Medical Injection Use Among Adults and Adolescents Aged 15 to 64 Years in Kenya: Results From a National Survey

Daniel Kimani, MD, MPH[*], **Rachel Kamau, MPH**[†], **Victor Ssempijja, MSc**[*], **Katherine Robinson, MPH**[*], **Tom Oluoch, MSc**[*], **Mercy Njeru, MSc**[*], **Jane Mwangi, MBChB, MMed**[*], **David Njogu, BSc**[‡], and **Andrea A. Kim, PhD, MPH**[*] for the KAIS Study Group

[*]Center for Global Health, Centers for Disease Control and Prevention, Nairobi, Kenya

[†]National AIDS and Sexually Transmitted Infection (STI) Programme, Ministry of Health, Nairobi, Kenya

[‡]National Public Health Laboratory Services, Ministry of Health, Nairobi, Kenya

Abstract

Background—Unsafe medical injections remain a potential route of HIV transmission in Kenya. We used data from a national survey in Kenya to study the magnitude of medical injection use, medication preference, and disposal of medical waste in the community.

Methods—The Kenya AIDS Indicator Survey 2012 was a nationally representative population-based survey. Among participants aged 15–64 years, data were collected regarding medical injections received in the year preceding the interview; blood samples were collected from participants for HIV testing.

Results—Of the 13,673 participants who answered questions on medical injections, 35.9% [95% confidence interval (CI): 34.5 to 37.3] reported receiving ≥1 injection in the past 12 months and 51.2% (95% CI: 49.7 to 52.8) preferred receiving an injection over a pill. Among those who received an injection from a health care provider, 95.9% (95% CI: 95.2 to 96.7) observed him/her open a new injection pack, and 7.4% (95% CI: 6.4 to 8.4) had seen a used syringe or needle near their home or community in the past 12 months. Men who had received ≥1 injection in the past 12 months (adjusted odds ratio, 3.2; 95% CI: 1.2 to 8.9) and women who had received an injection in the past 12 months, not for family planning purposes (adjusted odds ratio, 2.6; 95% CI: 1.2 to 5.5), were significantly more likely to be HIV infected compared with those who had not received medical injection in the past 12 months.

Conclusions—Injection preference may contribute to high rates of injections in Kenya. Exposure to unsafe medical waste in the community poses risks for injury and infection. We recommend that community- and facility-based injection safety strategies be integrated in disease prevention programs.

Correspondence to: Daniel Kimani, MD, MPH, Division of Global HIV/AIDS, US Centers for Disease Control and Prevention, P.O. Box 606-00621, Village Market, Mbagathi Road, Nairobi, Kenya (ipb3@cdc.gov).

Keywords

HIV; injection safety; Kenya; medical waste management; population-based survey

INTRODUCTION

Medical injections, if given safely, can save lives by preventing and treating disease. Each year, at least 16 billion injections are administered in low- and middle-income countries, but over half of these injections have been shown to be either unnecessary or unsafe.[1–4] Unsafe injections can cause bacterial infections leading to abscesses and septicemia.[1] Additionally, they are important routes of transmission of blood-borne pathogens.[2] These pathogens include hepatitis B virus, hepatitis C virus, HIV, malaria, trypanosomiases, and viral hemorrhagic fever viruses. In 2000, it was estimated that unsafe medical injections led to 260,000 HIV infections, 2 million hepatitis C virus infections, and 21 million hepatitis B virus infections globally.[5]

Poor disposal of contaminated needles and syringes and other medical waste poses a risk to health care providers, patients, and the community.[6] Traditionally, most health programs have concentrated their efforts on disposal of syringes and needles within the health care settings.[7] With expansion of health services and overwhelmed health facility waste management systems, there is increased disposal of medical waste, including contaminated needles and syringes, in the community.[6–8] This has led to increases in risk of injury to community members, especially children and domestic waste handlers.[9] Whereas industrialized countries such as the United States of America, Canada, and Australia have community-based programs for needle and syringe disposal,[10] this is not the case in most low- and middle-income countries, including Kenya.

The Kenya Ministry of Health recognizes that administration of unsafe and unnecessary injections and inappropriate disposal of the medical waste are health challenges.[11] In 2008, it was estimated that 2.2% of new HIV infections in Kenya were a result of unsafe injections received in health facilities.[12] The first Kenya AIDS Indicator Survey (KAIS 2007) reported that 33% of adults and adolescents aged 15–64 years had received at least 1 injection within the 12 months preceding the survey and that about 50% preferred injections over oral medications.[13] Furthermore, there was a corresponding increase in HIV prevalence with increasing number of medical injections reported.

Since 2004, the Ministry of Health has implemented several strategies to address injection safety, including health care provider trainings, behavior change communication, and community education on the dangers of unsafe and unnecessary injections.[11] It has also educated the public on its role in ensuring safe injections and preventing re-use among patients by confirming that the injection device used is new.[14] However, many people remain unaware of the increased health risks associated with unsafe administration of injections.[14]

Despite the ongoing interventions, no population-based data on injection preference, injection usage, and medical waste disposal in the community have been collected since

KAIS 2007. The second Kenya AIDS Indicator Survey (KAIS 2012) presented an opportunity to obtain current information on medical injection safety and medical waste disposal, allowing for an assessment of trends over the past 5 years.

METHODS

Study Design and Study Population

KAIS 2012 was a stratified 2-stage cluster population-based survey designed to generate national and sub-national estimates of HIV-related indicators among Kenyans aged 18 months to 64 years. The survey methods for KAIS 2012 are described in detail elsewhere.[15] Briefly, individual questionnaires were administered to adults and adolescents aged 15–64 years that collected information on sociodemographic characteristics, behaviors, and access to health care services, including medical injection practices, injection safety, and medical waste disposal. Participants were asked to provide blood samples for HIV testing at a central laboratory. Participants were informed that their HIV test results from the laboratory would not be returned to them. However, they were offered home-based HIV testing and counseling to learn their HIV status in the home using rapid HIV test kits according to the Kenyan national HIV testing and counseling protocol.[15] In this article, we present a subanalysis of KAIS 2012 to describe medical injection use, medication preferences, and reports of unsafe medical waste disposal in the community among Kenyan adults and adolescents aged 15–64 years.

