

HIV knowledge and health-seeking behavior in Zambézia Province, Mozambique

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Abstract

HIV prevalence rates in Zambézia Province were estimated to be 12.6% in 2009. A number of educational campaigns have been aimed at improving HIV transmission and prevention knowledge among community members in an effort to reduce infection rates. These campaigns have also encouraged people to seek health care at clinical sites, instead of employing traditional healers to cure serious illness. The impact of these programs on the rural population has not been well documented. To assess the level of knowledge about HIV transmission and prevention and health-seeking behavior, we interviewed 349 people in 2009 using free response and multiple choice questionnaires. Over half reported first seeking treatment at a government health clinic; however, the majority of participants had visited a traditional healer in the past. Knowledge regarding prevention and transmission of HIV was primarily limited to the sexual origins of infection and the protective advantages of condom use. Increased educational level and having learned about HIV from a community health worker were associated with higher HIV prevention and transmission knowledge. Traditional healers and community health-care workers were both conduits of health information to our study participants. HIV education and use of clinical services may be facilitated by partnering more closely with these groups.

Keywords: HIV care, health-seeking behavior, traditional medicine, rural health-care services, rural HIV, Africa, Mozambique, patient knowledge.

Résumé

Les taux de prévalence du VIH dans la province de Zambézia étaient estimés à 12,6 % en 2009. Un certain nombre de campagnes éducatives ont visé à améliorer les connaissances en matière de transmission et de prévention du VIH chez les membres de la communauté, dans un effort pour réduire les taux d'infection. Ces campagnes ont également encouragé les gens à rechercher des soins en centre médical, au lieu de faire appel à des guérisseurs traditionnels pour guérir une maladie grave. L'impact de ces programmes sur la population rurale n'a pas bien été documenté. Pour évaluer le niveau de connaissances sur la transmission et la prévention du VIH et les comportements favorables à la santé, nous avons interrogé 349 personnes en 2009 en utilisant des questionnaires à réponses libres et à choix multiples. Plus de la moitié ont indiqué rechercher un traitement dans les centres médicaux gouvernementaux ; cependant, la majorité des participants avait consulté un guérisseur traditionnel par le passé. Les connaissances relatives à la prévention et à la transmission du VIH se limitaient essentiellement aux origines sexuelles de l'infection et aux avantages de l'utilisation du préservatif dans la protection. Un niveau d'éducation plus élevé et le fait d'avoir obtenu des connaissances sur le VIH par un professionnel de la santé communautaire étaient associés à de meilleures connaissances en matière de prévention et de transmission du VIH. Les guérisseurs traditionnels et les professionnels de la santé communautaires constituaient des canaux d'informations sur la santé pour les participants à notre étude. L'éducation sur le VIH et le recours aux services médicaux pourraient être facilités en s'associant plus étroitement à ces groupes.

Mots-clés: Les comportements de santé cherche, la médecine traditionnelle, en milieu rural des services de soins de santé, en Afrique, au Mozambique, les connaissances des patients du VIH.

Introduction

Zambézia Province is located in north-central Mozambique (Fig. 1). HIV prevalence was estimated to be 12.6% among those aged 15–49 years in 2008 (INSIDA 2009). The Mozambican Ministry of Health has worked with non-governmental organizations, community-based organizations, and faith-based organizations to provide information about HIV transmission, prevention, and

treatment to rural communities in hopes of stemming infection rates (Agha, Karlyn & Meekers 2001; Karlyn 2001; Ministerio de Saude 2009). Educational programs aimed at HIV prevention in Zambézia Province currently include radio shows, live theater, and peer educator debates (Karlyn 2001). District clinics implement activities which provide information about tuberculosis,

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Fig. 1. Map of Mozambique and its neighbors

HIV, malaria, and other endemic diseases both in clinical waiting areas and in rural communities. These activities are aimed at improving knowledge about important health issues (how to prevent illness, identify symptoms and where to seek medical assistance), increase the number of people willing to be tested for HIV, and reduce stigma associated with testing and treatment. In an effort to generate data regarding HIV knowledge and health-seeking behavior in Zambézia Province, we conducted a cross-sectional study with 349 Mozambicans in three rural districts from July to October 2009. Using semi-structured interviews, we sought to evaluate their understanding of HIV transmission and prevention, and to determine frequencies and predictors of traditional healer use versus attendance of local clinics.

