



Short report

Social and structural aspects of the overdose risk environment in St. Petersburg, Russia

Traci C. Green^{a,*}, Laretta E. Grau^a, Ksenia N. Blinnikova^b, Mikhail Torban^c, Evgeny Krupitsky^c, Ruslan Ilyuk^c, Andrei Kozlov^b, Robert Heimer^a^a Department of Epidemiology and Public Health, Yale School of Medicine, PO Box 208034, 60 College Street, New Haven, CT 06520-8034, United States^b The Biomedical Centre, 8, Vyborgskaya Street, St. Petersburg, Russia^c Department of Addictions, Bekhterev State Research Psychoneurological Institute, 3, Bekhtereva Street, St. Petersburg 192019, Russia

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ABSTRACT

Background: While overdose is a common cause of mortality among opioid injectors worldwide, little information exists on opioid overdoses or how context may influence overdose risk in Russia. This study sought to uncover social and structural aspects contributing to fatal overdose risk in St. Petersburg and assess prevention intervention feasibility.

Methods: Twenty-one key informant interviews were conducted with drug users, treatment providers, toxicologists, police, and ambulance staff. Thematic coding of interview content was conducted to elucidate elements of the overdose risk environment.

Results: Several factors within St. Petersburg's environment were identified as shaping illicit drug users' risk behaviours and contributing to conditions of suboptimal response to overdose in the community. Most drug users live and experience overdoses at home, where family and home environment may mediate or moderate risk behaviours. The overdose risk environment is also worsened by inefficient emergency response infrastructure, insufficient cardiopulmonary or naloxone training resources, and the preponderance of abstinence-based treatment approaches to the exclusion of other treatment modalities. However, attitudes of drug users and law enforcement officials generally support overdose prevention intervention feasibility. Modifiable aspects of the risk environment suggest community-based and structural interventions, including overdose response training for drug users and professionals that encompasses naloxone distribution to the users and equipping more ambulances with naloxone.

Conclusion: Local social and structural elements influence risk environments for overdose. Interventions at the community and structural levels to prevent and respond to opioid overdoses are needed for and integral to reducing overdose mortality in St. Petersburg.

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Background

Illegal use and injection of drugs have increased dramatically in the Russian Federation since the 1990s (Koshkina, 2000). In addition to an injection-driven HIV epidemic, approximately 100,000 Russians die annually from overdoses and problems related to drug use, a mortality rate higher than that for motor-vehicle incidents and homicide in Russia (Bureau for International Narcotics and Law Enforcement Affairs, 2008). St. Petersburg, the second largest city in Russia, is home to an estimated 70,000 injecting drug users (IDU) (4% of adults), making it one of the largest subnational injecting populations of the developing and transitional countries (Burrows,

2006; Central and Eastern European Harm Reduction Network, 2006; Long et al., 2006). Compared to the 59% lifetime overdose experience reported in a 16-city survey of Russian IDUs that did not include St. Petersburg (Sergeev, Karpets, Sarang, & Tikhonov, 2003), 75% of IDUs surveyed in St. Petersburg had ever overdosed, 60% having experienced one or more in the past year (Grau et al., 2008).

The risk of dying from overdose encompasses not only factors precipitating overdose but also appropriateness of response when it occurs. Studies of overdose typically focus on individual behaviours such as injecting alone and concurrent alcohol use (Coffin et al., 2003; Melent'ev & Novikov, 2002; Sherman, Cheng, & Kral, 2007), a tendency that may obscure the role of other important aspects contributing to overdose causation and death. Social and structural factors can also influence drug users' ability to prevent overdose, respond effectively, and reduce likelihood of fatality (Dietze, Jolley,

* Corresponding author. Fax: +1 781 395 2125.

E-mail address: traci.c.green@yale.edu (T.C. Green).

Fry, Bammer, & Moore, 2006; Galea et al., 2003; Hembree et al., 2005; Tobin, Davey, & Latkin, 2005). In Russia, distrust of medical institutions arising from mistreatment, fear of police, and perceived ineffectiveness deterred people from seeking medical help (Sergeev et al., 2003). Consideration of the “risk environment” (Rhodes & Simic, 2005; Rhodes, Singer, Bourgois, Friedman, & Strathdee, 2005; Rhodes, Stimson, et al., 1999) includes the interplay of physical, social, economic, and policy factors, that influence production of risk and may determine intervention effectiveness (Kerr, Kimber, & Rhodes, 2007; Kerr, Small, Moore, & Wood, 2007; Van Beek, Dakin, Kimber, & Gilmour, 2004). Building upon this, we sought to uncover factors contributing to the overdose risk environment in St. Petersburg and to assess feasibility of a prevention intervention.

