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Acceptability of Global Positioning System technology to survey injecting drug users' movements and social interactions: a pilot study from San Francisco, USA

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Abstract

Background—Despite potential applications for improving health services using GPS technology, little is known about ethical concerns, acceptability, and logistical barriers for their use, particularly among marginalized groups.

Objectives—We garnered the insights of people who inject drug (PWID) in San Francisco on these topics.

Methods—PWID were enrolled through street-outreach (n=20) and an ongoing study (n=4) for 4 focus group discussions. Participants also completed a self-administered questionnaire on demographic characteristics and their numbers and types of interactions with other PWID.

Results—Median age was 30.5 years, majorities were male (83.3%) and white (68.2%). Most interacted with other PWID for eating meals and purchasing drugs over the last week; fewer reported interactions such as sexual contact, drug treatment, or work. Participants identified several concerns about carrying GPS devices, including what authorities might do with the data, that other PWID and dealers may suspect them as informants, and adherence to carrying and use. Most felt concerns were surmountable with detailed informed consent on the purpose of the study and practical ways to carry, charge, and hide devices.

Conclusions—PWID felt data collection on their movements and social interactions with other PWID using GPS can be acceptable with addressing specific concerns. The technology is now in hand to greatly expand the ability to monitor health conditions with respect to the environment and improve the location of prevention, care, and treatment facilities to serve hard to reach, mobile, and hidden populations.

Keywords

GPS Technology; Data Collection; Acceptability; People Who Inject Drugs

Introduction

People who inject drugs (PWID) are disproportionately affected by HIV, HCV, other infectious and non-infectious diseases, mental health disorders, suicide, violence, and in need of harm reduction programs, substance use treatment, and social welfare services [1]. They also can be difficult to access due to high mobility, homelessness, the need to remain hidden from law enforcement, and stigmatization. Given these challenges, detailed, accurate data on the movements of PWID and their points of interaction with each other could greatly enhance our ability to deliver outreach prevention interventions, guide peer interventions, and target structural interventions to promote health and reduce harm [2].

To date, data on the places where PWID gather has been collected through key informant interviews and observational mapping [3]. Both approaches are time-consuming and subject to recall and social desirability response bias. Another line of research has focused on locating preventive services, such as syringe exchange, and the impact of distance on their use and risky behavior [4–7].

The technology is now available to collect large amounts of detailed data on movements and interactions of populations of interest. Global Positioning Systems (GPS) and Radio Frequency Identification (RFID) technologies have reached the point of affordability and size to collect large amounts of geolocation data that can be also be synchronized temporally and with points of interactions between those carrying the devices. Such data are less vulnerable to recall bias and social desirability bias – providing that persons are willing and able to carry and use them.

Despite the potential applications for improving health services using GPS technology, little is known about ethical concerns, acceptability, and logistical barriers for their use. Such issues may be particularly acute among stigmatized and marginalized populations such as PWID. We therefore conducted a mixed-methods study examining the acceptability of GPS technology to gather detailed, real-time data on temporal movements and network interactions of PWID in San Francisco. The immediate objectives were to assess whether future studies can include carrying such devices and to identify what measures can be taken to improve acceptability and minimize potential harm.

Methods

Overall study design and objectives

To assess the range of issues around the use of GPS devices to collect data, we used a mixed-methods approach that including consultation with members of one of the UCSF Human Research Protection Program Institutional Review Boards (IRB), and with PWID. Focus group discussions (FGD) were held with PWID and a short quantitative survey was administered that queried participants regarding recent interactions with other PWID. The objectives were to progressively answer questions on what ethical pre-conditions need to be met prior to use of GPS devices for research and what specific concerns do PWID have that need to be met before agreeing to use GPS devices to collect continuous data on their movements and interactions with other PWID.