Methods

Design

We employed a cross-sectional design to recruit a systematic sample of 349 adults from a house-to-house survey from three rural districts of Zambézia Province, Mozambique. We arrived at the commercial center of each community and began radiating outwards from that point until no more homes were encountered. We solicited an interview from every 10th household. If no adult was home, we did not return but rather moved to the next house. To ensure that we had a large enough sample to conduct district specific analyses (for program evaluation), we sought to collect 100 surveys per district with an assumption that 40% of our participants would not identify themselves as users of traditional medicine. Both free response and multiple choice questions were used to obtain sociodemographic information, knowledge about HIV, experience and attitudes related to HIV stigma, perceived illnesses in the community, and health-seeking behaviors. HIV care-related questions included satisfaction with traditional medicine and standard government medical services, cost of services, and awareness of HIV-positive people in their communities. These qualitative questions had not been previously validated. The principal investigator (C.M.A.) asked these questions in face-to-face interviews with the help of a local translator for Chuabo and Lómwè speakers. All interviews were conducted

between 6 am and 5 pm. All participants were read a consent script, given a written consent form, and copies of the signed forms were returned to the interviewer. In an effort to minimize bias, we clearly stated that we did not work with the local clinic and that no names or identifying information would be recorded. Data were entered into an MS Excel™ (a Windows®-based application) file and checked twice for inaccuracies by the lead author. Data were coded and rechecked for accuracy by two investigators (C.M.A. and M.B.). Permission for this work was granted by the National Committee for Bioethics for Health in Mozambique and the Vanderbilt University Institutional Review Board.

Statistical methods

To summarize the health-seeking behavior and knowledge of study participants, we first applied bivariate comparisons employing two-sample rank sum and chi-squared tests. To determine which patient characteristics (e.g. age, sex, district, education, and belief in AIDS cure) were predictive of traditional healer use, we used multivariable logistic regression analysis. We used the same technique to examine predictors of visiting hospitals only or first versus traditional healers only or first; this outcome was determined *post hoc* using the same set of predictors. To assess HIV knowledge, two proportional-odds models with a number of correct routes of transmission and prevention identified by the patient are fit with age, sex, district, education, condom usage, and belief in commonality of HIV/AIDS as predictors. To avoid overfitting while examining the association of multiple sources of HIV information with HIV knowledge, we fit two additional proportional-odds models with the number of correct routes of two HIV-related themes – transmission and prevention – as outcomes. With the one exception identified above, all models and most predictors were selected *a priori*; AIDS identified by interviewee as a common illness was later added to examine multivariable association with HIV knowledge. To avoid case wise deletion of data in multivariable models, missing values of age for 31 participants were accounted for using multiple imputation techniques (Schafer 1997). In this technique, we use participant characteristics to predict each missing age value, and then we perform regression on the imputed data. We repeated this task 10 times and took the average estimates from multiple regressions. R-software 2.10.0 (<http://www.r-project.org>) was used for data analyses. R-scripts and estimates from all models are available online (<http://biostat.mc.vanderbilt.edu/wiki/Main/ArchivedAnalyses>).

Results

Characteristics of interviewees

We interviewed 349 people; no one declined to be interviewed (Table 1). The median age was 32 years (interquartile range [IQR]: 25–43) and 58% were female. Most (79%) were married, with 6% single, 7% divorced, and 7% widowed. Of those married, 84% were in a monogamous relationship, 15% were in a polygamous relationship with two wives, and 1% was in a relationship with three wives (two with missing data). The median time of formal education was 5 years (male 5 [4–9], female 4 [1–7]). The majority of the participants were Chuabo speakers from the districts of Inhassunge and Namacurra (251, 72%) with the remaining 28% Lómwè speakers from Alto Molócuè. Two-thirds (67%) of participants lived in rural areas,

