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# INTENTION TO CONTINUE WITH IVERMECTIN TREATMENT FOR ONCHOCERCIASIS CONTROL AFTER EIGHT YEARS OF ANNUAL DISTRIBUTION IN CAMEROON, NIGERIA, AND UGANDA

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### ABSTRACT

This study identified the socio-demographic correlates of intention to comply with ivermectin treatment, from a structured interview of 2,306 persons aged 10 years and above, grouped into high and low compliers, who took ivermectin 6-8 times and 0-2 times respectively. Simple descriptive

statistics were employed in characterizing the respondents into high and low compliers, while some socio-demographic and key perceptual factors were employed in regression models constructed to explain levels of compliance among the respondents. Demographic and perceptual factors associated with intention to comply with prolonged treatment with ivermectin were identified. Intention to comply was higher among married persons (91.8%, $p < 0.001$); local populations (89.8%, $p < 0.001$); and those with history of complying with treatment (98.2%, $p < 0.001$). Perception of onchocerciasis and effectiveness of ivermectin influenced intention to continue. The perceptual factors that drive the intention to comply should inform plans for health education at the project and village levels.

## INTRODUCTION

Over 33 million people are treated annually with ivermectin in the African Programme for Onchocerciasis Control (APOC) countries (Amazigo, Okeibunor, Matovu, Zouré, Bump, & Seketeli, 2007). Ninety-five thousand communities in 16 sub-Saharan countries distributed more than 98 million ivermectin tablets in 2005 using the APOC Community Directed Treatment with Ivermectin (CDTI) approach. Some of the communities have successfully conducted seven or more rounds of treatment since APOC's inception in 1995.

CDTI is based on the principle of community involvement and participation (Brieger, Otusanya, Oke, Oshiname, & Adeniyi, 2002). In the CDTI process, community members take the lead role in the planning and implementation of program activities to treat its members. CDTI, as a process, entails the empowerment of communities to make major decisions such as whether the community members should treat, when and how they will be treated (e.g., house-to-house, central place, or both systems combined). Communities also decide how to facilitate the work of the Community Directed Distributors (CDDs) they have selected to distribute ivermectin to the whole community. Other community responsibilities include conducting a census, collecting drug supplies, mobilization during the distribution, and recording and reporting coverage. CDDs may number one or more and play a major role in conducting these activities (APOC, 2007).

People in the onchocerciasis endemic communities are required to take ivermectin over a minimum of 15 years for effective control of onchocerciasis (Borsboom, Boatin, Nagelkerke, Agoua, Akpoboua, Alley, et al, 2003; Plaisier, Alley, van Oortmarssen, Boatin, & Habbema, 1997; Tielsch & Beeche, 2004). By the end of 2006, 25 of APOC's projects passed the half-way mark by distributing ivermectin for 8 years. The concern now as APOC moves into its second phase of activities is whether residents of endemic communities are willing to continue to take ivermectin for at least another 7 years.

Although many studies have addressed intention or willingness to comply with treatment regimens (see Bonanno, Noll, Putnam, O'Neill, & Trickett, 2003; Gibbons & Gerrard, 1995, 1997; Myklestad & Rise, 2007), little attention has been directed at intention for future compliance with community mass treatment programs. Some of the factors that affect intention to act in the future can be isolated from existing research. In Oslo, Myklestad and Rise (2007) examined the socio-cognitive processes contributing to intention to use contraception and willingness to engage in unsafe sex in three schools, using extended versions of the theory of planned behavior (TPB) and the Prototype/Willingness model (Gibbons & Gerrard, 1995, 1997). Hierarchical multiple regression analysis used to predict intention and willingness revealed gender difference in predictors of intentions. While subjective norm was the most important predictor of intentions for girls, moral norm was most important for boys' intentions and willingness. Prototypes were the most important predictor for girls' willingness. Discussing the predictors of willingness to disclose childhood sexual abuse (CSA) from measures of repressive coping and dissociated tendencies, Bonanno et al. (2003) identified psychological factors as the main explanatory variables. They found that women with documented CSA histories who did not disclose abuse when provided an opportunity to do so were more likely to show non-verbal expressions of shame and polite smiling, relative to disclosing CSA survivors or non-abused controls. Disclosing CSA survivors, in contrast, showed greater facial expressions of disgust. They also found that CSA disclosure was associated with chronic dissociative experiences, whereas non-disclosure was associated with repressive coping. Further, repressive coping and dissociative experiences were inversely related and showed opposite patterns of facial expressions and adjustment. Repressors expressed greater negative and positive emotion and were relatively better adjusted, whereas dissociators expressed little emotion and had relatively poorer adjustment.