Measurements

We had three outcome variables of interest: history of medical injection in the past 12 months, medication preference, and HIV infection. Previous history of medical injection was based on the question, "Have you had an injection for any reason in the last 12 months?" For female participants, we also based history of medical injection on the question, "Are you currently using any method to delay or avoid getting pregnant?" Those who answered "Yes-injectable method" and had not been captured in the question above were classified as having a history of medical injection in the past 12 months. Predictor variables for history of medical injection in the past 12 months included sex, age, marital status, level of education, area of residence, region, household wealth index, and medication preference. Medication preference was based on the question: "If you had a choice, would you like to receive medication as an injection or a pill?" Predictor variables for medication preference included demographic variables and history of medical injection in the past 12 months, number of injections, and use of injectable family planning method. HIV status was based on the laboratory-confirmed HIV results at the central laboratory. The predictor variables for HIV infection were age, injection history, use of injectable contraceptives (for women only), the number of injections received in the past 12 months, and whether the injection was self-administered.

Laboratory Measurements

Participants were requested to provide a blood specimen for HIV testing at the National HIV Reference Laboratory in Nairobi. Specimens were tested for HIV antibody using the Vironostika HIV-1/2 UNIF II Plus O Enzyme Immunoassay (bioMérieux, Marcy d'Etoile,

France), and positive results were confirmed using the Murex HIV.1.2.O HIV Enzyme Immunoassay (DiaSorin, SpA, Saluggia, Italy). Repeat testing was performed for discordant results using the same algorithm, and if results remained discordant, final results were obtained using polymerase chain reaction (Cobas Amplicor HIV-1 Monitor Test, version 1.5, Roche Molecular Diagnostics, Pleasanton, CA).

Data Management and Analysis

Data were collected at the point of interview using netbook computers (Mirus Innovations, Mississauga, Ontario, Canada). Data collected in the household were transmitted through a secure wireless network to a central database in Nairobi where data merging, cleaning, and weighting were performed before analysis. Statistical analyses were performed using survey procedures in STATA version 12.0 (STATA Corporation, College Station, TX) and SAS version 9.3 (SAS Institute Inc., Cary, NC). We conducted descriptive analyses to describe persons who had received a medical injection in the past 12 months by select demographic and injection-specific characteristics and present results as weighted population proportions and 95% confidence intervals (CI). We conducted bivariate analyses to estimate the frequencies and proportions of receiving injections in the past 12 months, medication preference, and HIV infection by select variables. Using variables that had a *P* value <0.1 in the bivariate anlayses, we also conducted multivariable analyses to determine factors independently associated with receiving injections in the past 12 months and medication preference. Estimates for measures of association are presented as odds ratios, adjusted odds ratios (aOR), and 95% CI. All analyses were weighted to account for sampling probability and to adjust for survey nonresponse.

Ethical Considerations

The survey protocol, survey collection tools, and consent procedures were approved by the Kenya Medical Research Institute (KEMRI) Ethical Review Committee, the US Centers for Disease Control and Prevention (CDC) Institutional Review Board, and the Committee on Human Research of the University of California, San Francisco (UCSF).

RESULTS

A total of 13,720 adults and adolescents aged 15–64 years participated in the survey. Of these, 13,673 (99.7%) completed the question on having received or not received an medical injection for any reason in the previous 12 months; 7928 (51.0%) of these were women, and 5745 (49.0%) were men.

History of Medical Injection in the Previous 12 Months

In total, 4906 (35.9%, 95% CI: 34.5 to 37.3) had received at least 1 medical injection in the previous 12 months. Among those, 63.6% (95% CI: 61.9 to 65.4) were women (Table 1). Over 60% were married or cohabiting (64.2%, 95% CI: 62.5 to 65.9), lived in rural residences (62.1%, 95% CI: 59.5 to 64.6), and aged less than 35 years, including 32.0% (95% CI: 30.5 to 33.4) of those aged 15–24 years and 32.8% (95% CI: 31.3 to 34.2) of those aged 25–34 years. Injection recipients were evenly distributed by household wealth index

with 17.3% (95% CI: 15.0 to 19.7) in the poorest and 20.3% (95% CI: 17.6 to 23.0) in the richest wealth index quintile.

Among respondents who reported receiving at least 1 injection in the previous 12 months, 96.3% (95% CI: 95.5 to 97.1) were administered by health care providers, 4.6% (95% CI: 3.5 to 5.7) were self-administered, and 0.4% (95% CI: 0.2 to 0.7) were administered by traditional practitioners. Injectable contraceptives accounted for 42.2% (95% CI: 40.0 to 44.4) of all medical injections administered to women (data not shown). The vast majority of respondents (95.9%, 95% CI: 95.2 to 96.7) reported that the last time they received an injection from a health care provider, the needle came from a new, unopened package. Half (50.2%, 95% CI: 48.4 to 52.0) preferred injections as medication, 36.5% (95% CI: 34.8 to 38.3) preferred pills, and 13.3% (95% CI: 12.1 to 14.4) had no treatment preference. Seven percent of injection recipients (7.4%, 95% CI: 6.4 to 8.4) had seen a used needle or syringe near their home or community in the past 12 months compared with 6.3% (95% CI: 5.5 to 7.0) of all survey respondents. In total, 14,982 injections received by participants were administered by health care providers in the previous 12 months, corresponding to an average of 3.6 injections per person among those that received at least 1 injection in the past year. When applied to the survey population, the per capita medical injection rate for adults and adolescents aged 15–64 years was 1.1 injections per person per year.