Table 1. Summary of characteristics and response by use of traditional healers

Do you visit traditional healers?	No (n = 61)	Yes (n = 288)	Total (n = 349)	P-value ^{a, b}
Age in years ^c	30 (23, 45)	33 (25,43)	32 (25,43)	0.43
Missing, n (%)	4 (6.6%)	27 (9.4%)	31 (8.9%)	
Male, n (%)	34 (55.7%)	112 (38.9%)	146 (41.8%)	0.02
Years of education	5 (3,7)	4.5 (2,8)	5 (2,8)	0.61
Location, n (%)				< 0.01
Alto Molócuè	33 (54.1%)	65 (22.6%)	98 (28.1%)	
Inhassunge	18 (29.5%)	101 (35.1%)	119 (34.1%)	
Namacurra	10 (16.4%)	122 (42.4%)	132 (37.8%)	
Number of children	2 (1,4)	3 (2,5)	3 (2,5)	0.03
AIDS mentioned as common ailment, n (%)	18 (29.5%)	149 (51.7%)	167 (47.9%)	< 0.01
Can you cure AIDS? n (%)				0.08
Do not know	5 (8.2%)	18 (6.2%)	23 (6.6%)	
No	49 (80.3%)	257 (89.2%)	306 (87.7%)	
Yes	7 (11.5%)	13 (4.5%)	20 (5.7%)	
Provider usage, n (%)				
Missing	2 (3.3%)	14 (4.9%)	16 (4.6%)	
Hospital only/first	59 (100.0%)	129 (48.9%)	188 (58.2%)	
Traditional healer only/first	0 (0.0%)	87 (33.0%)	87 (26.9%)	
Both providers at the same time	0 (0.0%)	10 (3.6%)	10 (3.0%)	
Depends on illness	0 (0.0%)	48 (18.2%)	48 (14.9%)	
Know someone with HIV/AIDS	16 (26.2%)	81 (28.1%)	97 (27.8%)	
Visits a specific TH	–	123 (42.7%)	–	
Satisfied with last visit	–	232 (80.6%)	–	
How much do you pay (MZN)? ^d	–	50 (30, 150)	–	
Missing/non-cash amount	–	84 (29.2%)	–	

^aTo compare the distribution of patient characteristics by use of traditional healers, we employ chi-square tests. Similarly, we use a two-sample rank sum test for continuous variables by use of traditional healers.

^bBolded P-values are considered significant.

^cContinuous variables are reported as medians (IQR).

^dNote that 50 MZN or meticals equaled US\$2 at the time of the 2009 survey.

with the others living in semi-urban or town environments. (Note: These towns are estimated to have < 50,000 persons each.)

Health-seeking behaviors

We asked participants if they had ever sought care from a traditional healer. Over four in five interviewees (288, 83%) had visited a traditional healer for their health-care needs. A logistic regression model indicated that older individuals (35 versus 25 years, OR [95% CI]: 2.0 [1.2–3.2]), those living in Namacurra or Inhassunge, and those who understood there was no existing cure for AIDS (OR [95% CI]: 0.26 [0.09–0.76]) were more likely to visit traditional practitioners. We failed to find statistical evidence that sex and education were associated with traditional healer usage. We asked participants who had visited a traditional healer if they were satisfied with the care they received at their last visit. Eighty percent indicated that they were satisfied because they believed that the healer had successfully treated their condition. We asked patients where they first sought care when ill. Among 333 participants who responded, 188 (56%) reported first seeking health care at a hospital or clinic. Over a quarter

(87, 26%) first sought treatment with a traditional healer. The remainder (48, 14%) indicated that their decision depended on the type of illness they were experiencing or that they would visit both providers for the same illness (10, 4%). We asked participants who first sought care at the clinic what they would do if they were not feeling better within a week. Seventy percent indicated they would seek care from a traditional healer if not feeling better.

We compared the 188 people who indicated that they first visited a hospital with the 87 who first visited a traditional healer for their health care, excluding non-responders and the groups that variably used one or the other. In our logistic model, men were more likely (OR [95% CI]: 2.5 [1.4–4.7]) to see a traditional healer for their health-care needs. Persons living in Alto Molócuè (northern part of the Zambézia province) were far less likely (OR [95% CI]: 0.26 [0.12–0.55]) to visit a traditional healer than those living in Inhassunge or Namacurra which are both nearer to Quelimane (the provincial capital and only large city in the province) on the coast.

