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SHORT COMMUNICATION

Linkage to care following community-based mobile HIV testing compared with clinic-based testing in Umlazi Township, Durban, South Africa*

IV Bassett,[1,2,3,4,5] S Regan,[1,3] P Luthuli,[6] H Mbonambi,[6] B Bearnot,[7] A Pendleton,[4] M Robine,[1,3] D Mukuvisi,[6] H Thulare,[6] RP Walensky,[1,2,3,4,5,8] KA Freedberg,[1,2,3,4,5,9,10] E Losina[1,3,4,5,11,12] and B Mhlongo[6]

[1]Division of General Medicine, Massachusetts General Hospital, Boston, MA, USA, [2]Division of Infectious Diseases, Massachusetts General Hospital, Boston, MA, USA, [3]Medical Practice Evaluation Center, Massachusetts General Hospital, Boston, MA, USA, [4]Harvard Medical School, Boston, MA, USA, [5]Harvard Center for AIDS Research, Harvard University, Boston, MA, USA, [6]AIDS Healthcare Foundation/Ithembalabantu Clinic, Durban, South Africa, [7]New York University Medical School, New York, NY, USA, [8]Division of Infectious Diseases, Brigham and Women's Hospital, Boston, MA, USA, [9]Department of Epidemiology, Boston University School of Public Health, Boston, MA, USA, [10]Department of Health Policy and Management, Harvard School of Public Health, Boston, MA, USA, [11]Department of Biostatistics, Boston University School of Public Health, Boston, MA, USA and [12]Department of Orthopedic Surgery, Brigham and Women's Hospital, Boston, MA, USA

Objectives

The aim of the study was to assess HIV prevalence, disease stage and linkage to HIV care following diagnosis at a mobile HIV testing unit, compared with results for clinic-based testing, in a Durban township.

Methods

This was a prospective cohort study. We enrolled adults presenting for HIV testing at a community-based mobile testing unit (mobile testers) and at an HIV clinic (clinic testers) serving the same area. Testers diagnosed with HIV infection, regardless of testing site, were offered immediate CD4 testing and instructed to retrieve results at the clinic. We assessed rates of linkage to care, defined as CD4 result retrieval within 90 days of HIV diagnosis and/or completion of antiretroviral therapy (ART) literacy training, for mobile *vs.* clinic testers.

Results

From July to November 2011, 6957 subjects were HIV tested (4703 mobile and 2254 clinic); 55% were female. Mobile testers had a lower HIV prevalence than clinic testers (10% *vs.* 36%, respectively), were younger (median 23 *vs.* 27 years, respectively) and were more likely to live >5 km or >30 min from the clinic (64% *vs.* 40%, respectively; all $P < 0.001$). Mobile testers were less likely to undergo CD4 testing (33% *vs.* 83%, respectively) but more likely to have higher CD4 counts [median (interquartile range) 416 (287–587) cells/μL *vs.* 285 (136–482) cells/μL, respectively] than clinic testers (both $P < 0.001$). Of those who tested HIV positive, 10% of mobile testers linked to care, *vs.* 72% of clinic testers ($P < 0.001$).

Conclusions

Mobile HIV testing reaches people who are younger, who are more geographically remote, and who have earlier disease compared with clinic-based testing. Fewer mobile testers underwent CD4 testing and linked to HIV care. Enhancing linkage efforts may improve the impact of mobile testing for those with early HIV disease.

Keywords: HIV/AIDS, linkage to care, mobile HIV testing, South Africa

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Correspondence: Dr Ingrid V. Bassett, 50 Staniford Street, 9th Floor, Boston, MA 02114, USA. Tel: 617 726 0637; fax: 617 726 2691; e-mail: ibassett@partners.org

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Introduction

A critical bottleneck in the provision of HIV care remains receiving an HIV diagnosis: in 2010, only 25% of adults in South Africa had received an HIV test in the past year and knew their results [1]. To improve testing uptake, the South African government launched an ambitious national HIV testing campaign in April 2010, with the goal of testing 15 million people by June 2011 [1]. This initiative catalysed interest in HIV testing in nonmedical venues, such as taxi stands and malls, accessible by mobile community-based testing units.

