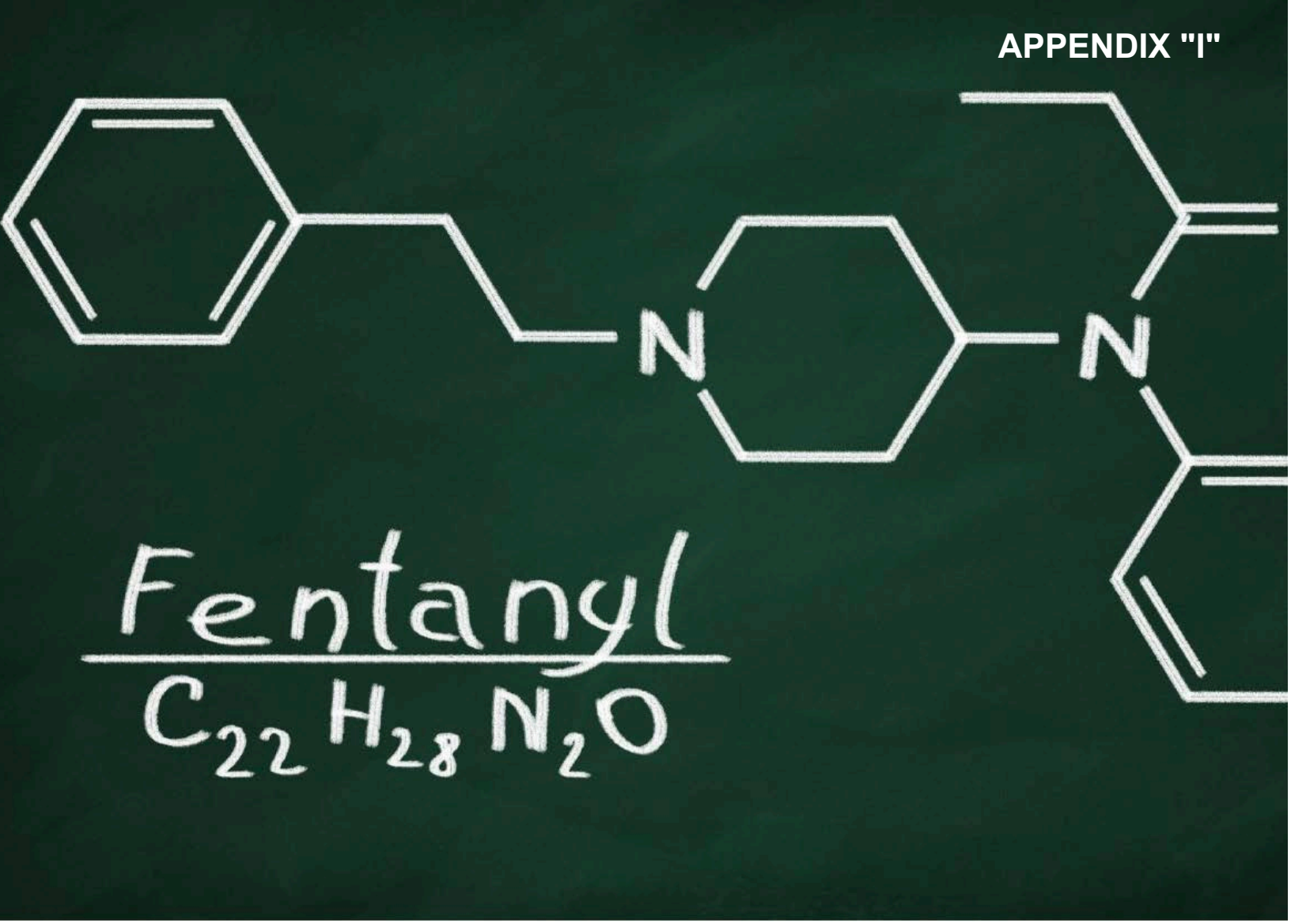
APPENDIX "I"



CITY OF SURREY OPIOID SUMMIT: DATA TO ACTION

Developing a Plan to Take Action from Data Insights to Prevent Overdoses and Overdose Fatalities

Hosted by the City of Surrey, British Columbia as part of the Opioid Overdose Intervention Project
June 4 and 5, 2019, Surrey City Hall, 13450 104 Avenue, Surrey, BC

Brenda Locke, Councillor
Len Garis, Fire Chief
Mark Griffioen, Deputy fire Chief
Donna Jones, General Manager, Investment & Intergovernmental Relations

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Acknowledgement is given that the Summit took place on the unceded traditional territory of the Salish people.

Every Life Matters

At the heart of the City of Surrey Opioid Summit and the work of the Opioid Overdose Intervention Project is a simple premise: every life matters.

Three to four people die every day in B.C. as a result of an opioid overdose. They are not merely numbers and statistics.

They are someone's husband or wife, someone's parent, someone's child, someone's friend, someone's student, someone's employee or coworker. Their deaths creates a ripple effect among their social connections, making the impact of the overdose crisis much larger than just the loss of those individuals.

In some way, we are all touched by this crisis.

Executive Summary

Potential solutions for the overdose crisis were developed a ground-breaking summit June 4 and 5 in Surrey. Bringing together more than 60 experts, academics and service providers, the City of Surrey Opioid Summit: From Data to Action stemmed from the multi-agency Opioid Intervention Project the City has been spearheading with Statistics Canada since fall 2017. The project has involved unprecedented inter-agency information-sharing and data analysis, with the intent to understand the factors that lead to an opioid overdose in order to create evidence-based policy and programming interventions.

The latest release of data from Statistics Canada was a springboard for the summit, intended to be the first step in a plan to provide insights through data to prevent overdoses and overdose fatalities.

The summit included presentations and discussion among academics, experts and service providers from government, public safety, health care, injury prevention and other fields, including the Honourable Judy Darcy, B.C. Minister of Mental Health and Addictions; Mark Griffioen, Surrey Deputy Fire Chief of Community Risk Reduction; Dr. Paul Maxim, Professor Emeritus from Western University; Lynn Barr-Telford, Incoming Assistant Chief Statistician and Dr. Anthony Matarazzo, Assistant Director from Statistics Canada; Dr. Penny Ballem, Vancouver Coastal Health Board Chair; Dr. Louis Francescutti, Former President of the Canadian Medical Association and Royal College of Physicians and Surgeons of Canada; Dr. Charles Jennings of the John Jay College of Criminal Justice in New York; Dr. Martha Dow of the University of the Fraser Valley; Dr. Ian Pike, Director of the BC Injury Research and Prevention Unit; Dr. Lindsey Richardson of the BC Center on Substance Use; Brooke Kinninburgh, Fraser Health Epidemiologist; Erin Gibson, Fraser Health Harm Reduction Coordinator; and Erica Thomson, Reginional Peer Coordinator with lived experience from Fraser Health.

Building on the insights, a day-long workshop session resulted in more than 50 short-, medium- and long-term recommendations for policy and programming changes or interventions that focused on three areas the data has showed to be common touchpoints for those who overdose: employment/social assistance, hospitalization and the justice system.

More than 96 per cent of those who overdose in B.C. from 2014 to 2016 touched at least one of those systems, and 41 per cent touched all three:

- 67% has visited a hospital or ER
- 87% had at least one prescription, and 42% had at least one opioid-related prescription
- 45% were employed
- 56% were on social assistance
- 45% had some contact with the police

Inherent to the recommendations was a recognition that the overdose crisis is a societal problem (not a moral or purely health based one), that there is still widespread stigma and institutional bias that is causing harm to people who need help.

Summit Speakers

- *Greetings* – Honourable Judy Darcy, BC Minister of Mental Health & Addictions
- *BC & Surrey – When it Started* – Mark Griffioen, Deputy Fire Chief of Community Risk Reduction, City of Surrey
- City Centre Response Plan and Crime, Overdoses and Social Assistance Evaluation – Dr. Paul Maxim, Professor Emeritus, Western University
- *Social/Data Linkage of Fatal and Non-fatal OD Victims* – Lynn Barr-Telford, Incoming Assistant Chief Statistician responsible for the Social, Health and Labour Statistics Field at Statistics Canada, and Dr. Anthony Matarazzo, Assistant Director in the Health, Justice and Special Surveys Branch at Statistics Canada
- *Fraser Health Perspective* – Brooke Kinniburgh, Epidemiologist and Erin Gibson, Harm Reduction Coordinator, Fraser Health
- *Addiction Medicine Perspective* – Dr. Sharon Vipler, Program Medical Director and Regional Department Head of Addiction Medicine and Substance Use Services, Fraser Health
- *Lived Experience* – Erica Thomson, Peer Coordinator, Harm Reduction Program, Fraser Health
- *Expert Perspective* – Dr. Penny Ballem, Vancouver Coastal Health Board Chair, University of BC Professor, former Vancouver City Manager, former BC Deputy Ministry of Health
- *Expert Perspective* – Dr. Louis Francescutti, Physician and Storyteller, University of Alberta Professor, Former President of Royal College of Physicians and Surgeons, Former President of Canadian Medical Association
- *Expert Perspective* – Dr. Charles Jennings, Associate Professor in the Department of Security, Fire and Emergency Management and Director of the Christian Regenhard Centre for Emergency Response Studies, John Jay College of Criminal Justice, New York
- *Expert Perspective* – Dr. Martha Dow, researcher and consultant on public safety, education and organizational change and Associate Professor in the Department of Social, Cultural and Media Studies at the University of the Fraser Valley.
- *Expert Perspective* – Dr. Ian Pike, Director of the BC Injury Research and Prevention Unit, Professor in the Department of Pediatrics at University of BC, Associate Scientist at the BC Children's Hospital Research Institute, Co-executive Director and Spokesperson for the Community Against Preventable Injuries
- *The Impacts of Changing Income Assistance Schedules on Drug Use and Associated Harm* – Dr Lindsey Richardson, Research Scientist, BC Centre on Substance Use and Associate Professor in the UBC Department of Sociology