In multivariate analyses, factors independently associated with increased odds of receiving a medical injection in the previous 12 months were being a woman (aOR, 2.1; 95% CI: 1.8 to 2.3); being currently or previously married or cohabiting compared with being never married or cohabiting [married or cohabiting (aOR, 2.2; 95% CI: 1.9 to 2.5); ever widowed (aOR, 1.7; 95% CI: 1.4 to 2.2); and separated/divorced (aOR, 1.7; 95% CI: 1.3 to 2.2)]; living in Nyanza (aOR, 1.6; 95% CI: 1.2 to 2.0) and Western (aOR, 1.4; 95% CI: 1.1 to 1.8) regions compared with Nairobi region; increasing education levels compared with having no primary education [incomplete primary (aOR, 1.7; 95% CI: 1.2 to 2.2); complete primary (aOR, 1.5; 95% CI: 1.2 to 1.9); and secondary or higher level of education (aOR, 1.4; 95% CI: 1.1 to 1.8)]; and being in the middle (aOR, 1.3; 95% CI: 1.1 to 1.6) or fourth highest (aOR, 1.3; 95% CI: 1.1 to 1.6) wealth quintile compared with being in the poorest wealth quintile (Table 2). Compared with persons aged 15–24 years, persons aged 35–64 years had significantly lower odds of receiving an injection in the past 12 months [aged 35–44 years (aOR, 0.7; 95% CI: 0.6 to 0.8), aged 45–54 years (aOR, 0.6; 95% CI: 0.5 to 0.7), and aged 55–64 years (aOR, 0.5; 95% CI: 0.4 to 0.7)]. We also examined these associations separately for men and women and found similar results (data not shown).

Medication Preference

Overall, 51.2% (95% CI: 49.7 to 52.8) of survey participants preferred an injection to a pill as medication (Table 3). Preference for injection was higher among women (56.7%, 95% CI: 54.9 to 58.5) than men (45.3%, 95% CI: 43.4 to 47.2). Preference for injection was highest among persons aged 25–34 years, at 56.2% (95% CI: 54.0 to 58.4) and decreased with increasing age to a low of 45.4% (95% CI: 41.4 to 49.4) for persons aged 55–64 years. Over half of those who preferred injections resided in rural areas (51.6%, 95% CI: 49.8 to 53.4), were married or cohabiting (54.6%, 95% CI: 52.9 to 56.3), and had completed

primary education (52.2%, 95% CI: 50.1 to 54.3). Preference for injection was higher among those who had received at least 1 injection in the previous 12 months (57.9%, 95% CI: 55.9 to 59.8) compared with those who had received no injection during the same time period (47.3%, 95% CI: 45.6 to 49.0).

In multivariate analyses, older respondents aged 35–44 years (aOR, 0.8; 95% CI: 0.7 to 0.9), 45–54 years (aOR, 0.7, 95% CI: 0.6 to 0.8), and 55–64 years (aOR, 0.6, 95% CI: 0.5 to 0.7) had lower odds of preferring an injection to a pill for medication than younger respondents aged 15–24 years. Female sex (aOR, 1.5; 95% CI: 1.3 to 1.6), residing in urban areas (aOR, 1.2; 95% CI: 1.1 to 1.4), and receiving an injection in the previous 12 months (aOR, 1.4; 95% CI: 1.3 to 1.5) were associated with a higher odds of preferring an injection to a pill.

Medication Injection and Associations With HIV Infection

HIV prevalence was 6.3% (95% CI: 5.1 to 7.4) among individuals who received at least 1 injection in the past 12 months compared with 5.3% (95% CI: 4.6 to 5.9) among those who had not (data not shown). Among those who had received an injection from a traditional practitioner in the past 12 months, HIV prevalence was 20.6% (95% CI: 0 to 44.4). In contrast, HIV prevalence among persons who had self-administered an injection in the past 12 months was 3.5% (95% CI: 0.4 to 6.6).

Among men, HIV prevalence among those who received a medical injection in the past 12 months (5.8%, 95% CI: 4.2 to 7.3) was significantly higher than those who did not receive an injection (3.8%, 95% CI: 3.1 to 4.5) (Table 4). Men who had self-administered an injection in the past 12 months had low HIV prevalence at 2.6% (95% CI: 0 to 6.3). Although men who reported receiving 2 to 3 (6.0%, 95% CI: 3.6 to 8.3) and 4 or more (6.6%, 95% CI: 3.0 to 10.2) medical injections from a health care provider in the past 12 months had higher HIV prevalence than men who had received no injections from health care providers (3.9%, 95% CI: 3.2 to 4.6), these differences were not statistically significant. After adjusting for age and number of injections received in the previous 12 months, men who had received a medical injection in the previous 12 months were 3 times more likely to be HIV infected than men who did not receive injections in the same time period (aOR, 3.2; 95% CI: 1.2 to 8.9).

Among women, HIV prevalence was 7.1% (95% CI: 6.2 to 8.1) among those who had not received a medical injection in the past 12 months, 5.5% (95% CI: 4.1 to 7.0) among women who received injectable contraceptives, and 7.4% (95% CI: 5.8 to 8.9) among women who received medical injections for reasons other than family planning (Table 5). Women who self-administered a medical injection in the past 12 months had an HIV prevalence of 4.8% (95% CI: 0 to 10.0). No associations were observed between the number of injections received by a health care provider and HIV infection among women. After controlling for age and the number of injections administered by a health care worker in the past 12 months, women who received injections for reasons other than family planning purposes were 3 times more likely to be HIV infected compared with women who received no injections in the past 12 months (aOR, 2.6; 95% CI: 1.2 to 5.5).