Early evidence suggests that mobile HIV testing units can be effective in accessing hard-to-reach populations [2–4]. However, few data inform rates of successful entry into HIV care following a new diagnosis from a mobile unit. Indeed, concern was raised that the government-led HIV testing campaign, which was far-reaching and used novel testing venues, was unable to provide data regarding linkage to care [5].

Characterizing mobile, community-based testers compared with clinic-based testers, and identifying barriers to accessing care following a new HIV diagnosis, would provide valuable information for optimizing outcomes tailored to the mobile HIV testing setting. Our objective was to evaluate yield and linkage to care from mobile HIV testing compared with clinic-based HIV testing in a high-prevalence South African township.

Methods

Study setting

Since 2002, Ithembalabantu 'The People's Hope' Clinic (IPHC) has been offering HIV care in Umlazi, the largest township outside Durban. Umlazi has a population estimated at 550 000 to over 1 million, with approximately 30% of people living in informal housing [6]. IPHC currently has >10 000 adults and children in HIV care. The clinic offers both clinic-based testing and mobile community-based testing at venues such as taxi stands, markets and sporting grounds. During the study period, 1–2 mobile units per day were deployed to community venues in Umlazi and the surrounding areas, where IPHC HIV counsellors spent the day offering counselling and rapid HIV testing under tents. The average distance from IPHC to the mobile testing sites was 3.7 km; the maximum distance was 6.4 km. The clinic raised community awareness of the mobile testing campaign through flyers, billboards, radio, and loudspeakers in outdoor settings [7].

Study sample

We prospectively collected programmatic data for adults (≥ 15 years old) presenting for HIV testing at the mobile HIV testing unit (mobile testers) and IPHC (clinic testers). We compared testers between July and November 2011 in the mobile unit and the clinic with respect to demographic data, presenting CD4 count, and linkage to HIV care. The study was approved by the McCord Hospital Research Ethics Committee (Durban, South Africa) and the Partners Human Research Committee (Protocol 2011-P-001195; Boston, MA, USA).

Data collection

As per usual Ithembalabantu practice, prospective testers were offered group HIV pre-test counselling in Zulu or English. Client consultations, including group pre-test counselling and individual post-testing counselling, ranged from 25 to 35 min in duration. Group size varied depending on the location and demand; if there was not a full group present, mobile unit testers received individual counselling to avoid unnecessary delays. Waiting time for HIV testing for both mobile and clinic testers was typically less than 10 min. Testers underwent an individual HIV test consent process that included an orally administered intake form. The intake form included demographic information, distance from IPHC, prior HIV testing, and prior history of sexually transmitted infection (STI) and tuberculosis (TB) treatment. Current TB symptoms (cough, night sweats, weight loss and fever) were assessed with a standardized South African Department of Health instrument. Subjects were counselled and tested by IPHC counsellors using serial rapid HIV tests [8] and given results within 20 min. Newly identified HIV-infected participants, regardless of testing site, were offered phlebotomy by a nurse for CD4 count testing, and were instructed to return 2 weeks later to IPHC for results. Waiting time for a phlebotomist on the mobile unit was typically less than 10 min; at the clinic the wait for phlebotomy could be 30 to 60 min. Subjects who returned for CD4 count results were referred to the IPHC nurse for staging and evaluation for antiretroviral therapy (ART) initiation, per South African guidelines [8]. Subjects who did not stay for phlebotomy at the mobile unit were encouraged to come to IPHC to undergo CD4 count testing. A dedicated research assistant reviewed clinic registers and medical records to assess CD4 count results and dates of result pick-up for all subjects, regardless of testing location.

Statistical methods

The outcome was initial linkage to care, defined for mobile and clinic testers as documented CD4 count result retrieval

at IPHC within 90 days of HIV diagnosis or initiation of medical record-confirmed ART literacy training at any time. Patients must have had a CD4 count to be eligible to start the literacy training and ART literacy training visits are more thoroughly recorded than CD4 count retrieval. Therefore, we included HIV literacy training visits in our definition of linkage to care, so that subjects who did not have a documented CD4 return date but who had entered the care system were still considered linked to care. We first compared characteristics of clinic-based and mobile testers, using χ^2 tests for categorical data and Wilcoxon rank-sum tests for continuous variables. We then compared the proportion of mobile and clinic testers who linked to care using χ^2 tests. We used logistic regression to estimate odds ratios (ORs) and 95% confidence intervals (CIs) for linking to care, adjusting for factors of interest (sex, age, distance between patient's home and IPHC, prior STI, and any TB symptoms).