Summit Participants

Kiah Ashley	Abbotsford Police Department
Ian MacDonald	Abbotsford Police Department
Margot Kuo	BC Centre for Disease Control
Allison Laing	BC Centre on Substance Use
Joanna Medell	BC Centre on Substance Use
Warren O'Briain	BC Centre on Substance Use
Dr. Lindsey Richardson	BC Centre on Substance Use
Dr. Ian Pike	BC Injury Research and Prevention Unit / University of BC
Donna Jones	City of Surrey
Cllr. Brenda Locke	City of Surrey
Dr. Terry Waterhouse	City of Surrey
Len Garis	City of Surrey / Fire Service
Mark Griffioen	City of Surrey / Fire Service
Vicky Waldron	Construction Industry Rehabilitation Plan
Sukh Shergill	Dialogues in Action, formerly Surrey Schools
Louise Meilleur	First Nations Health Authority
Catarina Witt	First Nations Health Authority
Amrit Atwal	Fraser Health
Chris Buchner	Fraser Health
Erin Gibson	Fraser Health
Dr. Shovita Padhi	Fraser Health
Lori Smart	Fraser Health
Dr. Sharon Vipler	Fraser Health
Erica Thomson	Fraser Health
Brooke Kinniburgh	Fraser Health
MLA Garry Begg	Government of BC
Dr. Brian Emerson	Government of BC - BC Ministry of Health
Linda DeBenedictis	Government of BC - BC Ministry of Social Development and Poverty Reduction
Taryn Walsh	Government of BC - Mental Health and Addictions
Lucas Corwin	Government of BC - Ministry of Labour
Dave Haralds	Government of BC - Ministry of Labour
Honourable Judy Darcy	Government of BC - Ministry of Mental Health & Addictions
Carolyn Davison	Government of BC - Ministry of Mental Health & Addictions
Elizabeth Vickery	Government of BC – BC Stats
Dr. Sonia Johnson	Government of Canada - Health Canada
Dr. Ann-Marie Ungat	Government of Canada - Public Health Agency of Canada
Laura MacDougall	Government of Canada – Public Health Agency of Canada
Dr. Charles Jennings	John Jay College of Criminal Justice, New York
Tej Sidhu	Office of the Chief Coroner
Jim Walker	Ontario Provincial Police - Organized Crime Enforcement Bureau

Susan Thorburn	Ontario Provincial Police - Organized Crime Enforcement Bureau
Upkar Tatlay	Opus Foundation
Jen Hanson	Pain BC
Kathryn Sutton	Pain BC
Keir MacDonald	Phoenix Society
Michael Legal	Providence Health Care
Dwayne McDonald	RCMP - Surrey Detachment
Trevor Dinwoodie	RCMP - Surrey Detachment - District 1 (City Centre)
Shawna Baher	RCMP - Vernon North Okanagan RCMP
Trefor Munn-Venn	Rhapsody Strategies
Raaj Chatterjee	Simon Fraser University
Dr. Andrey Zhdanov	Simon Fraser University
Julian Somers	Simon Fraser University, Faculty of Health Science
Lynn Barr-Telford	Government of Canada - Statistics Canada
Giséle Carriére	Government of Canada - Statistics Canada
Dr. Anthony Matarazzo	Government of Canada - Statistics Canada
Brenda Neveu	Surrey Schools, Data Visualization and Research
Mike Musgrove	Surrey Urban Mission
Dr. Louis Francescutti	University of Alberta, Former President of Royal College of Physicians and Surgeons, Former President of Canadian Medical Assoc.
Dr. Martha Dow	University of the Fraser Valley
Dr. Penny Ballem	Vancouver Coastal Health, University of BC
Dr. Paul Maxim	Western University
Jessica Berglund	WorkSafe BC

Problem

Opioid overdoses and deaths continue to be a serious public health issue across Canada, related to the escalating presence of fentanyl (a type of opioid) since 2012.

In 2016, British Columbia's provincial health officer declared opioid overdoses and deaths to be a public health emergency. While there has been action and progress, there were almost 1,500 suspected opioid deaths across B.C. in 2018 – an average of about four each day. For the first time in four decades, life expectancy has stopped rising as a direct result of this crisis.

Barriers to Progress

Why are we still seeing so many deaths close to three years after a public health emergency was declared? Some of the barriers to progress were discussed during the Summit.

Desensitized/dehumanized

- With the large number of deaths month after month, opioid-related deaths have become "the new normal."
- People lose sight that there are people behind the statistics – that each death affects not only the individual but their family, friends and community.

Lack of urgency & stigma

- The "crisis" is now in its third year.
- Homeless/poverty has become the face of crisis despite data showing the crisis affects all walks of life.
- Widespread stigma exists: Some do not view substance use disorders as a medical issue, and/or view the overdoses as a consequence of a particular lifestyle or simply, a "moral" failing.

Multi-faceted and complex

- The issue touches many agencies – which means no one is really in charge.
- The problem is vast and overwhelming.

Background

"*Statistics Canada is committed to supporting all levels of government in addressing the most significant challenges currently facing Canadian communities. As it relates to the Opioids Overdose Intervention Project, we have brought together data from across various social domains, in a privacy respectful and responsible way, to provide an unprecedented lens for delivering meaningful insights and allowing for the development of evidence-based policy and program interventions for those at greatest risk*." - Anil Arora, Chief Statistician of Canada

« Statistique Canada s'engage à aider tous les ordres de gouvernement à relever les défis les plus importants auxquels doivent actuellement faire face les collectivités du Canada. En ce qui concerne le projet d'intervention en matière de surdoses d'opioïdes, nous avons rassemblé des données de divers domaines sociaux, d'une façon responsable et respectueuse de la vie privée, afin de dresser un portrait sans précédent de la situation et de fournir des renseignements utiles qui permettront la mise au point de politiques et de programmes fondés sur des données probantes pour les personnes les plus à risque. » – Anil Arora, statisticien en chef du Canada

Opioid Overdose Intervention Project

The Opioid Overdose Intervention Project, which began in fall 2017 in Surrey, British Columbia, is a demonstration project bringing together agencies from all levels of government with an interest in sharing and gaining insights from data to tackle the overdose crisis (the upsurge in overdoses and deaths from opioids such as fentanyl).

The intent is to fully understand the roots of the crisis, the primary risk factors and those most at risk of opioid overdose, in order to identify and act on opportunities for intervention. The project has involved unprecedented inter-agency information-sharing and Statistics Canada expertise in data integration and analysis on this ongoing public health crisis.

The City of Surrey and Statistics Canada are leading the process, which leverages data from Surrey Fire Services, Surrey RCMP, Fraser Health Authority, BC Coroners Service, BC Centre for Disease Control, the Provincial Health Services Authority, BC Pharmanet, Mental Health Services, Medical Services Plan and others.

Surrey – which has B.C.'s second-highest opioid-related death rate – is serving as a case study for identifying the non-random characteristics of those who overdose on opioids.

The intended result is an anonymized and aggregated picture of typical potential overdose victims that will include age, gender, marital status, ethnicity, aboriginal identity, industry of employment, income, housing, education, medical history, health service utilization, frequency and location of use, justice system contact and other relevant factors, to support the development of data-informed programming and policy interventions.

The project is considered a model for the rest of the province and country, and has received funding and resource support from both the provincial and federal governments. The Opioid Summit in June 2019 is the first step towards actioning the data gleaned through the project to date.

Data Overview: Who is Overdosing?

The most recent release of data from Statistics Canada was made available on June 4, 2019 at the Opioid Summit.

The cohort is 1,942 individuals who experienced opioid overdoses in Surrey from Jan. 1, 2014 to Dec. 31, 2016. Of those, 228 people died of an overdose and 1,724 survived.

The key takeaways are below.

- 70% of those who overdosed were males.
- The average age when overdose occurred was 38.
- By and large, recent immigrants are at a lower risk than the general population.
- 73% experienced one overdose between 2014 and 2016. Among those aged 20 to 49, the average number of overdoses was two.
- Those who overdosed had lower levels of employment – 48% (men) and 28% (women) had jobs, compared to 77% (men) and 73% (women) in B.C.
- For those who were employed, the highest proportion were in construction, followed by building and other support services, and the manufacturing industry.

Touchpoints

New social data linkages allow us to take a closer look at the system contacts – hospitals/prescriptions, employment/social assistance and justice system – in the year leading up to the overdose.

Overall, 96% had touched at least one system and 41% had touched all three—with 20% only having touched one (highest among older people).

- 67% has visited a hospital or ER
- 87% had at least one prescription, and 42% had at least one opioid-related prescription
- 45% were employed
- 56% were on social assistance
- 45% had some contact with the police

Among those who only touched one system:

- Those under age 35 were most likely to have touched only employment
- Those age 55 and up were most likely to have only touched health care

Themes and Insights

The following summarizes key themes and insights that emerged from the presentations over the two days of the summit.

BC is Still a Hotspot

- One third of all overdoses in Canada take place in British Columbia, even though its population is only 13% of the country's.
- Approximately 15% of B.C.'s deaths take place in Surrey.

Stigma and Bias

- There is still a widespread view, in society and institutionally, that substance use disorders are a weakness or moral failure.
- There is a widespread lack of understanding, even in the health care and justice system, of the physical and mental pain associated with withdrawal.
- There are strong similarities with the stigma associated with HIV/AIDs in the 1980s.
- We need to change the conversation, become champions for a segment of the population – people with substance use / mental health disorders – who don't have one. We also need to find a way to make people understand that this is everyone's problem.