Methods

From September 2006 to June 2007, 21 interviews ($n=3$ for each group) were conducted with informants key to understanding overdose experiences and current response practices in St. Petersburg: drug users in treatment, drug users not in treatment, ambulance staff, toxicologists from the poisoning ward at the city’s primary hospital, policemen, inpatient narcologists (psychiatrists with sole authority for treating addiction) and outpatient narcologists. Topics included interviewee’s biographical details (age, sex, work experience), perceptions about overdose, causes and responses, details of overdoses witnessed and responded to, knowledge about naloxone (Bigg, 2002; Chamberlain & Klein, 1994), awareness of prevention overdose programmes, and attitudes toward a possible overdose prevention and naloxone training programme. Recruitment of drug users was based on random selection of: (a) patients who had been in detoxification for seven or more days for the in-treatment subset (Bekhterev Institute), and (b) for those out-of-treatment, drug users visiting The Biomedical Centre, a not-for-profit health and research organization for drug users. Their inclusion criteria were past month drug use and history of witnessing or experiencing overdose. Recruitment of professionals occurred only after gaining approval from a supervisor/chief (i.e., of police, of the ward), who typically nominated interviewees. Eligibility criterion for interviewing professionals was experience working with drug users. Interviews were audio-taped, transcribed, translated and coded thematically using inductive techniques (Layder, 1993) by two team members [TCG, LEG] in consultation with the Russian-speaking interviewers [KNB, MT]. Emergent themes typically pertained to individual circumstances and behaviours surrounding overdose; many were exogenous to the individual and suggested mediation of behaviours. To conceptualize and interpret these contextual drivers, we subsequently drew upon the risk environment framework for this analysis. Institutional Review Boards at Yale University, the Biomedical Centre, and the Bekhterev Psychoneurological Institute approved this study.

Results

An overdose problem has existed, does exist and will continue to exist in St. Petersburg. . . because overdose depends on heroin quality-and heroin quality comes down. But other reasons for overdose will exist forever. (male, 35, heroin injector, 18 years injecting).

Home and family conditions

Interviews with drug users and narcologists revealed that home and family conditions might contribute to overdose risk, since drug

use and overdoses often occur at home. Russian IDU tend to be younger than their Western counterparts and to live with partners, parents, or other relatives (Grau et al., 2008; Sergeev et al., 2003; Shaboltas et al., 2006), similar to IDUs in other non-Western settings (Dorabjee & Samson, 2000; Kartikeyan, Chaturvedi, & Bhalerao, 1992; Kumar et al., 2000). While this situation is observed elsewhere in Russia (Sergeev et al., 2003), the home is not typically considered a setting mediating overdose risk. Mechanisms by which family environment can influence their relative’s drug use and overdose risk emerged in interviews.

Some drug users inject at other (and potentially less safe) locations in order to avoid discovery of their drug use by other family members:

Usually I inject at home or when my parents are not at home, but sometimes I have to inject on the street. (male, 32, injecting heroin and other opioids 9 years).

Injecting secretly at home under physical or time constraints increases the potential of doing something careless or too quickly, which can result in overdose.

My last overdose was a heroin overdose. . . at home. I’d been in the toilet and I made an injection. My relatives felt that something was wrong, that I was in the toilet for too long, and then they opened the door and called an ambulance and began to slap my cheeks. (male, 35, injecting heroin 18 years).

Family can also play a powerful preventive role in reducing fatal overdose risk when a harm reduction approach is embraced. A rare report of naloxone administration illustrates one parent’s modification to the home environment:

I used my ordinary dose, but the quality was better and I ended up unconscious. My friend was with me. He injected some medicine (naloxone). It was in his home. His mother works in narcology and had some of the medicine at home. (male, 32, heroin injector, 7 years injecting).

Fear as a contextualizing factor of the overdose risk environment

Linked to broader stigmatisation of IDU in Russia, professional’s fears of drug users and drug user’s fears of professionals both contributed to suboptimal overdose response conditions. Fear of drug users legitimized professionals’ inaction to a witnessed overdose: “We have no instructions on how to respond [to] an overdose and I will not perform rescue breathing on a drug user- he can have AIDS!” (Policeman, policing 17 years). This fear was also a rationale for exerting greater control over emergency response encouraging emergency medical services (EMS) staff to alter protocols to include police escort, opening the possibility of harassment and arrest: “. . . sometimes the ambulance staff calls the police. . . when there are many drug users and the ambulance staff is just afraid.” (Dispensary narcologist, female, practicing 21 years).