Results

Cohort characteristics

From July to November 2011, we prospectively enrolled 6957 testers in the study. Of these, 4703 subjects were tested at the mobile unit and 2254 subjects at IPHC (Table 1). Mobile testers were younger than clinic testers [median 23 (interquartile range (IQR) 20–31) years *vs*. 27 (IQR 22–34) years, respectively; $P < 0.0001$]. Subjects tested at the mobile unit were more likely to be male than clinic testers (46% *vs*. 43%, respectively; $P = 0.005$). They were also more likely to live >5 km or >30 min away from the clinic (64% *vs*. 40%, respectively; $P < 0.001$). The majority of mobile testers lived > 5 km away from the clinic, with 16% of them living > 10 km away. Mobile testers were less likely to have had signs of an STI in the past 12 months (9% *vs*. 18%, respectively; $P < 0.001$). Similarly, fewer mobile testers than clinic testers reported prior TB treatment (1% *vs*. 5%, respectively; $P < 0.001$), or described one or more TB symptoms (12% *vs*. 30%, respectively; $P < 0.001$).

Clinical characteristics and linkage to care

Mobile testers had a lower HIV prevalence than clinic testers: 10% ($n = 455$) were HIV-infected compared with 36% ($n = 807$; $P < 0.001$) of clinic testers. In addition, mobile testers were less likely to undergo CD4 testing: 148 (33%) compared with 671 (83%) clinic testers ($P < 0.001$). Among those who had a CD4 test, mobile testers had higher CD4 counts than clinic testers; the median CD4 count for mobile testers was 416 cells/μL (IQR 287–587 cells/μL) compared with 285 cells/μL (IQR 136–482 cells/μL) for the clinic testers ($P < 0.001$). Of the 145 mobile testers who had a CD4 test result available, 89% ($n = 129$) had CD4 counts ≥200 cells/μL, compared with 64% ($n = 407$) of the 637 clinic testers who had a CD4 count result ($P < 0.001$; Fig. 1a). Figure 1b provides a detailed distribution of CD4 cell counts. CD4 cell counts were significantly related to testing site ($P < 0.001$). Mobile testers were less likely to link to care; of subjects who were HIV-infected, 45 (10%) mobile testers retrieved their results and linked to care, compared with 580 (72%) clinic testers ($P < 0.001$; Fig. 1a). Adjusting for other factors, the odds of linking remained lower for mobile testers than for clinic testers (OR 0.05; 95% CI 0.03–0.07). Among mobile testing sites, taxi stands at major transport junctions and commercial sites had the highest HIV prevalence (17–26%) and attracted a larger proportion of men (52–65%).

Discussion

Innovative, community-based HIV screening strategies can reach individuals who may not otherwise access health care facilities. This study demonstrated that, within a South African township, mobile unit HIV testers were younger,

Table 1 Baseline cohort characteristics in a study of mobile-based compared with clinic-based HIV testing in Durban, South Africa

	Mobile testers ($n = 4703$)	Clinic testers ($n = 2254$)	*P*-value
Age (years) [median (IQR)]	23 (20–31)	27 (22–34)	<0.0001
Gender (male) [% (95% CI)]	46 (45–48)	43 (40–45)	0.005
Travel time to IPHC (min) [median (IQR)]	20 (15–30)	20 (15–30)	<0.0001
Lives > 5 km or > 30 min from IPHC [% (95% CI)]	64 (63–66)	40 (38–42)	<0.001
Previously tested for HIV [% (95% CI)]	73 (71–74)	73 (71–75)	0.596
Signs of an STI within the last 12 months [% (95% CI)]	9 (9–10)	18 (16–19)	<0.001
Prior TB treatment [% (95% CI)]	1 (0.7–1.2)	5 (4–6)	<0.001
Has one or more TB symptoms [% (95% CI)]	12 (12–13)	30 (29–32)	<0.001

CI, confidence interval; IQR, interquartile range; IPHC, Ithembalabantu People's Hope Clinic; STI, sexually transmitted infection; TB, tuberculosis.