Some socio-demographic factors have also been associated with intention to act according to medical prescriptions. For instance, Zimmerman, Albert, Llewellyn-Thomas, and Hawker (2006) disclosed that adjusting for key demographic factors that may be associated with access of the end stage renal disease (ESRD) patients to living donor kidney transplant (LDKTx), perceptions about risks to the donor and benefits to the recipient were independently associated with a willingness to consider LDKTx as a treatment option. Provision of standardized comprehensible information about all treatment options to patients with ESRD may improve acceptance rates for living donor transplantation. Zillich, Blumenschein, Johannesson, and Freeman (2002) had earlier identified both the objective and subjective as major factors in willingness of those threatened with particular health conditions to perform the required acts to get well.

Bosampra (2001) applied the Theory of Reasoned Action (TRA) to the study of condom use intentions of students at a university in southern Ghana. The data supported the model, explaining 33% of the variance in students'

condom use intentions. According to him, subjective norms and the perceived disadvantages of condom use were significant determinants of intention, with the former being more important. Respondents who intended to use condoms consistently ("intenders") and those with no such intentions ("non-intenders") were equally motivated to comply with the wishes of their significant referents (sexual partners, close friends, parents, and medical doctors). The critical difference was that "intenders" consistently held a stronger belief than "non-intenders" that their significant referents approved of condom use. Significantly, whereas "intenders" believed that their sexual partners would approve of condom use, the "non-intenders" held the contrary belief that their partners would disapprove of such behavior.

This suggests that AIDS education interventions targeting a similar audience like the university students in this study should shift their foci away from individuals alone and instead focus simultaneously on individuals, their sexual partners, and their broader social networks in order to enhance perceptions of peer acceptance of condom use. However, writing on patient compliance during orthodontic treatment Bos, Hoogstrasten, and Prahl-Andersen (2005) suggest that patients' intentions to comply during orthodontic treatment are influenced by factors outside of the TRA. Therefore, they recommended the development of a new model, in which factors of the TRA are included, which can be used specifically for the study of compliance in orthodontics. They opined that efforts must be made to understand the perceived behavioral control and anticipated regret the individual has about a particular treatment. Writing earlier, Strader, Beaman, and McSweeney (1992) identified significant social referents that influence condom-use intentions; according to him, they are sexual partner, father, and friends. He concluded, therefore, that communication with these referents had a positive net effect on beliefs about and intentions to use condoms. Implications applicable for intervention programs to increase condom use are to promote talking about condoms between the sexual partners and important social referents and to develop such communication skills. This might be important for the onchocerciasis control program.

Suggesting a new approach to improving intention to treat, Horvitz-Lennon, O'Malley, Frank, and Normand (2005) recommended that the key first step is to consider non-compliance and drop-out as two independent phenomena, tracking and reporting rates separately. They argued that although the traditional ITT approach provides a valid method to estimate treatment effects, it could be biased in the presence of treatment non-compliance and drop-out. It is critical that researchers move beyond traditional approaches when trials are broken. Again, this could be relevant for the onchocerciasis program because a recent multi- site study on compliance with ivermectin treatment in three countries in Africa show a compliance of only 59% in 8 years. The non-compliant population must be targeted to understand their reasons and intention to continue. This article, however, presents results of an analysis of the people's intention to continue to comply with ivermectin treatment for a long period.

## METHODOLOGY

This component of the study was designed to determine willingness to continue taking ivermectin for the foreseeable future; in other words, intentions. The cross-sectional approach was adopted in collecting qualitative data from seven study sites in three countries that scaled through the feasibility study conducted in 2005. Individual structure questionnaires were used to identify factors associated with intentions, while focus group discussions (FGDs) and in-depth interviews were employed to obtain community views and explanations about future compliance.

The study was located in Cameroon, Nigeria, and Uganda. These are countries with CDTI projects that have been implementing CDTI since at least 1998 and where the feasibility study demonstrated adequate records at all levels. These project areas include Cameroon (SW1 CDTI project), Nigeria (Kaduna, Imo, Taraba, and Cross River States CDTI projects) and Uganda (Phase 1 and 2) CDTI projects.