HIV transmission knowledge

Eighty-six percent of the participants identified sex as a method of transmission, 72% identified razors, 20% identified needles, 6% identified blood, and 1% identified mother-to-child transmission (MTCT). Some participants (47, 13%) in our survey were unable to identify any routes of transmission. Nearly half (164, 47%) were able to identify a single route, 59 (17%) could identify two routes, while 79 (23%) could identify ≥ 3 routes of transmission. Of those who knew only a single-way HIV was transmitted, 163 (99%) identified sexual intercourse. Despite less than ideal levels of correct information, only five people (1%) provided incorrect answers to this question.

We conducted a proportional-odds model to adjust for multiple predictors of increased HIV transmission knowledge within our sample. Predictors were chosen *a priori*, based on factors researchers believed would impact knowledge. A person who lived in Alto Molócuè and Inhassunge was less likely to identify multiple routes of HIV transmission than a person from Namacurra (of the three towns, the one closest to Quelimane, the provincial capital). Education was a positive predictor for HIV knowledge, with every year of additional education resulting in nearly 20% higher odds of identifying more routes of infection (OR [95% CI]: 1.18 [1.10–1.26]). To determine which sources of learning predicted increased understanding of HIV transmission, we fit a second proportional-odds model. A person who reported receiving any information about HIV from community health workers or at school was more likely to identify more routes of HIV infection (OR [95% CI]: 10.1 [3.9–26.4] and 4.4 [1.9–10.5], respectively). Other associated sources of information were: traditional healers (4.0 [1.2–13.6]), radio (2.5 [1.6–3.9]), and clinics (2.0 [1.2–3.1]).

HIV prevention knowledge

The associations of HIV prevention knowledge with HIV transmission knowledge were probed as were behaviors, using an open-ended question, 'What are the ways in which you can prevent HIV infection?' Two-thirds of respondents (233, 66%) indicated that condoms were protective during sex. Ten percent suggested that people not share razors when receiving treatment from traditional healers, 21% knew having only one partner reduced their risk, and 5% suggested abstinence for protection. When asked if they used condoms to protect themselves from HIV, 61% said they did. Among those not using condoms, many indicated they either did not like to use them (i.e. they did not like the feel of condoms during sex), were unable to negotiate their use with their partners, or felt they were 'too old' to use condoms. We conducted a proportional-odds model to adjust for multiple predictors of increased HIV prevention knowledge. Education was a positive predictor for HIV knowledge, with every year of additional education resulting in nearly 20% higher odds of identifying more methods of prevention (OR [95% CI]: 1.17 [1.08–1.26]). We fit a proportional-odds model to identify which source of learning better predicted increased understanding of prevention activities. Those who received information from schools were most likely to identify sources of prevention (OR [95% CI]: 5.8 [2.2–15.4]), followed by community health workers (3.7 [1.4–9.5]), community meetings (2.3 [1.2–4.4]), radio (2.3 [1.4–3.8]), and clinics (1.7 [1.0–2.8]).

Discussion

This study has provided information about the current state of HIV transmission knowledge, and health-seeking behavior in Zambézia Province, Mozambique. We found that approximately 80% of participants had visited a traditional healer. This number is similar to what was found in a Zambian study from 2000 that reported 88% of people would visit a traditional healer if sick (Stekelenburg, Jager, Kolk, Westen, van der Kwaak & Wolffers 2005). Our data suggested that participants showed a preference for initially visiting a clinic when ill, only seeking care from a traditional healer if they were still feeling ill. Considering the limited staffing in rural clinics, supply-chain management problems leading to empty stock of important medications, and poor quality of diagnostic equipment available in some areas, there exists strong impetus for people to find alternatives.

Of those who do use traditional healers, men are more likely to visit a traditional healer first or exclusively (52%), whereas women tend to first seek care from a health-care clinic (67%) only turning to a traditional healer if they remain ill. When probed further about why men may initially avoid health-care services, men suggested that a lack of respect provided by clinicians was their primary reason for avoiding the health system. This sentiment has been echoed by the results of focus group discussions assessing barriers to care throughout the province (Groh, Moon, Tonela, Sidat, Vergara, Vermund, *et al.* 2010). A limitation to these data may be the belief that the interviewers were affiliated with the local allopathic HIV/AIDS clinics, i.e. social response bias (Fox 1967; Goldiamond 1964; O'Brien 1989). Improving treatment of patients at health-care facilities may facilitate men's use of allopathic medicine.