Ethical consultation

Recognizing the high sensitivity in carrying devices that can geographically locate individual PWID and their interactions with other PWID, we first conducted consultations with UCSF IRB members. The consultation was held with four members of the IRB, who had experience conducting and reviewing studies with marginalized populations, including PWID. Input was sought prior to finalizing study goals and procedures, including survey items, FGD questions and guides, and consent documents. From these discussions, we identified several themes to guide our qualitative and quantitative research, including concerns about confidentiality and privacy, data safety and security, potential misuse of data, reactions of other PWID towards those participating in the study, and about the responsibility of study participants regarding the GPS devices. The consultations also helped craft an informed consent process and content specific to these issues. Elements emphasized were that no personal identification be collected in any part of the study, including verbal consent, that the GPS devices not have identifying information, provision of more detailed description of how the data will be encrypted and password protected, and specifying who would have access to the data and, importantly, who will not; and obtaining a Certificate of Confidentiality from the National Institutes of Health. Also deemed necessary was to explicitly articulate that there were no consequences to the participant if they lost the GPS device or exited the study at any time. Following these guidelines, approval of the study protocol and procedures was obtained from the Committee of Human on Human Research, University of California, San Francisco (IRB 13-11119).

Study participants, sampling, and recruitment

To focus on movements and interactions with other PWID, we sought to include participants from a compact, contiguous area in inner-city San Francisco known to have a high concentration of PWID, namely parts of the Tenderloin, Civic Center, and South of Market neighborhoods [8]. Eligibility criteria were: injecting drugs in the past month, age 18 years or older, currently living in San Francisco, and willing and able to provide informed consent.

Two purposive sampling approaches were used. The first one was an adapted targeted sampling [9]. In brief, outreach workers providing services to or conducting research with PWID invited prospective study participants from the streets in the neighborhoods of

interest by going to where they know PWID congregate. The outreach workers intercepted persons and presented them with recruitment cards containing unique study codes, the study site location, and hours of operation, with brief mention of the study including potential incentives. The cards were redeemed at a scheduled visit time where eligibility was assessed and FGD scheduled. In addition, peer-recruitment coupons were distributed with the incentive of \$5 for each eligible PWID recruited. Twenty seven were approached using these methods; of these, 20 participated.

The second sampling source was from an on-going longitudinal study called UFO. UFO participants and recruitment methods have been described in detail previously [10]. For our study, we invited 12 PWID from UFO to participate in the FGD, of whom 4 attended.

Using these two methods, we attempted to meet *a priori* targets of 20 men and 10 women (including transmen and transwomen), with ethnic diversity to include Asian, Black, Pacific Islander, Latino, Native American, and White PWID.

Focus group discussions

A total of four FGD were conducted between December, 2013 and January, 2014. Each included a facilitator and co-facilitator, both experienced in qualitative research. A discussion guide was developed in advance and used in each group (Appendix 1). The guide prompted facilitators to inquire about participants' current knowledge and opinions of GPS and RFID, risks, concerns, and problems with carrying and using the device, including how to hide them and charge the batteries. Discussions were audio recorded. Informed consent was given by all participants prior to the beginning of each focus group. Upon conclusion, participants received a small stipend (\$25) for participation and completing the self-administered questionnaire.

Self-administered questionnaire

Self-reported demographic characteristics, frequency of injection, HIV and HCV infection status, and interactions with other PWID were collected using a paper-based, self-administered questionnaire. The level and type of interactions were recorded as the number and type of events in the preceding week with other PWID. The exercise was modified by narrowing the focus to within the two days before the interview, including the day prior to the interview, counting types of events, and estimating the proportion that occurred with other PWID. Types of events included typical social interactions (e.g., eating), drug-related events (e.g., injecting, buying drugs), or use of services together (e.g., needle exchange). The questionnaire was pilot tested with five PWID to ensure comprehensibility, and modified accordingly for clarity. Participants were given brief instructions with examples on how to fill the questionnaire on their own and trained staff were available throughout the process to answer any questions.

Analyses

Recorded FGD were transcribed. After each FGD, each facilitator independently reviewed the transcriptions, noting common themes and ideas, and reached consensus on a final summary of findings to guide the analysis. The questionnaire analysis centered on three

quantitative outcome variables: the number of other PWID with whom the participant interacted in the week before the interview, in the two days preceding, and the one day preceding. Descriptive statistics, including means and standard deviation (SD) were calculated for normally distributed continuous data; medians and interquartile range (IQR) for variables with skewed distributions. Analysis was done using STATA v.12.

