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Second-generation surveillance for HIV/AIDS in Pakistan: results from the 4th round of Integrated Behavior and Biological Survey 2011–2012

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Urdu and Arabic Abstract translations

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ABSTRACT

Objectives In an effort to fully analyse and understand the HIV situation and its epidemiology in Pakistan, a bilateral collaboration between the National AIDS Control Program and the Canadian International Development Agency resulted in the establishment of an effective second-generation surveillance (SGS) system for HIV/AIDS between 2004 and 2012 in accordance with the published guidelines. This paper presents findings from the 4th round of SGS.

Methods A mapping exercise was initially conducted for size estimations of the key vulnerable populations: people who inject drugs (PWIDs), male sex workers (MSWs), *hijra* sex workers (HSWs), and female sex workers (FSWs), followed by an Integrated Behavioral and Biological Surveillance in 20 selected cities across Pakistan.

Results The estimated sizes of the four key populations mapped in the 20 cities were 89 178 FSWs, 46 351 PWIDs, 23 317 HSWs and 19 119 MSWs. The HIV sero-prevalence among PWIDs was the highest among all key populations surveyed at 37.8% (CI 37.3 to 38.3) nationally, followed by a prevalence of 7.2% (CI 6.8 to 7.5) among HSWs, 3.1% (CI 2.8 to 3.4) among MSWs and 0.8% (CI 0.4 to 1.0) for FSWs. Various key risk behaviours, that is, sharing of syringes by PWIDs and inconsistent use of condoms by sex workers, were documented.

Conclusions Pakistan's HIV epidemic that once was characterised primarily by transmission among PWIDs is now increasingly characterised by significant sexual transmission, and all types of sex workers (male, *hijra* and female) exhibit epidemiological proportions of infection. There is a need to develop concrete strategic plans for each vulnerable subpopulation, initially focusing prevention resources on those with a higher risk or vulnerability.

INTRODUCTION

In response to the HIV pandemic, more countries are focused on developing systems to collect information about HIV trends to monitor their epidemics and to gather information to improve prevention planning and evaluation.[1 2] While differences in the epidemiology of and responses to HIV epidemics exist between and within countries, most countries in Asia, Europe and the Americas largely focus on people who inject drugs (PWIDs), female sex workers (FSWs), and men who have sex with men to understand their epidemics.[3] Having an accurate picture of the HIV epidemiology and barriers to services is critical for countries to most effectively and efficiently allocate scarce HIV resources.[4] To this end, Pakistan developed a second-generation surveillance (SGS) system to obtain extensive data about the status, changing trends and progress of its HIV epidemic. Unlike conventional surveillance systems, SGS helps identify vulnerability to infection and also ascertains the main determinants of the HIV epidemic. It also provides basic information for focusing and designing interventions, and for monitoring the impact of interventions proposed within the strategic planning process.[5–7]

Between 2004 and 2012, a bilateral collaboration between the National AIDS Control Program and the Canadian International Development Agency resulted in the establishment of an effective national SGS system for HIV/AIDS through the Canada–Pakistan HIV/AIDS Surveillance Project. This was implemented by a consortium of Agriteam Canada Consulting, University of Manitoba, Canada and ProAction: Partners for Community Health Inc, with technical assistance from the Public Health Agency of Canada. This SGS was designed to monitor the HIV epidemic among key populations at high risk, that is, PWIDs, and *hijra*, male and female sex workers (HSWs, MSWs and FSWs, respectively). Since the first pilot SGS was conducted in 2004, Pakistan has conducted four SGS rounds with PWIDs, HSWs, MSWs and FSWs in 8 major cities in 2005–2006, 12 cities in 2006–2007, 9 cities in 2007–2008 and 20 cities in 2011.[8–12] Findings from these surveys revealed changes in the HIV magnitude and trends over time, which helped in developing a comprehensive response to the epidemic.[13–15] The approach proved to be extremely relevant in a concentrated epidemic such as Pakistan's, whereby behavioural information is vital in predicting epidemic transition.

This paper shares the key results of the 4th round of SGS conducted in 20 cities in Pakistan. We also present key experiences and lessons learnt in the development of an effective SGS system, which can be utilised within the Asian, Eastern European and Latin American countries, but more importantly be contextually relevant for the Middle East and North Africa (MENA) region, for the development of a response against HIV/AIDS.