As has been found in other studies of HIV knowledge in sub-Saharan Africa, men trended towards having higher levels of HIV knowledge than women, although in our study this trend was not statistically significant (Glick & Saha 2007; Instituto Nacional de Estatística & Ministério da Saúde 2005). The number of people who knew HIV could be transmitted through sex was similar (or higher) than that found by researchers in Ethiopia, Tanzania, Nigeria, and Burkina Faso (Alene, Wheeler & Grosskurth 2004; DHS 2011; Negash, Gebre, Benti & Bejiga 2004; Nkya, Sindato, McHaro & Kibona 2006; Sarker, Milkowski, Slinger, Gondos, Sanou, Kouyate, *et al.* 2005; Yerdaw, Nedi & Enquoselassie 2002). While the use of condoms was associated with higher levels of HIV knowledge, there remains a cultural barrier to condom use that needs to be addressed. The understanding of sexual transmission also needs to be supplemented with additional transmission and prevention messages, to empower people to make informed health-care decisions (e.g. taking prophylaxis during pregnancy, exclusively using formula or breastfeeding, and taking precautions when in contact with blood). HIV knowledge was primarily limited to sexual transmission. The number of people who volunteered that HIV could be transmitted via blood or that mothers could pass the virus to their babies was surprisingly low. Higher levels of formal education did correlate significantly with increased rates of transmission and prevention knowledge, suggesting a way forward.

Table 2. Logistic regression model effects: predictors of Mozambicans who use traditional healers

<i>n</i> = 349	Odds ratio	Lower 95% CI	Upper 95% CI	<i>P</i> -value ^a
Age in years				0.016
25 (ref)	1			
35	1.95	1.21	3.15	
45	1.80	0.99	3.30	
Male	0.59	0.30	1.17	0.13
District				< 0.001
Namacurra (ref)	1			
Alto Molócuè	0.15	0.06	0.33	
Inhassunge	0.47	0.20	1.10	
Education (per year)	0.98	0.88	1.08	0.64
Can you cure AIDS?				0.048
No (ref)	1			
Do not know	0.88	0.27	2.88	
Yes	0.26	0.09	0.76	

^aBolded *P*-values are considered significant.

We were alarmed by the low proportion of participants (< 1%) who identified MTCT as a mode of transmission. Maternal use of ART prophylaxis in rural Zambézia remains low (Cook, Ciampa, Sidat, Blevins, Burlison, Davidson, *et al.* 2011), despite the availability of ART, possibly a result of low knowledge levels. In rural Tanzania, the number of people voluntarily identifying MTCT route was substantially higher (> 60%) (Nkya *et al.* 2006). Recent DHS surveys also point to a better understanding of MTCT throughout the region (Department of Health, Medical Research Council & OrcMacro 2007; DHS 2011).

Information provided by community health workers and teachers resulted in study participants identifying the greatest number of transmission and prevention methods. Similar results were found in rural Malawi, where researchers documented the relationship between the source of HIV knowledge to HIV knowledge scores (Barden-O'Fallon, deGraft-Johnson, Bisika, Sulzbach, Benson & Tsui 2004). Among men, community health-care workers messages resulted in higher knowledge scores, whereas among women in Malawi, those who listed media as the source of the information scored the highest (Barden-O'Fallon *et al.* 2004). People in Zambézia who reported learning about HIV prevention techniques in schools had the highest odds of knowing multiple ways to avoid infection, whereas the greatest predictor of HIV transmission knowledge was obtaining information from community health workers. There was no difference between men and women. We suggest training and deploying additional community health workers into areas that are extremely rural, particularly when educational opportunities are sparse. Qualitative data suggested that people liked speaking with community health workers about health-care issues, even

Table 3. Proportional-odds model effects: predictors of Mozambican HIV knowledge of transmission and prevention