Everyone's Path is Different

- Not everyone experiences drugs in the same way. Drugs hijack a brain's rewards system. While they make some people merely feel high, they may be the only way a person with mental health issues feels normal. The brain becomes used to the drug quickly and that becomes the new setpoint, which requires an increasing supply to maintain. Any tapering off will put that person into painful withdrawal.
- People with opioid substance use disorder come from all walks of life. Some are homeless, some have jobs and homes. They are all ages, genders and cultural backgrounds. There is no typical patient, and no typical approach.
- People use drugs for many different reasons – to feel good, to feel better, to perform better, or out of curiosity. Different factors in their life will determine how/why they do it.

The System Itself is Causing Harm

- In some cases, the system itself is causing harm. A Fraser Health Regional Peer Coordinator with lived experience spoke passionately about the continuing deaths and the punitive measures she experienced due to her substance use disorder, including negative experiences with law enforcement, her children

being taken away and the impact of a criminal record. It's "a pit to crawl out of" and these individuals are viewed as disposable by society and the system.

- Recovery homes are not currently provincially regulated, although some receive government funding and are often court-mandated. Many unlicensed recovery homes exist, and even among the licensed ones, living conditions, services and resident mentoring vary widely. Research in Surrey, based on data from 2016 to 2018, shows a relationship between the location of recovery homes, overdoses, and property crime that rises in the days leading up the income assistance cheque days. Greater regulation of recovery homes may not only ensure they provide safe and healthy living environments, but may increase their potential in providing outreach services.

The Cheque Effect

- Research in Surrey, based on data from 2016 to 2018, showed a clear city-wide pattern of people receiving income assistance cheques, using them to buy drugs, and then turning to property crime when they ran out of money.
- The ground-breaking work of Dr. Lindsey Richardson and her team at the BC Centre on Substance Use studied the impact of changing income assistance schedules on drug use and the associated harm. The preliminary results supported past research and anecdotal observation that overdoses are higher immediately following "cheque day" while offering other insights:
    - It's important to consider unintended consequences when you make a change – e.g., increased violence to, and by, individuals was one result of changing schedules.
    - The social aspect of "cheque day" is very important to some.
    - It can be difficult for some to adjust to budgeting around a new schedule.
    - Some of the negative effects could be minimized by providing individual choice and flexibility in cheque days, which is possible with automatic deposits.

There is Some Good News

- In the past year and a half, more overdoses are being reversed, even as the drug supply is getting more toxic every year. Some 4,700 deaths have been averted in the last 18 months, thanks to distribution of naloxone kits, more supervised injection sites, more people getting into recovery and other interventions.
- The social data linkages created by Statistics Canada's work, which builds on the work by the BC Centre for Disease Control, are a breakthrough in understanding this crisis and developing meaningful interventions.
- Progress is being made on some of the social conditions that lead to substance use disorders, including modular housing.
- New interventions are being implemented, such as a Second Responder Program in Surrey. The proposed program is designed to follow up with people who have overdosed but refused transportation upon discharge, to ensure they are connecting to services.
- Much can be learned by looking further afield at the successes outside of North America, such as in Portugal and Finland.
- Injury-prevention campaigns at the time and place when people's risk is highest have had positive results. This approach could be leveraged.

Cooperation, Courage and a New Approach is Key

- We have to get past the long-standing tension between harm reduction, and treatment/recovery. There is no room for judgment in this crisis. There is a place for all approaches because not everyone walks the same path, or at the same speed.
- Courage and leadership is now required to move boldly forward and act on the data.
- It's critical to identify and move forward quickly on some short-term items to create success to build upon.
- We need to work more closely with and leverage the knowledge of those with lived experience to create long-term solutions.
- Is the emergency room the best place to help people in crisis? It's time to consider alternatives, such as 24/7 wrap-around care.

Recommendations from Roundtable Sessions

Roundtable sessions were held on the second day to brainstorm opportunities for intervention in three broad areas: hospitalization, employment/social assistance, and the justice system. Based on the data collected to date, these areas were repeated touchpoints for those who had overdosed.

The following reflects the results of the sessions.

Hospitalization

HOSPITALIZATION – SHORT-TERM: 1-6 MONTHS	
RESPONSIBILITY	**POLICY INTERVENTIONS**
Local / regional	Treatment at the Door: • Ensure care is immediate and non-stigmatizing, with no awkwardness or difficulty (no run-around) • Strengthen this approach and make it universal throughout the system
Local / regional	Stigma Reduction in Health Care System: • Ensure respectful workplace policies are adhered to for patients, in and out of hospital • De-escalate law enforcement-based arrivals – don't treat them as criminals • Ensure mechanisms/programs for an appropriate non-stigmatizing response
Local / regional	System Navigation Assistance • Allow for peer support to help navigate the system
Local / regional	Spiritual/Cultural Appropriateness: • Acknowledge and support the individual's spiritual and cultural needs, and support network • Consider culturally-based alternatives not traditionally permitted in hospitals, e.g. smudging
Local / regional	Compassion Fatigue Training: • Provide first responders with training on compassion fatigue
Provincial	Pain Management in ER: • Acknowledge pain/suffering and destigmatize pain treatment • Ensure a safe supply of opioids to prevent suffering • Adopt a wholistic approach that allows for alternatives to opioids that can provide comfort • Ensure ER staff are educated to carry this out
Provincial / federal	Medication Policy (in-hospital): • Create policy about induction and dosage of methadone and suboxone for a consistent/universal approach • Ensure appropriate dosage to prevent suffering and turning to street drugs • Create clinical practice guidelines for withdrawal prevention while individual is in care • Ensure continuity of support after discharge • Provide a range of options e.g. sublingual, injectable, implants
Provincial / federal	Corrections Services: • Provide trauma, pain and mental health treatment within the corrections system

HOSPITALIZATION – SHORT-TERM: 1-6 MONTHS	
RESPONSIBILITY	**PROGRAM INTERVENTIONS**
Local / regional	Overdose Prevention Services: • Provide greater access to OPS / episodic supervised consumption services
Local / regional	Support a Safer Supply: • Pursue a pilot project with federal funding for prescription-based or episodic supervised consumption
Local / regional	Enhanced First Responders: • "Project Angel" Model – layer services at first response to provide for both immediate needs and additional/wrap-around services
Local / regional	Staff and Patient Safety: • Initiate programs to ensure safety for staff and patients related to substance use, including dedicated staff resources, and empowerment and accountability for staff.
Local / regional	System Navigation: • Create a program engaging people with lived experience or staff to provide support in navigating programs.
Local / regional	Staff Training / Culture Change: • Provide staff training and education to reduce stigma and create a change in culture *May extend into medium-term timeframe*
Local / regional	Academic Partnerships: • Create partnerships between universities and health authorities for research and program development (e.g. social innovation program)
Local / regional	Physician Education: • Educate doctors on Opioid Agonist Treatment and other alternatives
Local / regional	Pain Treatment Bridging: • Provide bridging between hospital and community pain treatment programs and services to provide continuous care
Local / regional	Parents and Children: • Connect parents with peer support and community services first when care of children is required, in consultation with social services

HOSPITALIZATION – MEDIUM-TERM: 6-12 MONTHS	
RESPONSIBILITY	**POLICY INTERVENTIONS**
Local / regional	Transitional Care Post-Discharge • Ensure continued access to Opioid Agonist Therapy and other treatments after discharge
Local / provincial	De-escalation and Advocacy In-hospital: • Provide "champion" to assist during visits • Acknowledge the person's existing support network and provide support for the supporters
Provincial	Funding Equity: • Reconsider funding calculation for health authorities, moving away from per-capita to a calculation that acknowledges each region's unique service demand

HOSPITALIZATION – MEDIUM-TERM: 6-12 MONTHS	
RESPONSIBILITY	**POLICY INTERVENTIONS**
Various	GP for All: • Ensure a consistent contact within the health care system (ideally a GP), providing a medical "home" that ensures consistent ongoing care • Ensure access to programs that require a GP for those without one

HOSPITALIZATION – MEDIUM-TERM: 6-12 MONTHS	
RESPONSIBILITY	**PROGRAM INTERVENTIONS**
Local / regional	Data Collection and Sharing: • Structure call coding to support the collection of actionable data and establish a system to share with partners • Share real-time data with operators, service-providers and emergency services to enable faster and more appropriate response
Provincial	Preventing Leave Against Medical Advice: • Create programs to address the incidence of patients leaving against medical advice because their needs are not being met
Provincial / federal	Curricular Changes: • Adjust curriculum and training for everyone working in the health care system, e.g. doctors, social workers etc., to create culture change
Various	24/7 Care: • Consider alternatives to hospital ERs for providing 24/7 care, housing assistance etc.

