



ELSEVIER

 JOURNAL OF
 ADOLESCENT
 HEALTH

www.jahonline.org

Review article

The Health Status of Street Children and Youth in Low- and Middle-Income Countries: A Systematic Review of the Literature

 Jessica Woan, M.D.^a, Jessica Lin, M.P.H.^b, and Colette Auerswald, M.D., M.S.^{b,c,*}
^a University of Washington School of Medicine, Seattle, Washington^b Division of Adolescent Medicine, Department of Pediatrics, University of California, San Francisco, School of Medicine, San Francisco, California^c University of California, Berkeley–University of California at San Francisco Joint Medical Program, UC Berkeley School of Public Health, Berkeley, California

Article history: Received June 19, 2012; Accepted March 14, 2013

Keywords: Review; Adolescent; Homeless youth; Street children; Health status; Developing countries

 A B S T R A C T

The health of the tens of millions of street children globally is understudied. We undertook a systematic review of the existing quantitative literature regarding the health status of street children and youth in low- and middle-income countries to summarize available knowledge, identify underexplored areas of research, and inform the future research agenda regarding the health of this population. A total of 108 articles met our inclusion criteria. Demographic data and structural factors associated with street life are summarized. Although data in specific regions or diseases are sparse, the literature review illustrates that youth's survival behaviors and the exposures associated with poor shelter have resulted in disproportionate morbidity in the areas of infectious illness, psychiatric disease, reproductive health, and perhaps to a lesser extent, growth. Vast areas of health that may disproportionately affect street children in childhood or later on as adults have not been investigated, including chronic diseases and cognitive deficits. Studies of specific diseases or conditions vary considerably by region. Strengths and limitations of the literature are discussed and principles for future research in this area are proposed.

© 2013 Society for Adolescent Health and Medicine. All rights reserved.

 IMPLICATIONS AND
 CONTRIBUTION

Our literature review systematically documents areas of street child health that are understudied or not studied at all as well as the limitations of current research. Informed by our findings, our principles for further research can inform the future study of this vulnerable population.

A *street child*, as defined by UNICEF, is one “for whom the street (in the widest sense of the word, i.e., unoccupied dwellings, wasteland, etc.) more than their family has become their real home, a situation in which there is no protection, supervision, or direction from responsible adults” [1]. Although the number of children and youth who live on the streets of the world's cities is unknown, existing estimates suggest that tens of millions of children are street-based and that their numbers are rising secondary to global population growth, the HIV epidemic,

migration, and increasing urbanization [2]. The vast majority of the world's children, and of the world's street children, live in low- and middle-income countries [3], yet existing research regarding street children and youth has overwhelmingly been conducted in high-income countries.

UNICEF defines two overlapping groups of street children: *on-the-street* children, who are street-based but primarily sleep at home, and *of-the-street* children, who rarely, if ever, return home. There is general agreement in the literature that most street children are on-the-street rather than of-the-street [4–7]. Though these terms have been widely and appropriately critiqued, they remain the most currently used and provide an important distinction. As has been well documented, disconnection from family, community, and social capital is associated with poorer health outcomes [8–11]. Thus, an of-the-street child may experience substantively different challenges and health outcomes than his or her on-the-street counterpart. There is

Tables 1, 2, and 3 are available in the online edition of this article, which can be accessed through the DOI number below.

* Address correspondence to: Colette Auerswald, M.D., M.S., Associate Professor of Pediatrics, Division of Adolescent Medicine, UCSF, Associate Professor and Director of MS Program, UC Berkeley–UCSF Joint Medical Program, UC Berkeley School of Public Health, c/o JMP, 570-R University Hall MC #1190, Berkeley, CA 94720-1190.

E-mail address: coco.auerswald@gmail.com (C. Auerswald).

a longstanding history of qualitative research regarding the survival strategies and lived experience of street children. However, quantitative research regarding the health status of both of- and on-the-street children in low- and middle-income countries is limited.

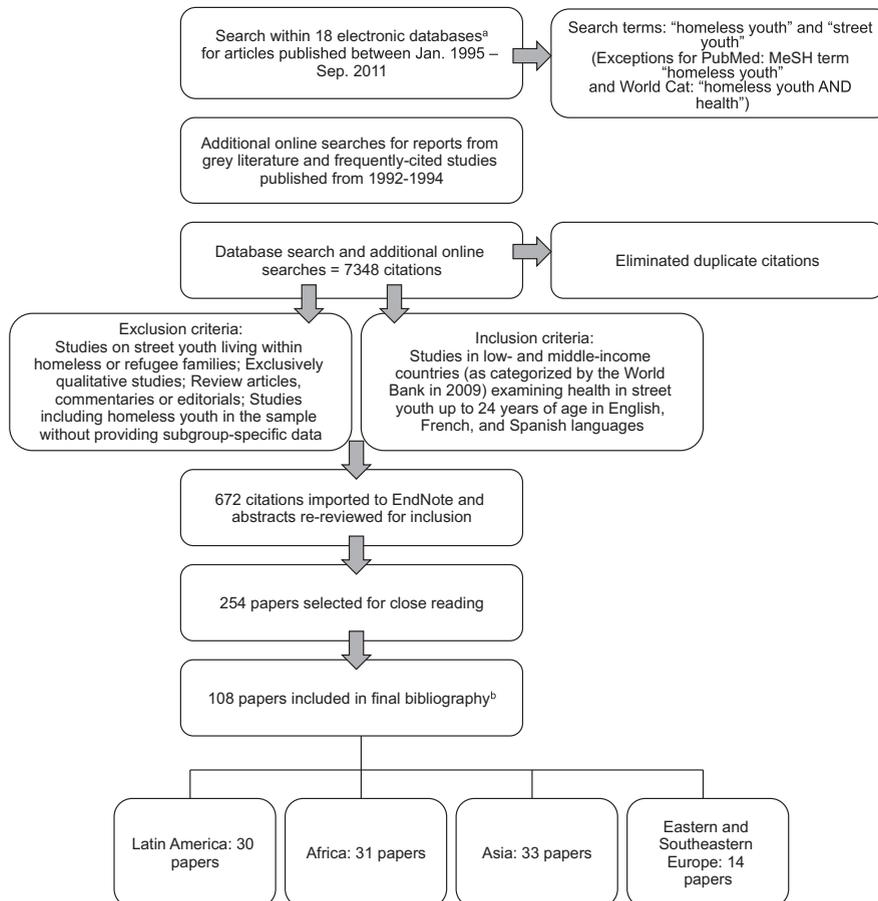
As emphasized in recent reviews of adolescent health, adolescence is a critical period of development, during which many of the health-related behaviors that will affect young people both in the present and into adulthood are initiated. Investment in adolescent health has lasting impacts on a country's overall health and economic wellbeing [12]. The goal of this review is to summarize available knowledge and identify underexplored areas of the health of street children in order to encourage and inform interventions and the future research agenda regarding street children in resource-limited settings. Our approach was informed by an ecological framework, consistent with the World Health Organization's definition of health as "a state of complete physical, mental, and social well-being" [13]. Our review therefore included studies that examined a range of health outcomes among street children, including both

traditional health indicators such as nutritional and growth status, and globally recognized, broader determinants of adolescent health, such as experiences of violence, substance use, and mental health [14].

Methods

Figure 1 summarizes our literature search. We performed a systematic search of 18 databases for articles published between January 1995 and September 2011 using the key words *homeless youth* and *street youth*. We complemented our formal search with reports from the gray literature (i.e., non-peer-reviewed reports from nongovernmental organizations or national or international bodies) found online or referenced in other sources. A few frequently cited studies coincident with the escalating HIV epidemic and published in 1994 were also included. A total of 7,348 citations were found in the database searches and gray literature and reviewed for inclusion.

Inclusion criteria included: quantitative measures of the health of street children and youth up to 24 years of age; publication in an



* AnthroPlus, Article First, CINAHL, Clase Periodica, Contemporary Women's Health eBooks, ECO, EconLit, eHRAF World Cultures, Francis, GenderWatch, PapersFirst, Proceedings, PsycInfo, PubMed, Scopus, Web of Science, WorldCat, WorldCat Dissertations

^b Countries covered: Argentina, Bangladesh, Bolivia, Brazil, Cameroon, Colombia, Costa Rica, Ecuador, Egypt, Ethiopia, Ghana, Guatemala, Guyana, Honduras, India, Indonesia, Iran, Kenya, Mexico, Mongolia, Namibia, Nepal, Nigeria, Pakistan, Peru, Philippines, Russia, Rwanda, South Africa, Sudan, Tanzania, Thailand, Turkey, Uganda, Ukraine, Zimbabwe

Figure 1. Literature search algorithm.

English, French, or Spanish language journal; publication between January 1, 1995, and September 1, 2011; and research conducted in low- and middle-income countries (Figure 1), as defined by the World Bank's 2009 classifications according to gross national income per capita [15]. Though a wide range of wealth is included in this list, many of the upper-middle income countries included underwent dramatic economic change over the time period covered in the review.

Studies were excluded if they: were exclusively qualitative, examined youth living within homeless or refugee families, included homeless youth within a broader population without providing age-specific data, or did not provide original data.

A total of 108 articles representing 35 countries met inclusion criteria and were included in this review. The most studied health outcomes (detailed in Tables 1–3, which can be found in the online edition of this article) were nutritional status, substance use, and sexual health.

Definitions and eligibility criteria employed by investigators, generally study-specific, often differ from each other and from those employed by the United Nations. To standardize our review, we translated, when analogous, the varying terms used by researchers into of-the-street and on-the-street. Otherwise, study participants are referred to simply as street children.

Results

Demographics

Children reported leaving home when they were between 6 and 16 years of age and having lived on the streets for a period of days to, more frequently, years [16–43]. On-the-street children tended to be younger than of-the-street children (10–12 vs. 13–16 years old) [44–49]. These data suggest that on-the-street children may grow to be of-the-street youth. However, longitudinal cohort data needed to support this hypothesis are absent.

Boys were the most visible group on the street in low- and middle-income countries, constituting 50% to 100% of study samples reviewed. Where reported, of-the-street boys were often significantly older than of-the-street girls [22,48–53]. Boys had generally spent more years on the street than girls, whereas girls tended to have more contact with family [28,48,52,54]. Several studies hypothesized that street girls may have experienced more severe familial breakdown, because impoverished boys are more likely to be sent to the street by families to earn money, whereas girls are generally kept at home to help with the household [5,28,55,56]. Girls may also be more amenable than boys to sleep in institutions, be living with relatives, be recruited into sex work, or be in “sugar daddy” relationships with older men, all of which may render them less visible [5,28,54].

Structural factors affecting street children's health

Children most frequently reported family conflict (including violence, parental drug use, physical abuse, neglect) or changes in family structure (death of a parent, remarriage and resulting discrimination or abandonment) as their reason for being on the street [5,22,23,28,29,35,36,41–43,56–64]. Other reasons for leaving home included poverty, learning a trade, peer encouragement, running away from a children's institution, adventure-seeking, and escaping political violence [17,22, 23,29,35,36,41–44,51,57,58,60–63].