DISCUSSION

In this nationally representative survey, we found that approximately one-third of adults aged 15–64 years had received a medical injection in the 12 months preceding the survey, and the vast majority of these had received injections from a health care provider. Those who received injections were mainly women, currently or previously married, with higher wealth and education, and residents of Nyanza and Western regions. The estimated number of injections from health care providers per person per year was 1.1 injections. A global average of 3.4 medical injections per person per year among children and adults has been reported elsewhere, with Africa reporting an average of 2.2 medical injections per person per year.[1] The proportion of medical injection recipients in our study, however, remained similar to what was reported in KAIS 2007, where 1 in every 3 persons aged 15–64 years received at least 1 medical injection in the previous 12 months.[13]

We found that 1 in 15 participants had seen a used syringe or needle near their home or in their community in the past 12 months. This finding corroborates 2 recent studies reporting improper medical waste disposal in the community. Mazrui and colleagues[16] found that 11% of private health facilities in Nairobi disposed of medical waste in open dump sites, and a United Nations Environmental Program study team reported seeing used needles in the general waste disposal site in Dandora, Nairobi.[17]

Given a choice, half of Kenyan adults and adolescents preferred an injection to a pill for medication purposes, similar to what was reported in KAIS 2007.[13] Furthermore, this rate was also similar to findings from a program evaluation of safe medical injections in Kenya, which showed that 5 out of 10 persons in Western and Nyanza regions preferred medical injections to pills.[18] We also found that individuals who received an injection in the previous 12 months had significantly higher odds of preferring medical injections to pills compared with those who had no medication preference. These findings indicate that injection preference can influence injection use which could potentially lead to unnecessary and unsafe injections. Women were more likely than men to prefer injections over pills and accounted for 70% of medical injections that were administered by health care providers, with at least 40% for contraceptive purposes. This was consistent with findings from the Kenya Demographic and Health Survey of 2008–09, which reported that injectable contraceptives were the most widely used family planning method, with 1 in 5 women aged 15–49 years reporting that they were currently using this method.[19]

Individuals who had received higher number of injections from a health care provider in the previous 12 months had similar odds of HIV infection compared with individuals who had received no injections from a health care provider in the same time frame. Both men and women who received medical injections in the 12 months preceding the survey (not for contraceptive purposes among women) were more likely to have been HIV infected than those who had not received any injections in the previous 12 months. High HIV prevalence was noted among persons who had received injections from traditional practitioners, though the number reporting this practice was small. There is a possibility of re-use of injection devices in traditional medicine settings, potentially increasing the risk of HIV transmission and acquisition. We were encouraged to find that over 95% of those who received injections

from health care providers observed a new, unopened needle package being opened. Patient-observed sterile treatment is a national strategy that has been adopted in Kenya since 2004 to ensure sterile care and reduction in HIV transmission risk in health care settings.[20]

This study had several limitations. The analysis relied on self-reported data that may have been limited by recall bias. To minimize this bias, we restricted the recall period to the preceding 12 months from the survey. Second, variables on medical waste in the community were dependent on correct knowledge of a used syringe or needle, but no informational material was provided to survey participants to confirm visual understanding of medical waste. Therefore, our reported estimates on medical waste could be either an overestimate or underestimate of true values in the population. Because KAIS 2012 was a cross-sectional survey where potential predictors and outcomes were measured at the same time, we were not able to determine causality in associations observed, such as those reported for injection status and HIV infection. In addition, we did not collect information on whether medical injections received were curative or preventative, both of which may have impacted our estimates of injection history and injection preference. Finally, the number of self-administered injections and number of injections received from traditional practitioners were not quantified, which may have contributed to lower injection totals.

Despite these limitations, this study provides important nationally representative population-based data that can be used to inform the national program on targeted strategies for the prevention of medical transmission of HIV and other blood-borne pathogens. Efforts to improve health communication, particularly to those who are more likely to receive medical injections, are needed to reduce the risks of unsafe injections, to address the hazards of medical waste disposal in the community, and to educate traditional practitioners on safe injection practices. In addition, medical waste management programs need to support waste disposal at the health facility and the community. Finally, given the wide use of injectable contraceptives among women, we recommend that the national reproductive health program integrate injection safety practices in reproductive health services. These recommendations can form the basis for policy makers to support injection safety interventions for patients, health care providers, and the community as part of comprehensive infection prevention and control programs.

Acknowledgments

collection of the data set: Willis Akhwale, Sehin Birhanu, John Bore, Angela Broad, Robert Buluma, Thomas Gachuki, Jennifer Galbraith, Anthony Gichangi, Beth Gikonyo, Margaret Gitau, Joshua Gitonga, Mike Grasso, Malayah Harper, Andrew Imbwaga, Muthoni Junghae, Mutua Kakinyi, Samuel Mwangi Kamiru, Nicholas Owenje Kandege, Lucy Kanyara, Yasuyo Kawamura, Timothy Kellogg, George Kichamu, Andrea Kim, Lucy Kimondo, Davies Kimanga, Elija Kinyanjui, Stephen Kipkerich, Danson Kimutai Koske, Boniface O. K'Oyugi, Veronica Lee, Serenita Lewis, William Maina, Ernest Makokha, Agneta Mbithi, Joy Mirjahangir, Ibrahim Mohamed, Rex Mpazanje, Silas Mulwa, Nicolas Muraguri, Patrick Murithi, Lilly Muthoni, James Muttunga, Jane Mwangi, Mary Mwangi, Sophie Mwanyumba, Francis Ndichu, Anne Ng'ang'a, James Ng'ang'a, John Gitahi Ng'ang'a, Lucy Ng'ang'a, Carol Ngare, Bernadette Ng'eno, Inviolata Njeri, David Njogu, Bernard Obasi, Macdonald Obudho, Edwin Ochieng, Linus Odawo, James Odek, Jacob Odhiambo, Caleb Ogada, Samuel Ogola, David Ojakaa, James Kwach Ojwang, George Okumu, Patricia Oluoch, Tom Oluoch, Kenneth Ochieng Omondi, Osborn Otieno, Yakubu Owolabi, Bharat Parekh, George Rutherford, Sandra Schwarcz, Shahnaaz Sharrif, Victor Ssempijja, Lydia Tabuke, Yuko Takenaka, Mamo Umuro, Brian Eugene Wakhutu, Wanjiru Waruiru, Celia Wandera, John Wanyungu, Anthony Waruru, Paul Waweru, Larry Westerman, and Kelly Winter.