The study population consisted of people living in villages where ivermectin distribution has occurred using the CDTI approach since 1998, that is 8 continuous years. To be included in the study, such people would have had to be at least 5 years old in 1998 so that they would have been eligible to receive ivermectin for each of the consecutive years. In addition, potential respondents were divided into two groups, high and low compliers. The former included those who were recorded as having taken ivermectin 6-8 times in the previous 8 years, while low compliers took ivermectin only 0-2 times.

At each site the research team balloted for two districts among those that were found to have conducted ivermectin distribution since 1998. Further, within each of the two districts, a random sample of 10 villages was chosen. CDD records were used to identify high and low compliers in each village.

Data were entered and analyzed with the EPI version 6. Simple descriptive statistics were employed in characterizing the respondents while some socio-demographic and key perceptual factors were employed in regression models constructed to explain levels of compliance among the respondents.

The individual questionnaire was a structured questionnaire designed to provide data on respondents' compliance to ivermectin treatment as well as the demographic and perceptual factors that influence compliance with ivermectin treatment in the communities. This questionnaire was administered on 2,306 persons aged 10 years and above. Two categories of respondents were purposively selected. These were people with two or fewer treatments and those with five or more out of eight distributions in the communities. The first category constituted the low compliers while the latter constituted the high compliers.

The FGDs sought the opinion of the community members on how long they are expected to take this drug, how long they are willing to take the drug, and how long

they would say members of your community will be willing to take this drug. Probes were also carried out to get the reasons for their opinion.

## DATA PROCESSING AND ANALYSIS

All quantitative data were processed and analyzed with the EPI version 6. Standard data entry programs were prepared with the EPI INFO program for all quantitative data collection instruments. Simple descriptive statistics were employed in characterizing the respondents while some socio-demographic and key perceptual factors were employed in regression models constructed to explain levels of compliance among the respondents.

All qualitative data were entered in the computer using standard word processing software. A computer-assisted analysis of these data was undertaken using ATLAS.ti, a computer program for qualitative data analysis, to ensure a standardized and comparable analysis and interpretation of the qualitative data across study sites. Illustrative quotes were extracted to explain the results of the quantitative analysis.

## RESULTS

The individual questionnaire was completed for 2,306 persons selected from the CDD register because of their high (6-8 times, 50.7%) or low (0-2 times, 49.3%) compliance with annual ivermectin treatment. Just under half (49.0%) of respondents were female. The majority (79.1%) were adults, that is 25 years of age and older. The average age was 38.7 years. Over one-third (46.2%) were currently not married. One-third (33.9%) of respondents had no formal education, while 38.8% had primary schooling and 27.2% had post-primary education. Nearly two-thirds (63.1%) listed their primary source of income as farming, hunting, or fishing. Ethnic minorities living among villagers of the local majority ethnic group comprised 4.6% of the sample. The large majority (94.6%) were Christians, while the remaining adhered to Islam and other faiths.

### Willingness to Continue Taking Ivermectin

Overall, 90.3% of the 2,306 respondents expressed willingness to continue taking ivermectin into the foreseeable future. This consisted of 98.0% of the 1,412 high compliers and 81.7% of the 1,265 low compliers ($p < 0.000001$).

Most respondents (92.5%) agreed that most community members currently take ivermectin annually. Likewise 91.0% said that most people in the community are willing to take ivermectin for many more years. On a personal level, 90.3% said that they were willing to take ivermectin for many more years. These perceptions are clearly related to the respondents' current levels of compliance as seen in Table 1.

Further analysis was done to determine the perceptual factors associated with personal intention to continue taking ivermectin for many years as seen in Table 1. Among those who see benefits in ivermectin, 96.3% are willing compared to 61.2% of those who see no benefits. The situation reverses for those who see problems, 76.2% of whom are willing compared to 92.9% among those who mention no problems.

Among those who think orthodox medicine is best, 91.7% are willing to continue compared to 74.2% who think other forms of medicine are best for onchocerciasis. Ironically, those who feel more susceptible to onchocerciasis symptoms are less willing to continue. A greater proportion of those who believe onchocerciasis is serious are willing to continue (93.6%) compared to those who do not think it is serious (53.6%). Those who perceive encouragement are more likely to continue while those who perceive discouragement are less likely to continue with ivermectin treatment.