<i>n</i> = 349	Odds Ratio	Lower 95% CI	Upper 95% CI	<i>P</i> -value ^a
Predictors of greater knowledge (i.e. suggesting more routes) of HIV transmission				
Age (per 10 years)	0.97	0.80	1.19	0.80
Male	0.75	0.47	1.19	0.22
District				<0.001
Namacurra (ref)	1			
Alto Molócuè	0.42	0.24	0.73	
Inhassunge	0.36	0.22	0.59	
Education (per year)	1.18	1.10	1.26	<0.001
Use condoms	2.58	1.56	4.28	<0.001
Identify AIDS as common	1.11	0.70	1.74	0.66
Predictors of suggesting more routes of prevention:				
Age (per 10 years)	0.86	0.69	1.09	0.22
Male	1.44	0.83	2.48	0.19
District				0.18
Namacurra (ref)	1			
Alto Molócuè	0.91	0.49	1.68	
Inhassunge	0.60	0.35	1.04	
Education (per year)	1.17	1.08	1.26	<0.001
Use condoms	3.50	1.92	6.37	<0.001
Identify AIDS as common	0.63	0.38	1.06	0.081

^aBolded *P*-values are considered significant.

more than with allopathic clinicians or their friends, and saw community health workers as people they could trust.

Our study includes mixed qualitative and quantitative methods, the systematic survey methodology, and the care to interview in the local language. No such study has been reported from Zambézia Province, the second most populous province in the nation. Limitations include that opinions reflect a non-random selection of community members in three rural communities of Zambézia Province. While we attempted to remove sample bias through systematic selection, the timing of our interviews (during daytime, working hours) limited the number of full-time workers enrolled in our study. In addition, translation from local languages to Portuguese (and subsequently to English) complicates analysis. The challenge of cultural understanding can be difficult in rural areas where only local languages are understood. While we have made all attempts to maintain the integrity of our data, it is possible that some words or phrases were missed during translation. Social response bias was also a possibility within our survey, particularly on questions dealing with the use of traditional medicine (Tables 2 and 3).

Conclusion

Our survey in rural Mozambique suggests that the use of traditional healers was common, often simultaneously with accessing allopathic HIV/AIDS services. Knowledge was prevalent that

sexual transmission of HIV was a cause of AIDS, but we noted a low awareness of vertical transmission or blood contamination (e.g. needles or razors). While contact with community health workers correlated with higher HIV transmission knowledge, it did not predict an understanding of HIV prevention techniques. Thirty years into the AIDS epidemic, we found unacceptably low prevention awareness in a systematic house-to-house survey in rural Zambézia Province. Expansion of community health worker coverage, education of traditional healers, and other community health advocates is needed. Health-care workers should be aware that traditional healers are likely to be consulted by patients, particularly if symptoms do not subside quickly. It will take intense educational and community work over several years before rural Mozambique residents share the awareness of HIV prevention that many of their urban African counterparts do.