Employment / Social Assistance

EMPLOYMENT/INCOME – SHORT-TERM: 1-6 MONTHS	
RESPONSIBILITY	**POLICY INTERVENTIONS**
Various	Cultural/Gender Safe Practices: • Ensure all policies consider cultural/gender safety
Various	Acknowledge Lived Experience: • Consult with those with lived experience when developing programs and services for them
Various	Workplace Stigma: • Reduce punitive response to drug use • Close loopholes around dismissal for substance use disorders

EMPLOYMENT/INCOME – SHORT-TERM: 1-6 MONTHS	
RESPONSIBILITY	**PROGRAM INTERVENTIONS**
Provincial / federal	Enhanced Workplace Health Supports: • Create Attendance Management Programs • Leverage OHS partnerships already in place • Improve communication between physicians and service providers • Provide individual with choice in service provider • Engage all health care professionals in the conversation, including allied health • Engage regulated health profession colleges in the conversation
Various	Training/Skill Building: • Government-supported training and hiring • Incentives to businesses to hire
Various	Peer Support Employment • Stipends/meaningful work for peer system navigators and peer advocates
Various	Opioid Agonist Treatment Clinics: • Promote stability to enable pursuit of employment, e.g. through incentives to take methadone/suboxone (provided free)
Various	Wrap-around Services: • Provide wrap-around services (e.g. housing, counselling) to those who engage in income/employment programs
Various	Workplace Programs: • Work with businesses, schools and trade schools to reduce stigma, promote safety to disclose, and encourage a quicker return to work • Provide proactive compassionate interventions in workplaces to raise awareness of services available and identify when people are struggling (e.g. injury/absenteeism rates) alongside individual/supportive conversations • Increase employer education about mental health and wellness issues, prevention, absenteeism/sick time and productivity, how to support employees, benefits for employee retention • Provide bridging programs to support faster return-to-work and reduce stigma • Enhance employee assistance programs

EMPLOYMENT/INCOME – MEDIUM-TERM: 6-12 MONTHS	
RESPONSIBILITY	**POLICY INTERVENTIONS**
Provincial / federal	Income Assistance Payments: • Consider changes to cheque issuance days – offer choice in payment structure and consider potential harms when making changes • Review/increase income assistance rates
Various	Extended Health Benefits: • Review policies and collective agreement language to consider ways to enhance health supports • Review policies around sick time and leave • Develop options for small businesses that don't offer benefits – e.g. provincial-level program

EMPLOYMENT/INCOME – LONG-TERM: 12-24 MONTHS	
RESPONSIBILITY	**POLICY INTERVENTIONS**
Various	Poverty Reduction Policy addressing: • Sufficient incomes (living costs, inflation) – including regional living wages • Hiring incentives for businesses • Child poverty reduction, including support for school completion • Skill building/training opportunities where people are located • Affordable and adequate housing (cross-ministry approach) • Increased shelter rate to ensure people can afford housing

Justice System

JUSTICE SYSTEM – SHORT-TERM: 1-6 MONTHS	
RESPONSIBILITY	**POLICY INTERVENTIONS**
Local / regional	Diversion Policy: • Standardize programs like Project Angel, use of community courts and diversion programs
Various	Police in School Programs: • Ensure programs are guided by best practice. • Don't have police provide drug education. • Educate officers (during initial training and ongoing) on harm reduction, mental illness, supports available
Various	*Good Samaritan Act*: • Assure consistent compliance with *Good Samaritan Act* for police attending overdoses
Various	Bylaw Enforcement: • Guidance / education on alternatives to removal of belongings when dealing with homeless individuals

JUSTICE SYSTEM – SHORT-TERM: 1-6 MONTHS	
RESPONSIBILITY	**PROGRAM INTERVENTIONS**
Local / regional	Peer Coordinators: • Utilize peer coordinators / subject matter experts to assist first responders and coordinate supports • Educate community / responders on peer coordinator program
Local / regional	Provide mobile showers for homeless
Local / regional	One Call: • Introduce a single number for support and referrals
Provincial / federal	Diversion Programs: • Expand and increase access to programs like Project Angel • Increased diversion for property crimes, e.g. shoplifting, foraging into programs or employment

JUSTICE SYSTEM – SHORT-TERM: 1-6 MONTHS	
RESPONSIBILITY	**PROGRAM INTERVENTIONS**
Provincial / federal	Expand In-custody Supports and Care: • Supervised consumption / clean drug supply • Naloxone training • Opioid Agonist Therapy • Training programs

JUSTICE SYSTEM – MEDIUM-TERM: 6-12 MONTHS	
RESPONSIBILITY	**POLICY INTERVENTIONS**
Local / provincial	Children • Develop alternatives to apprehending children when parents are in custody
Local / provincial	Recovery Homes: • Increase regulation of recovery homes – look at differences between licensing and regulation
Provincial/federal	Substance Use Consideration • Consider substance use disorders in all court proceedings • Consider intermittent sentencing and options to address substance use, diverting where possible • Review sentencing conditions, e.g. abstinence clauses, curfews, red zones etc. biased against those struggling with a substance use disorder
Various	Racial Analysis: • Review policy and procedure related to stops, seizures and convictions based on race (review racial analysis / research in Toronto)

JUSTICE SYSTEM – MEDIUM-TERM: 6-12 MONTHS	
RESPONSIBILITY	**PROGRAM INTERVENTIONS**
Provincial / federal	Peer Support and Expertise: • Utilize lived experience to provide support and consultation for programs
Provincial / federal	Situation Tables: • Increase use and access of situation tables as a diversion option • Expand use beyond justice system
Various	Business Engagement: • Partner with/engage businesses affected by shoplifting/foraging activities • Work with businesses with labour shortages (e.g. construction, food service) for diversion / employment opportunities
Various	Re-integration Services: • Provide peer mentors • Provide supported housing and wrap-around services
Various	Front-line Officer Training: • Provide education in harm reduction, relationship-based engagement, core addictions training, trauma-informed resilience and de-escalation

JUSTICE SYSTEM – LONG-TERM: 12-24 MONTHS	
RESPONSIBILITY	**POLICY INTERVENTIONS**
Provincial / federal	Decriminalize Possession: • Law should reflect what happens in practice
Provincial / federal	Incarceration Policy: • Review incarceration policies to consider if a custodial sentence is the appropriate response for certain crimes (e.g. crimes perpetrated to support a substance use disorder)
Various	Address Systemic Stigma: • Create policy designed to create cultural change and end bias • Integrate subject matter experts into the justice system • Allow for in-custody treatment, withdrawal prevention and transition services upon release

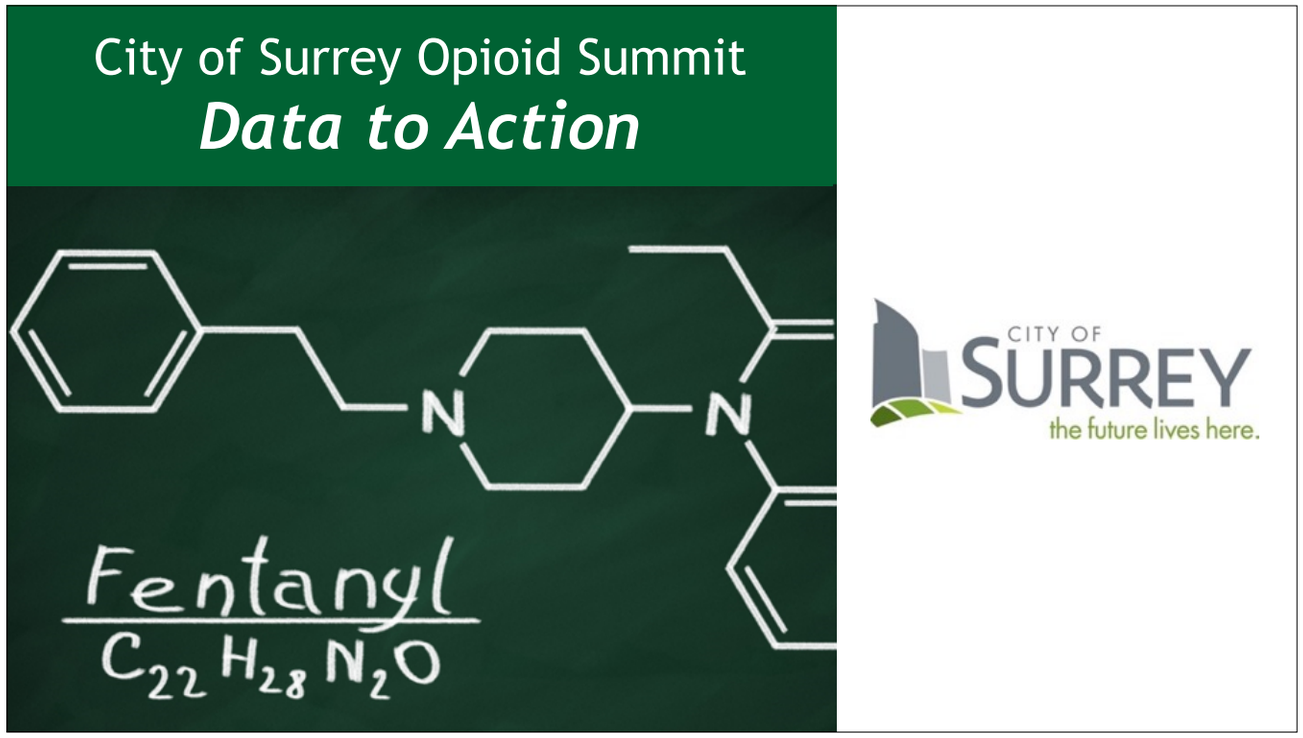
JUSTICE SYSTEM – LONG-TERM: 12-24 MONTHS	
RESPONSIBILITY	**PROGRAM INTERVENTIONS**
Various	Community / Drug Courts: • Provide non-criminalized methods for dealing with drug-related crimes
Various	Youth Intervention Programming • Target at-risk youth

Next Steps

The proceedings of the Summit will be synthesized and matured over the next week. The intent is to make them available as soon as possible, with June 17, 2019 as the goal.