Demographic factors were also compared with willingness to continue treatment for many years as seen in Table 2. Only having ever been married, being in the ethnic majority, and being a farmer were positively associated with willingness to continue ivermectin treatment.

A model was constructed to explain future willingness to take ivermectin using the perceptual and demographic factors described above. Table 3 presents those results. Only two demographic factors were important, being in the ethnic majority in one's village and being a farmer by occupation.

Several perceptual factors were positively associated with future willingness including seeing benefits in ivermectin: thinking onchocerciasis is serious and receiving encouragement from others. A negative association with future willingness was found for those who experience discouragement from others and see problems with ivermectin. Higher perception of susceptibility to onchocerciasis symptoms was negatively associated with willingness. This was also the case in terms of current compliance status; those feeling susceptible were the ones with low compliance.

Qualitative results were overwhelmingly favorable for continued ivermectin treatment. "We have the desire to take the drug for a long time because the fly is still in existence and if it bites a person with oncho then it also bites you, you can also be re-infected" (Uganda). "Nobody has ever told us when we should stop taking ivermectin. But we want to continue taking it until they tell us that we are free from the disease" (Uganda). "We are willing to take for the next 200 years if it is brought to us because our children are in school and we want them to see and read clearly" (Nigeria).

People ask for ivermectin as evidence that they want the program to continue. "They have been enlightened about the importance of the drug. Many of them have been taking it and have seen the result and the health benefits of it. That is why they take it regularly and when it is delayed, they keep asking, when

Table 1.  Perceptual Factors and Intention to Continue Taking Ivermectin

| Factor | Number | % Intention to continue | $\chi^2$ (Yates for 2 × 2) p Value |
|---|---|---|---|
| Most people take | | | |
| Yes | 2,118 | 92.6 | 325.41 |
| No | 188 | 49.5 | < 0.001 |
| Community will continue to take | | | |
| Yes | 2,087 | 93.7 | 473.40 |
| No | 219 | 45.2 | < 0.001 |
| See Benefits | | | |
| Yes | 1,877 | 96.1 | 501.96 |
| No | 429 | 58.5 | < 0.001 |
| See Problems | | | |
| Yes | 396 | 75.3 | 92.10 |
| No | 1,910 | 91.9 | < 0.001 |
| Best medicine for oncho | | | |
| Orthodox | 2,098 | 90.6 | 54.79 |
| Indigenous/Other | 208 | 73.6 | < 0.001 |
| Perceived seriousness | | | |
| Yes | 2,095 | 92.8 | 332.10 |
| No | 210 | 51.4 | < 0.001 |
| Someone encourages | | | |
| Yes | 2,109 | 91.6 | 154.02 |
| No | 197 | 62.4 | < 0.001 |
| Someone discourages | | | |
| Yes | 312 | 67.3 | 173.01 |
| No | 1,994 | 92.5 | < 0.001 |

| | Number | Mean, SD | t Value p Value |
|---|---|---|---|
| Perceived susceptibility | | | |
| Willing | 2,054 | 3.9, 3.7 | 4.06 |
| Not willing | 252 | 4.9, 3.7 | < 0.001 |

Table 2. Demographic Factors and Intention to Continue

| Factor | Number | % Willing to continue | $\chi^2$ (Yates for 2 × 2) p Value |
|---|---|---|---|
| **Sex** | | | |
| Male | 1,175 | 90.0 | 1.77 |
| Female | 1,130 | 88.1 | 0.18 |
| | | | |
| **Age** | | | |
| Youth (10-24 yrs) | 481 | 89.2 | 0.0 |
| Adult | 1,823 | 89.1 | 0.99 |
| | | | |
| **Currently married** | | | |
| Yes | 1,238 | 91.8 | 19.81 |
| No | 1,061 | 86.0 | < 0.001 |
| | | | |
| **Religion** | | | |
| Christian | 1,824 | 88.5 | 0.21 |
| Others | 104 | 86.5 | 0.64 |
| | | | |
| **Education** | | | |
| None | 782 | 89.1 | 1.70 |
| Primary | 895 | 88.2 | 0.43 |
| Post-primary | 627 | 90.3 | |
| | | | |
| **Ethnic** | | | |
| Indigene of village | 2,196 | 89.8 | 22.51 |
| Minority in village | 106 | 74.5 | < 0.001 |
| | | | |
| **Occupation** | | | |
| Farmer | 1,454 | 90.4 | 7.19 |
| Others | 852 | 86.7 | 0.007 |
| | | | |
| **Compliance history** | | | |
| High | 1,180 | 98.2 | 205.86 |
| Low | 1,126 | 79.5 | < 0.001 |