METHODOLOGY

The SGS methodology was divided into two parts: a mapping exercise for size estimation among PWIDs, MSWs, HSWs and FSWs; and Integrated Behavioral and Biological Surveillance (IBBS). Round 4 of the mapping was conducted in 20

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cities (9 in Punjab, 7 in Sind, 2 each in Khyber PukhtoonKhwa and Baluchistan) and round 4 of the IBBS was conducted in all these cities with the exception of Hyderabad, Larkana and Mirpurkhas in Sind. The cities were selected based on population size, reported number of HIV cases and because of their inclusion in the previous rounds for comparison.

Mapping of key populations at a higher risk of HIV

The first step of field activity was mapping of key populations in targeted cities to obtain a better understanding of population sizes and patterns of risk behaviour. Two different approaches were used: geographical and network mapping.[16] The geographical approach involved characterising sex work (MSWs, street and brothel-based FSWs) and injection drug use, and estimating the number of individuals involved in these activities through identifying and characterising locations and spots, that is, 'hot spots' where high-risk activities take place. Each city was divided into smaller data collection units referred to as 'zones', with detailed zonal maps for all cities developed using the geographical information system, based on satellite imagery. The information was collected identifying 'hotspots' and places where high-risk activities take place. Field teams went to all identified hotspots to verify the location, describe the type of spot, and get more specific information on the size of the key population (minimum, maximum and median estimates) by interviewing members of key populations operating through that spot. One key population member was interviewed at each spot who provided information of other key population members at that specific spot. Spots not validated, that is, no peer members were found on at least three successive visits, were dropped from the list, while new spots identified or informed by primary key informants were added to the list.

Network mapping focused on the promoters and mediators of sex work; network operators (pimps for FSWs and 'gurus' for HSWs) and mapped networks within which the target populations operate. Network operators were systematically identified within each zone through a process of 'snowballing', whereby each key informant in the field (pimps and gurus) were asked to identify others that they knew. This process continued until a level of 'saturation' was attained (ie, mostly redundant information was provided from the new contacts about other network operators).

All data were field edited and entered into a specially designed Microsoft Access database. The final stage of information consists of data triangulation and developing a city-wide estimate through combining zonal estimates and removing overlaps. To generate final estimates of each risk population, a cumulative estimate for each zone was initially developed by adding up minimum and maximum estimates for each site and location. These estimates were adjusted for duplication and overlaps and finally all zonal estimates were added up to produce minimum and maximum estimates of the population under study for each city.[12 16]

Integrated Behavioural and Biological Survey

Final mapping estimates were used to design sampling frames from which representative samples of each key population were drawn. Sample sizes were calculated based on an expected change in prevalence of various risk behaviours (condom use in sex workers and needle sharing in PWIDs) by 10% with 95% significance level and 80% power. The sample sizes calculated were: 365 PWIDs, 375 FSWs, 360 MSWs and 356 HSWs for each site. Sampling of each population was conducted based on its dynamics and operative nature. PWIDs and MSWs were recruited through multistage cluster sampling, while HSWs were recruited using information obtained from network mapping of '*gurus*' to gather information on both '*dera*-based' and 'home-based' *hijras* categorised by the way in which they operate and where they dwell. *Dera* is a house operated under the supervision of a *guru* (teacher), where a number of his adopted *chela's* (student *hijra*) live. Among FSWs, brothel-based FSWs were selected through systematic random sampling, while street-based FSWs (who solicit clients in public places through cruising sites or pick-up points) were selected through multistage cluster sampling. *Kothi-khana* (FSWs who live in small premises/houses rented by a network operator and entertain clients) and home-based FSWs (sex workers who live at home with their families and are involved in covert sexual activities through contacts with network operators) were recruited through a similar sampling technique used for HSWs after applying sampling weights obtained from the mapping study. Behavioural data were collected by trained interviewers using structured questionnaires predesigned in English and subsequently translated into the local language. Informed consent was obtained prior to conducting the interviews. Dried blood spot (DBS) specimens were collected by trained interviewers. [17 18] All DBS specimens were first screened by ELISA. Positive results were subsequently confirmed in duplicate by the Vironostika HIV Uni-Form II EIA and indeterminate specimens were confirmed by Western blot.