For additional information, contact:

Mark Griffioen
Deputy Chief
Surrey Fire Services
MEGriffioen@surrey.ca
604.543.6704

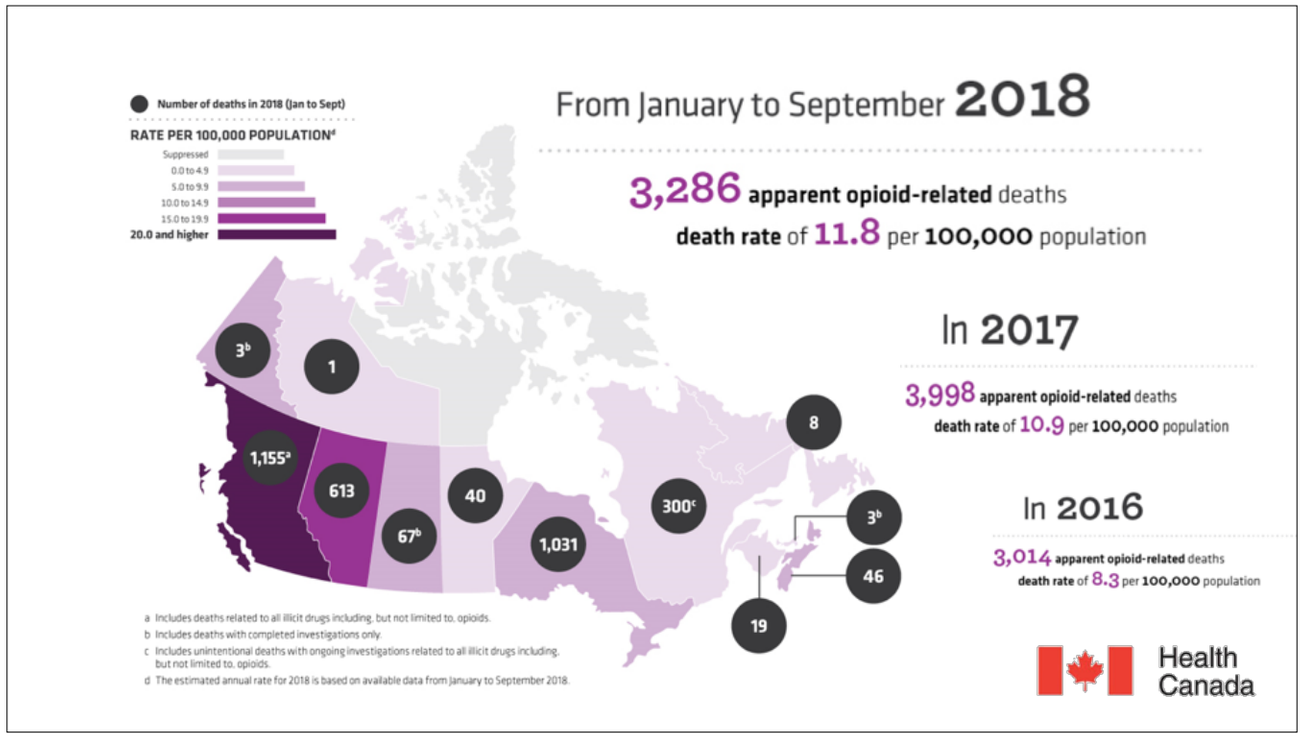


Hello my name is Mark Griffioen.

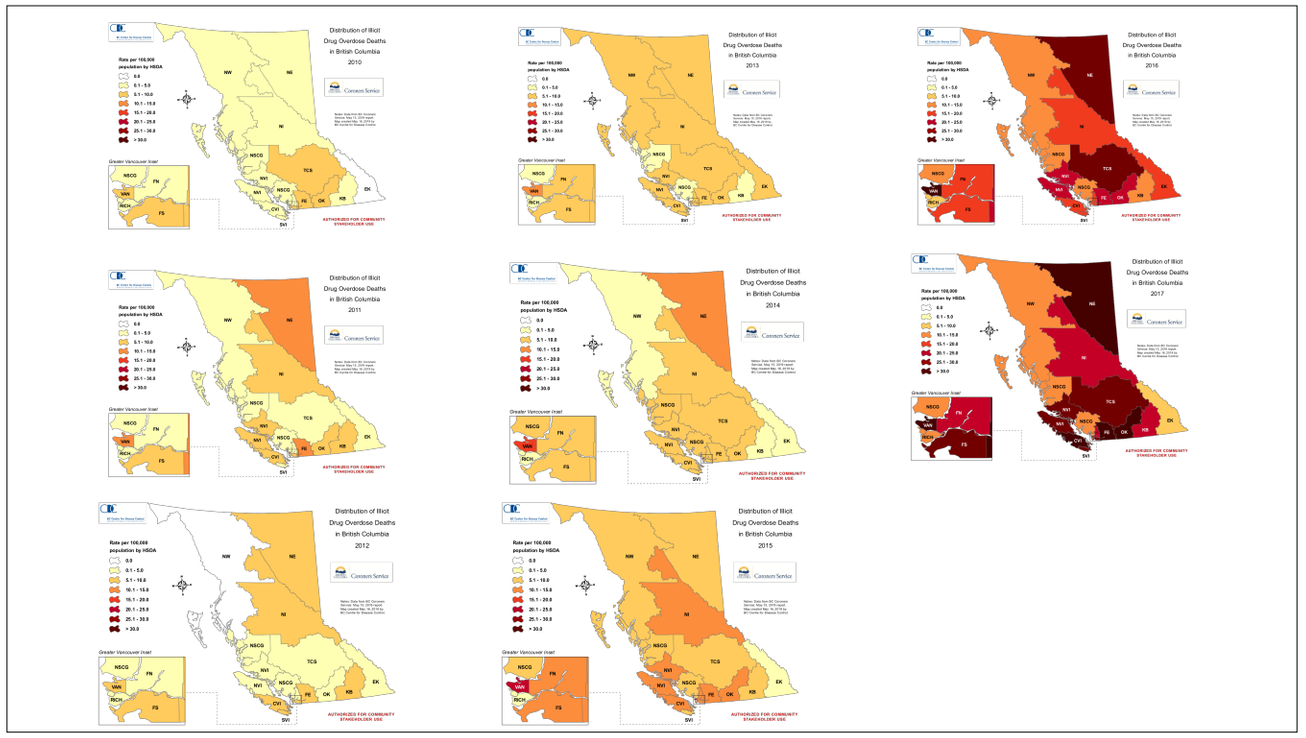
I am a Deputy Fire Chief with the City of Surrey.

I lead the Surrey Fire Prevention Division and am responsible for the Surrey Fire Service's community engagement program.

I'd like to take a few minutes to outline the overdose epidemic as experienced here in Surrey.

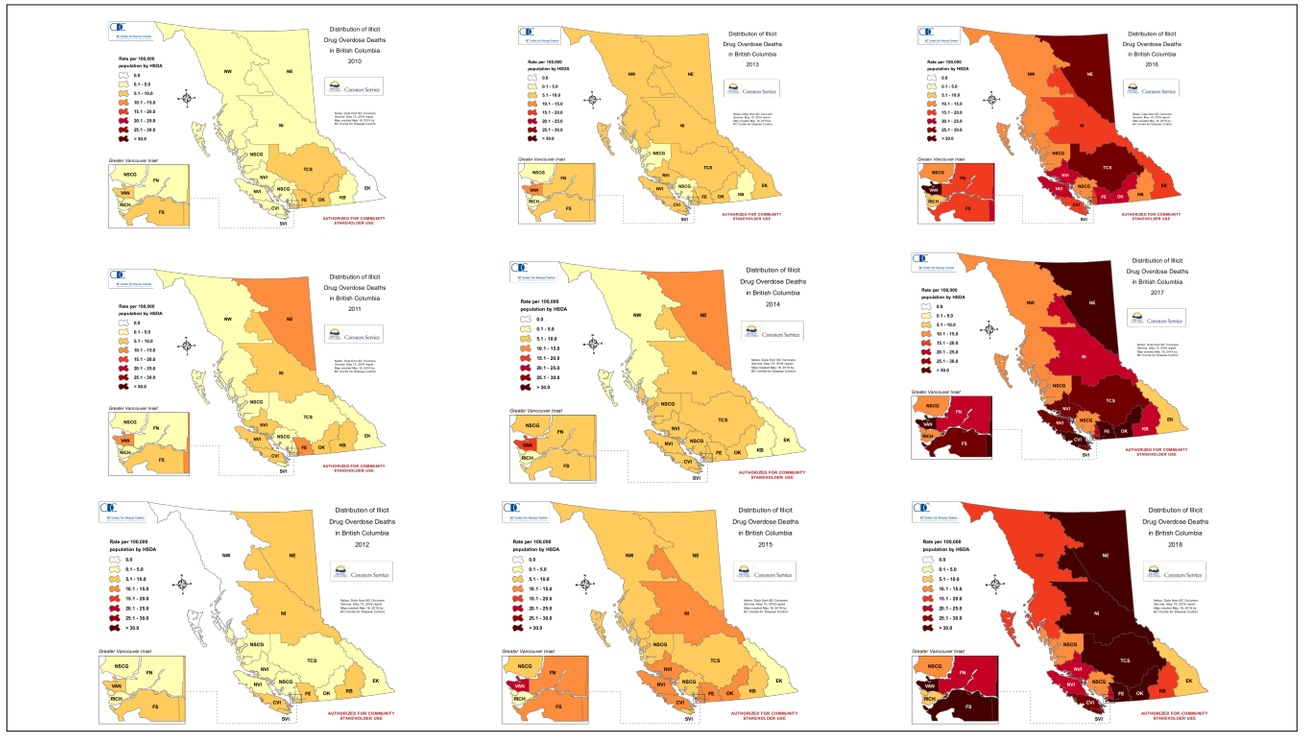


Since 2016, roughly 1/3 of annual opioid deaths in Canada have occurred in the Province of British Columbia though British Columbia makes up only 13% of the population of Canada.