Street children primarily earned money through informal economies, including working as vendors, parking attendants, street performers, garbage collectors and recyclers, shoe shiners, sex workers, or petty thieves [20–23,28–30,33,35,37,38,41,42,44, 45,47,51,53,57,58,61,62,65–71]. Few youth reported begging as their sole source of income, though the frequency of panhandling for supplemental income varied across studies [21–23,29,35, 42,47,53,58,62,66]. Money earned was typically sent to family or spent on food, entertainment, or drugs [37,47,56,65].

The majority of participating street children were not currently in school [22,27,29,35,42,57,58,61,72,73]. Where reported, most had ceased schooling at primary levels [6,18,21,28,33,41,43, 48,53,66–68,70–72,74,75]. When assessed, literacy rates were low, with one study reporting lower literacy among of-the-street children than on-the-street children [18,21,28,35,42,47,48,56,66, 67,72,74,76,77]. Children most commonly cited poverty, needing to work, lack of interest, or migration as reasons for leaving school [44,47,61,78]. Girls may have been denied the opportunity to go to school [72].

Nutrition and growth

Fifteen studies (detailed in Table 1, which can be found in the online edition of this article) examined the nutritional and growth effects of being on the street. The literature, primarily conducted in Asian countries, has yielded mixed results. Multiple studies have documented participants' poor nutritional or growth status, primarily using measures of body mass index or stunting [24,35,37,44,48,65,75,79,80]. Some studies have found that of-the-street children have poorer nutritional status than on-the-street children, suggesting that street children with ties to family and community have better growth outcomes, whereas others suggest that of-the-street children may fare better in their nutritional and growth status than youth on the margins between home and the street [22,34,81,82].

Of particular note is a series of studies by Panter-Brick and colleagues, who compared on-the-street not only with of-the-street children but also to community controls, including both rural village children and urban, middle-class schoolchildren [34,83,84]. They found that of-the-street children fared better than on-the-street and rural children based on weight, height, and other nutritional measures. They speculated that of-the-street children may be a self-selected, resilient subgroup of youth who have better access to nutritional sources on the street than in the village. Given their findings, Panter-Brick et al. concluded that “urban homelessness may represent an appropriate response to circumstances of poverty” [34].

Infectious diseases

Six studies, of which four were conducted in Asia, examined parasitic infections. Parasitic infections, including enteroparasitic infections, were more prevalent among street children than non-street children and among of-the-street children than on-the-street children [22,76,85]. One study found that simultaneous pediculosis corporis and capitis infections were more common among street children than schoolchildren [85]. Other studies found higher prevalence rates of ectoparasitic and enteroparasitic infections among of-the-street than on-the-street children [22,76]. Enteroparasitic infections found in street children included schistosomes, *Tricuris*, *Ascaris*, *Encheliophis vermicularis*, *Giardia*, *Entamoeba*, *Blastocystes hominis*, and *Endolimax nana*

[76,86–88]. One study found intestinal parasites in 85% of orphaned and of-the-street children [88].

Only one study examined the prevalence of bacterial infections among street children, diagnosing 12.3% of their sample of of-the-street children with pneumonia by chest x-ray and clinical evaluation [86].

Although malaria and tuberculosis are leading sources of morbidity and mortality in many low- and middle-income countries and disproportionately impact impoverished populations, no studies addressing malaria or tuberculosis in street children were found [89].

Several studies, primarily in Brazil and Iran, examined rates of hepatic infection among youth. One study examining hepatitis A prevalence among street children found high rates of hepatitis A virus (80.0%–92.2%) among youth, with no statistical difference in rates of anti-hepatitis A virus in on-the-street versus of-the-street youth [90]. Seven studies tested for hepatitis B prevalence among street children [6,37,46,76,86,91,92]. Exposure to hepatitis B virus, measured by anti-hepatitis B core prevalence, was more common among of-the-street than on-the-street children [46,76]. Three studies reported hepatitis C prevalence rates ranging from 0% to 3.5%, with one study reporting higher hepatitis C virus rates among of-the-street than on-the-street children [6,92,93].

Sexual and reproductive health

The sexual and reproductive health of street children, including sexual risk behaviors, sexually transmitted infections (STIs) and HIV, is one area of greater, though still incomplete, knowledge. Nineteen studies globally (detailed in Table 2, which can be found in the online edition of this article) tested for or (more frequently) assessed the self-reported history of STIs or HIV among street children.

Across studies, youth reported an average age of sexual initiation ranging from 10 to 16 years [17,46,52,53,71,76]. The proportion of sexually active children and youth was markedly greater among of-the-street than on-the-street children, though this finding may be confounded by age differences between the two groups [45,46,58,76,94].

Though street-involved youth in low- and middle-income countries are widely cited as being at higher risk for STIs [95], studies assessing self-reported STI history are few, and only four articles globally reported STI testing with youth (noninclusive of HIV and hepatitis B testing). Among those studies that conducted STI testing, prevalence rates for gonorrhea, chlamydia, syphilis, and genital herpes ranged from 2% to 22% [6,66,76,96]. One study found comparable syphilis prevalence rates in on-the-street and of-the-street children [76]. Studies yielded mixed findings on the association between gender and STI prevalence, with one study finding significantly higher STI prevalence among females and another finding higher STI prevalence among males [66,96]. Risk factors for testing STI-positive included sleeping on the streets, drug use, older age, female gender, and survival sex [46,76,96]. There were no data reporting rates of trichomoniasis. Hepatitis B, discussed in the prior section, is included in Table 2.

Eight studies, detailed in Table 2 and conducted exclusively in Russia, Iran, and South America, tested street children for HIV [6,66,76,91,94,96–98]. HIV prevalence in these studies was uniformly several-fold greater than corresponding population rates of HIV [66,76,94,97,98]. In one study, street youth rates were higher than those of commercial sex workers, truck drivers,

or prisoners [98]. The strongest independent predictors of seropositivity among street youth were: older age, using injection drugs, using non-injection drugs (Stadol, inhalant, ephedrine), orphanhood, being of-the-street, having “no place to live or living in an attic or basement,” being recruited from a street rather than service setting, having multiple partners, and reporting a previous STI diagnosis [76,94,97,98].

Unintentional injuries

One multinational study quantifying injuries sustained by street children found high rates of physical injury [99]. Forty percent of street children reported work-related injuries, including scratches, cuts and lacerations, burns, sprains, and amputations. Longer work hours, working as a street performer, male gender, and older age were associated with increased risk of injury.

Violence

Violence and sexual abuse were ubiquitous in the worlds of street children. Street children commonly reported experiencing physical violence, verbal abuse, and monetary extortion by peers and adults, including parents, other relatives, police, and sex work clients [16,18,20,23,29,30,35–37,39,43,64,72,100–104]. Despite international recognition of the frequent harm to street children by police, rates of police abuse of street children are unknown [105–107].

Study participants worldwide commonly reported experiencing sexual abuse by peers and adults [16,17,23,27–30,33,35,37,38,40,43,59,64,66,71,72,76,94,101,102,104,108–110]. The prevalence of sexual abuse for girls may be particularly high; in one study, 42% of street girls reported that their first sexual experience was forced [27].

Street children reported widely ranging rates of survival sex, the practice of exchanging sex for money, drugs, shelter, or protection [20,27,33,45,49,53,68,71,76,111]. Girls more frequently reported engaging in survival sex than boys [27,30,96,112,113]. In addition, one study found that of-the-street children were significantly more likely to report survival sex than on-the-street children [114].

Mental health

Few nonethnographic studies have systematically addressed the mental health needs of street children. Internalizing and externalizing behaviors were mentioned frequently throughout the literature without rigorous description of diagnostic criteria or use of validated testing tools. Traumatic experiences were frequently described, but studies measuring posttraumatic stress disorder using standardized diagnostic tools were not found.

Chronic exposure to stressors puts individuals at risk for hopelessness, depression, and suicide. Eight studies evaluated street youth's experiences of hopelessness, depressive symptoms, self-harm, and suicidality. Studies used different measures, making results difficult to compare. Overall, studies indicated that street children experience high levels of hopelessness, vulnerability to depression, and depressive symptoms [58,64,114,115]. Two studies found that of-the-street were more likely than on-the-street children to report feelings of hopelessness [58,114]. Another study found that of-the-street children had significantly lower self-efficacy scores and ability to deal with problems than did their on-the-street counterparts [116]. Suicide attempts were reported

across studies by 2% to 23% of street children, with one study reporting higher rates of suicidality among of-the-street than on-the-street children [58,61,114,115]. Risk factors for self-harm and suicidal behaviors included female gender, reported history of physical or sexual abuse, and engagement in survival sex [29].

Substance use and abuse

Substance use (detailed in Table 3, which can be found in the online edition of this article) was the most common topic in the literature reviewed. We have summarized only the articles principally focused on street children's drug use. The published prevalence of drug use ranged widely, from 35% to 100%. Street youth reported that they used drugs to fit in on the street; cope with street life, sexual abuse, violence and/or survival sex; numb emotions; curb hunger; keep warm; induce or prevent sleep; feel pleasure; or for entertainment [28–30,32,36,45,59,67,117,118].

In the majority of studies, the average age of drug use initiation was 10 to 13 years, with earlier initiation reported among of-the-street than on-the-street children [32,39,47,76,117]. Street children commonly reported being introduced to substance use by family members and peers [32,36]. Stated reasons for initiation included emotional problems, curiosity, pleasure-seeking, and peer pressure [32,47,61].

Factors associated with current drug use included older age; male gender; increased hours on the street; duration of life on the street; depression, especially among girls; child abuse; out-of-school status; lack of family contact; unprotected sex; survival sex; having had sex; higher numbers of sex partners; STI history; having had an HIV test; perceiving oneself to be HIV positive; and having an HIV-positive friend [16,20,29,32,39,46–48,52,58,66–68,76,96,119]. Across studies, of-the-street children were significantly more likely to report current drug use than their on-the-street counterparts [45–47,58,66,76,114,117].

Street children most commonly reported using cigarettes, inhalants, alcohol, and marijuana. Other substances included kola nut, coca paste, cocaine, amphetamines, and heroin [32,38,45,46,49,52,61,68,76,91,118]. Injection drug use was generally more common in middle-income countries, among males, and among of-the-street versus on-the-street children [16,46,49,52,76,91,94,120].

There is an inhalant use epidemic in low- and middle-income countries. Inhalants, such as shoemaker's glue, paint thinner, and correction fluid, are inexpensive, ubiquitous, and may cost less than food while suppressing appetite [29,36,67,80,121]. The health effects of chronic ingestion of toluene, the main ingredient in most inhalants, include cardiotoxicity, neurotoxicity, hepatotoxicity, hematologic toxicity, glomerulopathy, and tubulopathies leading to both metabolic and renal tubular acidosis [80,121]. One study has noted that it can be difficult to detect intoxication among street children who have built up tolerance for inhalants and suggested screening for inhalant use by detecting toluene metabolized to urine hippuric acid [122].