This perpetuates the impression among drug users that a *sine qua non* in calling an ambulance is involvement of police. Drug users commonly expressed a potent fear of arrest, interrogation, and criminal prosecution whether they were receiving care within a hospital or from EMS.

My friend was hospitalized after an overdose. . . when he woke up in the hospital, he hit and beat the doctors and ran away. He did it because he feared the police were there. (female, 28, injects heroin and methadone, injecting 10 years).

Consistently, drug users cited fear that police will arrive with the ambulance as motivation not to call for one. In the rare instance when ambulances were called, drug users engaged in protective behaviours.

We never tell them that it's an overdose. . .we say that something is wrong with the person's heart, unconscious, drunk on alcohol. . .On the question about drug use, we say that we don't know, but think that he didn't take any. (male, 32, heroin injector, 7 years injecting).

But such actions may have unintended negative consequence. Reporting only selected details of the emergency situation determines the type of ambulance dispatched (see next section) which, in the Russian EMS system, may reduce the likelihood of naloxone being available for successful overdose reversal.

Medical response to opioid overdose

An emergency call identified as a drug-involved event dispatches a special narcological ambulance, equipped with naloxone and staff trained in its administration. According to ambulance staff interviewed, *only two of the more than 190 ambulance cars in St. Petersburg are narcological*. If the caller indicates that the victim is not breathing but does not mention involvement of drugs, the case may instead be responded to by a resuscitation ambulance with advanced life support capabilities or, if neither involvement of drugs nor apnoea is mentioned, by typical EMS ambulances with more limited staffing. *Gaufberg (2007)* also describes this sequence.

Interviews with toxicologists and narcologists independently described the same overdose treatment protocol. Victims are taken directly to the toxicology department of the one emergency hospital in St. Petersburg (St. Petersburg Emergency Institute), which is well known for its overdose care. Toxicologists reported that their department treats 1600 opioid overdoses annually, constituting over 40% of their patient load. Once in the unit, serious cases are placed on a special 'emergency regimen' while less serious cases are monitored, possibly re-administered large doses of naloxone, and typically subjected to a detoxification regimen consisting of a saline solution infusion and other medications to manage symptoms. Patients can opt to enter hospital-based drug treatment in the narcology unit, where they receive a 7–14 day detoxification. Other treatment options include dispensary narcology clinics, akin to American outpatient drug treatment. However, maintenance therapy is legally prohibited in the Russian Federation (*Butler, 2003*). Standard care consists of a cocktail of tranquilizers, antipsychotics, and anticonvulsants to stave off withdrawal coupled with psychotherapy. Successful treatment outcomes are rare (<10%, *Heimer, Booth, Irwin, & Merson, 2007*). Usually drug users leave after a 1–3 day hospital stay, a function of ineffective treatment options, fearing police stationed at the hospital, motivation level, inability to pay for treatment, or "just because they need a dose", among others.

Detoxification protocols may contribute to high risk of overdose

Detoxification, as an interruption in drug use that can alter users's tolerance (*Warner-Smith, Darke, Lynskey, & Hall, 2001*), has been associated with elevated overdose risk (*Buster, van Brussel, & van den Brink, 2002; Strang et al., 2003*). Moreover, co-administration of sedatives and opioids can increase risk of fatal overdose (*Rubio, 2004; Warner-Smith et al., 2001*) because they act to depress the central nervous system. Both the protocol of compulsory detoxification for drug users admitted to toxicology units after opioid overdose and the extant sedative-reliant treatment proto-

cols in dispensary and inpatient narcology clinics described by the nine medical professionals may therefore actually be *creating* a subsequent risk of fatal overdose upon release from care. One drug user's story illustrates possible consequences:

The last heroin overdose I witnessed was my brother's overdose. He had just come home from the hospital and he asked me to prepare a dose of heroin for him. The overdose happened on the stairs [outside]; it was only me and him. I did CPR (cardiopulmonary resuscitation) on him. . . I called the ambulance, but it came too late. So, they called the police 'for the corpse'. (male, 35, heroin injector, 18 years injecting).