they are going to bring the yearly drug for them" (Nigeria). "If I also don't take the drug to them, they look for me. The desire is now high. I don't think the people will refuse the drug because they still like it. We never return the drug. We only return empty tins" (Uganda).

Although no negative comments were recorded, some put conditions on willingness to continue. "If the problem is still troubling them, then they can still continue, come in and administer the drug to us. It is the clearing of the diseases that will determine" (Nigeria). "There is a lot of confusion on the duration of intake. Some people say we are expected to take the drugs five times before eliminating the disease, while others indicate we have to take it ten

Table 3. Factors Associated with Intention to Continue Ivermectin Treatment

Correlation coefficient:  $r^2 = 0.42$   $ra^2 = 0.42$

| Source | df | Sum of squares | Mean square | F-statistic |
|---|---|---|---|---|
| Regression | 10 | 93.9382 | 9.3938 | 167.68 |
| Residuals | 2286 | 128.0696 | 0.0560 | |
| Total | 2296 | 222.0078 | | |

B Coefficients

| Variable | Mean | B coefficient | 95% confidence | | Std. Error | Partial F-test |
|---|---|---|---|---|---|---|
| | | | Lower | Upper | | |
| COMPLY2 | 0.5128 | 0.0567329 | 0.035012 | 0.078454 | 0.011076 | 26.2341 |
| MOSTTAKE | 0.9186 | 0.0767559 | 0.032344 | 0.121168 | 0.022647 | 11.4868 |
| COMMWILL | 0.9055 | 0.2528817 | 0.211080 | 0.294684 | 0.021316 | 140.7380 |
| SEEBENE | 0.8145 | 0.2097171 | 0.181445 | 0.237989 | 0.014417 | 211.6040 |
| SEEPROB | 0.1702 | -0.0835875 | -0.111485 | -0.055690 | 0.014226 | 34.5238 |
| SERIOUS | 0.9099 | 0.1748163 | 0.137324 | 0.212308 | 0.019118 | 83.6105 |
| ENCOUR | 0.9142 | 0.0823091 | 0.045237 | 0.119381 | 0.018904 | 18.9569 |
| DISCOUR | 0.1345 | -0.1169990 | -0.148034 | -0.085964 | 0.015826 | 54.6568 |
| AGE | 38.7061 | -0.0014384 | -0.002054 | -0.000823 | 0.000314 | 21.0119 |
| CURRMARSTAT | 0.5385 | 0.0240982 | 0.003849 | 0.044348 | 0.010326 | 5.4463 |
| Y-Intercept | | 0.2305324 | | | | |

times. We do not know which is correct" (Cameroon). "One cannot tell how long the community is willing to take the drug because lectures have not been carried out the benefits of the drug" (Cameroon).

## Community Suggestions to Improve Intention to Continue to Comply

The respondents to the individual questionnaire offered their ideas about improving compliance. Table 4 shows their ideas. Of note, people with low compliance offered fewer suggestions, but their top three corresponded exactly to those offered by the high compliers, namely enlightenment campaigns, showing people the benefits of treatment and announcing clearly when the ivermectin is available in the village. Both groups also had their fifth suggestion in common, use of town criers. Suggestion number 4 separated the groups. While high compliers wanted the drug available always, the low compliers worried about side effects and wanted to ensure that means were available in the village to manage/treat these.

Through qualitative methods, community members gave examples of improving compliance through health education. One said, "The reason why they take the drug is as a result of the awareness created, and they have tested the drug and see its benefits." Another added that, "From enlightenment program campaign that created awareness on the benefits of the drugs, we now realize how it can cure diseases and started taking it." Educational intervention helped according to one person, "(They did not take it) because they believed they could get healed of whatever disease through prayers. But after the intervention of the chief of health post, there is no particular group of people who do not take Mectizan."

