,852	100.0	450	403	89.6% (82.6–96.5%)	*	↘	
2005	Bamendjou	29,560	24,830	22,198	89.4	438	426	97.3% (93.5–100%)	*	↗	
	Bandja	36,400	30,576	30,270	99.0	476	456	95.8% (91.4–100%)	NS	–	
	Batcham	61,200	51,408	49,866	97.0	472	463	98.1% (95.1–100%)	NS	–	
	Kekem	28,500	23,940	22,025	92.0	443	436	98.4% (95.6–100%)	*	↗	
	Lagdo	59,450	49,938	43,945	88.0	489	452	92.4% (86.7–98.2%)	NS	–	
	Penka Michel	64,440	54,130	42,438	78.4	476	446	93.7% (88.3–99.2%)	*	↗	
	Poli	41,230	34,633	30,824	89.0	484	411	84.9% (77.1–92.7%)	NS	–	
	Tcholliré	62,300	52,332	50,762	97.0	489	447	91.4% (85.3–97.5%)	NS	–	
2006	Bafang	67,540	56,734	55,599	98.0	493	491	99.6% (98.5–100%)	*	↗	
	Bandjoun	88,961	74,727	71,290	95.4	480	467	97.3% (93.7–100%)	NS	–	
	Dschang	165,501	139,021	137,075	98.6	482	477	99% (96.7–100%)	NS	–	
	Kekem	32,840	27,586	27,310	99.0	481	477	99.2% (97.2–100%)	NS	–	
	Mbouda	129,880	109,099	105,826	97.0	498	488	98% (95–100%)	NS	–	
	Poli	64,906	54,521	49,123	90.1	497	444	89.3% (82.7–96%)	NS	–	
	Tcholliré	90,846	76,311	71,045	93.1	491	440	89.6% (83–96.2%)	NS	–	
	Toubo	137,425	115,437	102,739	89.0	499	463	92.8% (87.2–98.3%)	NS	–	
2007	Banja	37,840	31,786	31,468	99.0	489	428	87.5% (80.4–94.7%)	*	↘	
	Foumbot	68,319	57,388	54,519	95.0	484	458	94.6% (89.7–99.5%)	NS	–	
	Massagam	32,530	27,325	27,325	100.0	488	435	89.1% (82.4–95.9%)	*	↘	
	Mbouda	139,632	117,291	116,704	99.5	494	462	93.5% (88.2–98.8%)	*	↘	
	Ngong	34,361	28,863	28,863	100.0	488	425	87.1% (79.8–94.4%)	*	↘	
	Rey Bouba	80,430	67,561	46,415	68.7	496	390	78.6% (69.8–87.5%)	*	↗	
	Santchou	24,727	20,771	20,355	98.0	498	428	85.9% (78.5–93.4%)	*	↘	
	Toubo	149,061	125,211	120,203	96.0	494	426	86.2% (78.8–93.7%)	*	↘	
2008	Baham	43,160	36,254	36,254	100.0	117	92	78.6% (60.4–96.8%)	*	↘	
	Bandja	38,620	32,441	30,819	95.0	120	113	94.2% (83.9–100%)	NS	–	
	Batcham	77,016	64,693	61,459	95.0	108	103	95.4% (85.7–100%)	NS	–	
	Dschang	170,473	143,197	134,605	94.0	120	113	94.2% (83.9–100%)	NS	–	
	Foumban	160,089	134,475	123,717	92.0	109	95	87.2% (71.8–100%)	NS	–	
	Kouoptamo	45,770	38,447	38,062	99.0	120	119	99.2% (95.2–100%)	NS	–	
2009	Baham	46,660	39,194	39,194	100.0	120	90	75% (56–94%)	*	↘	
	Bandjoun	98,640	82,858	82,858	100.0	114	96	84.2% (67.8–100%)	NS	–	
	Foumbot	69,310	58,220	58,220	100.0	119	113	95% (85.3–100%)	NS	–	
	Kekem	34,800	29,232	28,355	97.0	118	100	84.7% (68.9–100%)	NS	–	
	Mbouda	141,820	119,129	114,364	96.0	120	114	95% (85.4–100%)	NS	–	
	Ngong	35,600	29,904	29,904	100.0	115	104	90.4% (77.3–100%)	NS	–	
	Penka Michel	74,000	62,160	60,917	98.0	120	114	95% (85.4–100%)	NS	–	
	Tcholliré	110,945	93,194	80,147	86.0	120	102	85% (69.4–100%)	NS	–	
	Toubo	156,600	131,544	130,886	99.5	119	113	95% (85.3–100%)	NS	–	
2010	Bandjoun	112,400	94,416	94,416	100.0	106	80	84% (48.8–100%)	NS	–	
	Banja	39,340	33,046	33,046	100.0	25	21	75.5% (55.4–95.5%)	*	↘	
	Dschang	171,230	159,120	159,120	100.0	200	190	95% (87.6–100%)	NS	–	
	Kouoptamo	52,500	44,100	41,454	94.0	52	40	76.9% (48.9–100%)	NS	–	
	Lagdo	64,250	53,970	43,176	80.0	104	98	94.2% (83.3–100%)	*	↗	
	Penka Michel	74,860	62,882	62,254	99.0	123	120	97.6% (90.9–100%)	NS	–	
	Poli	46,830	39,337	36,584	93.0	208	200	96.2% (89.8–100%)	NS	–	
	Tcholliré	116,800	98,112	87,320	89.0	208	197	94.7% (87.3–100%)	NS	–	
2011	Baham	76,560	64,310	64,310	100.0	78	73	93.6% (80.3–100%)	NS	–	
	Bangourain	44,073	37,903	34,113	90.0	78	73	93.6% (80.3–100%)	NS	–	
	Batcham	85,600	71,904	71,904	100.0	104	102	98.1% (91.6–100%)	NS	–	
	Galim	65,591	56,408	52,459	93.0	104	103	99% (94.4–100%)	*	↗	
	Mbouda	149,800	125,832	123,315	98.0	146	144	98.6% (94–100%)	NS	–	