Results

A total of 26 participants were interviewed. We did not achieve the entire recruitment goal (see Methods). Data from two participants were discarded as unreliable after checking the internal consistency of answers to different questions, resulting in a final sample size of 24. On average, one woman and five men participated in each of the four FGD. Median age was 30.5 years (IQR 26.5–44.5) (Table 1). A majority (83%) was recruited by street-based outreach. The majority (68.2%) was also White. Participants reported injecting an average of 3.7 times per day during the week prior to the interview. Almost one-third (29.2%) self-reported being HCV infected; 8.3% reported their HIV status as positive.

Table 2 presents the number and context of other PWID with whom study participants interacted in the week prior to the survey. Having sex, attending drug treatment, and work were infrequent events, while injecting, eating meals, getting clean needles, and purchasing drugs with other PWID were common. Narrowing the focus to within one or two days before the interview (Table 3), similarly, very few participants reported sexual contact, attending drug treatment, or work. Participants reported a median of 2 instances of eating a meal, 2.5 instances of drug injection, and 2 instances of purchasing drugs either one or two days before the interview. Although few, 7 out of 24, reported being sexually active, most of their sexual events were with another PWID.

Following the FGD guide (Appendix 1), we solicited participants' knowledge and opinions of GPS and RFID, perceived risks, concerns, and opinions about carrying the device and overall logistics, such as how to carry the device and recharging. Table 4 describes barriers and facilitators to carrying and using the GPS device as reported by participants. Overall, participants identified several concerns regarding carrying the device, including privacy and safety issues, reporting the exact time and place of where they inject (i.e., by pressing a button programmed on the device), or when with other injectors (i.e., who also carry a GPS device with the RFID technology). Below, we present further discussion and context for several concerns voiced.

Confidentiality, use of data, safety

A few participants were concerned about the police or other government agencies actively monitoring data collected from the devices. However, many others felt the police already had information on where they buy and sell drugs and the GPS data would provide only minimal additional information.

“In my opinion, the government, any agency that’s a branch of the government, isn’t going to learn anything new about us while we’re carrying these than they already know right now.” –Barry FGD3

“The notion that cops would use this information is ludicrous, because the effort involved to get it when they can get the exact same data from the number of arrests on the street. I mean, they drive around the streets 24/7, they know where everyone is, what they’re doing, they don’t need the hassle of getting this data, and they’ve got better things to worry about.” –Joseph, FGD3

A few participants cited concerns these data might be used to relocate vulnerable populations or provide information to authorities:

“...things are started with vulnerable populations like homeless or IV drug users, and then they’re moved into, like kids, let’s get GPS’s on kids and then it moves into the whole society and then soon everybody’s gonna have GPS.” –Susan, FGD2

The majority of participants felt those using methamphetamine would be too paranoid to carry the device. Some felt those with a criminal record or excessive warrants may opt not to participate.

With respect to personal safety, some participants felt they might be labeled a police informant if dealers found out about the device, posing substantial risk to them. Discussions on the topic evolved into the best approaches for handling such situations. Some said they would be up front with their dealer on the purpose of the device; others responded it would be simple enough to conceal it:

“This [device] is not a flag. Put it in your sock or something.” –Paul FGD4.

“I would probably put my bag outside the building, and be up front with my dealer about it being a study. He would be OK with it.” –Sleepy, FGD4.

Most felt the circumstances, including relationship with their dealer, would determine the best method.