Health care

Street children reported limited access to health care. Barriers included cost, minority status, stigmatization by providers, distrust in quality of care, and difficulty finding time to seek care because of lost earnings [19,26,51]. Two studies found that a majority of street youth did not seek medical help for ailments,

instead ignoring their symptoms or self-medicating when ill [51,65]. As a measure of access to primary care, one study found that street children were one fifth as likely to have been vaccinated for measles as slum children living with their parents [22]. We found no other data regarding vaccination rates among street children. Studies examining the dental health of street children found that children's teeth were in poor condition and that children had an unmet need for dental care, particularly for caries and tooth loss [24,29,37,65,76,82,123–125].

Burden of disease

No formal data documenting mortality rates or causes of death of street children were found in our review. Limited data were found documenting life expectancy or burden and types of chronic illness in street children.

One study examined the burden of disease among street children by measuring antichymotrypsin as a marker for the inflammation due to repeated and chronic infections as well as by measuring allostatic load as a marker of stress. Antichymotrypsin and allostatic load were highest in housed rural village children, followed by, in decreasing order, of-the-street children, on-the-street schoolchildren, and middle class schoolchildren [83].

Discussion

Our review has limitations, most predominantly our limitation to studies published in English. Though we reviewed studies in French and Spanish, none met our inclusion criteria. Similarly, though we searched 18 databases, publications not included in those databases would not have been included, and within the databases, our search terms may have missed some studies. Our sources from the gray literature were primarily found through references and nonsystematic web searches and so are not comprehensive. Finally, a major limitation of many of the articles reviewed and thus of our review is that the majority did not incorporate community controls or overall community comparisons. Thus, although existing data suggest that street youth suffer disproportionate morbidity, we were unable to provide direct comparisons against the adolescent population overall for all outcomes reviewed.

Street children serve as a compelling example of the global disparity in child health. The available literature paints a picture of children who, often in response to circumstances at the structural and familial level, engage disproportionately in high-risk behaviors. These risk behaviors include not only those behaviors also engaged in by youths' non-homeless counterparts (such as early sexual debut or experimentation with substances) but, more importantly, very high-risk behaviors that are not normative in any setting (such as survival sex or substance dependence). These behaviors and the exposures associated with poor shelter have resulted in disproportionate morbidity in the areas of infectious illness, psychiatric disease, reproductive health, and, perhaps to a lesser extent, growth.

Implications for a future research agenda

Findings from our review, as well as several notable gaps and limitations in the current research, suggest a number of next steps. Based on these findings and gaps, we offer the following principles to inform future research regarding street children in

low- and middle-income nations. We hope this article will inform future research and provide support for an evidence-based dialogue among researchers, child advocates, and policymakers.

More data are needed. Although our review included 108 studies regarding street child health, data regarding specific health topics are sparse, vary considerably by region, and are often inadequate for developing evidence-based approaches. For example, there are far more published data regarding STIs and HIV among street children in South America and Russia than from other regions of the world, and only 12 studies globally that conducted STI or HIV testing with street children. Though the available data are compelling, there is a need for data from other highly HIV-impacted regions of the world to inform policy and interventions. Similarly, data regarding growth and development have had contradictory conclusions regarding the effect of being street-based and have been gathered primarily from South Asia. In addition, vast areas of health that may disproportionately affect street children in childhood or as adults have not been investigated, including cognitive deficits and chronic diseases like malaria and tuberculosis. Likewise, the burden of years of productive life lost in this population is likely great, but has not been estimated.

There is a need for standardization of definitions of street youth to allow for comparisons across studies [1]. We acknowledge that all terms are hampered by the fact that children are not static and may frequently move between groups. In addition, there is a need for standardized measures of health, including measures of the social determinants of health across studies within this population [10]. Our review particularly noted a lack of standardized diagnostic criteria in studies of mental health.

There is a need for an expansion of quantitative studies of street children's health, including surveys, clinical studies, and evidence-based public health interventions. Given the importance of environmental and social contexts in child and adolescent health and development, there is a need for studies that go beyond the descriptive to the explanatory, including elucidating the structural mediators for of street children's poor health outcomes.

There is a need for more rigorous study design and recruitment. Most studies reviewed relied on cross-sectional convenience samples recruited from service settings. Studies are needed that make use of more rigorous sampling and recruitment methods in order to reach less visible subpopulations of street children and youth, whose needs and health status may be significantly different from those reached by convenience sampling. Investigators would do well to learn from studies of other hard-to-reach and marginalized populations in low- and middle-income nations that are employing novel methods to sample participants and document social determinants of health and health status [126–128]. In addition, there is a critical need for longitudinal studies to answer basic questions regarding street youths' life course, such as whether they grow up to be street-based adults or whether being street-based is simply a rite of passage for children in the many marginalized families living in the rapidly expanding cities of low- and middle-income nations. One particular strength of the existing literature has been investigators' clear collaborative efforts with community partners. These street-based partners frequently have longitudinal relationships with children. Continued community-based research in collaboration with such programs may facilitate the collection of longitudinal data from cohorts of

street youth. Finally, future studies would be further strengthened by the inclusion of community-based controls of non-street-based children. The work of Panter-Brick and colleagues stands out in this regard.

Programs to reintegrate youth into their communities need to be developed that are appropriate to local settings and recognize the universal human rights of children [129]. Our findings strongly support the conclusion that of-the-street youth have poorer health outcomes than on-the-street youth, particularly regarding infectious diseases and STIs, reproductive health, mental health and substance abuse, and violence. This suggests that the provision of safe shelter must be a primary intervention to improve the health of these youth. Based on our findings, interventions such as increased access to education for street-based children, the regulation of access to inhalants, and the enforcement of laws protecting all children from physical and sexual abuse and neglect (as codified in the United Nations Convention of the Rights of the Child), are also indicated [12]. Youths' resilience and need for independence to survive under particularly harsh circumstances should be recognized. However, it is also imperative to recognize the fiduciary responsibility and shared interest of communities at the local and global level to support youth in becoming productive, healthy adults.

Acknowledgments

We gratefully acknowledge the support of David Cash for his invaluable assistance in locating and managing sources and in the drafting of this manuscript. All individuals who have contributed significantly to the work have been listed here. This article was supported by University of California San Francisco Department of Pediatrics Chairman's Funds for J.W. and J.L.

References

- [1] UNICEF Executive Board. Exploitation of working children and street children. U.N. Doc. E/ICEF/1986/CRP.1983; 1986.
- [2] UNICEF. The state of the world's children 2012: Excluded and invisible: United Nations Publications Report No.: 9280639161; 2012.
- [3] World Bank. How we classify countries. 2012. Available at: <http://data.worldbank.org/about/country-classifications> (accessed April 5, 2013).
- [4] Hutz CS, Koller SH. Methodological and ethical issues in research with street children. *New Dir Child Adolesc Dev* 1999;85:59–70.
- [5] Raffaelli M, Koller SH, Reppold CT, et al. Gender differences in Brazilian street youth's family circumstances and experiences on the street. *Child Abuse Negl* 2000;24:1431–41.
- [6] Vahdani P, Hosseini-Moghaddam SM, Gachkar L, et al. Prevalence of hepatitis B, hepatitis C, human immunodeficiency virus, and syphilis among street children residing in southern Tehran, Iran. *Arch Iran Med* 2006;9:153–5.
- [7] Jones GA, Herrera E, Thomas de Benítez S. Tears, trauma and suicide: Everyday violence among street youth in Puebla, Mexico. *Bull Latin Am Reserch V* 2007;26:462–79.
- [8] Berkman LF, Kawachi I. *Social epidemiology*. New York: Oxford University Press; 2000.
- [9] Kawachi I, Subramanian S, Kim D. Social capital and health. *Social Capital Health* 2008:1–26.
- [10] Sawyer SM, Afifi RA, Bearinger LH, et al. Adolescence: A foundation for future health. *Lancet* 2012;379:1630–40.
- [11] World Health Organization. Programming for adolescent health and development. WHO technical report series no. 886. Report of WHO/UNFPA/UNICEF Study Group on Programmin1g for Adolescent Health; 1999.
- [12] Viner RM, Ozer EM, Denny S, et al. Adolescence and the social determinants of health. *Lancet* 2012;379:1641–52.
- [13] World Health Organization. Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference,