References

1. Hutin YJF, Hauri AM, Armstrong GL. Use of injections in healthcare settings worldwide, 2000: literature review and regional estimates. BMJ. 2003; 327:1075. [PubMed: 14604927]

2. Simonsen L, Kane A, Llyod J. Unsafe injections in developing countries. Bull World Health Organ. 1999; 77:789–800. [PubMed: 10593026]

3. Kermode, M. Health Promotion International. Vol. 9. Oxford: Oxford University; 2004. Unsafe injections in low-income country health settings: need for injection safety promotion to prevent the spread of blood borne viruses. press release

4. Sudesh G, Devendra SR, Bhuvan KC, et al. Study of status of safe injection practice and knowledge regarding injection safety among primary health care workers in Baglung district, western Nepal. BMC Int Health Hum Rights. 2013; 13:3.10.1186/1472-698X-13-3 [PubMed: 23286907]

5. Hauri AM, Armstrong GL, Hutin YJF. The global burden of disease attributable to contaminated injections given in health care settings. Int J STD AIDS. 2004; 15:7–16. [PubMed: 14769164]

6. Manyele SV, Lyasenga TJ. Factors affecting medical waste management in low-level health facilities in Tanzania. Afr J Environ Sci Technol. 2010; 4:304–318.

7. Turnberg WL, Jones TS. Community syringe collection and disposal policies in 16 states. J Am Pharm Assoc. 2002; 42:S99–S104.

8. Leonard, L. Health care waste in southern Africa: a civil society perspective. Presented at: Proceeding International Health Care Waste Management Conference and Exhibition; 2003; Johannesburg, South Africa.

9. Papenburg J, Blais D, Moore D, et al. Pediatric injuries from needles discarded in the community: epidemiology and risk of seroconversion. Pediatrics. 2008; 122:e487–e492. [PubMed: 18676535]

10. Macalino GE, Springer KW, Rahman ZS, et al. Community-based programs for safe disposal of used needles and syringes. J Acquir Immune Defic Syndr Hum Retrovirol. 1998; 18(suppl 1):S111–S119. [PubMed: 9663633]

11. Kenya Ministry of Health, Government of Kenya. National Policy on Injection Safety and Medical Waste Management. Nairobi, Kenya: Kenya Ministry of Health; 2007.

12. National AIDS Control Council (NACC). Kenya Analysis of HIV Prevention, Response and Modes of HIV Transmission Study, 2009. Nairobi, Kenya: NACC; 2012.

13. National AIDS and STI Control Programme (NASCOP). 2007 Kenya AIDS Indicator Survey Final Report. Nairobi, Kenya: NASCOP; 2009.

14. Kenya Ministry of Health. Injection Safety and Safe Disposal of Medical Waste National Communication Strategy. Nairobi, Kenya: Kenya Ministry of Health; 2010.

15. Waruiru W, Kim AA, Kimanga DO, et al. The Kenya AIDS indicator survey 2012: rationale, methods, description of participants and response rates. J Acquir Immune Defic Syndr. 2014; 66(suppl 1):S3–S12. [PubMed: 24732819]

16. Mazrui N. Medical waste management in Kenya: opportunity for improvement. Tropical resources. 2010; 29:66–70.

17. United Nations Environmental Program (UNEP). Environmental Pollution and Impacts on Public Health: Implications of Dandora Municipal Dumping Site in Nairobi, Kenya. Nairobi, Kenya: UNEP; 2007.

18. Achola, P.; Oanda, I.; Otieno, BT., et al. Evaluation of Making Medical Injections Safer (MMIS) Project in Hospitals in Nyanza and Western Provinces of Kenya. MMIS for the Office of the Global AIDS Coordinator and the HHS Centers for Disease Control and Prevention; Arlington, VA: 2009.

19. Kenya National Bureau of Statistics (KNBS) and ICF Macro. Kenya Demographic and Health Survey 2008–09. Calverton, MD: KNBS and ICF Macro; 2010.

20. Gisselquist D, Friedman E, Potterat J, et al. Four policies to reduce HIV transmission through unsterile health care. Int J STD AIDS. 2003; 14:717–722. [PubMed: 14624731]

TABLE 1

Select Characteristics Among Adults and Adolescents Aged 15–64 Years Reporting At Least 1 Medical Injection in Previous 12 Months, Kenya AIDS Indicator Survey 2012

Selected Characteristics	Received Injection in Previous 12 Months[*]	
	Unweighted, N	Weighted % (95% CI)
Total	4906	–
Sex		
Men	1464	36.4 (34.6 to 38.1)
Women	3442	63.6 (61.9 to 65.4)
Age group, yrs		
15–24	1588	32.0 (30.5 to 33.4)
25–34	1608	32.8 (31.3 to 34.2)
35–44	897	18.5 (17.3 to 19.6)
45–54	509	10.7 (9.6 to 11.7)
55–64	304	6.1 (5.4 to 6.8)
Marital status		
Never married/never cohabited	1113	23.4 (22.0 to 24.9)
Married/cohabiting	3149	64.2 (62.5 to 65.9)
Separated/divorced	295	5.9 (5.3 to 6.6)
Ever widowed	348	6.5 (5.8 to 7.2)
Highest educational attainment		
No primary	420	6.0 (5.1 to 6.9)
Incomplete primary	462	8.4 (7.3 to 9.5)
Complete primary	1662	34.2 (32.5 to 36.0)
Secondary or higher	2362	51.4 (49.4 to 53.4)
Residence		
Rural	3030	62.1 (59.5 to 64.6)
Urban	1876	37.9 (35.4 to 40.5)
Region		
Nairobi	609	10.5 (9.3 to 11.7)
Central	503	11.4 (9.9 to 12.8)
Coast	550	8.2 (6.8 to 9.7)
Eastern	830	14.8 (13.0 to 16.6)
Nyanza	800	16.9 (14.7 to 19.0)
Rift Valley	918	26.1 (23.4 to 28.9)
Western	696	12.0 (10.5 to 13.5)
Household wealth index, quintiles		
Poorest	880	17.3 (15.0 to 19.7)
Second	1047	20.8 (18.7 to 22.8)
Middle	1041	21.1 (19.0 to 23.2)
Fourth	982	20.5 (18.0 to 22.9)
Richest	956	20.3 (17.6 to 23.0)