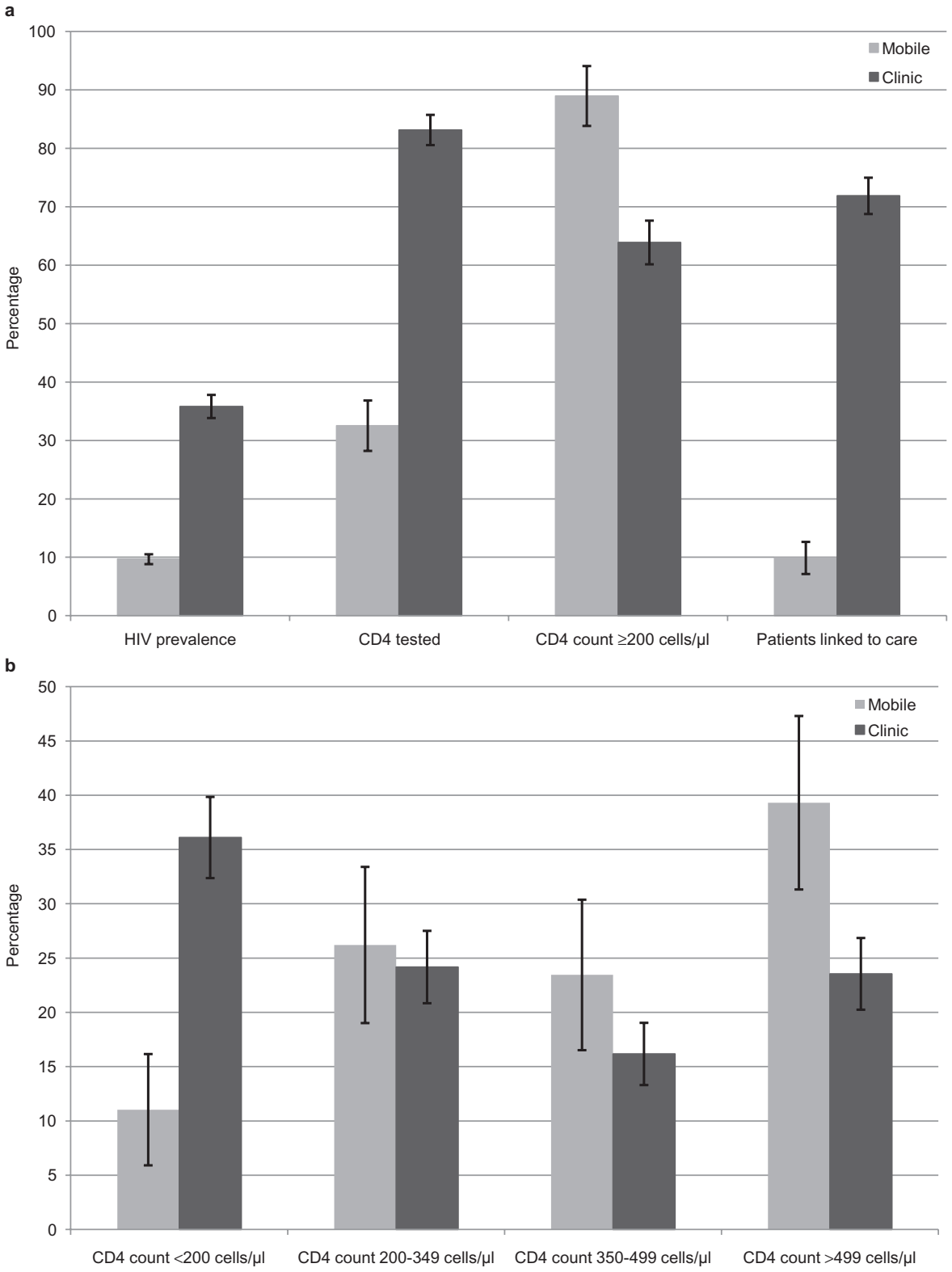

Fig. 1 HIV prevalence, CD4 testing, and linkage to care for mobile-based compared with clinic-based testers. (a) Outcomes (with 95% confidence intervals) for mobile-based compared with clinic-based testing (HIV-tested, $n = 4703$ and $n = 2254$, respectively) in a township of Durban, South Africa ($P < 0.001$ for all comparisons). (b) Percentage of people in each CD4 count stratum (with 95% confidence intervals) for mobile-based compared with clinic-based testing ($n = 145$ and $n = 637$, respectively) in a township of Durban, South Africa.

were more frequently male, and lived further away from the clinic, compared with clinic testers. Those mobile testers who completed CD4 testing were diagnosed with higher CD4 counts compared with clinic testers. Fewer mobile testers, however, underwent CD4 count testing or returned to the clinic to retrieve their results and link to care.