Other approaches were also mentioned. Social Control was exhibited in this response, "Within our community, we don't allow anybody to stay without taking it. We mandate people to take it so that there won't be transfer of the sickness from the person who didn't take it to person who took it" (CDD,

Table 4.  Suggestions for Improving Intention to Continue to Comply

| Group | High | Low |
|---|---|---|
| Average suggestions | 2.1 | 1.4 |
| Number | 1,248 | 1,106 |
| Top five suggestions | | |
| 1 | Enlightenment | Enlightenment |
| 2 | Show benefits | Show benefits |
| 3 | Announce drug | Announce drug |
| 4 | Drug available always | Manage side effects |
| 5 | Town crier | Town crier |

Nigeria). The importance of Logistic Support was emphasized by the person who said, "Federal Government to support distributor i.e. by means of providing motorcycles, posters and stickers and LGAs to always come to supervise during distribution" (Nigeria).

Community members stressed the importance of addressing logistical and structural issues that would guarantee access for compliance. One commented that, "I will say that what went well is because the drug is been distributed street by street, and the CDDs are selected from each street and since they know their people, they can go from house to house to distribute the drug. That is why I say everything about the distribution went well, so we thank God for that" (Nigeria, Male FGD). On the other hand, when things do not go well, "the demand often surpasses the supply. It is often in short supply. This, particularly, was the case this year. As such, it is difficult for people to get it, and at the end many eventually do not take it" (Cameroon).

Respondents thought better organization is needed. "Difficulties experienced with ivermectin distribution in the community have been the time of distribution, which is mostly during rainy season." Although many mentioned CDD incentive as being important, few linked it to performance, which could affect compliance. Two specific links include, "Those that are distributing it, if you people are not giving them something, they will not be serious over it," and "CDDs need financial support to reach the whole people."

Several community members questioned whether flexibility is possible to ensure more people are treated. "There are those who ask for the drug after 2 months but we can't give them the drug because according to how we were taught they are supposed to take it once a year" (Uganda). "One day my mother called the distributor and said, 'that your medicine, how do you stay so long before you give me. Bring me the medicine,' and the man told her we have duration of taking the medicine, and I cannot give you anytime you want it" (Nigeria).

## DISCUSSION

Only two socio-demographic factors were important—being a farmer, and thus more stable in village, and being younger—and influenced intention to comply in the future. Age was positively associated with actual compliance, so we are not sure why the reverse is true for intention? Of note is the finding that past compliance is predictive of future willingness.

Most of the factors associated are cognitive/affective and possibly amenable to health education. According to TRA/TPB social influences and attitudes toward behavior important—social factors here like perceptions of what others will do (community will continue taking) and perceived encouragement/discouragement are important. Also, attitudes toward behavior—i.e., seeing benefits

or problems—Drawing from Health Belief Model the issue of perceived seriousness of onchocerciasis is an important factor in willingness to continue ivermectin.

There was general willingness to continue with ivermectin in the future. Some key factors that would encourage or limit this were also identified. There were generally positive perceptions that both individuals and communities as a whole would take ivermectin annually and continue to do so into the foreseeable future. Perceptions of willingness in all forms (whether individual or community) were significantly higher among those who were already high compliers. Previous enlightenment/information about a possible 10- or 15-year duration of treatment may create a barrier. Positive perception of benefits from treatment may help propel compliance into the future.

Since the perceptual factors play a key role in intention to comply, it will inform plans for health education at the project and village levels. Based on our analysis, it will be wise for health education to focus on the benefits of taking the drug alongside stressing the seriousness of the disease.

While the portion of people who perceived problems was small, their concerns were consistently echoed in the qualitative data. Memory of side effects as well as observing them in others appears to be a powerful deterrent to compliance for that small group of people. Good faith efforts to provide villages drug kits to treat side effects should compliment educational efforts that stress benefits.

Conclusions here build on community experiences and suggestions. Enlightenment, awareness, and information strategies topped the list of suggestions. Of note was the continued concern about side effects and their management that haunts the low compliers, even though one would expect these to reduce with time. Program management suggestions were also important for enhancing access to ivermectin. Enlightenment alone may not overcome some deep seated beliefs (such as avoidance of medicine, religious injunctions, and perceptions of what suits one's own body) and implies that simple informational campaigns will not be adequate.

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