Receiving a monetary incentive was a key motivation for carrying the device, while some participants also cited altruistic reasons. A common agreement was to clearly define how the data are used and whom the study benefits as essential for larger group buy-in:

“Tell them how it would make their lives better and easier and safer, because right now it just seems like someone’s tracking me. Instead say we’re using the data to tell us where the best places for services would be, it would help people who are more ethically averse to this. Once I realized that it was benefitting people, I’m all for that.” –Joseph, FGD3

Logistical considerations

FGD participants were informed that the device would need to be charged approximately every two days. Despite many participants reported being homeless, they were able to identify several venues throughout San Francisco where they could charge the device:

“People can find ways to charge it. I don’t think that’s going to be a big problem.” –Susan, FGD2

While access to charging was not identified as an issue, some expressed concern that they may forget to charge the device. Other logistical issues raised included the potential for losing the device, with emphasis around the time they are preparing to inject drugs, handling theft, or the police taking the device. Some also felt methamphetamine users may attempt to take the device apart due to paranoia.

“A lot of meth users, sometimes they develop psychosis that could really mess with them. Suddenly that thing starts talking to them.”-Richard, FGD1

Since the GPS devices themselves do not report the type of event the person is involved in, we explored the acceptability of participants in pressing a button pre-programmed to report injection time and place. Opinions among participants varied. Some thought it would be personally interesting and useful to be able to see a graph of their own injecting frequency. Others had concerns about remembering to do it all the time. After all the discussions, almost all acknowledged no real barriers to doing so, but the feasibility of it remains unclear. Participants were then shown a button on the device which read “SOS” which could be programmed to record injection. Most people felt they would remember to push the button, but only if it was done right before injecting. One participant joked about prioritizing the SOS button while preparing her drugs:

“Your nose is running, you’re sneezing... you’re like, ‘oh my god, let me put this aside for a minute and press my button.”-Betty, FGD2

In the company of others, a few said they would feel uncomfortable having the button, with one expressing acute safety concerns:

“You will become shark bait if they [dealer] find the device in the pocket with an SOS button.”-John FGD4

Despite this, most felt they could employ methods to discreetly push the button without others noticing. A few expressed concerns the SOS button might bring the police.

“75% of the people in this study are showing up at this one corner every day. We don’t care what they’re doing, but who’s on the corner?” -Susan, FGD2

However, most agreed concerns about the police showing up would be extinguished after a week or so once they realize there was no relationship between the button and a police response

Use of RFID

Potential use of radio-frequency identification (RFID) in future studies was raised by the FGD facilitators. After a brief introduction of RFID and the use of it for the study, most felt it was acceptable. A few participants stated they were uncomfortable with the technology, however.

“Just because you have the technology doesn’t mean you should use it. I think it takes a wise person to say I know that this technology which could be used for good could also be used for bad, so I’m not going to do it.”-Susan, FGD2

A few others initially expressed concern the precision of tracking users would be improved to the extent of pinpointing exact locations of drug sale/use, but later dismissed these concerns feeling it was not robust enough to locate them.

“A block of accuracy that could be like any of the other 50 junkies on the block other than you if the cops are coming after you.”—Kevin, FGD3

Discussion

Overall, the use of GPS technology for continuous tracking of movements, place of injections, and interactions with other injectors raised several serious but ultimately addressable concerns for PWID in San Francisco. Our study participants identified several concerns with privacy, consequences of carrying the devices from other PWID, challenges with adherence, and potential safety issues. Throughout the group discussions, concerns abated with suggestions to address these issues. Several participants reevaluated their initial opinion and there was a general expression of more interest in the technology and its potential health uses as the FGD progressed.

We also found through the questionnaires of self-reported events and type of people with whom the participants interacted that PWID are socially active, meet other injectors frequently on daily basis, particularly for drug-related behavior, but also for use of preventive services and other more typical activities. Such findings have been noted for other PWID network studies in the US [11, 12] and internationally [13, 14]. Together, data of spatial movement and social interactions, if collected accurately and timely, can be used to identify high-risk socio-spatial networks and facilitate of the planning of HIV-HCV prevention intervention services [14].

