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Evaluation of Treatment Coverage and Enhanced Mass Drug Administration for Onchocerciasis and Lymphatic Filariasis in Five Local Government Areas Treating Twice Per Year in Edo State, Nigeria

Emily Griswold,[1]* Abel Eigege,[2] Cephas Ityonzughul,[3] Emmanuel Emukah,[2] Emmanuel S. Miri,[2] Ifeoma Anagbogu,[4] Yisa A. Saka,[4] Saliu Kadiri,[5] Solomon Adelamo,[2] Paul Ugbadamu,[3] Clement Ikogho,[3] and Frank O. Richards[1]

[1]*The Carter Center, Atlanta, Georgia;* [2]*The Carter Center, Jos, Nigeria;* [3]*The Carter Center, Benin City, Nigeria;* [4]*Federal Ministry of Health, Abuja, Nigeria;* [5]*Edo State Ministry of Health, Benin City, Nigeria*

Abstract. The western region of Edo state in southern Nigeria is highly endemic for onchocerciasis. Despite years of mass drug administration (MDA) with ivermectin (IVM), reports suggest persistently high prevalence of onchocerciasis,

FIGURE 1. Local government areas (LGAs) treating twice per year in 2016, Edo state, Nigeria. This figure appears in color at www.ajtmh.org.

Questionnaires covered treatment compliance, conduct of MDA, knowledge of diseases, and exposure to health education. Other variables like bed net coverage and school attendance were collected for the program. This analysis focuses on coverage and conduct of MDA.

Sa e d. Nigeria's file of census enumeration areas (EAs) is a comprehensive, geographically ordered list, developed during the 2006 census, which presumes a population of approximately 200–500 per EA. The EA lists are different from those used by the FMoH or the CDTI program to manage treatment distribution. Each EA has an associated hand-drawn map. We used the EA as the cluster, or first stage of selection. Enumeration areas were selected systematically using a random start.

The second stage of sampling occurred when teams arrived at the EA. Teams would work with a local guide to trace the boundaries of the EA using the maps provided by the census office. While walking along this boundary, teams would enumerate all the households within the EA. A household was defined as a group of people who live together and share cooking arrangements. Once the total number of households was determined, the EA was divided into roughly equal segments of a maximum of 50 households, if necessary. A segment was chosen at random by the local guide by drawing numbered papers from a cup or hat. Teams then used a random number generator to determine the first household to interview, and interviewed a fixed number of households per EA, selected systematically using the number of households in the segment divided by the number to interview. Teams could revisit households a maximum of three times, but absent or nonconsenting households were not replaced. Abandoned households were not included in the enumeration.

All residents of the five LGAs were eligible for the study, including those normally deemed ineligible (e.g., under age

five) to confirm that treatment decisions were made accurately by distributors. Only visitors were excluded. Parents could speak for children under age 10 if they wished. The head of household and each household member gave verbal consent to be interviewed.

Sa e e ca c a . Following the first round of MDA, which occurred from approximately May through July of 2016, we selected 30 EAs from each LGA (total of 150 EAs). The goal was to develop a statistically robust estimate of

To compare results from both rounds, we combined the two datasets but adjusted the sampling design to account for the different selection probabilities; the EA remained the primary sampling unit, the household the secondary sampling unit. Proportions from two rounds were compared using a Pearson χ^2 test.

E ca e e . Approval was also granted by the Edo State Ministry of Health. Both surveys were reviewed by the Institutional Review Board at Emory University and deemed nonresearch. The findings are not generalizable beyond the LGAs in question.

RESULTS

F . d. The survey took place in August 2016. We visited 145 EAs; five were abandoned or inaccessible because of insecurity. Teams interviewed 4,942 respondents, exceeding our minimum sample size of 4,405.

Sec d . d. The survey took place in January/February 2017. We visited 87 EAs; nine were inaccessible or abandoned. We interviewed 3,362 individuals, which was under our target sample size of 3,580, likely because of the time of year and lack of school holidays, which is evident by the slightly older average age in the second round. Participant characteristics for both surveys are described in

generate more or better CDDs and insufficient to overcome other weaknesses in the program.