NS = not significant.

* Yes.

Di ic -le el e l. The arrows in the far right columns of Tables 2 and 3 indicate the direction of a significant difference when the reported district coverage was outside of the 95% CIs of the sample survey conducted in that district. Only 20%

of districts reported a coverage figure above the corresponding sample survey's upper 95% CI (Table 4). Sixty-eight percent of district program reports fell within the 95% CIs of the corresponding year's surveys, and so were judged as

accurate. Twelve percent of districts reported lower coverage than determined by the survey (i.e., were below the lower 95% CI). Therefore, 80% of surveys demonstrated that district reports were either accurate or below surveyed coverage, disproving our hypothesis that district reports would be more frequently higher than surveyed coverage.

Point estimate. Overall 89% of districts reported coverage of $\geq 90\%$, which was considerably higher than the 68.4% of district surveys whose mean reached or exceeded the 90% goal. In Cameroon, 83.3% of districts reported reaching 90% coverage compared with only 66.7% of surveys, and for Uganda, 94.7% of districts reported reaching 90% or more coverage, whereas only 71.1% of surveys had such results. All these differences were highly statistically significant ($P < 0.01$).

In contrast to survey point estimates, when 95% CIs were considered, reported results could not be distinguished from surveys. In this analysis, 96.9% of all survey CIs included 90% coverage, not significantly different from a reported 89% attainment of the 90% treatment goal ($P = 0.258$). In Cameroon, 96.7% of surveys included 90% in their 95% CIs (versus 83.3% of district reports, $P = 0.198$) (Table 2). In Uganda, 97.4% of surveys had $\geq 90\%$ coverage in their CIs (compared with 94.7% reported, $P = 0.811$) (Table 3).

DISCUSSION

The prevailing opinion among assisting institutions and independent researchers is that the treatment coverage reported through MOH “roll-up” reporting systems is inaccurate and overstated—in other words, not to be trusted. More than 30 two-stage cluster household surveys carried out across Africa, the Americas, and Asia by the CDC and collaborators showed that figures from programmatic reports were likely to be higher than those from corresponding surveys.³ A study

carried out in Cameroon reported the immunization program overestimating the vaccination coverage by 1–29%.¹⁹ In Plateau State, Nigeria, the reported treatment coverage in MDA for trachoma control was 76%, but only 60% of the respondents said they had been treated.^{20,21}

Our results, by contrast, showed that, at the district level, the surveyed treatment coverage largely validated the reported coverage in Cameroon and Uganda onchocerciasis MDA programs when surveys were analyzed statistically.