- New York, 19–22 June, 1946, and entered into force on 7 April 1948. Official Records of the World Health Organization 1946;2:100.
- [14] UNICEF. The state of the world's children 2011: Adolescence—An Age of Opportunity 2011. Available at: http://www.unicef.org/publications/index_57468.html. Accessed April 5, 2013.
 - [15] World Bank income classifications July 2009. In: Fuster V, Kelly B, eds. Institute of Medicine (US) Committee on Preventing the Global Epidemic of Cardiovascular Disease: Meeting the Challenges in Developing Countries. Washington, DC: National Academies Press (US); 2010.
 - [16] Nada KH, Suliman EDA. Violence, abuse, alcohol and drug use, and sexual behaviors in street children of Greater Cairo and Alexandria, Egypt. *AIDS* 2010;24:S39.
 - [17] Ramakrishna J, Karott M, Murthy R. Experiences of sexual coercion among street boys in Bangalore, India. In: Bott S, Jejeebhoy S, Shah I, et al, eds. Towards adulthood: Exploring the sexual and reproductive health of adolescents in South Asia. Geneva, Switzerland: 2003. p. 95–98.
 - [18] Agnihotri P. Street boys of Delhi: A study of their family and demographic characteristics. *Indian J Med Sci* 2001;55:543–8.
 - [19] Ali A, de Muynck A. Illness incidence and health seeking behaviour among street children in Rawalpindi and Islamabad, Pakistan - a qualitative study. *Child Care Health Dev* 2005;31:525–32.
 - [20] Sherman SS, Plitt S, ul Hassan S, et al. Drug use, street survival, and risk behaviors among street children in Lahore, Pakistan. *J Urban Health Bull NY Acad Med J Urban Health* 2005;82:IV113–24.
 - [21] Beyene Y, Berhane Y. Characteristics of street children in Nazareth, Ethiopia. *East Afr Med J* 1997;74:85–8.
 - [22] Greksa LP, Rie N, Islam AB, et al. Growth and health status of street children in Dhaka, Bangladesh. *Am J Hum Biol* 2007;19:51–60.
 - [23] Hosny G, Moloukha TM, Abd Elsalam G, et al. Environmental behavioural modification programme for street children in Alexandria, Egypt. *East Mediterr Health J* 2007;13:1438–48.
 - [24] Nzimakwe D, Brookes H. An investigation to determine the health status of institutionalised street children in a place of safety in Durban. *Curationis* 1994;17:27–31.
 - [25] Raffaelli M, Koller SH, Morais D, et al. Assessing the development of Brazilian street youth. *Vulnerable Children Youth Studies* 2007;2:154–64.
 - [26] Ruiz J. Street youth in Colombia: Lifestyle, attitudes and knowledge. *AIDS health promotion exchange/World Health Organization, Global Programme on AIDS. Health Promotion Unit* 1994;1:12–4.
 - [27] Wutoh AK, Kumoji EK, Xue ZY, et al. HIV knowledge and sexual risk behaviors of street children in Takoradi, Ghana. *AIDS Behav* 2006;10:209–15.
 - [28] The story of children living and working on the streets of Nairobi. Women Education Researchers of Kenya (WERK) for SNV/Kenya and German Technical Organization (GTZ); 2002.
 - [29] Huang CC, Barreda P, Mendoza V, et al. A comparative analysis of abandoned street children and formerly abandoned street children in La Paz, Bolivia. *Arch Dis Child* 2004;89:821–6.
 - [30] Kudrati M, Plummer ML, Yousif ND. Children of the Sug: A study of the daily lives of street children in Khartoum, Sudan, with intervention recommendations. *Child Abuse Negl* 2008;32:439–48.
 - [31] Matchinda B. The impact of home background on the decision of children to run away: The case of Yaounde city street children in Cameroon. *Child Abuse Neglect* 1999;23:245–55.
 - [32] Morakinyo J, Odejide AO. A community based study of patterns of psychoactive substance use among street children in a local government area of Nigeria. *Drug Alcohol Depend* 2003;71:109–16.
 - [33] Olley BO. Social and health behaviors in youth of the streets of Ibadan, Nigeria. *Child Abuse Neglect* 2006;30:271–82.
 - [34] Panter-Brick C, Todd A, Baker R. Growth status of homeless Nepali boys: Do they differ from rural and urban controls? *Soc Sci Med* 1996;43:441–51.
 - [35] Salem EM, El-Latif FA. Sociodemographic characteristics of street children in Alexandria. *East Mediterranean Health J* 2002;8:64–73.
 - [36] Seth R, Kotwal A, Ganguly KK. Street and working children of Delhi, India, misusing toluene: An ethnographic exploration. *Subst Use Misuse* 2005;40:1659–79.
 - [37] Turkmen M, Okyay P, Ata O, et al. A descriptive study on street children living in a southern city of Turkey. *Turk J Pediatr* 2004;46:131–6.
 - [38] Tiwari P. Life on streets. *Indian J Pediatr* 2007;74:283–6.
 - [39] Pagare D, Meena G, Singh M, et al. Risk factors of substance use among street children from Delhi. *Indian Pediatr* 2004;41:221–6.
 - [40] Pagare D, Meena GS, Jiloha RC, et al. Sexual abuse of street children brought to an observation home. *Ind Pediatr* 2005;42:134–9.
 - [41] Lugalla JLP, Mbwambo JK. Street children and street life in urban Tanzania: The culture of surviving and its implications for children's health. *Int J Urban Reg Res* 1999;23:329–44.
 - [42] UNICEF. Street and unsupervised children of Mongolia; 2003. Available at: http://www.unicef.org/mongolia/street_children_Report_Eng.pdf. Accessed April 5, 2013.
 - [43] UNICEF. 2001 ZIM: A study on street children in Zimbabwe. 2001. Available at: http://www.unicef.org/evaldatabase/index_14411.html. Accessed April 5, 2013.
 - [44] Ali M, Shahab S, Ushijima H, et al. Street children in Pakistan: A situational analysis of social conditions and nutritional status. *Soc Sci Med* 2004;59:1707–17.
 - [45] Campos R, Raffaelli M, Ude W, et al. Social networks and daily activities of street youth in Belo Horizonte, Brazil. *Street Youth Study Group. Child Dev* 1994;65(2 Spec No):319–30.
 - [46] Porto SOB, Cardoso DDP, Queiroz DAO, et al. Prevalence and risk factors for HBV infection among street youth in central Brazil. *J Adolesc Health* 1994;15:577–81.
 - [47] Forster LMK, Tannhauser M, Barros HMT. Drug use among street children in southern Brazil. *Drug Alcohol Depend* 1996;43:57–62.
 - [48] Wittig MCW, Wright JD, Kaminsky DC. Substance use among street children in Honduras. *Substance Use Misuse* 1997;32:805–27.
 - [49] Raffaelli M, Siqueira E, Paynemerritt A, et al. HIV-related knowledge and risk behaviors of street youth in Belo-Horizonte, Brazil. *AIDS Educ Prev* 1995;7:287–97.
 - [50] Gurgel R, Da Fonseca J, Neyra-Castaneda D, et al. Capture-recapture to estimate the number of street children in a city in Brazil. *Arch Dis Childhood* 2004;89:222.
 - [51] Anarfi JK. Vulnerability to sexually transmitted disease: Street children in Accra. *Health Transit Rev* 1997;(7 Suppl):281–306.
 - [52] de Carvalho FT, Neiva-Silva L, Ramos MC, et al. Sexual and drug use risk behaviors among children and youth in street circumstances in Porto Alegre, Brazil. *AIDS Behav* 2006;10:557–66.
 - [53] Anarfi JK. Street youth in Accra city: Sexual networking in a high-risk environment and its implications for the spread of HIV/AIDS. *Health Trans Rev (Supplement)* V 1995;5:131–52.
 - [54] Kidolezi YN, Holmes JA, Nopo H, et al. Selection and reporting bias in household surveys of child labor: Evidence from Tanzania. *Afr Develop Rev* 2007;19:368–78.
 - [55] Aptekar L, Ciano-Federoff LM. Street children in Nairobi: Gender differences in mental health. *New Dir Child Adolesc Dev* 1999:35–46.
 - [56] Abdelgalil S, Gurgel RG, Theobald S, et al. Household and family characteristics of street children in Aracaju, Brazil. *Arch Dis Child* 2004;89:817–20.
 - [57] Aderinto AA. Social correlates and coping measures of street-children: A comparative study of street and non-street children in south-western Nigeria. *Child Abuse Neglect* 2000;24:1199–213.
 - [58] Kerfoot M, Koshyl V, Roganov O, et al. The health and well-being of neglected, abused and exploited children: The Kyiv Street Children Project. *Child Abuse Neglect* 2007;31:27–37.
 - [59] Lee JAB, Odie-Alie S. Carry me home: A collaborative study of street children in Georgetown, Guyana. *J Soc Work Res Eval* 2000;1:185–96.
 - [60] Lalor KJ. Street children: A comparative perspective. *Child Abuse Neglect* 1999;23:759–70.
 - [61] Noto AR, Nappo SA, Galduroz JCF, et al. Use of drugs among street children in Brazil. *J Psychoactive Drugs* 1997;29:185–92.
 - [62] Grundling J, Grundling I. The concrete particulars of the everyday realities of street children. *Human Relations* 2005;58:173.
 - [63] Veale A, Donà G. Street children and political violence: A socio-demographic analysis of street children in Rwanda. *Child Abuse Neglect* 2003;27:253–69.
 - [64] Seager JR, Tamasane T. Health and well-being of the homeless in South African cities and towns. *Develop S Africa* 2010;27:63–83.
 - [65] Thapa K, Ghatane S, Rimal S. Health problems among the street children of Dharan municipality. *Kathmandu Univ Med J (KUMJ)* 2010;7:272–9.
 - [66] Bal B, Mitra R, Mallick AH, et al. Nontobacco substance use, sexual abuse, HIV, and sexually transmitted infection among street children in Kolkata, India. *Substance Use Misuse* 2010;45:1668–82.
 - [67] Elkoussi A, Bakheet S. Volatile substance misuse among street children in upper Egypt. *Substance Use Misuse* 2011;46:35–9.
 - [68] Towe VL, ul Hasan S, Zafar ST, et al. Street life and drug risk behaviors associated with exchanging sex among male street children in Lahore, Pakistan. *J Adolesc Health* 2009;44:222–8.
 - [69] Ogel K, Taner S, Tosun M, et al. Juvenile offences among hospitalized adolescent inhalant users in Istanbul: A comparison regarding place of residence. *J Psychoactive Drugs* 2006;38:297–304.
 - [70] Mondal NK, Ghosh S, Ray MR. Micronucleus formation and DNA damage in buccal epithelial cells of Indian street boys addicted to gasp 'Golden glue'. *Mutat Res* 2011;721:178–83.
 - [71] Owoaje E, Uchendu O. Sexual risk behaviour of street youths in southwest Nigeria. *East Afr J Public Health* 2009;6:274.