Data entry was conducted by trained staff supervised by a data manager. Laboratory results were linked to the corresponding interview data by the encrypted unique identifier and unique study site code; no personal information accompanied these records. The final dataset was converted to SPSS files (version 19.0) for analysis. The study protocol was reviewed and approved by the Ethical Review Board of the Public Health Agency of Canada, and in Pakistan by HOPE International's Ethical Review Board. HSWs/MSWs received a compensation of Rs 300 ($4 per person), PWIDs received Rs 250 ($3 per person) and FSWs received Rs 500 ($6 per person) for their time.

RESULTS

Operational dynamics and size estimations

The estimated population sizes in the 20 mapped cities were 89 178 FSWs, 46 351 PWIDs, 23 317 HSWs and 19 119 MSWs, as illustrated in table 1. The largest FSW typology were home-based sex workers (average 41 313), followed by *kothi-khana*-based sex workers (average 20 926), street-based

Table 1 Estimates of key populations derived from mapping of 20 cities in Pakistan, 2011–2012

Key population type	Average (n)	%
Female sex workers (FSWs)	89178 (78778–99592)	
Brothel based	1268	1
Home based	41313(3.5/NWO)	46
Street based	18275(4.6 per spot)	21
Kothi khana based	20926 (1.7/NWO)	24
Cell phone based	4714	5
Other	2682	3
People who inject drugs	46351 (39793–52896)	
Hijra sex workers	23317 (20050–26634)	
Dera based	16433	70.5
Home based	6884	29.5
Male sex workers	19119 (16010–22220)	

NWO, Net Work Operators.

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sex workers (average 18 275), cell phone based sex workers (average 4714), and finally, brothel-based sex workers (average 1268). An average of 3.5 home-based FSWs in comparison to 1.7 *kothi-khana*-based FSWs were reported to be working with a network operator, while an average of 4.6 FSWs were attached to each street spot.

The second largest key population was PWIDs (average 46 351), the majority of which were reported to be injecting on the streets. HSWs were the third largest key population mapped, among which two major subtypes were identified: home based (average 6884) and *dera* based (average 16 433).

Sociodemographic characteristics

The key sociodemographic characteristics of PWIDs, MSWs, HSWs and FSWs recruited for this behavioural and biological assessment are shown in table 2. PWIDs were the oldest of the four groups, with an average age of 30.4 years (SD ±8), while MSWs were the youngest (average age 21.4 years (SD ±5.0)). Unexpectedly, 42% of MSWs were between the ages of 13 and 19 years, while another 36% were between the ages of 20 and 25 years. Of all the key populations studied, FSWs represented the largest proportion who reported to be currently married (63.7%), while only 13% of HSWs and 15% of MSWs reported being currently married. Nearly half of PWIDs reported living on the streets. Most HSWs reported living in *deras* (70.6%), with their peer group members. A high proportion of FSWs and HSWs were not natives of the city where they were recruited, demonstrating a high level of mobility.

Table 3 shows the various HIV risk behaviours and injecting and sexual practices.

Drug-injecting practices

PWIDs reported first injecting drugs at an average age of 25.6 years and reported injecting for approximately 4.9 years on average. A total of 39.2% of PWIDs reported sharing a needle/syringe during their last injection, while 44.3% used the services/help of a professional injector during their last injection.