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TABLE 3
Annually reported and surveyed treatment coverage by district for Uganda (2003–2011) (n = 38)

Year	District	Reports				Surveys			Statistically significant from reports	Estimate above (↗) or below (↘) reported coverage
		Population	Treatment goal	Treated	Coverage (%)	Sample size	Treated	Coverage (95% CI)		
2003	Adjumani	166,954	140,241	139,961	99.8	250	222	88.8% (79.2–98.4%)	*	↘
	Kanungu	45,315	38,065	37,189	97.7	250	244	97.6% (93%–100%)	NS	–
	Kisoro	20,795	17,425	16,403	94.1	100	85	85% (67.9–100%)	NS	–
	Mbale	175,365	147,307	147,307	100.0	250	245	98% (93.7–100%)	NS	–
	Nebbi	276,604	232,347	232,115	99.9	250	230	92% (83.8–100%)	NS	–
	Sironko	58,331	48,998	47,969	97.9	250	234	93.2% (85.6–100%)	NS	–
2004	Kanungu	46,448	39,016	37,768	96.8	250	244	97.6% (93–100%)	NS	–
	Kisoro	21,315	17,905	17,869	99.8	101	85	84.2% (66.7–100%)	NS	–
	Mbale	179,749	150,989	150,838	99.9	250	243	97.2% (93.5–100%)	NS	–
	Moyo	177,788	140,069	139,019	99.3	250	212	84.8% (73.9–		

The literature comparing the reported and surveyed MDA coverage in public health programs such as immunization and PC-NTDs is still insufficient. The challenge of attaining and maintaining believable optimal treatment coverage was a major concern for the APOC and still remains so.⁴ Studies on treatment compliance have been published, but have not compared reported and surveyed MDA coverage.^{14,15} A study that attempted to understand the use of reported immunization reports referred to as administrative data by district health services in Burkina Faso in 1999 applied a cluster survey method.¹⁶ Tally sheets were used in capturing immunization reports, and the population denominators were unknown. The

results showed that administrative coverage estimates did not allow districts with moderate coverage to be distinguished from those with high coverage. Similar studies in Cameroon reported the immunization program overestimating vaccination coverage by 1–29%, whereas in Zimbabwe, the underreported coverage was 4–10%.^{17,18} Also, more than 30 two-stage cluster household surveys carried out across Africa, the Americas, and Asia by the CDC and collaborators showed that the reported coverage was likely higher than that surveyed.⁶ In Plateau State, Nigeria, the reported treatment coverage in MDA for trachoma control from village registers was compared with cluster survey results. Both did not attain

the desired treatment coverage of 80%, but the reported coverage indicated 76%, whereas 60% of the respondents in the survey were treated.¹⁹ Although the study considered surveyed as more authentic and believable, both the reported and surveyed MDA coverage were deficient in their knowledge of the population involved.

Although the present study had a good grasp of the population involved as well as reported and surveyed treatment

3. Worrell C, Mathieu E, 2012. Drug coverage surveys for neglected tropical diseases: 10 years of field experience. *Am J Trop Med Hyg* 87: 216–222.
4. Amazigo UV, Brieger WR, Katarawa M, Akogun O, Ntep M, Boatun B, N'Doyo J, Noma M, Seketeli A, 2002. The challenges of community-directed treatment with ivermectin (CDTI) within the African Programme for Onchocerciasis Control (APOC). *Ann Trop Med Parasitol* 96 (Suppl 1): S41–S58.
5. Yaya G, Kobangué L, Kémata B, Gallé D, Grésenguet G, 2014. Elimination or control of the onchocerciasis in Africa? Case of Gami village in Central African Republic [in French]. *Bull Soc Pathol Exot* 107: 188–193.
6. Mas J et al., 2006. Reduction in the prevalence and intensity of infection in *Onchocerca volvulus* microfilariae according to ethnicity and community after 8 years of ivermectin treatment on the island of Bioko, Equatorial Guinea. *Trop Med Int Health* 11: 1082–1091.
7. WHO, 1996. *Community Directed Treatment of Onchocerciasis: Report of a Multicenter Study*. Geneva, Switzerland: World Health Organization, 80.
8. Boatun BA, Richards FO Jr., 2006. Control of onchocerciasis. *Adv Parasitol* 61: 349–394.
9. Katarawa M, Habomugisha P, Eyamba A, Agunyo S, Mentou C,