- [72] Ikechebeli JI, Udigwe GO, Ezechukwu CC, et al. Sexual abuse among juvenile female street hawkers in Anambra State, Nigeria. *Afr J Reprod Health* 2008;12:111.
- [73] Baybuga MS, Celik SS. The level of knowledge and views of the street children/youth about AIDS in Turkey. *Int J Nurs Stud* 2004;41:591–7.
- [74] Duyan V. Relationships between the sociodemographic and family characteristics, street life experiences and the hopelessness of street children. *Childhood* 2005;12:445–59.
- [75] D'Abreu RC, Mullis AK, Cook LR. The resiliency of street children in Brazil. *Adolescence* 1999;34:745–51.
- [76] Pinto JA, Ruff AJ, Paiva JV, et al. HIV risk behavior and medical status of underprivileged youths in Belo-Horizonte, Brazil. *J Adolesc Health* 1994;15:179–85.
- [77] Apt NA, Blavo EQ. Response. Street children and AIDS. Legon, Ghana: Centre for Social Policy Studies, Faculty of Social Studies, University of Ghana; 1997.
- [78] Gregson S, Nyamukapa CA, Garnett GP, et al. HIV infection and reproductive health in teenage women orphaned and made vulnerable by AIDS in Zimbabwe. *AIDS Care* 2005;17:785–94.
- [79] Gross R, Landfried B, Herman S. Height and weight as a reflection of the nutritional situation of school-aged children working and living in the streets of Jakarta. *Soc Sci Med* 1996;43:453–8.
- [80] Olgar S, Oktem F, Dindar A, et al. Volatile solvent abuse caused glomerulopathy and tubulopathy in street children. *Hum Exp Toxicol* 2008;27:477–83.
- [81] D'Abreu RC, Mullis AK, Cook LR. Social support and the ability to adapt to life among Brazilian street children and non-street children. *J Soc Psychol* 2001;141:127–9.
- [82] Ayaya SO, Esamai FO. Health problems of street children in Eldoret, Kenya. *East Afr Med J* 2001;78:624–9.
- [83] Panter-Brick C, Lunn PG, Baker R, et al. Elevated acute-phase protein in stunted Nepali children reporting low morbidity: Different rural and urban profiles. *Br J Nutr* 2001;85:125–31.
- [84] Worthman C, Panter-Brick C. Homeless street children in Nepal: Use of allostatic load to assess the burden of childhood adversity. *Dev Psychopathol* 2008;20:233–55.
- [85] Poudel SKS, Barker SC. Infestation of people with lice in Kathmandu and Pokhara, Nepal. *Med Vet Entomol* 2004;18:212–3.
- [86] Njord L, Merrill RM, Njord R, et al. Characterizing health behaviors and infectious disease prevalence among Filipino street children. *Int J Adolesc Med Health* 2008;20:367–74.
- [87] Baldo ET, Belizario VY, De Leon WU, et al. Infection status of intestinal parasites in children living in residential institutions in Metro Manila, the Philippines. *Korean J Parasitol* 2004;42:67–70.
- [88] Guignard S, Arienti H, Freyre L, et al. Prevalence of enteroparasites in a residence for children in the Cordoba Province, Argentina. *Eur J Epidemiol* 2000;16:287–93.
- [89] Russell S. The economic burden of illness for households in developing countries: A review of studies focusing on malaria, tuberculosis, and human immunodeficiency virus/acquired immunodeficiency syndrome. *Am J Trop Med Hyg* 2004;71(2 Suppl):147–55.
- [90] Queiróz DA, Cardoso DD, Martelli CM, et al. Seroepidemiology of hepatitis A virus infection in street children of Goiânia-Goiás. *Rev Soc Bras Med Trop* 1995;28:199–203.
- [91] Avila MM, Casanueva E, Piccardo C, et al. HIV-1 and Hepatitis B virus infections in adolescents lodged in security institutes of Buenos Aires. *Pediatr AIDS HIV Infect* 1996;7:346–9.
- [92] Fallah F, Karimi A, Eslami G, et al. The homeless youth and their exposure to hepatitis B and hepatitis C among in Tehran, Iran. *Gene Ther Mol Biol* 2008;12:95–100.
- [93] Martins R, Porto S, Vanderborght B, et al. Short report: Prevalence of hepatitis C viral antibody among Brazilian children, adolescents, and street youths. *Am J Trop Med Hyg* 1995;53:654.
- [94] Hillis SD, Zapata L, Robbins CL, et al. HIV seroprevalence among orphaned and homeless youth: No place like home. *AIDS* 2011;26:779–92.
- [95] Dehne KL, Reidner G. Sexually transmitted infections among adolescents. In: Berer M, ed. *The need for adequate health services*. Geneva, Switzerland: WHO; 2005.
- [96] Shakarishvili A, Dubovskaya LK, Zohrabyan LS, et al. Sex work, drug use, HIV infection, and spread of sexually transmitted infections in Moscow, Russian Federation. *Lancet* 2005;366:57–60.
- [97] Kissin DM, Zapata L, Yorick R, et al. HIV seroprevalence in street youth, St Petersburg, Russia. *AIDS* 2007;21:2333–40.
- [98] Lambert ML, Torrico F, Billot C, et al. Street youths are the only high-risk group for HIV in a low-prevalence South American country. *Sex Transm Dis* 2005;32:240–2.
- [99] Pinzon-Rondon AM, Koblinsky SA, Hofferth SL, et al. Work-related injuries among child street-laborers in Latin America: Prevalence and predictors. *Rev Panam Salud Publica* 2009;26:235–43.
- [100] Banerjee SR. Physical abuse of street and slum children of Kolkata. *Ind Pediatr* 2001;38:1163–70.
- [101] Khurana S, Sharma N, Jena S, et al. Mental health status of runaway adolescents. *Ind J Pediatr* 2004;71:405–9.
- [102] Ribeiro MO. Street children and their relationship with the police. *Int Nurs Rev* 2008;55:89–96.
- [103] McAlpine K, Henley R, Mueller M, et al. A survey of street children in Northern Tanzania: How abuse or support factors may influence migration to the street. *Community Ment Health J* 2010;46:26–32.
- [104] Scivoletto S, da Silva TF, Rosenheck RA. Child psychiatry takes to the streets: A developmental partnership between a university institute and children and adolescents from the streets of Sao Paulo, Brazil. *Child Abuse Neglect* 2011;35:89–95.
- [105] Brooke J. Gunmen said to be police kill 7 street children in Rio. July 24, 1993. *The New York Times*; 1993.
- [106] UNICEF. The state of the world's children 2006: Excluded and invisible: United Nations Publications Report No.: 9280639161; 2005.
- [107] Pinheiro P. United Nations Secretary-General's Study on Violence Against Children. *World Report on Violence against Children*; 2006.
- [108] Aral SO, St Lawrence JS, Dyatlov R, et al. Commercial sex work, drug use, and sexually transmitted infections in St. Petersburg, Russia. *Soc Sci Med* 2005;60:2181–90.
- [109] Ahmadkhaniha HR, Shariat SV, Torkaman-nejad S, et al. The frequency of sexual abuse and depression in a sample of street children of one of deprived districts of Tehran. *J Child Sex Abuse* 2007;16:23–35.
- [110] Malamud S. At risk and abandoned: Street children, AIDS and human rights. *AIDSlink* 1995:6–7.
- [111] Robbins C, Zapata L, Kissin D, et al. Multicity HIV seroprevalence in street youth, Ukraine. *Int J STD AIDS* 2010;21:489–96.
- [112] Ntozi JP, Najjumba IM, Ahimbisibwe F, et al. Has the HIV/AIDS epidemic changed sexual behaviour of high risk groups in Uganda? *Afr Health Sci* 2003;3:107–16.
- [113] Tahmina Q, Moral S. Sex-workers in Bangladesh, Livelihood, at what Price? Mirpur, Bangladesh: Society for Environment and Human Development; 2004.
- [114] Merrill RM, Njord L, Njord R, et al. The effect of family influence on indicators associated with street life among Filipino street children. *Vulnerable Child Youth Stud* 2010;5:142–50.
- [115] Techakasem P, Kolkijkovin V. Runaway youths and correlating factors, study in Thailand. *J Med Assoc Thai* 2006;89:212–6.
- [116] Sta Maria M. Concomitants of risk and protection among Filipino street youth. *Int J Psychol* 2008;43:12.
- [117] Njord L, Merrill RM, Njord R, et al. Drug use among street children and non-street children in the Philippines. *Asia-Pacific J Public Health* 2010;22:203–11.
- [118] Jutkowitz JM, Spielmann H, Koehler U, et al. Drug use in Nepal: The view from the street. *Substance Use Misuse* 1997;32:987–1004.
- [119] Obando P, Kliever W, Murrelle L, et al. The comorbidity of substance abuse and depressive symptoms in Costa Rican adolescents. *Drug Alcohol Depend* 2004;76:37–44.
- [120] Zapata LB, Kissin DM, Robbins CL, et al. Multi-city assessment of lifetime pregnancy involvement among street youth, Ukraine. *J Urban Health* 2011;88:1–14.
- [121] Olgar S, Dindar A, Ertugrul T, et al. Electrocardiographic and echocardiographic findings in street children known to be substance abusers. *Cardiol Young* 2008;18:58–61.
- [122] Thiesen FV, Noto AR, Barros HMT. Laboratory diagnosis of toluene-based inhalants abuse. *Clin Toxicol* 2007;45:557–62.
- [123] Contreras-Bulnes R, Reyes-Silveyra LJ, Fuentes-Alvarez T, et al. Dental caries and treatment needs in street children in Toluca, Mexico. *Int Dent J* 2008;58:134–8.
- [124] Dogan MC, Haytac MC, Ozali O, et al. The oral health status of street children in Adana, Turkey. *Int Dental J* 2006;56:92–6.
- [125] Kahabuka FK, Mbawalla HS. Oral health knowledge and practices among Dar es Salaam institutionalized former street children aged 7–16 years. *Int J Dent Hyg* 2006;4:174–8.
- [126] Lane T, Raymond HF, Dladla S, et al. High HIV prevalence among men who have sex with men in Soweto, South Africa: Results from the Soweto Men's Study. *AIDS Behav* 2011;15:626–34.
- [127] Raymond HF, Kajubi P, Kanya MR, et al. Correlates of unprotected receptive anal intercourse among gay and bisexual men: Kampala, Uganda. *AIDS Behav* 2009;13:677–81.
- [128] Auerswald C, Kwena ZA, Ochieng JH, et al. Feasibility of employing respondent-driven sampling for HIV/STI testing of street children: Experience from the Vijana Wetu pilot study in Kisumu, Kenya. Vienna, Austria: AIDS 2010-XVIII International AIDS Conference, <http://www.iasociety.org/Abstracts/A200739893.aspx>; 2010.
- [129] United Nations. Convention on the Rights of the Child. 1990. Available at: <http://www.unicef.org/crc/>. Accessed April 5, 2013.

Appendix

Table 1
Nutritional and growth status of street children in low- and middle-income countries

Country (city)	Author, year	Sample	Source	Gender (% male)	Mean age in years (range) ^a	Results
Brazil (Rio de Janeiro)	D'Abreu, 1999 [75]	N = 60 (30 "on" and "of"; 30 control school children)	Street Service programs	100	15.6 (13–18)	BMI of control school children: 21.19 BMI of street-based children: 15.54
Brazil (Belo Horizonte)	Pinto, 1994 [76]	N = 394 (199 "on"; 195 "of")	School Government shelter	Total sample: 71 "On:" 62 "Of:" 80	13.3 (10–18)	Mean BMI: 18.9 A high proportion classified as chronic energy deficiency II and III, (16% "of"/18% "on"; 10% "of"/11% "on")
Honduras (Tegucigalpa)	Wittig, 1997 [48]	N = 1,244 (1,084 "on"; 160 "of")	Street	Total sample: 58 "On:" 53; "Of:" 95	"On:" 10 "Of:" 13	Of-the-street inhalant users more likely than nonusers to be assessed by interviewers as having "fair" or "poor" nutritional status (28.9% vs. 20.5%)
Bangladesh (Dhaka)	Greksa, 2007 [22]	N = 292 (150 "on"; 142 "of")	Street	"On:" 50 "Of:" 52	(7–14) Median ages: male "on" 11.0; male "of" 11.5; female "on" 10.0; female "of" 10.0	Majority of both of- and on-the-street children stunted and underweight, with no significant difference between groups. Of-the-street had larger fat deposits than on-the-street children Boys significantly taller, leaner and less stunted than girls No wasting seen in either of- or on-the-street children
Indonesia (Jakarta)	Gross, 1996 [79]	N = 89 (79% "on"; 21% "of")	Street	88	(8–15)	52% stunted (height-for-age below 3rd centile) 7% wasted (weight-for-height below 3rd centile)
Nepal (Kathmandu; rural village)	Panter-Brick, 1996 [34]	N = 307 (62 "on"; 111 "of"; 52 village controls; 82 middle-class schoolchild controls)	Street Service program School	100	(6–14)	On- and of-the-street boys had high proportions of mild stunting (13%/20%, respectively), moderate stunting (50%/43%), and severe stunting (34%/23%) Of-the-street less stunted than on-the-street and village boys. Only middle-class boys not stunted
Nepal (Kathmandu; rural village)	Worthman and Panter-Brick, 2008 [84]	N = 107 (20 "on"; 27 "of"; 30 middle-class school child controls; 30 village child controls)	Street Service program School	100	11.8 (10–14)	Of-the-street had better nutritional status (weight for age) than on-the-street boys but no difference in growth status (height for age) Of-the-street boys did not have significantly different nutritional or growth status from village controls