Misinformation about naloxone at the professional level

Common to several interviews was a degree of misinformation about naloxone. Toxicologists were quick to point out contraindications for its use and reflected reservations about administering it in the hospital due to "complications such as cardiovascular problems, overexcitation, and naloxone-induced seizures". Medical professionals were consistently adamant about dangers of using naloxone in cases of "coma. . .[or]. . .severe breathing problems", a directive that appeared institutionalized. Yet, in accepted medical practice, naloxone is indicated in cases of dyspnoea to restore normal ventilation. In rare occasions where an opioid overdose occurred among asthmatics, naloxone can exacerbate respiratory depression (*Allegretti, Bzdusek, & Leonard, 2006*). The interviewees' focus on contraindications and complications may illustrate a common bias in medical decision-making, confirmation bias, i.e., selectively accepting information about rare cases when naloxone was ineffectual and ignoring information on more typical effectual cases that appear outside of their unit. Regardless of origin, perpetuation and institutionalization of such misinformation may contribute to underutilization of naloxone in opioid overdose cases where it is medically indicated.

The missing 'first responder': compartmentalization and limited responsibilities

In Russia, there is no parallel concept of 'first-aid' nor of 'first responder', the medically trained person to initially respond to an emergency. Interviews consistently highlighted that police do not view themselves as nor are they trained to be first responders to emergencies. Set within a highly compartmentalized system, the city police have specific, narrowly defined job descriptions and will not engage in medical treatment or public health work. Their duties entail responding to crimes or, in the case of fatal overdose, reporting the "when, where, who of the death, not helping (a victim)". While fear may drive some of this inaction, lack of training and the pervasive excuse that it is "not my job" distances them from responsibility to respond: "We come only if there is a corpse. We have no instructions on what to do in cases of overdose. I don't know what to do to save a life. Maybe rescue breathing, but I will not do it." (Policeman, policing 10 years). Moreover, these roles are affirmed by members of the medical community who view themselves as uniquely capable and motivated to care for overdose victims.

Inadequate emergency response: delay, corruption, and bureaucratization of care

Opioid overdoses require immediate attention and resuscitation. Often, reliability of the St. Petersburg EMS response is poor. Timeframes mentioned by interviewees for an ambulance to reach an overdose case ranged from 3 min to 1 h. Additionally, drug users

and many treatment professionals believed that EMS staff would intentionally “come later or not come at all” if they knew the emergency was an overdose, providing drug users another rationale for not calling for help. Appropriate response upon arrival was also questioned:

I think that ambulance staff won't even approach if they see (a victim) foaming at the mouth. I hope that there are doctors who would help drug users even if they are found in the trash. I really hope, but I'm not sure it happens. (Dispensary narcologist, female, practicing 25 years).

Still, some drug users felt EMS responded effectively, associating success more with medicines EMS carry than with EMS themselves. When there is a successful reversal, it was not uncommon for drug users to experience demand for payment of otherwise free services:

When I called the ambulance, I told them that it was an overdose to make them come faster and send a specialized car [i.e., the narcological ambulance]. They came in 5 minutes. They did a lot, injected something, and he woke up almost immediately. He refused to go to the hospital. They didn't call the police. We paid them 500 rubles [about \$20] for their help. (female, 47, heroin injector, 17 years injecting).

Others told of having to pay a bribe for not calling the police after a successful reversal, despite the existing police protocol to respond only in fatal cases:

The ambulance works effectively. They gave me an injection of medicine when they came and saved my life. But you should give them money so that they will not call the police - \$12 is enough. (male, 26, heroin injector, 8 years injecting).

For those without sufficient funds to cover these hidden and variable costs or who fear repercussions that might involve police if they do not pay, there is little motivation to call an ambulance.

Finally, a compartmentalized EMS in which not all ambulances are equipped with naloxone impedes effective and appropriate overdose responses:

Once the ambulance injected something, but that medicine was very mild. Maybe that was just an ordinary, therapeutical ambulance that was not properly equipped. . . If a good ambulance comes, a narcological one, they have all the medications. (male, 32, heroin injector, 7 years injecting).

In the absence of a first responder role, an EMS system that is ill-equipped to respond to overdoses and often fails to provide consistent and timely care, a medical framework that promotes marginalization by treating narcological emergencies exceptionally, and the unpredictable police involvement with ambulance response, there is good reason that many drug users do not seek professional help when an overdose occurs and instead attempt to help without it.