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References

- Agha, S., Karlyn, A., & Meekers, D. (2001). The promotion of condom use in non-regular sexual partnerships in urban Mozambique. *Health Policy Plan*, 16(2), 144–151.
- Alene, G.D., Wheeler, J.G., & Grosskurth, H. (2004). Adolescent reproductive health and awareness of HIV among rural high school students, North Western Ethiopia. *AIDS Care*, 16(1), 57–68.
- Barden-O'Fallon, J.L., deGraft-Johnson, J., Bisika, T., Sulzbach, S., Benson, A., & Tsui, A.O. (2004). Factors associated with HIV/AIDS knowledge and risk perception in rural Malawi. *AIDS Behavior*, 8(2), 131–140.
- Cook, R.E., Ciampa, P.J., Sidat, M., Blevins, M., Burlison, J., Davidson, M.A., et al. (2011). Predictors of successful early infant diagnosis of HIV in a rural district hospital in Zambezia, Mozambique. *Journal of Acquired Immune Deficiency Syndromes*, 56(4), e104–9.
- Department of Health, Medical Research Council, & OrcMacro (2007). South Africa demographic and health survey 2003. <http://www.measuredhs.com/pubs/pdf/FR206/FR206.pdf> (Accessed 27 May 2011).
- DHS, M. (2011). 2010 Tanzania demographic and health survey (TDHS). <http://www.measuredhs.com/pubs/pdf/GF20/GF20.pdf> (Accessed 27 May 2011).
- Fox, J. (1967). Social desirability, prediction equation, regression equations, and intrinsic response bias. *Psychological Bulletin*, 67(6), 391–400.
- Glick, P. & Saha, D.E. (2007). Changes in HIV/AIDS knowledge and testing behavior in Africa: how much and for whom? *Journal of Population Economics*, 20(2), 383–422.
- Goldiamond, I. (1964). Social factors and disorders of communication. Response bias and perceptual communication. *Research Publications: Associations for Research in Nervous and Mental Disorders*, 42, 334–363.
- Groh, K., Audet, C.M., Baptista, A., Sidat, M., Vergara, A., Vermund, S.H., et al. (2011). Barriers to antiretroviral therapy adherence in rural Mozambique. *BMC Public Health*, 11, 650.
- INSIDA (2009). National survey on prevalence, behavioral risks and information about HIV and AIDS (2009 INSIDA). <http://xa.yimg.com/kq/groups/15255898/801713730/name/INSIDA> (Accessed 24 May 2011).
- Instituto Nacional de Estatística, & Ministério da Saúde (2005). Moçambique Inquérito Demográfico e de Saúde 2003. <http://www.measuredhs.com/pubs/pdf/FR161/FR161.pdf> (Accessed 26 May 2011).
- Karlyn, A.S. (2001). The impact of a targeted radio campaign to prevent STIs and HIV/AIDS in Mozambique. *AIDS Education and Prevention*, 13(5), 438–451.
- Ministerio de Saude (2009). Plano estrategia do sistema de informacao para a saude 2009-2014. http://74.125.113.132/search?q=cache:nhUyeuoni4wj:www.who.int/healthmetrics/library/countries/HMN_MOZ_StrPlan_Draft_2009_06_pt.pdf+Minist%C3%A9rio+dia+Sa%C3%BAde,+Direc%C3%A7%C3%A3o+Nacional+de+Planifica%C3%A7%C3%A3o+el+Coopera%C3%A7%C3%A3o,+Departamento+de+Informa%C3%A7%C3%A3o+para+a+Sa%C3%BAde,+Mozambique:+Plano+Estrat%C3%A9gico+do+Sistema+de+Informa%C3%A7%C3%B5es+para+a+Sa%C3%BAde+-+2009-2014&cd=1&hl=en&ct=clnk&gl=us (Accessed 26 May 2011).
- Negash, Y., Gebre, B., Benti, D., & Bejiga, M. (2004). A community based study on knowledge, attitude, and practice (KAP) on HIV/AIDS in Gambella town, Western Ethiopia. *Ethiopian Journal of Health Development*, 17(3), 205–213.
- Nkya, G.M., Sindato, C., McHaro, J., & Kibona, S.N. (2006). Community knowledge on HIV/AIDS and its relationship with sexual practices in Tabora and Igunga Districts, Western Tanzania. *Tanzan Health Research Bulletin*, 8(3), 173–176.
- O'Brien, F.P. (1989). Work-related fear of AIDS and social-desirability response bias. *Psychological Report*, 65(2), 371–378.
- Sarker, M., Milkowski, A., Slinger, T., Gondos, A., Sanou, A., Kouyate, B., et al. (2005). The role of HIV-related knowledge and ethnicity in determining HIV risk perception and willingness to undergo HIV testing among rural women in Burkina Faso. *AIDS Behavior*, 9(2), 243–249.
- Schafer, J.L. (1997). *Analysis of incomplete multivariate data*. Boca Raton, FL, Chapman & Hall/CRC.
- Stekelenburg, J., Jager, B.E., Kolk, P.R., Westen, E.H., van der Kwaak, A., & Wolffers, I.N. (2005). Health care seeking behaviour and utilisation of traditional healers in Kalabo, Zambia. *Health Policy*, 71(1), 67–81.
- Yerdaw, M., Nedi, T., & Enquoselassie, F. (2002). Assessment of awareness of HIV/AIDS among selected target groups in and around Addis Ababa, Ethiopia. *African Journal of Reproduction and Health*, 6(2), 30–38.