Selected Characteristics	Received Injection in Previous 12 Months[*]	
	Unweighted, N	Weighted % (95% CI)
No. injections received by health care provider in previous 12 months[†]		
0	167	3.7 (2.9 to 4.5)
1	1324	32.6 (30.9 to 34.2)
2–3	1693	39.5 (37.9 to 41.2)
4+	1067	24.2 (22.5 to 25.9)
Injection by traditional practitioner in previous 12 months[†]		
No	4881	99.6 (99.3 to 99.8)
Yes	21	0.4 (0.2 to 0.7)
Self-administered injection in previous 12 months[†]		
No	4169	95.4 (94.3 to 96.5)
Yes	196	4.6 (3.5 to 5.7)
Health care provider used a needle from a new, unopened package[‡]		
No	168	4.1 (3.3 to 4.8)
Yes	4034	95.9 (95.2 to 96.7)
Medication preference		
Injection	2458	50.2 (48.4 to 52.0)
Pills	1762	36.5 (34.8 to 38.3)
Unsure/no preference	686	13.3 (12.1 to 14.4)
Had seen used needle/syringe near home or community in the previous 12 months		
No	4530	92.6 (91.6 to 93.6)
Yes	359	7.4 (6.4 to 8.4)

[*] Includes 537 women who reported current injectable contraceptive use but answered "no" to receiving injections in the last 12 months.

[†] Excludes 537 women who reported current injectable contraceptive use but answered "no" to receiving injections in last 12 months and therefore not asked to quantify the number of injections received.

[‡] Among those who received injections from a health care provider. Because of missing values, totals vary between variables.

TABLE 2

Factors Associated With Receiving Injections in Previous 12 Months Among Adults and Adolescents Aged 15–64 Years, Kenya AIDS Indicator Survey 2012

Selected Variables	Unweighted, N	Unweighted, n	Weighted % (95% CI)	OR (95% CI)	aOR (95% CI)
			Received an Injection in the Previous 12 Months		
Overall	13,673	4906	35.9 (34.5 to 37.3)	—	—
Sex					
Men	5745	1464	26.6 (24.9 to 28.4)	1.0	1.0
Women	7928	3442	44.7 (43.1 to 46.4)	2.2 (2.0 to 2.5)	2.1 (1.8 to 2.3)
Age group, yrs					
15–24	4529	1588	34.7 (32.8 to 36.6)	1.0	1.0
25–34	3827	1608	42.0 (40.1 to 43.9)	1.4 (1.2 to 1.5)	1.0 (0.8 to 1.1)
35–44	2563	897	35.1 (32.7 to 37.4)	1.0 (0.9 to 1.1)	0.7 (0.6 to 0.8)
45–54	1689	509	31.0 (28.4 to 33.5)	0.8 (0.7 to 1.0)	0.6 (0.5 to 0.7)
55–64	1065	304	28.3 (25.2 to 31.3)	0.7 (0.6 to 0.9)	0.5 (0.4 to 0.7)
Marital status					
Never married/never cohabited	3983	1113	27.9 (26.1 to 29.7)	1.0	1.0
Married/cohabiting	7805	3149	40.3 (38.7 to 41.9)	1.7 (1.6 to 1.9)	2.2 (1.9 to 2.5)
Separated/divorced	848	295	35.1 (31.7 to 38.5)	1.4 (1.2 to 1.6)	1.7 (1.4 to 2.2)
Ever widowed	1031	348	34.4 (31.0 to 37.8)	1.4 (1.1 to 1.6)	1.7 (1.3 to 2.2)
Highest educational attainment					
No primary	1570	420	29.7 (26.2 to 33.3)	1.0	1.0
Incomplete primary	1156	462	39.8 (35.9 to 43.7)	1.6 (1.2 to 2.0)	1.7 (1.2 to 2.2)
Complete primary	4303	1662	38.0 (36.1 to 39.8)	1.4 (1.2 to 1.7)	1.5 (1.2 to 1.9)
Secondary or higher	6644	2362	34.8 (33.3 to 36.4)	1.3 (1.1 to 1.5)	1.4 (1.1 to 1.8)
Household wealth index					
Poorest	2841	880	32.3 (29.6 to 35.1)	1.2 (1.0 to 1.3)	1.0
Second	2853	1047	35.7 (33.5 to 37.9)	1.3 (1.1 to 1.5)	1.2 (1.0 to 1.4)
Middle	2664	1041	38.2 (36.1 to 40.3)	1.3 (1.1 to 1.5)	1.3 (1.1 to 1.6)
Fourth	2567	982	38.1 (35.3 to 40.9)	1.1 (1.0 to 1.3)	1.3 (1.1 to 1.6)
Richest	2748	956	35.0 (32.5 to 37.5)	1.2 (1.0 to 1.3)	1.2 (1.0 to 1.5)