Though treatment coverage was low, compliance was very high. Refusals were generally below 2% in both rounds. Coverage was highly clustered within communities (intra-cluster correlation coefficients for IVM coverage were 0.72 in the first round and 0.54 in the second), indicating that upstream variables such as drug supply or the number and quality of drug distributors, be they health workers or volunteers, largely determine the outcomes of this treatment program.[14,30] It also suggests that treatment is based on convenience or preference, rather than diligence toward universal coverage of the whole community[31]; IVM coverage among those living in treated EAs was only 45.4% (38.2–52.5%) in the first survey and 47.2% (39.1–55.3%) in the second. There was no statistical difference in coverage between rural (38.4%, 95% CI: 31.7–45.5%) and urban (30.8%, 95% CI: 21.4–42.1%) EAs ($P = 0.25$). Although we did not conduct a risk-factor analysis, we noted that having previously taken IVM was protective against refusal (round 1 odds ratio [OR]: 0.65, round 2 OR: 0.12), but these results were not statistically significant. Among the very

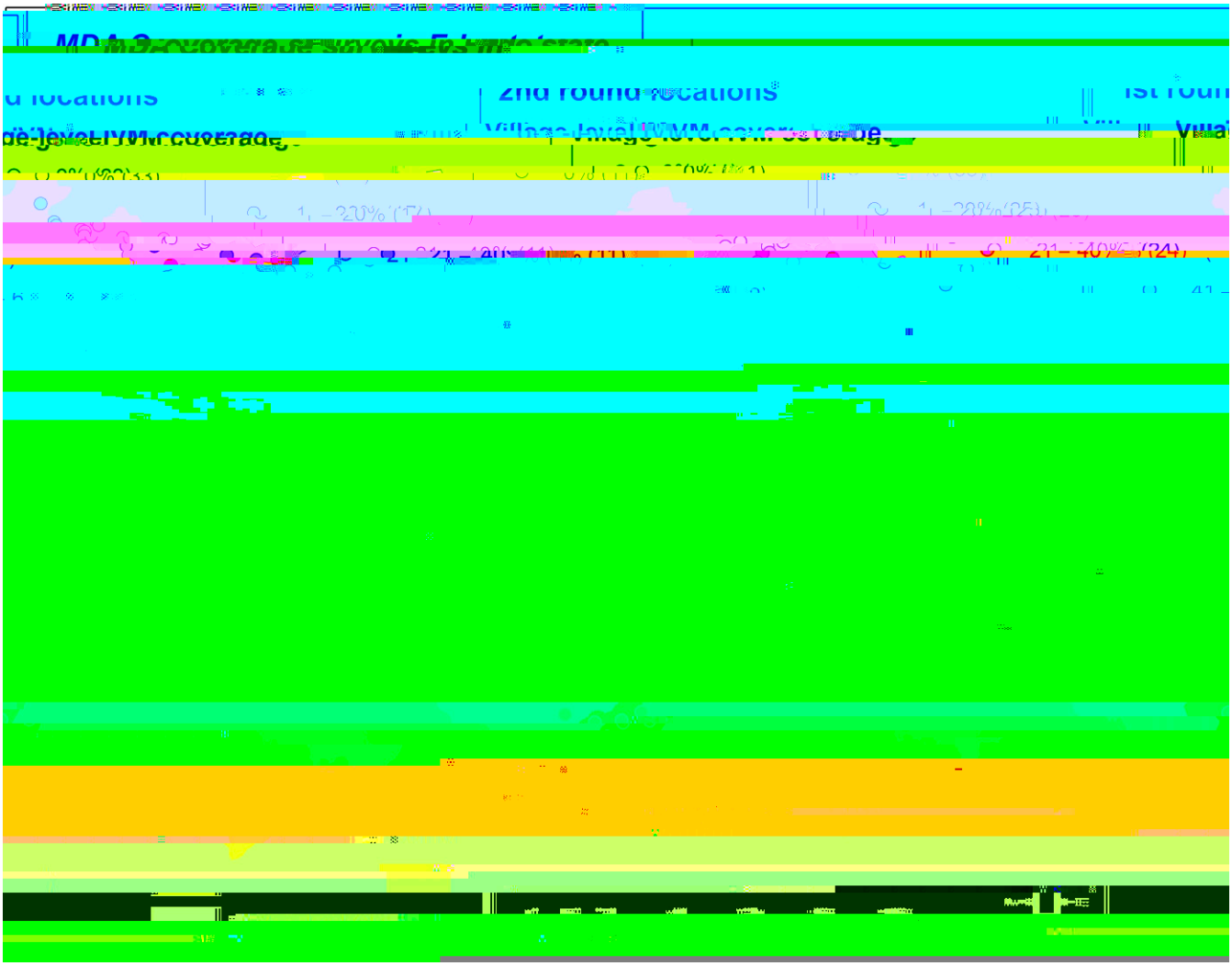

FIGURE 2. Geographic distribution and allocation of EAs in different categories of treatment coverage. Global positioning system coordinates were not available for one EA in the first round. Group designations apply to the second round only but are shown in the first for comparison. Note that the plurality of villages was not treated in the first round, whereas in the second 41–60% was the most common level of coverage. EA = enumeration area. This figure appears in color at www.ajtmh.org.

Staff and volunteers were able to handle an additional MDA at similar levels of service as before. Treating more frequently could provide more opportunities to reach people who would otherwise have been missed, and more chances to see if changes within the system succeed.