Nepal (Dharan)	Thapa, 2009 [65]	N = 48 (77.1% “on”; 22.9% “of”)	NR	95.8	Most (68.8%) 11–15	Of-the-street boys had better nutritional status and poorer growth status than schoolchild controls
Pakistan	Ali, 2004 [44]	N = 108 (101 “on”; 7 “of”)	Street	81	(4–13) Girls: 5–11 Boys: 4–13	Of-the-street boys who had been on the streets for <2 years had better nutritional status than those who had been on the streets for >2 years but did not differ significantly in growth status
Philippines	Njord, 2008 [86]	N = 179	Service program	60	12.8	43.8% underweight by CDC 2000 standards
Turkey (Istanbul)	Olgar, 2008 [80]	N = 97 (48 street-based, inhalant-using children; 49 healthy controls living with family)	Government shelter Case control (control source not reported)	100	Street: 16.24 Control: 16.96	20% stunted; 25% undernourished; 2% wasted Boys more likely than girls to be stunted (23% vs. 6%) and undernourished (27% vs. 18%) BMI of males: 15.6 BMI of females: 15.8
Turkey (Adana)	Turkmen, 2004 [37]	N = 52 (89% “on”; 11% “of”) N = 39 for subset undergoing physical exam	Service program (drop-in shelter)	96.0	Median age 14 (7–18)	Inhalant-using street-based children were shorter than control children (160.8 ± 8 cm vs. 172 ± 6.96 cm, respectively) and weighed less than controls (53.2 ± 10.8 kg vs. 72.7 ± 12.6 kg)
Egypt (Alexandria)	Salem, 2002 [35]	N = 100	Street Shelter	100	13.7 (7–16)	67% under the 50th percentile for height (Turkish standard) 97% below the 50th percentile for weight, including 19% under 3rd percentile
Kenya (Eldoret)	Ayaya, 2001 [82]	N = 191 (38 “on”; 47 “of”; 56 abandoned and in shelter; 50 schoolchildren)	Street (snowball sample) School Case control	NR	14 (5–22)	83% malnourished (“wasting and stunting”) 78% anemic
South Africa (Durban)	Nzimakwe, 1994 [24]	N = 50	Shelter (“place of safety”)	80	13.8 (12–16)	Shelter and on-the-street children more likely to be undernourished than of-the-street or schoolchildren (64.3%/55.3%/27.7%/20%, respectively), as well as more stunted (51.8%/44.7%/17.4%/20%)
						All girls above the 3rd percentile for weight; 60% below the 3rd percentile for height 37.5% of boys below the 3rd percentile for weight; 62.5% below the 3rd percentile for height Malnutrition: 20% girls; 27.5% boys

BMI = body mass index; CDC = Centers for Disease Control and Prevention; NR = not reported.

^a Unless otherwise specified.

Table 2
Sexually transmitted infections and HIV in street children in low- and middle-income countries

Country (city)	Author, year	Sample size	Source	Gender (% male)	Mean age in years (range) ^a	Data source	Results
Argentina (Buenos Aires)	Avila, 1996 [91]	N = 1,460	Detention centers (“Security Institute”)	81.0	16.6 (12–20)	Serology	HIV: 4.58% HBV: 6.78% HIV and HBV prevalence higher among males than females Drug users (IDU and non-IDU) more likely to be HIV-positive than nonusers (OR = 2.3) IDUs more likely to be HIV-positive (OR = 16.84) and HBV-positive (OR = 3.17) than non-IDUs
Bolivia (Cochabamba)	Lambert, 2005 [98]	N = 536	Street Shelter	75.9	Boys: median age 18 Girls: median age 15	Serology	HIV: 2.1% (0% among youth under 15; 3.5% among youth 15 and older)
Brazil (Porto Alegre)	de Carvalho, 2006 [52]	N = 161	Service programs (drop-in “Service Centers”)	79.5	14 (Interquartile range 13, 17)	Self-report	Among youth who had ever had sex (N = 95), 9.5% reported having been diagnosed with an STI in the past year Among youth who reported having had an HIV test in their lifetime (N = 66), 9.0% reported testing HIV positive and 13.6% did not know the result of their test
Brazil (Belo Horizonte)	Pinto, 1994 [76]	N = 394 (199 “on”; 195 “of”)	Government shelter	Total sample: 71 “On:” 62 “Of:” 80	13.3 (10–18)	Serology Self-report	STI history (self-reported): 11% on-the-street; 22% of-the-street HIV: 0% “on”; 2.1% “of” Syphilis: 2.0% “on”; 2.6% “of” (also reported in tables as 2.5% “on”/3.1% “of”) Hepatitis B: 11.1% “on”; 14.9% “of” Genital lesions: 12% “on”; 8% “of”
Brazil (Goiania)	Porto, 1994 [46]	N = 496 (395 “on”; 101 “of”)	Street Service programs (state institutions)	Total sample: 93.3 “On:” 76.2 “Of:” 97.7	“On:” 13.6 (SD 2.2) “Of:” 14.3 (SD 2.2)	Serology Self-report	STI history (self-reported): 13.4% Hepatitis B: Anti-HBc: 13.5% HBsAg: 2.0% Anti-HBs: 5.4% Anti-HBc IgM: 0% In multivariate analysis, of- significantly more likely than on-the-street children to be anti-HBc positive

Russia (St. Petersburg)	Aral, 2005 [108]	NR	Chart review	0	(12–14)	Retrospective chart review	STI-positive: 86% Primary or secondary syphilis: 14%
Russia (St. Petersburg)	Kissin, 2007 [97]	N = 313	Street locations randomly selected from sampling frame	63	(15–19)	Serology	HIV: 37.4%
Russia (Moscow)	Shakarishvili, 2005 [96]	N = 401	Juvenile detention center	50	(15–17)	Serum and urine samples	HIV: 2% Syphilis: 7% HSV2: 8% Gonorrhea: 22% Chlamydia: 20% HIV rates not significantly different between males and females (2.7% males vs. 1.1% females) Females significantly more likely to have one or more bacterial STIs than males (58% vs. 25%) Females reporting sex work had higher rates of chlamydia (43% vs. 22%), syphilis (18% vs. 7%), and bacterial STIs (63% vs. 43%) than females who did not report sex work
Ukraine (Odessa, Kiev, Donetsk)	Hillis, 2011 [94]	N = 929 (20% housed non-orphan; 37% homeless non-orphan; 11% housed orphan; 32% homeless orphan)	Street (time-location sampling)	76	(15–24)	Serology	HIV: 7% among housed non-orphans; 16% in homeless non-orphans; 17% in housed orphans; 28% in homeless orphans
India (Kolkata)	Bal, 2010 [66]	N = 554	Street	65	Median age 13 (50% between 11 and 15)	Serology	HIV: 1% (n = 6; 1 female/5 male) Syphilis: 4% (n = 22; 7 female/15 male) Males were significantly more likely than females to test positive for HIV and syphilis
Iran (Tehran)	Fallah, 2008 [92]	N = 203	Service program	96.6	(7–18)	Serology	HBV: HBsAg positive: 3% HBsAb positive: 26.6% HBcAb positive: 8% HCV: 3.5%
Iran (Tehran)	Vahdani, 2006 [6]	N = 102	Service program	38.0	10.1 (SD 3.0)	Serology and self-report	HIV: 0% Syphilis: 0% HCV: 0% HBV: HBsAg positive: 3% Anti-HBsAb: 15% HBV: 7.9%
Philippines (Manila)	Njord, 2008 [86]	N = 179	Service program	60.0	12.8 (8–17)	Serology	HBV: HBsAg positive: 5% Anti-HBcAg: 32% Anti-HBsAg: 24%
Turkey (Adana)	Turkmen, 2004 [37]	N = 38 (96% "on"; 4% "of")	Service program (drop-in center)	96.0	Median age: 14 (7–18)	Serology	

(continued on next page)

Table 2
Continued

Country (city)	Author, year	Sample size	Source	Gender (% male)	Mean age in years (range) ^a	Data source	Results
Kenya (Eldoret)	Ayaya, 2001 [82]	N = 191 (38 “on”; 47 “of”; 56 abandoned and in shelter; 50 schoolchildren with families)	Street Shelter School	NR	14.3 (5–21)	Physical exam	STI: 2.6% diagnosed with an STI (HSV2, genital warts, genital ulcers) 13.1% reported symptoms related to STI
Nigeria (Ibadan)	Olley, 2006 [33]	N = 169	Street (snowball sample)	89.3	18.4 (11–24)	Self-report	STI history (self-reported): any STI (21.7%); gonorrhea (14.2%); syphilis (5.3%); chancroid (.5%); herpes (1.7%)
Nigeria (Ibadan)	Owojao, 2009 [71]	N = 818 (580 “on”; 192 “of”)	Street	68.8	(15–24)	Self-report	Past year (self-reported): genital/vaginal discharge (7.7%); genital ulcer (4.2%)
South Africa (Cape Town)	Seager, 2010 [64]	N = 305	Street	93	(12–17)	Self-report	Past year STI (self-reported): 5.5%
Zimbabwe (Harare; Bulawayo; Mutare; Gweru; Kadoma)	UNICEF, 2001 [43]	N = 260	Street	84.6	13 (0–18)	Self-report	STI history (self-reported): 14.3% Of-the-street children and children sleeping both at home and on the street more likely than on-the-street to report STI history (16.5% vs. 22.2% vs. 5.2%, respectively)

HBc = hepatitis B core; HBs = hepatitis B surface; HBsAg = HBs antigen; HBV = hepatitis B virus; HSV2 = herpes simplex virus 2; IDU = intravenous drug user; IgM = immunoglobulin M; OR = odds ratio; SD = standard deviation; STI = sexually transmitted infection.

^a Unless otherwise specified.