Sexual behaviour

MSWs and HSWs reported initiating sex work at an average age of 16 years, whereas FSWs reported initiating sex work at an average age of 21.9 years. Duration of being involved in sex work was the highest for HSWs (average 11.6 years), followed by MSWs (average 5.6 years) and FSWs (average 5.3 years). The main source of soliciting clients for the various sex workers also varied. The dependence of FSWs on pimps and network operators for soliciting clients was highest (43.1%) compared with other sex worker groups, namely MSWs and HSWs. MSWs predominantly solicited clients directly through public places (57.6%) and had little or no dependency on any network operators (0.8%). A large reliance on cell phones to solicit and set meeting times was reported in all three sex worker groups, with the highest proportion being reported among HSWs (44.4%), followed by MSWs (30.4%) and then FSWs (24.7%). Only 10.7% of HSWs showed a dependence on a *guru* for client solicitation. FSWs reported that on days that they worked, they entertained an average of 3.0 (SD ±2.3) clients per day, while HSWs and MSWs reported having an average of 2.2 (SD ±1.6) and 2.3 (SD ±1.4) clients per day, respectively. On average, FSWs reported having 50.0 (SD ±37.2) clients in a month, while HSWs and MSWs reported having an average of 40.0 (SD ±33.0) and 40.4 (SD ±32.1) clients per month, respectively. One-third of FSWs interviewed reported using condoms consistently with paid clients, while only 13% of MSWs and 23.6% of HSWs reported consistent condom use. Condom use was lower when the sexual partner was reported to be a non-paying regular partner. Lubricant use during last anal sex was higher than condom use among HSWs and MSWs at 66.5% and 71.1%, respectively.

Overlapping among these populations was seen as 13.9% of PWIDs and 39.5% of MSWs paid a FSW for sex in the past month, and 7.1% of PWIDs had sex with either an MSW or an HSW. Furthermore, 10.7% of FSWs and 10.1% of HSWs and MSWs reported having had sex with a PWID in the past 6 months. In addition, 4.9% FSWs, 3.4% of HSWs and 1.7% of MSWs reported injecting drugs in the past 6 months.

HIV sero-prevalence

Table 4 shows the weighted HIV sero-prevalence among all key populations surveyed. The prevalence among PWIDs was the highest among all key populations surveyed at 37.8% nationally, followed by a national sero-prevalence of 7.2% among HSWs, 3.1% among MSWs and 0.8% nationally for FSWs.

Table 2 Sociodemographic characteristics of people who inject drugs (PWIDs), male sex workers (MSWs), *hijra* sex workers (HSWs) and female sex workers (FSWs) in Pakistan

Sociodemographic characteristics	PWIDs N=4956 (±SD)	MSWsN=3674 (±SD)	HSWs N=3714 (±SD)	FSWs N=4298 (±SD)
Average age	30.4±8	21.4±5.0	27.6 ± 6.2	26.9±6.4
Currently married (%)	33.8	15.5	13	63.7
Illiterate (%)	57.1	40.0	42.4	50.6
Current living at (%)				
Home	45.4	80.9	29.1	84.3
Street	47.6	–	–	–
Dera	–	3.5	70.6	–
Alone	–	5.1	–	5.8
Median income, PKR ($)	6000 (68)	6000 (69)*	7000 (77)*	15000* (165)
Migration from other cities (%)				
Permanently staying	89.5	60.3	59.3	55.6
Visiting	10.5	39.7	40.7	44.4

Integrated Behavioural and Biological Surveillance, 2011–2012.
*Income from sex work only.

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Table 3 Sexual behaviours and practices of people who inject drugs (PWIDs), male sex workers (MSWs), *hijra* sex workers (HSWs) and female sex workers (FSWs) in Pakistan

Practice/behaviour	PWIDs (±SD)	MSWs (±SD)	HSWs (±SD)	FSWs (±SD)
Age of initiating (sex work; injecting) (avg±SD)	25.6±8.2	15.8±3.1	16±3.6	21.9±5.6
Duration (in sex work; as PWIDs)	4.9±4.4	5.6±4.3	11.6±5.9	5.3±6.6
Sharing needle/syringe at last injection	39.2			
Injected by professional injector at last injection	44.3			
Main source of clients				
Pimp/guru/madam		0.8	10.7	43.1
Directly from public places		57.6	38.0	22.3
Cell phone contact		30.4	44.4	24.7
Client referral		10.8	6.5	9.6
Other sources		0.3	0.3	
Number of clients				
Avg clients/day±SD		2.3±1.4	2.2±1.6	3.0±2.3
Avg clients in past month±SD		40.4±32.1	40.0±33.0	50.0±37.2
Consistent condom use with				
Paid clients		13.0	23.6	33.2
Non-paid sex partner		10.9	18.1	20.6
Lubricant use during last anal sex	40.1	71.1	66.5	
Paid a FSW in the past month	13.9	39.5		
Had sex with a MSW/HSW	7.1			
Injected drugs in the past 6 months	100	1.7	3.4	4.9
Had sex with PWIDs in past 6 months		10.1	10.1	10.8

Integrated Behavioural and Biological Surveillance, 2011–2012.