Coverage surveys should be repeated after additional work is carried out to correct the problems identified. These include 1) increased recruitment and training of CDDs, 2) better advertising of MDA; 3) better engagement and oversight of endemic communities, and 4) investigation of supply and

TABLE 3

Treatment coverage of IVM and ALB during the first round of 2016 mass drug administration by local government area

	Akoko Edo	Ovia Northeast	Ovia Southwest	Owan East	Owan West
Number interviewed	1,093	895	848	1,016	1,090
Reported IVM coverage (over treatment target)	80%	74%	82%	92%	90%
Reported IVM coverage (over total population)	64%	60%	66%	73%	73%
IVM coverage, weighted (95% CI)	53.9% (43.3–64.2%)	23.3% (10.4–44.2%)	16.4% (8.2–30.0%)	38.5% (28.3–49.8%)	42.8% (32.3–54.0%)
IVM coverage, weighted, treated EAs only (95% CI)	56.8% (46.6–67.1%	46.3% (23.1–69.5%)	33.9% (17.5–50.3%)	40.1% (29.0–51.3%)	45.7% (34.9–56.5%)
ALB coverage, weighted (95% CI)	54.23% (43.8–64.2%)				

distribution issues within the health system. Although more must be carried out to eliminate onchocerciasis in this area, we are confident that the program can be strengthened to reach the coverage necessary for accomplishing this important goal.

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Authors' addresses: Emily Griswold and Frank O. Richards, The Carter Center, Atlanta, GA, E-mails: emily.griswold@cartercenter.org and frank.richards@cartercenter.org. Abel Eigege, Cephas Ityonzughul, Emmanuel Emukah, Emmanuel S. Miri, Solomon Adelamo, Paul Ugbadamu, and Clement Ikogho, The Carter Center, Nigeria, E-mails: abel.eigege@cartercenter.org, cephas.ityonzughul@cartercenter.org, emmanuel.emukah@cartercenter.org, emmanuel.miri@cartercenter.org, solomon.adelamo@cartercenter.org, paul.ugbadamu@cartercenter.org, and clement.ikogho@cartercenter.org. Ifeoma9.4(m258.6.018..5(s:)-9p8u9.4(m28..6.018.d)-275.3(Y).1(i)7(s)-2.6(a)]TJ0-1.1239TD-.0194Tc[(A)6.8(.)-162(S)6.8(a)-.5(ka)

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