Table 3
Substance use in street children in low- and middle-income countries

Country (city)	Author, year	Sample size	Source	Gender (% male)	Mean age in years (range) ^a	Results
Argentina (Buenos Aires)	Avila, 1996 [91]	N = 1460	Detention centers (“security institute”)	81.0	16.6 (12–20)	53% reported use of cocaine or morphine derivatives (IDU and non-IDU); 6.43% reported IDU
Bolivia (La Paz)	Huang, 2004 [29]	N = 159 (35 “on,” i.e., street children in orphanage; 124 “of,” i.e., abandoned on street)	Street Orphanage	69.0	14.4 (SD 2.9)	Lifetime use of ETOH and inhalants (paint thinner) higher among abandoned children on the street than among street children in orphanage (58%/88% vs. 12%/41%, respectively)
Brazil (Belo Horizonte)	Campos, 1994 [45]	N = 379	Street	“On:” 79 “Of:” 75	Boys: 13.9 (9–18) Girls: 14.6 (9–18)	Daily/weekly use of ETOH, drugs (inhalants, marijuana, ether, cough syrup, amphetamines, cocaine, hallucinogens), and injection drugs lower among on- than of-the-street children (18.2%/8.0%/6%, vs. 40.0%/57.5%/10.6%, respectively) Current alcohol and drug use associated with older age among both on- and of-the-street children
Brazil (Porto Alegre)	de Carvalho, 2006 [52]	N = 161	Service programs (drop-in “service centers”)	79.5	14 (Interquartile range 13, 17)	Past year use: inhalants (31.7%); ETOH (83.8%); marijuana (34.2%); cocaine/crack (19.9%); overall illicit drug use (39.7%); IDU (1.2%)

Brazil (Porto Alegre)	Forster, 1996 [47]	N = 105 (48 "on," i.e., living with family but not attending school; 31 "of," i.e., not living with family and not attending school; 26 control, i.e., living with family and going to school)	Street	Total sample: 83 Control: 77 "On:" 81 "Of:" 90	"On:" 11.8 (6–18) "Of:" 12.1 (7–16) Control: 11.1 (8–18)	Inconsistent condom use associated with a history of inhalant use but not ETOH, marijuana, or cocaine History of illicit drug use independently associated with: older age, not currently in school, not in contact with family, been on the streets longer, spent more hours daily on the streets, history of sex, more sex partners, inconsistent/no condom use, STI in past year, having had an HIV test, perceiving self to be HIV+, having an HIV+ friend In multivariate analysis, illicit drug use associated with: older age, not being in contact with family, being on the street more hours/day, having had an HIV test Lifetime use of drugs (inhalants, marijuana, cocaine, medicines): 11% in control, 25% in on-the-street, 68% in of-the-street Of-the-street children significantly more likely than controls to report past year use of inhalants, marijuana, and medicines Of- significantly more likely than on-the-street youth to regularly use (5+ days in past week) inhalants and marijuana (42%/26%, vs. 12%/4%)
Brazil (Belo Horizonte)	Pinto, 1994 [76]	N = 394 (199 "on"; 195 "of")	Government shelter	Total sample: 71 "On:" 62 "Of:" 80	13.3 (10–18)	Of- more likely than on-the-street children to report drug use (77% vs. 29%, OR 7.8) Of-/on-the-street children reported use of: shoemaker's glue (81%/45%, respectively); paint thinner (79%/38%); marijuana (61%/38%); cough syrup (28%/7%); amphetamines (27%/12%); inhaled cocaine (21%/10%); injected cocaine (7%/5%) Of- initiated drug use earlier than on-the-street children (mean age at initiation 10.3 vs. 12.1)
Brazil (Goiania)	Porto, 1994 [46]	N = 496 (395 "on"; 101 "of")	Street Service programs (state institutions)	Total sample: 93.3 "On:" 76.2 "Of:" 97.7	"On:" 13.6 (SD 2.2) "Of:" 14.3 (SD 2.2)	Of- more likely than on-the-street children to report oral or inhaled drug use (62.4% vs. 11.4%) and lifetime IDU (14.9% vs. .8%)
Brazil (Fortaleza; Recife; Rio de Janeiro; Sao Paulo; Porto Alegre)	Noto, 1997 [61]	N = 565 (148 "on"; 414 "of"; 3 no response)	Service programs (drop-in centers)	72.6	6–17 (86.9% ≥12)	Lifetime/past month/daily use: any drug (74.5%/51.7%/27.1%); solvents (67.6%/41.2%/20.9%); marijuana (53.1%/33.5%/12.0%); cocaine (21.2%/10.4%/2.3%); anticholinergics (15.2%/10.3%/5.5%); anxiolytics (16.8%/10.8%/6.0%); benzydamine (4.0%/1.2%/2%) Lifetime IDU: 3.4%
Brazil (Belo Horizonte)	Raffaelli, 1995 [49]	N = 379	Street	77.0		

(continued on next page)

Table 3
Continued

Country (city)	Author, year	Sample size	Source	Gender (% male)	Mean age in years (range) ^a	Results
Costa Rica (Heredia; San Jose; Puntarenas; Limon)	Obando, 2004 [119]	N = 5,268 (83 street children from San Jose; 218 youth in treatment for substance abuse; 4,967 high school students)	Street Service program (drug treatment) School	71.0	Boys: 13.9 Girls: 14.6 Street children: 15.34 Drug treatment: 15.89 Schoolchildren: 15.27	Lifetime reported: IDU (5.8%); shared needles (2.4%) Street children's reported lifetime prevalence of drug use (inhalants, marijuana, tobacco, cocaine, crack, "basuco," ecstasy) and ETOH/drug-related problems higher than schoolchildren and lower than children in drug treatment Depressive symptoms higher among street children and children in treatment than schoolchildren. Depressive symptoms most strongly associated with substance use among female street children
Honduras (Tegucigalpa)	Wittig, 1997 [48]	N = 1,244 (1,084 "on"; 160 "of")	Street	Total sample: 58 53 "on"; 95 "of"	"On:" 10 "Of:" 13	Of- more likely than on-the-street children to report use of inhalants (toluene) (53.2% vs. .8%); ETOH (43.1% vs. 3.9%); cigarettes (56.7% vs. 4.9%) Among of-the-street children, inhalant users more likely than non-inhalant users to: report use of ETOH (76.5% vs. 5.6%), tobacco (90.2% vs. 16.9%), and marijuana (29.3% vs. 1.4%); be older (mean age 14 vs. 12); sleep on the street (82.9% vs. 33%); have lived on the street longer (42.3 vs. 22.9 months); be in "fair" or "poor" physical health (27.8% vs. 17.8%), nutritional status (28.9% vs. 20.5%), and mental health (28.9% vs. 5.5%); report never receiving medical care (12.5% vs. 1.6%); have been treated for an STI (78.2% vs. 54.5%)
Ukraine (Odessa, Kiev, Donetsk)	Hillis, 2011 [94]	N = 929 (182 housed non-orphan; 343 homeless non-orphan; 104 housed orphan; 300 homeless orphan)	Street (time-location sampling)	76	(15–24)	ETOH ≥10 days in the past month: 6% neither homeless nor orphan; 9.6% either homeless or orphan; 15.3% both homeless and orphan Lifetime use (either/neither/both): any drug (61%/70.7%/84.3); IDU (15.4%/31.8%/47.7%); needle sharing (7.7%/21.7%/31.7%)
Ukraine (Kyiv)	Kerfoot, 2007 [58]	N = 97 (29 "on," i.e., live permanently at home; 57 "of," (i.e., sleep away from home, with 23 youth partially and 34 fully disconnected from family)	Service programs (shelter facilities and outreach/drop-in center)	74.2	12.8 (6–17)	63% reported substance use (ETOH, inhalants, and/or other drugs) 24% used ETOH only; 15% inhalants only; 12% ETOH and inhalants; 3% ETOH and other drugs; 9% ETOH, inhalants, and other drugs Of- more likely than on-the-street children to report substance abuse (91% children connected to family but not sleeping at home vs. 73% children

Ukraine (Kyiv; Odessa; Donetsk)	Zapata, 2011 [120]	N = 929 (182 housed non-orphan; 343 homeless non-orphan; 104 housed orphan; 300 homeless orphan)	Street (time-location sampling)	76	(15–24)	fully disconnected from family vs. 35% children sleeping at home) Among the full sample, males more likely than females to report lifetime experience of: any drug use (76.9% vs. 61.4%); IDU (36.4% vs. 25.1); needle sharing (24.2% vs. 15.7%)
Russia (St. Petersburg)	Kissin, 2007 [97]	N = 313	Street locations randomly selected from sampling frame	63.3	(15–17)	Lifetime use of any drug: 84.7% ETOH consumption several times or more/week: 72.2% Lifetime/current use: inhalants (55.2%/40.1%); marijuana (75.6%/29.6%); Stadol (44.2%/19.9%); heroin (34.4%/23.3%); ephedrine (19.8%/7.4%); IDU (50.7%/32.9%); needle sharing (33.3%/18.9%) HIV-positive youth significantly more likely to report lifetime substance use, more frequent alcohol consumption, obtaining drugs from a pharmacy, lifetime/current inhalant, heroin, and Stadol use, lifetime/current IDU, needle sharing
Nepal (Dharan)	Thapa, 2009 [65]	N = 48 (37 “on”; 11 “of”)	NR	95.8	Most (68.8%) 11–15	Reported use of: smoking tobacco (87.5%); chewing tobacco (37.5%); ETOH (50%); glue (dendrite) (72.9%)
India (Kolkata)	Bal, 2010 [66]	N = 554	Street	65	Median age 13 (50% between 11 and 15)	52% reported substance use; 22% reported tobacco use only; 30% reported “regular drug use” Among substance users, children reported using: dendrite (43%); ETOH (16%); marijuana (25%); “brown sugar” (11%); heroin (3%); N-10 (2%) 89.7% initiated drug use by the age of 15 Substance abuse associated with older age, male, orphan, no contact with family, sleeping in public places
India (Delhi)	Khurana, 2004 [101]	N = 150	Shelter (“child observation home”)	NR	(10–16)	Lifetime use of: any drug (55.3%); inhalants (2.66%); tobacco (49.6%); marijuana (.67%)
India (Kolkata)	Mondal, 2011 [70]	N = 352 (302 tobacco and/or glue-using street boys; 50 schoolchildren controls)	Street Schools	100	(8–16)	Current inhalant use (2–8 times daily): 51.3% Glue sniffing by street children was correlated with chromosomal and DNA damage in buccal, epithelial cells, controlling for tobacco exposure and loss of appetite
India (Delhi)	Pagare, 2004 [39]	N = 115	Shelter (“child observation home”)	100	(6–16)	Lifetime use of: any drug (57.4%); inhalants (glue, petrol, thinner, spirit) (24.3%); ETOH (21.8%); nicotine (44.5%); marijuana (26.4%) 70% reported knowledge of harmful effects of drugs
India (Bangalore)	Ramakrishna, 2007 [17]	N = 121	Service program (outreach)	100	16 (9–23)	Substance use associated with maltreatment at home Half reported inhalant use (typewriter correction fluid); 46% used ETOH

(continued on next page)