The mobile unit successfully attracted 'hard-to-reach' subgroups, such as young adults and men. Mobile units represent a means to access adolescents and young adults, who have the steepest increase in HIV incidence in South Africa [1]. Overall, a slightly greater proportion of testers at the mobile unit were men compared with at the clinic, as found in other studies [4]. Fewer men are aware of their HIV status than women in South Africa [9] and mobile testing may represent a more convenient HIV testing alternative. While the proportion of people who reported a prior HIV test was the same among mobile and clinic testers, mobile testing may allow for more frequent testing of the 'hard-to-reach' subgroups. In addition, significantly more mobile testers lived >5 km or >30 min away from the clinic compared with clinic testers. These findings are consistent with other sub-Saharan Africa studies, in which distance was a barrier to clinic-based testing [10].

We found that mobile testing identified substantial numbers of HIV-infected individuals with relatively early disease. Mobile testers were significantly less likely than clinic testers to have had signs of an STI within the last 12 months, to have received TB treatment in the past, or to have TB symptoms. Fewer mobile testers were HIV positive (10%), and of those who received CD4 counts, the majority had a CD4 count of ≥200 cells/μL. While only 10% of those testing positive in the mobile unit linked to care, the mobile unit was able to test 4703 people, finding 455 newly diagnosed HIV-infected individuals, compared with 36% of 2254 of the clinic, for a total of 807 individuals. Thus, although the prevalence among mobile testers was lower than among clinic-based testers, there was still a substantial number of newly diagnosed HIV infections, in a group that may not routinely access clinic-based testing.

Mobile testers were significantly less likely than clinic testers to undergo CD4 testing and to obtain results. One possible explanation for lower acceptance rates is that mobile testers were less symptomatic than clinic testers and, therefore, less motivated by illness to wait to undergo phlebotomy for a CD4 count or to seek care [11–13]. Although attrition in this study was high, it is consistent with other studies [14,15]. Failure to undergo CD4 count testing or to retrieve results can lead to delayed ART initiation and increased mortality [9]. Delayed presentation for care, which is common in South Africa [1], threatens the success of efforts such as 'test and treat' that rely on early detection [16,17].

Although mobile units represent an attractive tool to help reach South Africa's target of 80% of eligible HIV-infected people on treatment by 2016 [1], innovative approaches to improving linkage are required. Emerging evidence supports the efficacy of point-of-care (POC) CD4 tests to improve linkage to care from mobile units [18]. Clinics are often open only during working hours, making it difficult for employed people to link to care after mobile testing [11]. Extending clinic and mobile unit hours may be beneficial, as may offering treatment itself from the mobile units. Incentives, in the context of active patient recruitment, have been effective in increasing the number of HIV diagnoses [3,19] and the number of patients who retrieved their test results [20].

Assessment of linkage to care was only conducted at IPHC. Clinic and mobile testers, however, could have linked to care at other sites providing HIV services in Umlazi. Therefore, linkage to care in this cohort may have been underestimated. The estimate of the difference in CD4 count between mobile and clinic testers is limited by the small proportion of mobile testers who obtained a CD4 count. Another limitation to this study was the use of programmatic data, which did not allow ascertainment of patient-identified barriers to linkage to care.

We found that mobile HIV testing in a Durban township reached people who were younger, who were more likely to be male and to be geographically remote, and who may have had earlier disease compared with clinic-based testing. The majority of mobile testers did not receive a CD4 count or retrieve their CD4 count result, and were not linked to care. Harnessing the full potential of mobile testing in community venues – where testers may be less symptomatic and unprepared for a new HIV diagnosis – requires novel approaches to promote linkage to care. Mobile testing with enhanced linkage efforts – such as POC CD4, longer hours, mobile treatment, or incentives – could have a major impact on improving care for those with early HIV disease.

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AP collected and assembled the data. IVB, SR, MR, DM, RPW, KAF and EL analysed and interpreted the data. SR and EL performed statistical analysis. IVB and MR drafted the article. SR, PL, HM, BB, AP, DM, HT, RPW, KAF, EL and BM critically revised the article for important intellectual content.

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