GPS technology has become relatively inexpensive and improved with the convergence of satellite and digital cellular data networks, longer battery life, and conveniently small size. Current GPS technology is able to geolocate, collect, and record time-linked data for research on biological, behavioral, and structural interventions for populations disproportionately affected by multiple health outcomes. Our findings are particularly applicable to populations marginalized from society due to poverty, mental health issues, illegal behavior, mobility, and social isolation. Data on spatial and temporal movements and type of social interactions, in addition to individual characteristics, has potential to identify high-risk socio-spatial networks which in may facilitate better targeting for programs such as HIV/HCV harm reduction services [14] including syringe supply programs [6] and Narcan-based overdose prevention. Other potential health interventions include having a built-in heart rate monitor as objective proxy measure of potential over-dose times and places, and having a specified button to report emergency situations, including overdose [15]. We also can monitor the access and use of existing services by mapping the current locations and tracking the movements of the target population being reached. Such data are difficult to collect using routine approaches. GPS technology therefore has great potential to improve access to health care, particularly for underserved marginalized populations.

The ability to use these data to better plan programs was recognized as a major benefit by the majority of our study participants. At the beginning of each FGD, participants would ask

the study team “why does tracking individuals who inject drugs matter?” Addressing such questions with examples on finding the best way to locate the services such as needle exchange programs [6], made almost all the study participants comfortable with the use of the tracking devices.

Concerns about privacy and data use dominated each FGD; but each also for each, information provided during the informed consent process explaining the ways we would protect their individual data enhanced the comfort level of the study participants. We also discussed further steps, such as Certificate of Confidentiality, to protect data from forced disclosure. All of these processes, which should be clarified as part of a comprehensive informed consent process, greatly contributed to allay concerns by discussants about GPS tracking. A similar experience has been reported by Zenk *et al* in their study among urban adults in Michigan [16]. Of note, Zenk *et al* also reported that older people (>64 years), African Americans, and people with higher socio-economic status have a lower comfort level with their movement being tracked [16]. In our relatively small pilot study of PWID, we were unable to measure such differences.

In discussions on using RFID technology to measure social interactions between PWID carrying the devices few participants had initial concerns. Further discussion narrowed the chief concern as being tracked by police to dealers and other uses as such technology operates on radio frequency signals. RFID technology has been explored among students and conference attendees and found feasible and accurate way to measure social interactions [17]. Debates on the topic have in fact led to RFID privacy guidelines [18]. Nonetheless, the technology has not yet piloted among PWID in outdoor settings in the scale of a city. This area needs to be systematically explored, hopefully expanding the guidelines for RFID use in research and program planning and evaluation.

Our study has limitations. We recognize the sample size was small and not necessarily representative of all PWID in San Francisco. However, as the overall purpose of this study was to explore the range of issues in acceptability of GPS technology and to inform future larger studies which may employ such devices to PWID to record events and movement, our goal was not to reach a large, statistical sample. The openness and candor with which participants shared and discussed the issues about the feasibility of research with the devices provided important insight for next steps in assessing the utility of this technology for health related research. We also recognize the high potential for social desirability in concurring with the use of the GPS devices. There may also be a discrepancy in minimizing concerns and challenges to use with actually adhering to their use in the field.

GPS technology has great potential to facilitate more comprehensive and accurate measurement of spatial movements and social interaction of individuals. As such, it also has the potential to be a “game changer” regarding how data are collected and used, or possibly misused. In our study, we found that the use of GPS to collect such data can be an acceptable method even for marginalized populations who often seek to avoid detection if their concerns over the use of such data are met. Further research is needed to examine whether such technology is feasible in practice, the degree of adherence, interference with

daily routine, how such data are analyzed, and most importantly if such data have a beneficial effect on health and welfare of the populations from whom they are collected.

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Appendix 1 - FOCUS GROUP DISCUSSION GUIDE

Copies of informed consent forms should be provided to each participant and read aloud for the benefit of those who cannot read. Participants should be provided an opportunity to ask any questions. Verbal agreement should be taped.

The following is a guide. Try to ask all the questions below in the order given, but it is more important to maintain the flow of discussion. Suggested probes have been included. You should try to encourage participation of all group members in the conversation.