Selected Variables	Unweighted, N	Unweighted, n	Weighted % (95% CI)	OR (95% CI)	aOR (95% CI)
			Received an Injection in the Previous 12 Months		
Residence					
Rural	8617	3030	35.3 (33.7 to 37.0)	1.0	*
Urban	5056	1876	36.8 (34.5 to 39.0)	1.1 (0.9 to 1.2)	*
Region					
Nairobi	1730	609	34.5 (31.8 to 37.2)	1.0	1.0
Central	1577	503	30.9 (28.0 to 33.9)	0.9 (0.7 to 1.0)	0.8 (0.6 to 1.1)
Coast	1707	550	31.8 (28.2 to 35.4)	0.9 (0.7 to 1.1)	0.9 (0.7 to 1.2)
Eastern	2677	830	34.4 (31.5 to 37.3)	1.0 (0.8 to 1.2)	1.1 (0.9 to 1.5)
Nyanza	1830	800	43.0 (39.3 to 46.7)	1.4 (1.2 to 1.7)	1.6 (1.2 to 2.0)
Rift Valley	2477	918	35.7 (32.2 to 39.2)	1.1 (0.9 to 1.3)	1.2 (1.0 to 1.6)
Western	1675	696	39.8 (37.0 to 42.6)	1.3 (1.1 to 1.5)	1.4 (1.1 to 1.8)
Medical preference					
Pill	5722	2458	42.2 (40.3 to 44.1)	1.0	1.0
Injections	5599	1762	32.3 (30.7 to 33.9)	1.5 (1.4 to 1.7)	1.3 (1.1 to 1.4)
Laboratory-diagnosed HIV result					
HIV-positive	647	258	40.2 (35.0 to 45.4)	1.2 (1.0 to 1.5)	1.0 (0.8 to 1.2)
HIV-negative	10,954	3937	35.9 (34.6 to 37.3)	1.0	1.0

OR, odds ratio.

aOR, adjusted odds ratio.

*
Indicates variable not retained in final multivariate model.

TABLE 3

Factors Associated With Preferring Injections to Pills Among Adults and Adolescents Aged 15–64 Years, Kenya AIDS Indicator Survey 2012

Selected Variables	Unweighted, N	Unweighted, n	Weighted % (95% CI)	OR (95% CI)	aOR (95% CI)
			Preferred Injections to Pills		
Overall	11,387	5725	51.2 (49.7 to 52.8)	—	—
Sex					
Men	4650	2036	45.3 (43.4 to 47.2)	1.0	1.0
Women	6677	3689	56.7 (54.9 to 58.5)	1.5 (1.4 to 1.6)	1.5 (1.3 to 1.6)
Age group, yrs					
15–24	3955	1893	49.0 (47.1 to 51.0)	1.0	1.0
25–34	3220	1790	56.2 (54.0 to 58.4)	1.1 (1.0 to 1.2)	1.0 (0.9 to 1.1)
35–44	2068	1092	52.4 (49.9 to 54.9)	0.8 (0.8 to 0.9)	0.8 (0.7 to 0.9)
45–54	1297	600	47.2 (44.4 to 50.1)	0.6 (0.6 to 0.7)	0.7 (0.6 to 0.8)
55–64	787	350	45.4 (41.4 to 49.4)	0.6 (0.5 to 0.6)	0.6 (0.5 to 0.7)
Marital status					
Never married/never cohabited	3471	1542	45.4 (43.4 to 47.5)	1.0	1.0
Married/cohabiting	6349	3423	54.6 (52.9 to 56.3)	1.0 (0.9 to 1.1)	1.1 (1.0 to 1.3)
Separated/divorced	707	378	53.4 (49.5 to 57.2)	1.1 (0.9 to 1.3)	1.2 (1.0 to 1.4)
Ever widowed	794	382	49.0 (44.8 to 53.1)	0.7 (0.6 to 0.9)	1.0 (0.8 to 1.2)
Highest educational attainment					
No primary	1118	502	51.0 (44.5 to 57.4)	1.0	1.0
Incomplete primary	972	500	50.0 (46.7 to 53.2)	1.5 (1.2 to 2.0)	1.4 (1.1 to 1.8)
Complete primary	3651	1900	52.2 (50.1 to 54.3)	1.6 (1.3 to 2.0)	1.4 (1.1 to 1.8)
Secondary or higher	5586	2823	50.9 (49.1 to 52.6)	1.5 (1.2 to 1.9)	1.4 (1.1 to 1.8)
Household wealth index					
Poorest	2228	1085	52.6 (49.2 to 56.0)	1.0	1.0
Second	2344	1225	52.4 (49.8 to 55.1)	1.1 (1.0 to 1.2)	1.1 (1.0 to 1.3)
Middle	2222	1137	51.1 (48.7 to 53.6)	1.1 (1.0 to 1.3)	1.1 (0.9 to 1.2)
Fourth	2189	1134	51.6 (49.1 to 54.1)	1.2 (1.1 to 1.4)	1.1 (1.0 to 1.2)
Richest	2344	1144	48.8 (46.5 to 51.0)	1.1 (1.0 to 1.3)	0.9 (0.8 to 1.1)
Residence					