Prospects for overdose prevention and naloxone training

Overdose prevention and response programmes, including naloxone distribution and training of first-responders, constitute structural interventions that fundamentally alter the overdose risk environment. While CPR and rescue breathing are learned in the military and in certain professions, community-based CPR training programmes are rare. None of those interviewed knew of such pro-

grammes or any preventive overdose programmes in St. Petersburg. Providing naloxone to opioid users in Russia is not illegal. As in the U.S., naloxone is viewed as a medication without abuse potential, it is not on the “dangerous drugs” list, and no special forms or licenses are needed to write prescriptions for naloxone. Naloxone is widely available in Russian pharmacies; a package of 10 vials for injection costs about US \$6. Furthermore, administering medication by injection is both culturally acceptable and a norm in Russia (Rhodes, Ball, et al., 1999). Interviewed drug users as well as those who took part in a companion survey (Grau et al., 2008) were interested and willing to participate in an overdose prevention and naloxone training programme.

Mutual support between drug users and police suggests opportunities for intervention. Interviewed drug users opined that police were not likely to oppose an overdose intervention programme, as it does not affect their duties. Indeed, police were generally indifferent or marginally supportive of such a programme, noting that there would be fewer dead drug users to deal with. In contrast, medical professionals did not favour intervention, especially naloxone distribution. They worried that it endorses drug use and would encourage more or careless use of opioids; they preferred “harsh measures” like “toughening the laws” and resumption of Soviet-era compulsory drug use treatment, firmly stating “only abstinence could save drug user's lives”. Further, medical professionals insisted that naloxone administration could only be done correctly by a medically trained professional and they exaggerated naloxone's side effect risk as justification for limiting administration permissions:

(Drug users). . . should never inject naloxone themselves. Naloxone (use). . . can lead to life-threatening complications when it's administered by a non-professional (i.e., seizures, pulmonary oedema, brain oedema). If drug users will have access to naloxone and start injecting it themselves, the fatality rate will increase. (Ambulance narcologist, male, practicing 15 years).

However, medical professionals supported incorporating overdose prevention into continuing medical education for those who treat drug users and providing a comprehensive training on overdose risk, identification, prevention, and response for police, but they stopped short of recommending they be equipped with naloxone:

. . . police will not administer naloxone even if they are taught how to handle it. (Dispensary psychiatrist, male, 17 years practicing).

Discussion

This study identified several elements of the environment contributing to overdose risk in St. Petersburg that warrant further investigation. To our knowledge, this is the first study to indicate that family dynamics may mediate or moderate overdose risk. Scientific plausibility of this relationship draws upon empirical studies establishing family environment influences on problem drinking (El-Sheikh & Buckhalt, 2003), drug use (Barrera, Chassin, & Rogosch, 1993) and intentional drug overdose (Al-Jahdali et al., 2004; Al Ansari et al., 2001; Orford, 2005), with or without genetic predisposition for problems (Jacob et al., 2003; Stice, Barrera, & Chassin, 1993). In a companion study conducted in St. Petersburg, we found that recent personal and witnessed overdoses among IDU were associated with family conflict, further suggesting family influence risk context (Grau et al., 2008). The proximity of active drug use to the home (Sergeev et al., 2003), precedence for family involve-

Table 1
Social and structural elements of the overdose risk environment and possible intervention components to reduce nonfatal and fatal overdose risk in St. Petersburg

Local social, structural factors detected in this study	Possible intervention components	Other possible social, structural factors that could influence risk environment, not detected in this study
Physical		
Detoxification and drug treatment Medical institutions	Supervised injecting facilities Overdose prevention counseling prior to release from detoxification, drug treatment, prison	Prison Public, semi-public spaces
Home environment	Remove police stationed at drug treatment wards of medical institutions	Shooting galleries
Ambulance type	Equip all drug using locations (e.g., homes, dealer's home) with overdose prevention education materials and naloxone Equip all ambulance types with naloxone	Age distribution of drug users Heroin purity Availability and number of other opioids Availability of alcohol
Social		
Family (cohesion, adaptability)	Family-targeted overdose initiatives, orientation to harm reduction approaches	Social, drug using networks
Local policing	Peer, network, dealer overdose prevention and response interventions	Attitudes of pharmacists toward drug users
Medical, police, community attitudes toward drug users, naloxone Curriculum/training on overdose recognition, response (police, medical professionals)	Trainings on overdose recognition, improving attitudes toward drug users for police Continuing medical education on overdose, naloxone, and reducing stigma of drug use for medical professionals, pharmacists	Attitudes of dealers toward naloxone Norms (individual, social, cultural) Civil society and social infrastructure
Economic		
Cost of naloxone, drug treatment, ambulance services Corruption	Distribution of naloxone for no/low cost Improve no/low-cost drug treatment options Enforcement of anti-corruption laws Local investment in public health infrastructure, toxicological resources, EMS, law enforcement	Cost of alcohol, other pharmaceuticals Local economies of healthcare Employment practices for medical, law enforcement National public health and toxicological infrastructure, spending
Policy		
Naloxone availability at pharmacies	Improve access to naloxone at pharmacies	Quality, coordination and access to statistics on fatal overdose in the community Legal status of methadone, buprenorphine
CPR, rescue breathing trainings in community	Trainings for CPR, rescue breathing in community, for drug users, family members, treatment providers Increase number of narcological ambulances	
Ratio of narcological to non-narcological ambulances		Laws governing drug use, health, welfare, citizen rights, immigration, registration of drug users and city non-residents
Hospital detoxification policies	Revision of hospital detoxification policies	