These maps from the the BC Centre for Disease Control and the BC Coroners Service dramatically demonstrate how the rate of overdose deaths has intensified in British Columbia over the past 8 years:

*



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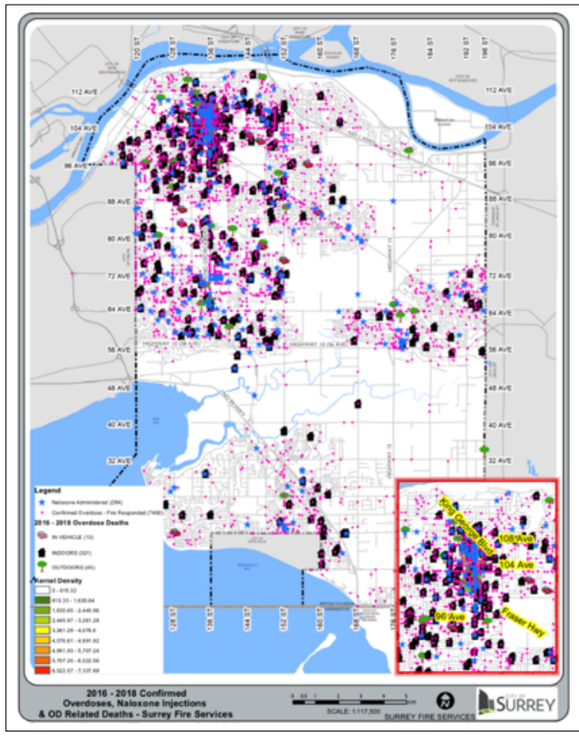


Three Years (2016 - 2018): 7,469 Overdoses

509 Deaths in Surrey
85% Indoors
12% Outdoors
4% In Vehicles

	2017	2018	Increase
Vancouver	376	389	**3%**
Surrey	180	212	**18%**
Victoria	93	96	**5%**

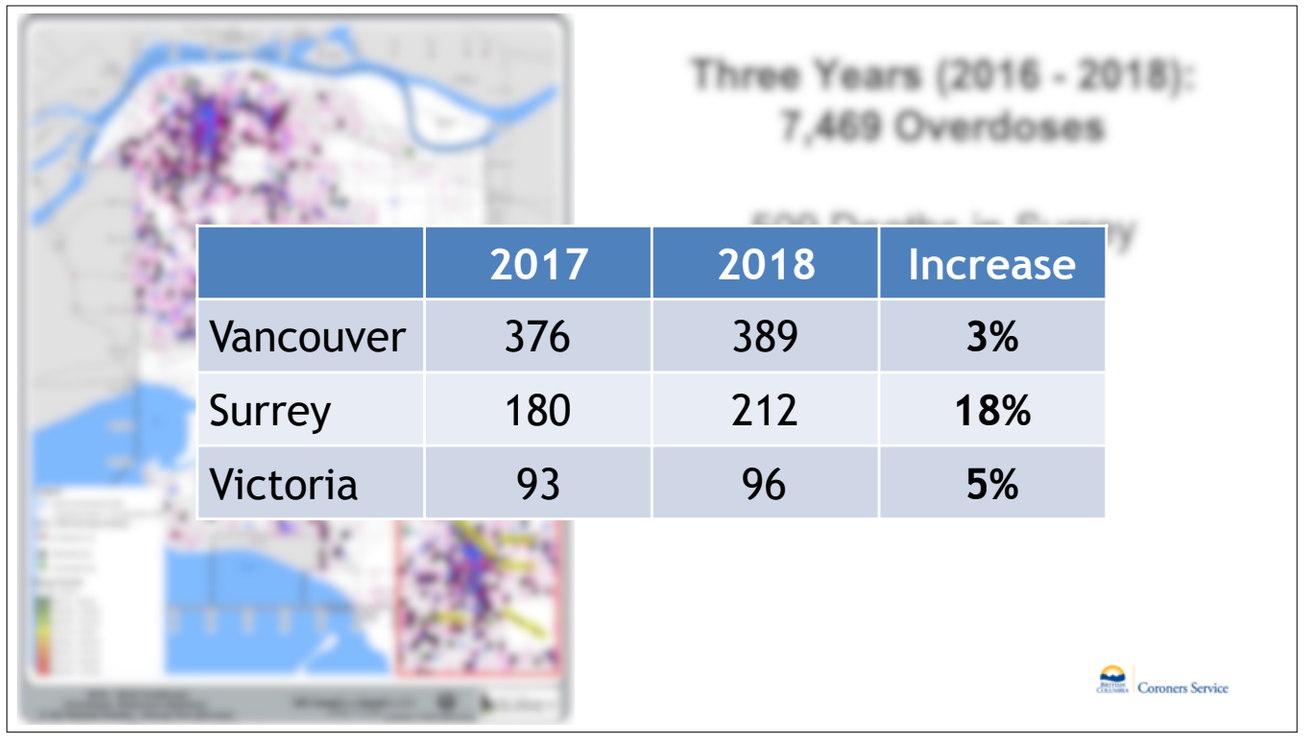
Coroners Service

Surrey accounts for approximately 15% of British Columbia’s overdose deaths annually.

There was a reduction last year in the rate of increase across the province, more or less levelling off.

*

Of the 3 Cities in BC with the highest overdose rates, 2018 showed only minor increases for Vancouver and Victoria. In Surrey, however, the rate continued to climb.



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23 years ago, when I was a rookie in the Fire Service, overdose calls were rare. Throughout the early part of my career responding to overdoses meant, in the worst cases, providing rescue breathing until paramedics arrived with their ‘magical’ administration of Naloxone, which usually caused the patient to recover and left crews with a feeling of having provided a valuable intervention.

Over time, however, as we became more experienced in the treatment of overdoses we observed that at times patients were not always appreciative of the opioid-inhibiting effects of Naloxone. There was concern that some patients began to receive repeat visits from fire crews who were often first to arrive on scene.

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In late 2015 stories began to circulate about severe effects of fentanyl and shocking and confusing circumstances around calls for service. As the Provincial Health Officer declared a Public Health emergency, Surrey Fire Service trained first responders in the administration of Naloxone in early 2016.

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As the population of vulnerable homeless people living along 135a Street increased, fire fighters were engaged so frequently in managing overdose related incidents that a new ‘medical engine’ was ordered and resources were managed to staff it.

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This shortened critical response times for opioid overdose patients and also relieved some pressure fire crews were experiencing in the Whalley area.

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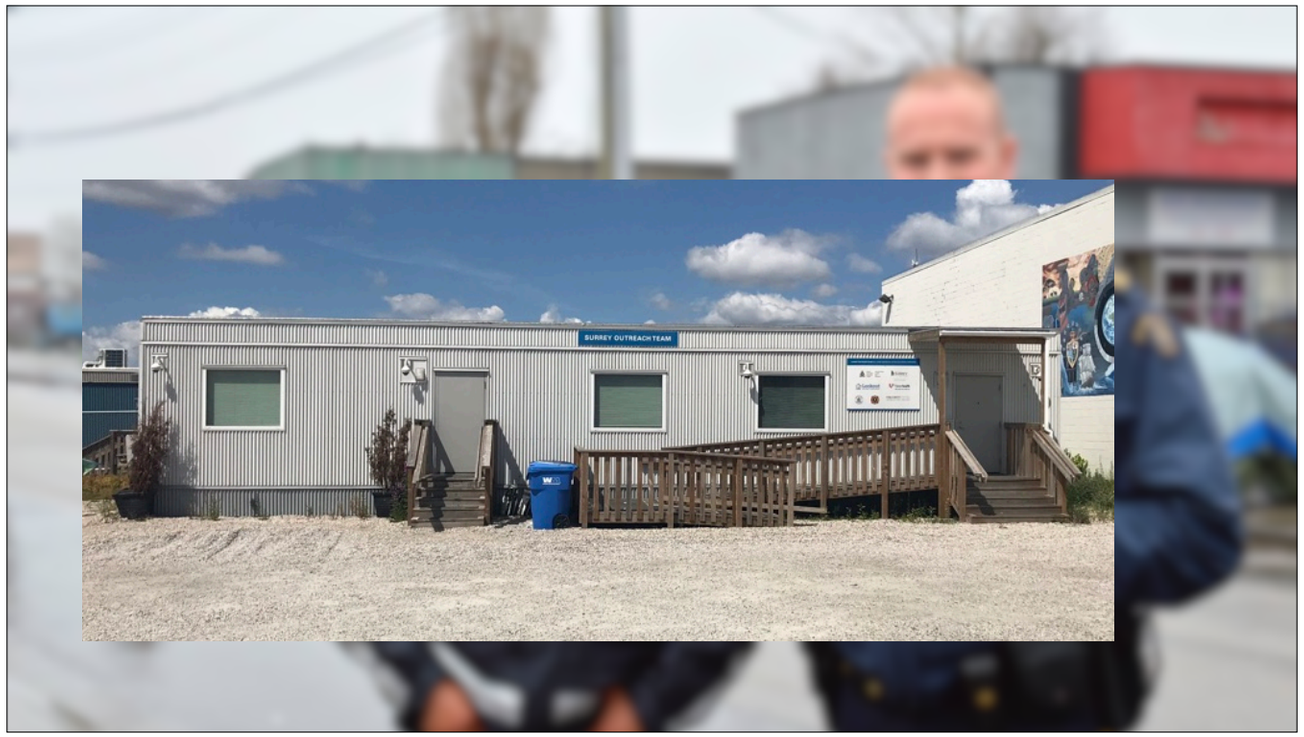
The Outreach Team was provided training in cooperation with Fraser Health, and maintained a consistent and supportive presence on 135A Street. This strategic approach was employed to enhance public safety by engaging the public, businesses, and to safely facilitate the work of community partners working in the area. The Team worked to build relationships with residents and connect them to available resources.

Regular cleanups were arranged by City Engineering staff to combat the threat of illness. Safe alternatives were traded for open-flame sources of heat and light – it was calculated that residents of 135a were more than 100 times more likely to experience a fire than housed citizens.

*

In 2017 a permanent trailer was installed, allowing space for debriefings and meetings with partner agencies.



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The City Centre Response Plan included the establishment of Fraser Health's SafePoint safe consumption facility and the provision of over 150 units of 24/7 supportive housing.