Start by explaining the ground rules as follows:

- Before we start, I would like to remind you that there are no right or wrong answers in this discussion. We are interested in knowing what each of you think, so please feel free to be frank and to share your point of view, regardless of whether you agree or disagree with what you hear. It is very important that we hear all your opinions.
- You probably prefer that your comments not be repeated to people outside of this group. Please treat others in the group as you want to be treated by not telling anyone about what you hear in this discussion today.
- Let's start by going around the circle and having each person introduce themselves. (Members of the research team should also introduce themselves and describe each of their roles.)

Open questions:

1. What do you think about the topic that has brought us here today (using new technology such as GPS and RFID to study individuals' movement and social networks)? (Probe: after the discussion, briefly explain why movement and social networks matter in public health)
2. What do you know about GPS technology? (Probe: after they explain, briefly talk about these new technologies)

3. If you were asked to participate in a study to use GPS/, what kind of concerns you might have? (Probe: Health/Safety? Confidentiality/Privacy? Responsibility for the device? Personal benefits of using the device?)
4. Can you recognize any potential risks of carrying a GPS in your community, family? (Probe: Misuse of data? Police arrest? Interfere with other friends?)
 - What do you think about your friends' reaction if they informed you are carrying GPS devices in a study?
5. What your resistance would be to participate in the study; I mean carry the GPS devices?
6. Which of the above mentioned concerns/risks are crucial and you cannot afford at all?
7. If we address the above concerns/risks, are you willing to use GPS units for a period of a month? (Probe: If the answer is No, ask about the reasons)
8. (Show device to participants). What do you think about carrying around this device?
9. What can be done to make participants wear/carry the GPS devices constantly during the study?
10. This device requires that you charge it about once every 5 days. How do you feel about this? What issues or concerns might come up regarding charging?
11. One thing we are considering adding into the next phase of the study is asking participants to push this SOS button on the device every time they inject drugs. How would you feel about this?
 - a. What potential concerns might you have with this SOS button?
 - b. How would adding the SOS button affect your feeling about participating in the study?
12. In the future, we might decide to upgrade the GPS technology to an even more sophisticated technology called Radio Frequency Identifier (RFID). It would look the same as this GPS, but it would allow us to track interactions between two people wearing the device. For example, if you met up with another participant in the study, the devices would track and record that interaction. How would you feel about participating in a study using the RFI device?
 - a. How would changing the device from GPS to RFID affect your willingness or interest in participating in the study?
 - Let's summarize some of the key points from our discussion. Is there anything else?
 - Do you have any questions?
 - Thank you for taking the time to talk to us!

Table 1

Characteristics of people who inject drugs (PWID) participating in a feasibility and acceptability study of using GPS technology to measure movements and social interaction of PWID, San Francisco, 2013 (n = 24).

Variable	N (%), mean $\pm$ SD, median $\pm$ IQR
Recruited from	
Street outreach	20 (83.3)
Research cohort study	4 (16.7)
Age	
Mean $\pm$ SD	34.1 $\pm$ 10.9
Median $\pm$ IQR	30.5 $\pm$ 18
Sex	
Male	20 (83.3)
Female	4 (16.7)
Transgender	0
Race/ethnicity*	
Asian/Asian-American	0
Black/African-American	2 (9.1)
Filipino/a or Pacific Islander	0
Latino/a, Hispanic, or Latin American	1 (4.5)
Native American	3 (13.6)
White	15 (68.2)
Other	1 (4.6)
Times of injecting drug on a typical day <u>last week</u>	
Mean $\pm$ SD	3.7 $\pm$ 2.1
Median $\pm$ IQR	3.5 $\pm$ 3
Hepatitis C infection status	
Negative	15 (62.5)
Positive	7 (29.2)
Tested but did not get result	1 (4.2)
Never tested	1 (4.2)
Did not want to answer	0
HIV status	
Negative	21 (87.5)
Positive	2 (8.3)
Tested but did not get result	1 (4.2)
Never tested	0
Did not want to answer	0

* Two participants did not provide answers to race/ethnicity questions.

Table 2

Types and frequencies of interactions reported by people who inject drugs (PWID) with other PWID in the last week; San Francisco, 2013 (n = 24).