DISCUSSION

Since it was first detected in 1986, the HIV/AIDS epidemic in Pakistan has progressed from a low-level epidemic to a concentrated epidemic, with measurable prevalence rates among all prominent risk behaviour groups. Pakistan's HIV epidemic, once concentrated primarily among PWIDs, is now increasingly characterised by significant sexual transmission (ie, MSWs, HSWs and FSWs,).[19] While many countries in the MENA region are still trying to identify and describe their key populations, Pakistan has already established a knowledge base to characterise, operationalise and estimate the sizes of their key populations.[16]

This study found a large population of PWIDs in Pakistan, much higher than that found in previous studies of PWIDs.[9 10]

Table 4 HIV prevalence among people who inject drug (PWIDs), male sex workers (MSWs), *hijra* sex workers (HSWs) and female sex workers (FSWs) in Pakistan

	HIV prevalence, % (95% CI)			
City	PWIDs	MSWs	HSWs	FSWs
Overall	37.8 (37.3 to 38.3)	3.1 (2.8 to 3.4)	7.2 (6.8 to 7.5)	0.8 (0.4 to 1.0)
DG Khan	49.6 (45.6 to 53.6)	NA	NA	0.5 (0.1 to 1.9)
Faisalabad	52.5 (51.4 to 53.6)	0.3 (0.07 to 1.5)	3.9 (2.3 to 6.5)	0
Gujrat	46.2 (41.5 to 50.9)	NA	NA	NA
Lahore	30.8 (29.3 to 32.3)	1.7 (0.8 to 3.6)	5.2 (3.5 to 8.2)	0.5 (0.1 to 1.9)
Multan	25.0 (22.2 to 28.0)	1.9 (0.96 to 4.0)	1.1(0.5 to 2.9)	0.3 (0.05 to 1.5)
Pakpattan	3.3 (2.1 to 5.3)	NA	NA	NA
Rahim Yar Khan	14.9 (11.8 to 18.6)	NA	NA	NA
Sargodha	40.6 (38.2 to 43.0)	0	3.7 (2.2 to 6.2)	0.3 (0.05 to 1.6)
Rawalpindi	NA	0.6 (0.2 to 2.0)	4.2 (2.6 to 6.9)	0
Dadu	16.0 (13.0 to 19.6)	NA	NA	NA
Karachi	42.2 (41.4 to 42.9)	5.9 (3.9 to 8.9)	12.0 (9.3 to 16.1)	1.9 (0.9 to 3.8)
Larkana	18.6 (16.4 to 21.0)	3.1 (1.7 to 5.4)	14.9 (11.6 to 19.1)	1.9 (0.9 to 3.8)
Sukkur	19.2 (17.5 to 21.0)	2.2 (1.2 to 4.3)	6.2 (4.1 to 9.2)	0.8 (0.3 to 2.3)
Haripur	7.9 (5.8 to 10.3)	0	0	0.9 (0.3 to 3.4)
Peshawar	20.0 (18.3 to 21.9)	0	1.1 (0.5 to 2.9)	0
Quetta	7.1 (5.3 to 9.3)	1.1 (0.5 to 2.8)	2.7(1.4 to 5.1)	0
Turbat	21.4 (17.8 to 25.5)	NA	NA	NA

Integrated Behavioural and Biological Surveillance, 2011–2012.