ment in treatment (Krupitsky et al., 2004; Pollini, McCall, Mehta, Vlahov, & Strathdee, 2006), and the profound impact of death from overdose borne by the family (da Silva, Noto, & Formigoni, 2007) suggest a strong motivation (Strang et al., 2008) and an opportunity to organize family-based harm reduction efforts, including naloxone training. There are few examples of family-focused harm reduction interventions (Dear, 1996); to date, none exist in Russia with only one known family-carer naloxone training pilot in the United Kingdom (Strang et al., 2008). Further research on family interventions to mitigate negative consequences of drug use in Russia is warranted. Additionally, to determine a causal link between Russian-specific detoxification regimens and overdose risk suggests future observational study.

Key informant interviews alone cannot comprehensively capture all characteristics of the overdose risk environment. As an exploratory approach, we synthesized our findings, other studies of overdose risk, and the HIV risk environment literature to conceptualize the interacting physical, social, economic, and policy realms (Rhodes & Simic, 2005) of overdose risk (Table 1) in St. Petersburg.

Behavioural interventions to reduce health risks are minimally effective and heavily context dependent (Heimer, Bray, Burris, Khoshnood, & Blankenship, 2002). Thus, alone they are insufficient to respond to factors in Table 1. Instead, community-based and structural interventions are warranted (Blankenship, Bray, & Merson, 2000; Heimer et al., 2002). While these may not be able to

entirely curtail corruption, organize a city's EMS network, or quickly effect attitudes of police and treatment providers, they might, if implemented on a wide scale, have significant impact on overdose risk. Table 1 suggests such focused interventions arising from our results.

In particular, results revealed prospects for overdose prevention and naloxone distribution programmes aimed at drug users, family members, and others who interact with drug users in St. Petersburg. Insistence that only trained medical professionals can correctly respond to overdose is unfounded: trained drug users identify and respond to opioid overdose with naloxone as well as medical professionals (Green, Heimer, & Grau, 2008). Additional consensus building will have to be undertaken to overcome resistance on the part of some medical professional to training the drug users themselves. On the other hand, training tailored specifically for medical and law enforcement professionals in overdose response appropriate to their societal role appears needed and generally acceptable. Moreover, equipping more ambulances with naloxone and with staff trained in its use would vastly increase its availability, a key component of structural interventions (Blankenship et al., 2000). Given the hierarchical and siloed organization of Russian civil society, it is essential to any social or structural intervention to garner support and cooperation across stakeholders from different occupations. Here this would include the ambulance services, hospitals, medical universities, police, narcologists, and harm

reduction services, with strong leadership from the St. Petersburg Public Health Committee, as demonstrated in past local initiatives (e.g., Barents HIV/AIDS Programme). The current political situation in Russia (Garrett, 2000; Knight, 2008) may preclude or constrain controversial or highly unorthodox interventions such as supervised injecting facilities, naloxone distribution may not. Regardless of the feasibility of naloxone provision to active drug users, the range of possible fatal overdose prevention responses emerging from this study provides multiple starting points to explore change, some of which may prove more politically palatable than others.

Study limitations include small sample size and possible interviewer and reporting bias. As a result some social or structural features may have not received sufficient attention (see Table 1). Generalizability of findings beyond this particular sample and city cannot be assumed. As an exploratory exercise, this study uniquely described aspects of the overdose risk landscape and revealed plausible, feasible interventions at the local scale integral to reducing risk of overdose mortality in St. Petersburg.

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