The introduction of safe consumption services began a marked decline in the percentage of overdoses occurring in the Central Core. In addition to providing a space where people could inject or consume substances under supervision by oral or intra-nasal means, first-line treatment was provided for opioid addiction using medications such as Suboxone and methadone. SafePoint staff provided health education as well as referrals to first-line treatment and other health and social services.

There was also an identified need in our community to help individuals transition between the street, shelters and stable housing. The low supply of appropriate options in Surrey for this hard-to-house population made it challenging to transition shelter residents into housing, and thus individuals in tents to temporary shelters.

*

Three buildings of short-term transitional accommodations were opened in July 2018. In coordination with BC Housing, as part of the City Centre Response Plan, City staff, Fraser Health, RCMP members, and community partners helped residents on 135a Street to transition into short term transitional housing in support of health and safety for the entire community. Almost one year later, the move to housing has proven a resounding success – both for the community partners involved and the residents themselves.

Provision of health and support services on site allows residents to focus on issues related to treatment, employment and health. It also brings these vulnerable residents under the umbrella of the BC Building and Fire Codes where conditions can better managed under the direction of the Surrey Fire Service inspectors.

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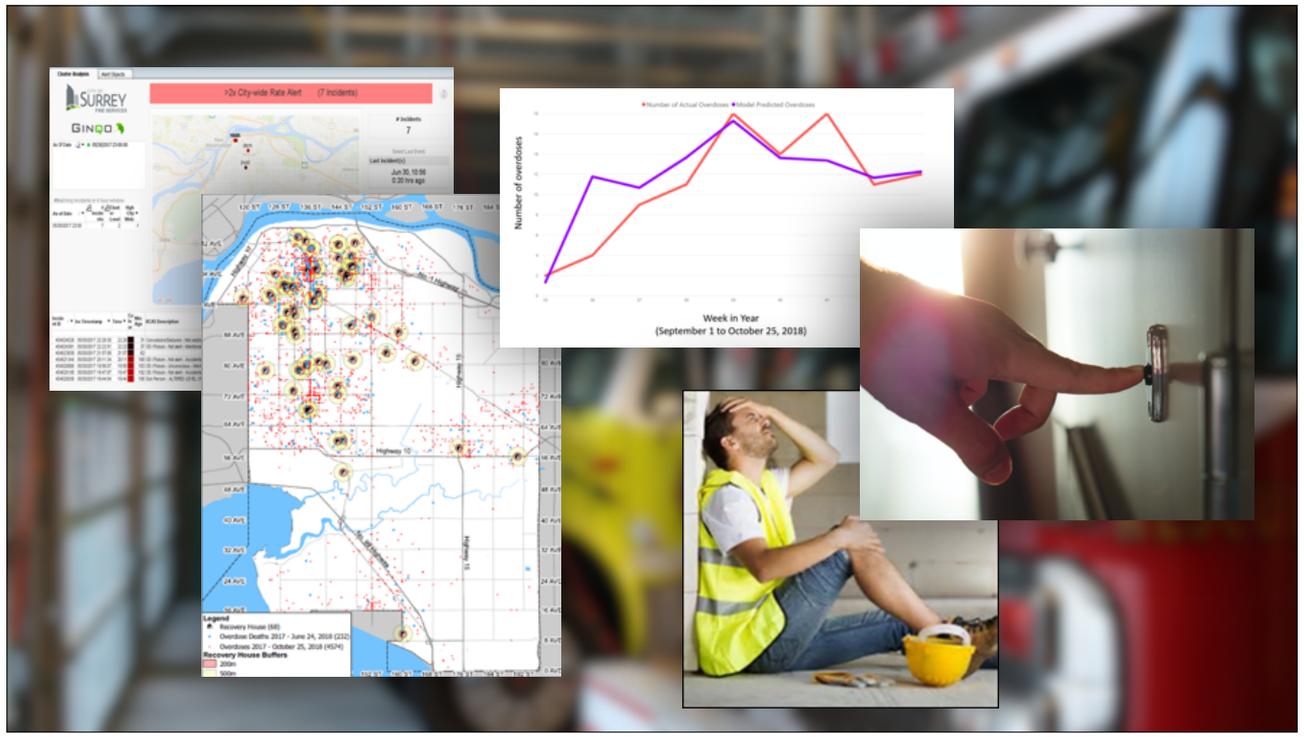


The City of Surrey has initiated many unique projects in an effort to action the data available through careful record keeping:

*

In partnership with Surrey RCMP and Fraser Health: The Overdose Cluster App, which uses Business Intelligence software to alert authorities when overdoses occur with a short time and distance of each other or surpass a City-wide threshold

*

In partnership with Fraser Health: The Recovery Home Project - bringing harm reduction and fire safety tools and education to recovery home residents

*

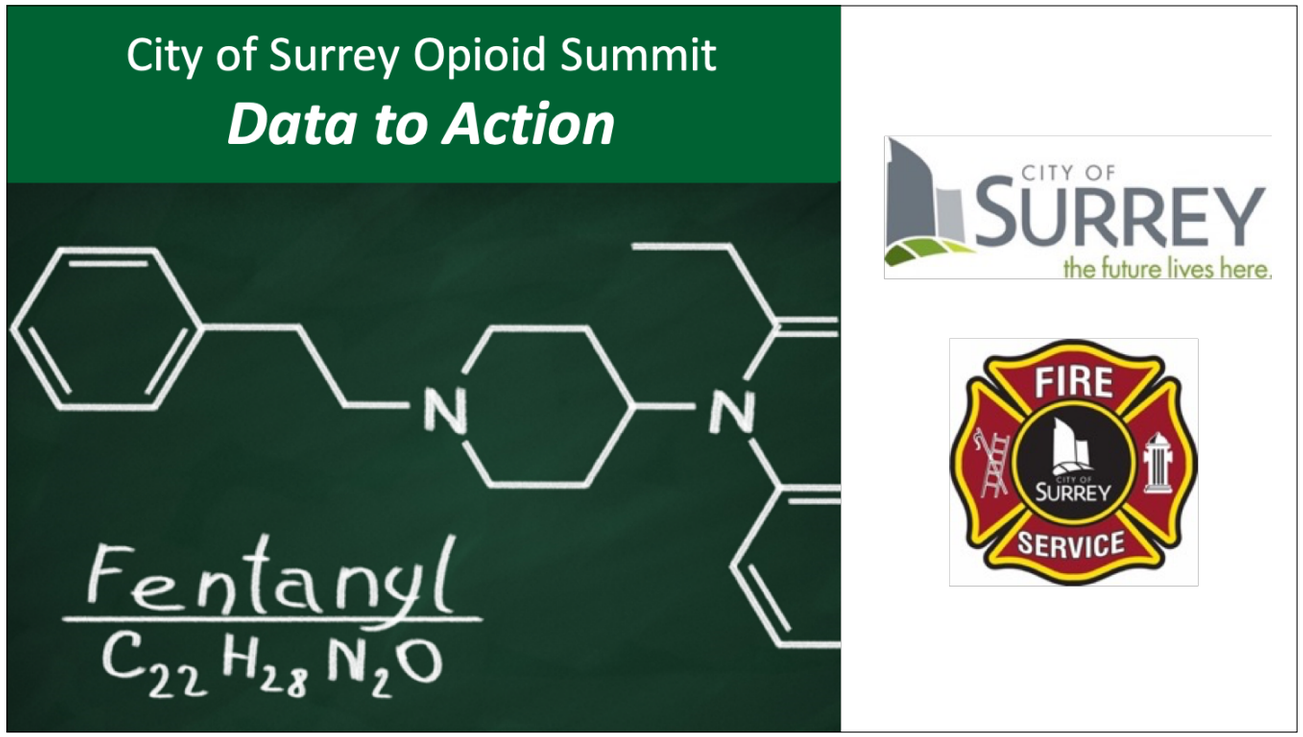
In partnership with Microsoft Canada: The Machine Learning tool - seeking to predict the timing and location of overdoses before they occur using Microsoft's machine learning and artificial intelligence platform

*

In partnership with Fraser Health and Preventable BC: The Construction Fire Safety Plan project - connecting workers in the construction industry with resources and information

*

In partnership with Fraser Health: The Second Responder Program - connecting persons who overdose at home with support and resources



It was recognized that understanding the factors that lead individuals to opioid use and overdose is critical to developing effective interventions.

*

Since December 2017, Statistics Canada, the City of Surrey, Surrey Fire Services, Surrey RCMP, Fraser Health Authority, BC Coroners Service, the Provincial Health Authority and others have been working together in a research partnership. This partnership was formed to bring together data on the individuals who have experienced overdose events and fatalities and examine their case histories in terms of justice and health care involvement and employment status and other factors.

The data generated by the project will be critical to identify the primary risks and characteristics of those individuals most at risk of opioid use or overdose. Now that the initial data analysis is completed, it is timely to address the key policy questions that arise from this analysis and begin to design new responses to reduce the risk of overdose and death in our community.

In addition to directly benefiting the efforts of the Surrey Fire Service in combatting the Opioid Crisis, lessons learned have provided insight into other potential areas of improvement. We didn't know what we didn't know, and we extended a hand to Stats Canada to help us understand.

You have been invited these two days to hear the when, where and why of what he have learned about the opioid crisis, hear some experts and practitioners evaluate the effectiveness of responses and theory of what needs to changed, and finally we would like you to engage in conversations about how existing programs can be augmented, improved or adjusted to improve efficiency.

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Thank you!