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There is an apparent increasing shift from inhalation to injection drug use across the country, which has led to these high numbers.[6] The results of this study also highlight the presence of a well developed sex work industry, in all large and small-sized cities in Pakistan where mapping data were collected. We saw evidence of diminishing street-based sex work and the presence of much larger hidden networks managed by pimps and network operators. Moreover, improvements in communication technology, especially the availability of cell phones, have revolutionised the sex industry in Pakistan. Sex workers now interact with clients via cell phones, without having to stand on streets to find clients, or involving network operators.[9 10 16]

Serial prevalence data obtained from the SGS rounds in Pakistan provide an understanding of the progression of HIV in this country.[8–11] The sero-prevalence among PWIDs has shown a consistent increase across all rounds, which increased from 10.8% in 2005 to 37.8% in 2011. Although the analysis conducted in 2011 produced a weighted HIV prevalence, and the numbers cannot be strictly compared with the previous rounds (as previous analyses were not weighted), it does show an upward and a rapid progression of HIV prevalence in this group. Likewise among HSWs, the gradual and consistent increase in HIV prevalence from 0.8% in 2005 to 7.2% in 2011 indicates that the epidemic is now well established in this group. A similar trend is noted in MSWs, which now stands at an overall HIV sero-prevalence of 3.1%. While only one FSW tested positive for HIV from a sample of 12 cities in 2007, 25 FSWs tested positive for HIV from the same number of cities in this round.[10] Even with lower prevalence rates, the sheer size of this population and its close links with the general population warrants careful monitoring of this population to ensure successful prevention of HIV transmission.

While looking at HIV risk behaviours, multiple practices known to put PWIDs at a higher risk for acquiring infection were found. These mainly included sharing of needles and using services of professional injectors/street doctors (PWIDs themselves, who assist other PWIDs in injecting). In comparison to previous studies, the number of PWIDs using the service of professional injectors has increased significantly over the years.[9 10] Since these professional injectors use the same injecting equipment on multiple PWIDs, this explains to some extent why the HIV epidemic among PWIDs has exploded in various cities surveyed in this round.

Sex workers reported to engage in a combination of HIV risk practices such as having a high number of sex partners and engaging in unprotected sex with paying and non-paying partners. Consistent condom use which is the key to preventing sexual transmission of HIV infection showed significantly low levels, most notably in MSWs and HSWs. Given the potential for the spread of HIV infection through unprotected anal sex, the progression of HIV in these populations and their possible role in bridging sexual networks to PWIDs is a cause for serious concern. Service utilisation data from Pakistan continues to show low levels of awareness about, and participation in, prevention programmes. This indicates the need to scale up interventions and bring substantial improvement in coverage to reach a larger proportion of these key populations.

A few limitations of this study should be acknowledged. Regarding results of the mapping, there is a possibility of missing some spots and either overestimating or underestimating some key population groups depending on the extent of their invisibility. Thus, sex workers operating through network operators or cell phones are likely to be under-represented. Moreover, since the methodology relies on numeric estimates rather than a count of population members at a spot, the possibility exists that some key informants may still overestimate or underestimate the numbers, depending on their numeric orientation and competence. Finally since the behavioural assessment asked for a few exposures from the past, there might be issues of recall, especially with PWIDs. Despite these limitations, this research provided appropriate and vital information about the nature and risk practices of the key populations, their transmission dynamics, their networks and sub-typologies.[20 21] These details are imperative in programme design, ensuring a service delivery package that optimises coverage and penetrates deeply into the population networks is feasible. Pakistan is fortunate in terms of its wealth of scientific data that are to be used to better set priorities and define responses.[22] There is a need to develop concrete strategic plans for each vulnerable sub-population, initially by focusing prevention resources on those with higher risk or vulnerability, and subsequently, by expanding these prevention efforts outward to reach those with lower risk of HIV.

Key messages

- Pakistan's HIV epidemic that once was characterised primarily by transmission among people who inject drugs (PWIDs) is now increasingly characterised by significant sexual transmission.
- Despite various preventive efforts, PWIDs continue sharing syringes and unprotected sex is frequent among sex workers, most notably in male sex workers and *hijra* sex workers.
- The future of the HIV epidemic in Pakistan will depend on the scope and effectiveness of HIV prevention programmes for PWIDs, their sexual partners, sex workers and their clients.

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Contributors FE was the PI of the study, led the field data collection, analysis and interpretation of results, and was the lead on the development of this manuscript. MS wrote sections of this manuscript and also conducted a few analyses. NA contributed to the writing of the manuscript and provided feedback on the various analyses. SA wrote sections of this manuscript, conducted a literature search and finalised the references. TER was the lead epidemiologist and data analyst and conducted the data analysis.

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