Table 3
Continued

Country (city)	Author, year	Sample size	Source	Gender (% male)	Mean age in years (range) ^a	Results
India (Delhi)	Seth 2005 [36]	N = 45 (15 “on”; 30 “of,” i.e., living on street or shelter)	Service programs (drop-in centers) (snowball sample)	NR	Median age 13 (9–18)	Inclusion criteria included current inhalant use. Inhalant use frequency ranged from twice ever to multiple times per day Most reported poly-substance use (including ETOH, tobacco, marijuana, and heroin) Median reported age of drug initiation: 10 (6–14) 84.4% experienced withdrawal symptoms Most recognized that inhalant use had harmful physical/mental effects
India (Delhi)	Tiwari, 2006 [38]	N = 400	Shelter (“child observation home”)	100	(6–16)	Reported use of: any substance (50.5%); ETOH (16.7%); smoked tobacco (26.0%); chewed tobacco (8.5%); drugs (marijuana, “bhang,” “charas,” IDU) (8.25%); poly-substance use (32.0%)
Iran (Tehran)	Fallah, 2008 [92]	N = 203	Government shelter (“welfare center”)	96.6	(7–18)	13% reported current tobacco smoking. Of these, 3% heavy smokers (10+/day); 1% medium (1–9/day); 9% rare (1–2/week)
Pakistan (Lahore)	Sherman, 2005 [20]	N = 347	Service program (outreach)	96.0	13	Lifetime drug use: 83.0% Past month use: any drug (67.1%); inhalants (73.4%); hashish (80.7%); “bhang” (46.4%), heroin (sniff/smoke) (8.6%); heroin (IDU) (3.9%) Current drug users more likely than former/never-users to: be male (99.1% vs. 98.2%/81.4%, respectively); be older (14 vs. 13/12); sleep on the streets rather than at home (82.3% vs. 67.9%/66.1%); have lived on the streets longer (30 vs. 12/6 mos.); have had sex (62.7% vs. 45.5%/18.6%); want to go home (68.0% vs. 62.3%/41.7%) In multivariate analyses, current drug use associated with older age, wanting to go home, exchange sex, self-cutting
Pakistan (Lahore)	Towe, 2009 [68]	N = 565	Service program (outreach)	100	(5–19)	Children who engaged in exchange sex more likely than those who did not to report lifetime use of: any drug (93.0% vs. 77.4%); inhalants (61.5% vs. 35.4%); tobacco (98.1% vs. 97.4%); hashish (67.7% vs. 48.2%); heroin (sniff/smoke) (9.6% vs. .9%); IDU (3.1% vs. .3%) 29.7% had exchanged sex for drugs in their lifetime
Philippines (Manila)	Merrill, 2010 [114]	N = 624 (441 “on”; 183 “of”)	Service program	54	(8–17)	Lifetime use: legal substances (tobacco, ETOH, inhalants) (44%); illicit substances (marijuana,

Philippines (Manila)	Njord, 2010 [117]	N = 839 (170 "on"; 141 "of"; 528 non-street)	Service programs; Schools	Total sample: 51.3 (13–17) "On:" 48.5 "Of:" 70.7 Non-street: 47		amphetamines, ecstasy) (14%) Of-the-street children reported higher rates of drug use than those living with family (licit drug use, 73%–87% vs. 29%; illicit drug use, 22%–40% vs. 6%). Of- more likely than on-the-street and non-street children to report using: tobacco (78.7% vs. 34.3% vs. 33.3%); ETOH (73.8% vs. 45.0% vs. 48.8%); inhalants (61.7% vs. 15.2% vs. 1.7%); illegal drugs (methamphetamines, marijuana, ecstasy) (40.4% vs. 15.2% vs. 4.7%) On-the-street more likely than non-street children to use inhalants and illegal drugs
Turkey (Istanbul)	Ogel, 2006 [69]	N = 200 (51.2% of-the-street; 48.8% children living with family)	Service program (drug treatment facility)	100	Total sample: 15.6 (±2.0)	Inclusion criteria included daily inhalant use in past 6 months Among total sample, children reported use of: inhalants (glue/thinner, 91.0%/74.0%); ETOH (85.0%); tobacco (99.5%); marijuana (56.5%); flunitrazepam (6.5%); clonazepam (1.5%); opioids (2.0%) 87.5% of street children reported lifetime inhalant use Street children reported use of: tobacco ("almost all"); morphine/morphine derivatives (27.1%); ecstasy (29.2%); hashish (14.6%) Street children initiated thinner use earlier (12.6 ± 2.6 vs. 12.93 ± 2) and had used for longer (4.56 years ± 2.6 vs. 3.4 years ± 2) than non-street children Significantly increased urinary excretion of protein, N-acetyl-beta-D-glucosaminidase (NAG) and of electrolytes among street children relative to noninhalant using housed controls suggest glomerular damage and proximal and distal tubular dysfunction
Turkey (Istanbul)	Olgar, 2008 [80]	N = 97 (48 street-based children; 49 healthy controls living with family)	Government shelter Case control (source unspecified)	100	Street: 16.24 Control: 16.96	Street children reported lifetime use of: thinner (73.6%); glue (75.5%); ETOH (60.4%); tobacco (100%); hashish (79.2%); ecstasy (37.7%); antiemetics (13.2%) Street children reported mean ages of initiation to substances ranging from 9.68 (tobacco) to 14.72 (cocaine) ECG abnormalities found only in street children. PR, QRS, and QT intervals significantly longer among street children than among housed controls. Echocardiographic findings
Turkey (Istanbul)	Olgar, 2008 [121]	N = 114 (53 street-based children; 61 healthy controls living with family)	Government shelter Case control (source unspecified)	100	Street: 16.24 Control: 16.96	Street children reported lifetime use of: thinner (73.6%); glue (75.5%); ETOH (60.4%); tobacco (100%); hashish (79.2%); ecstasy (37.7%); antiemetics (13.2%) Street children reported mean ages of initiation to substances ranging from 9.68 (tobacco) to 14.72 (cocaine) ECG abnormalities found only in street children. PR, QRS, and QT intervals significantly longer among street children than among housed controls. Echocardiographic findings

(continued on next page)

Table 3
Continued

Country (city)	Author, year	Sample size	Source	Gender (% male)	Mean age in years (range) ^a	Results
Turkey (Adana)	Turkmen, 2004 [37]	N = 52 (89% "on"; 11% "of")	Service program (drop-in center)	96.0	Median age 14 (7–18)	also significantly different from housed controls 46% reported use of tobacco (15% more than 10 per day; 4% 1–9 per day; 27% less than daily) Lifetime substance use (smelling adhesives, ETOH, cigarettes, marijuana, heroin): 50% 2% reported use of smelling adhesives; 40% reported "unknown" substance use
Egypt (Assiut)	Elkoussi, 2011 [67]	N = 120	Stratified random sample	97.5	14.63 (10–18)	Daily use of: inhalants (90.8%); any other substances (75%); prescription drugs (45.8%); marijuana (25.0%); hashish (20.8%); opium (7.5%) Study further reports toxicological effects of glue on rats
Egypt (Alexandria)	Hosny, 2007 [23]	N = 35 (8% "on"; 92% "of")	Service program (shelter)	100	(7–15)	All children reported tobacco use Children reported using unspecified substances: "always," 43%; "sometimes," 57%; "never," 0%
Egypt (Cairo, Alexandria)	Nada, 2010 [16]	N = 857	Street (time-location sampling)	84.8	(12–17)	Lifetime drug use: 62% Current use: drugs (51%); ETOH (35%); IDU (3%) Current drug use higher among males than females; current ETOH use higher among older youth and males
Egypt (Alexandria)	Salem, 2002 [35]	N = 100 (6% "on"; 94% "of")	Street, service program (rehabilitation program)	100	13.7 (7–16)	All children reported substance use, including: inhalants (glue/solvents) (88%/37%); ETOH (6%); tobacco (75%); marijuana (bango) (24%); unspecified "drug addiction" (40%); heroin (1%); poly-substance use (100%)
Ethiopia (Addis Ababa)	Lalor, 1999 [60]	N = 160	Street	NR	NR	Lifetime/weekly/daily use of: ETOH (16.4%/2.4%/1.6%); tobacco (5.5%/1.1%/3.2%); khat (7.3%/4%/4%); benzene (2.5%/1%/2%); other (7.9%/4%/2%)
Kenya (Eldoret)	Ayaya, 2001 [82]	N = 191 (38 "on"; 47 "of"; 56 abandoned and in shelter; 50 schoolchildren with families)	Street Service program (shelter) School	NR	Total sample: 14.03 (5–21)	The rate of substance use for the total sample was 545 per 1,000 children; none of the schoolchildren reported substance use Reported use of: inhalants (glue) (31.2%); ETOH (18.3%); tobacco (37.6%); marijuana (8.3%); cocaine (4.6%)
Nigeria (Ibadan)	Morakinyo, 2003 [32]	N = 180	Street	96.70	14.6 (8–18)	Lifetime/past month use of: any substance (45%/42.2%); inhalants (.6%/0%); ETOH (30.6%/23.9%); kola nut (16.7%/13.9%); tobacco (14.4%/10.0%); marijuana (10.0%/7.8%); stimulants (15.6%/6.1%); hypnotosedatives (3.3%/3.3%); "paw-paw" (1.1%/1.1%) No reported lifetime use of heroin,

Nigeria (Ibadan)	Olley, 2006 [33]	N = 169	Street (snowball sample)	89.3	18.4 (11–24)	<p>cocaine, hallucinogens, or IDU</p> <p>No reported current or lifetime substance use among females</p> <p>51.9% aged 10–13 at initiation of substance use</p> <p>Introduced to substances by friends (39.9%) and family members (33.3%)</p> <p>Time on the street associated with current substance use</p> <p>Lifetime: ETOH abuse (69.0%); tobacco use (50.2%); “other” unspecified drug abuse (14.0%)</p> <p>ETOH, tobacco, and “other” drug dependence associated with older age (19–24 vs. 11–18)</p>
Nigeria (Ibadan)	Owoaje, 2009 [71]	N = 818 (580 “on”, 192 “of”)	Street	68.8	(15–24)	<p>Past month use: ETOH (28.6%); amphetamine-containing drugs (14.9%); marijuana (2.0%); IDU (<2%)</p>
South Africa (Cape Town)	Seager, 2010 [64]	N = 305	Street	93	(12–17)	<p>Lifetime use: any drug (37%)</p> <p>Past 3 months’ use: any drug (37%); glue/thinners/petrol (25.9%); mandrax (4.9%); marijuana (23.3%); heroin (2.6%); crystal methamphetamine (2.6%); ecstasy, (2.0%); “other” (4.6%)</p> <p>ETOH 2+ times per week (3.7%).</p> <p>Drinkers reported 6+ drinks on one occasion: never, 30.9%; less than monthly, 14.5%; monthly, 23.6%; weekly, 23.6%; daily/almost daily, 1.8%</p>
Sudan (Khartoum)	Kudrati, 2008 [30]	N = 432	Street	91.9	<p>Estimated ages: <10, 13%–14% 11–14, 37%–42% 15–18, 47%–48%</p>	<p>Lifetime (male/female) use: glue (70%/69%); ETOH (42%/40%).</p> <p>Past day (male/female) use: glue (63%/68%); ETOH (31%/21%); tobacco (63%/63%)</p>

ECG = electrocardiogram; ETOH = ethanol; IDU = intravenous drug use; STI = sexually transmitted infection.

^a Unless otherwise specified.