Type of event	Mean episodes in last week $\pm$ SD	Median episodes in last week $\pm$ IQR
Inject drugs	4.6 $\pm$ 7.1	1 $\pm$ 5
Eat meals	3.5 $\pm$ 4.1	2 $\pm$ 3.5
Attend needle exchange program	3.2 $\pm$ 8.2	1 $\pm$ 3
Leisure activities	2.7 $\pm$ 4.1	1 $\pm$ 3
Purchase drugs	2.0 $\pm$ 1.8	2 $\pm$ 2
Attend drug treatment	1.6 $\pm$ 3.8	0 $\pm$ 0.5
Sleep in same space	0.9 $\pm$ 1.2	1 $\pm$ 1
Work	0.8 $\pm$ 1.6	0 $\pm$ 1
Have sex	0.5 $\pm$ 0.6	0 $\pm$ 1

Table 3

Types and frequencies of interactions reported by people who inject drugs (PWID) with other PWID in the last two days and in the last day; San Francisco, 2013 (n = 24).

Type of event	Two days before interview		One day before interview	
	Median number of events $\pm$ IQR	Events N (% with another PWID)	Median number of events $\pm$ IQR	Events N (% with another PWID)
Inject drugs	2.5 $\pm$ 3.5	20 (68.5)	3 $\pm$ 3.5	21 (67.7)
Eat meals	2 $\pm$ 2	20 (51.7)	2 $\pm$ 2	20 (62.1)
Purchase drugs	2 $\pm$ 3	18 (65.9)	2 $\pm$ 3.5	18 (63.9)
Sleep in same space	1 $\pm$ 0	18 (77.8)	1 $\pm$ 0	18 (85.2)
Leisure activities	0.5 $\pm$ 1.5	12 (79.3)	1 $\pm$ 1.5	14 (86.6)
Attend needle exchange program	0 $\pm$ 1	9 (62.9)	0.5 $\pm$ 1	12 (50.0)
Work	0 $\pm$ 1	8 (68.7)	0 $\pm$ 0	5 (40.0)
Have sex	0 $\pm$ 0	5 (80.0)	0 $\pm$ 0	5 (65.0)
Attend drug treatment	0 $\pm$ 0	2 (50.0)	0 $\pm$ 0	2 (0.0)

Table 4

Facilitators and barriers to carrying and using the GPS device; feasibility and acceptability study of using GPS technology to measure injecting drug users' movement and social interaction, 2013 (n = 24).

	Facilitators	Barriers
Willingness to carry device	<ul style="list-style-type: none"> • Most participants familiar with GPS technology • Most participants not concerned with data being tapped by government or police • Most feel that the police already have information about where they buy and use drugs • Most participants not concerned with breach of confidentiality • Most participants interested in monetary incentive • Some interested in helping improve services for the drug user community 	<ul style="list-style-type: none"> • Some participants feel it's an invasion of privacy • Some participants fear that government could tap data • Some participants worry that data could be used to relocate vulnerable populations • Some participants worry that data could be used to arrest drug dealers or users • Some participants worry that others would think they were a "snitch" if they saw device • Could pose risk if dealer sees device • Methamphetamine users would be paranoid about device • People with warrants or with criminal record might not carry device
Ease of carrying/charging device	<ul style="list-style-type: none"> • Most have easy access to charger • Device easy to conceal in bag or pocket • Most people wouldn't tell anyone they were carrying device 	<ul style="list-style-type: none"> • Device could get stolen • Cops might take device • People might lose device • Methamphetamine users would take device apart • Some might not remember to charge device
SOS button	<ul style="list-style-type: none"> • Most feel they could remember to push button before injecting • Most feel they could press button discreetly without others noticing • Some feel that pressing button would be fun 	<ul style="list-style-type: none"> • Some might forget to push button after injecting • Some would feel uncomfortable pushing the button in front of others • Some would be worried that pushing button would bring police
RFID	<ul style="list-style-type: none"> • Most don't have any objective to RFID • Some like that it provides more accurate data 	<ul style="list-style-type: none"> • Some not comfortable with this technology