Selected Variables	Unweighted, N	Unweighted, n	Weighted % (95% CI)	OR (95% CI)	aOR (95% CI)
			Preferred Injections to Pills		
Rural	7015	3533	51.6 (49.8 to 53.4)	1.0	1.0
Urban	4312	2192	50.7 (48.4 to 52.9)	1.2 (1.0 to 1.3)	1.2 (1.1 to 1.4)
Region					
Nairobi	1505	739	48.1 (45.0 to 51.2)	1.0	1.0
Central	1398	665	46.5 (43.8 to 49.3)	1.0 (0.8 to 1.2)	1.1 (0.9 to 1.4)
Coast	1394	644	43.4 (38.8 to 47.9)	0.8 (0.6 to 0.9)	0.9 (0.7 to 1.1)
Eastern	2097	988	51.9 (48.3 to 55.6)	0.9 (0.8 to 1.1)	1.0 (0.8 to 1.2)
Nyanza	1487	711	46.6 (42.8 to 50.3)	0.8 (0.7 to 0.9)	0.8 (0.7 to 1.0)
Rift Valley	2056	1205	58.9 (55.6 to 62.1)	1.1 (1.0 to 1.3)	1.2 (1.0 to 1.5)
Western	1390	773	53.9 (50.3 to 57.4)	1.0 (0.8 to 1.1)	1.0 (0.8 to 1.2)
Received an injection in the previous 12 months					
No	7101	3264	47.3 (45.6 to 49.0)	1.0	1.0
Yes	4220	2458	57.9 (55.9 to 59.8)	1.6 (1.5 to 1.7)	1.4 (1.3 to 1.5)
Had seen used needle/syringe near home or community in the previous 12 months					
No	10,579	5316	51.2 (49.7 to 52.7)	1.0	*
Yes	694	383	52.0 (47.6 to 56.4)	1.1 (0.9 to 1.2)	*
Laboratory-diagnosed HIV result					
HIV-positive	544	279	51.0 (45.8 to 56.2)	1.0 (0.8 to 1.2)	*
HIV-negative	9090	4668	52.1 (50.4 to 53.7)	1.0	*

OR, odds ratio.

aOR, adjusted odds ratio.

*
Indicates variable not retained in final multivariate model.

TABLE 4

Prevalence of HIV Infection and Associations With Injection Behavior Among Men Aged 15–64 Years, Kenya AIDS Indicator Survey 2012

Selected Variables	Unweighted, N	Unweighted, n	HIV-Infected Men Weighted % (95% CI)	OR (95% CI)	aOR (95% CI)
Age group, yrs					
15–24	1603	12	1.1 (0.5 to 1.8)	1.0	1.0
25–34	1263	62	5.4 (3.9 to 6.8)	5.0 (2.7 to 9.5)	5.3 (2.7 to 10.3)
35–44	917	58	6.4 (4.6 to 8.3)	6.1 (3.1 to 12.2)	6.3 (3.1 to 12.8)
45–54	623	44	7.7 (5.4 to 10.1)	7.5 (4.0 to 13.8)	7.9 (4.2 to 14.9)
55–64	430	17	4.1 (2.2 to 6.1)	3.8 (1.8 to 8.1)	4.3 (2.0 to 9.4)
Received an injection in the previous 12 months					
No	3580	129	3.8 (3.1 to 4.5)	1.0	1.0
Yes	1244	63	5.8 (4.2 to 7.3)	1.5 (1.1 to 2.1)	3.2 (1.2 to 8.9)
No. injections administered by health care provider in the previous 12 months					
0	3639	134	3.9 (3.2 to 4.6)	1.0	1.0
1	462	16	3.9 (1.9 to 6.0)	1.0 (0.6 to 1.7)	0.3 (0.1 to 1.1)
2–3	443	24	6.0 (3.6 to 8.3)	1.6 (1.0 to 2.4)	0.5 (0.2 to 1.2)
4+	246	14	6.6 (3.0 to 10.2)	1.7 (0.9 to 3.1)	0.5 (0.2 to 1.6)
Self-administered injection in the previous 12 months					
No	4762	191	4.4 (3.7 to 5.1)	1.0	*
Yes	74	2	2.6 (0 to 6.3)	0.6 (0.1 to 2.5)	*

OR, odds ratio.

aOR, adjusted odds ratio.

*
Indicates variable not retained in final multivariate model.

TABLE 5

Prevalence of HIV Infection and Associations With Injection Behavior Among Women Aged 15–64 Years, Kenya AIDS Indicator Survey 2012

Selected Variables	Unweighted, N	Unweighted, n	HIV-Infected Women		
			Weighted % (95% CI)	OR (95% CI)	aOR (95% CI)
Age group, yrs					
15–24	2215	63	3.0 (2.2 to 3.7)	1.0	1.0
25–34	1947	147	7.3 (6.0 to 8.7)	2.6 (1.9 to 3.5)	3.1 (2.3 to 4.3)
35–44	1291	140	11.5 (9.5 to 13.5)	4.2 (3.1 to 5.8)	4.7 (3.4 to 6.6)
45–54	827	82	10.5 (8.3 to 12.7)	3.8 (2.8 to 5.2)	4.1 (2.9 to 5.8)
55–64	510	23	4.3 (2.2 to 6.4)	1.5 (0.8 to 2.6)	1.5 (0.8 to 2.6)
Received an injection in the previous 12 months					
No	3826	260	7.1 (6.2 to 8.1)	1.0	1.0
Yes, for family planning purposes	1234	68	5.5 (4.1 to 7.0)	0.8 (0.6 to 1.0)	1.6 (0.7 to 3.7)
Yes, not for family planning purposes	1717	127	7.4 (5.8 to 8.9)	1.0 (0.8 to 1.4)	2.6 (1.2 to 5.5)
No. injections administered by health care provider in the previous 12 months					
0	3901	269	7.3 (6.3 to 8.2)	1.0	1.0
1	645	42	6.5 (4.5 to 8.5)	0.9 (0.6 to 1.3)	0.4 (0.2 to 0.9)
2–3	1017	55	4.9 (3.4 to 6.3)	0.7 (0.5 to 0.9)	0.3 (0.1 to 0.7)
4+	680	54	8.4 (5.5 to 11.2)	1.2 (0.8 to 1.7)	0.5 (0.2 to 1.3)
Self-administered injection in the previous 12 months					
No	6694	452	6.9 (6.1 to 7.6)	1.0	*
Yes	96	3	4.8 (0 to 10.0)	0.7 (0.2 to 2.1)	*

OR, odds ratio.

aOR, adjusted odds ratio.

*
Indicates variable not retained in final multivariate model.