City Centre Response Plan and Crime, Overdoses, Social Assistance Evaluation

Paul Maxim
Professor Emeritus
Western University

Opioid Summit

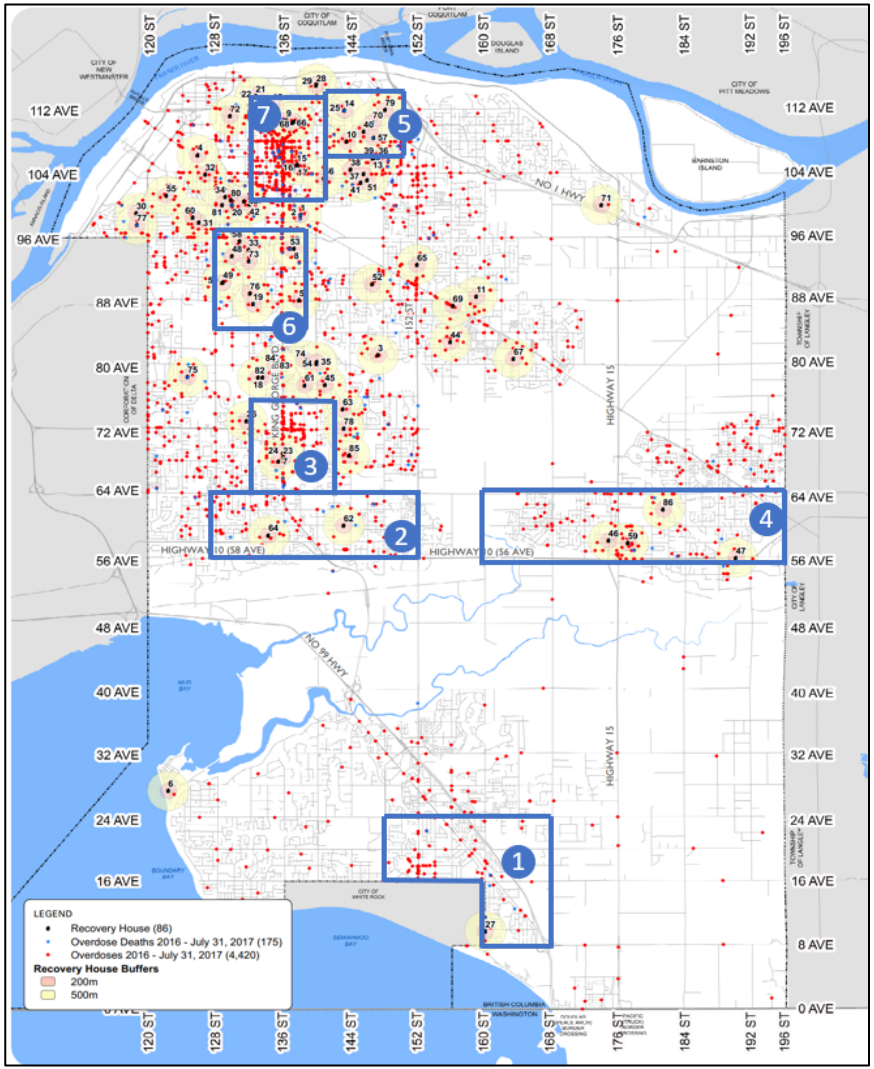
June 4, 2019

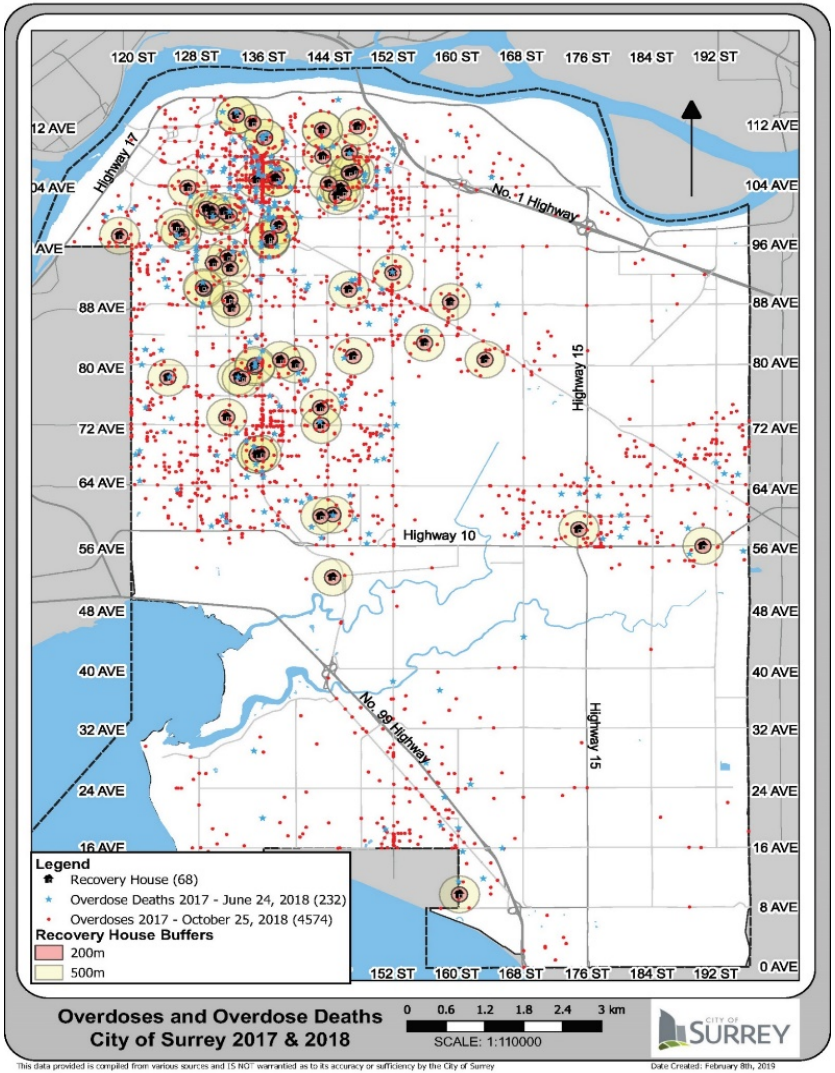
City of Surrey

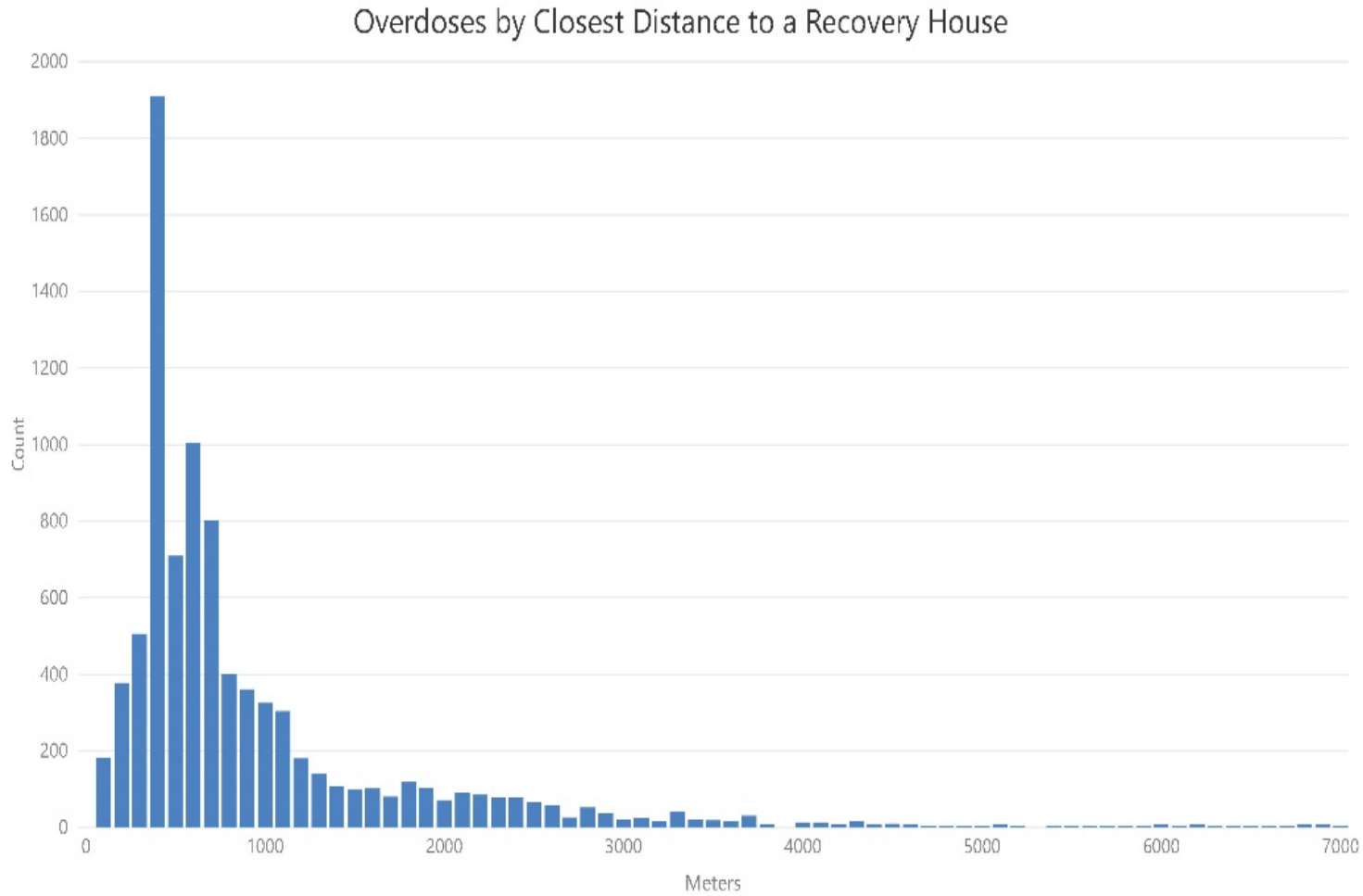
Outline

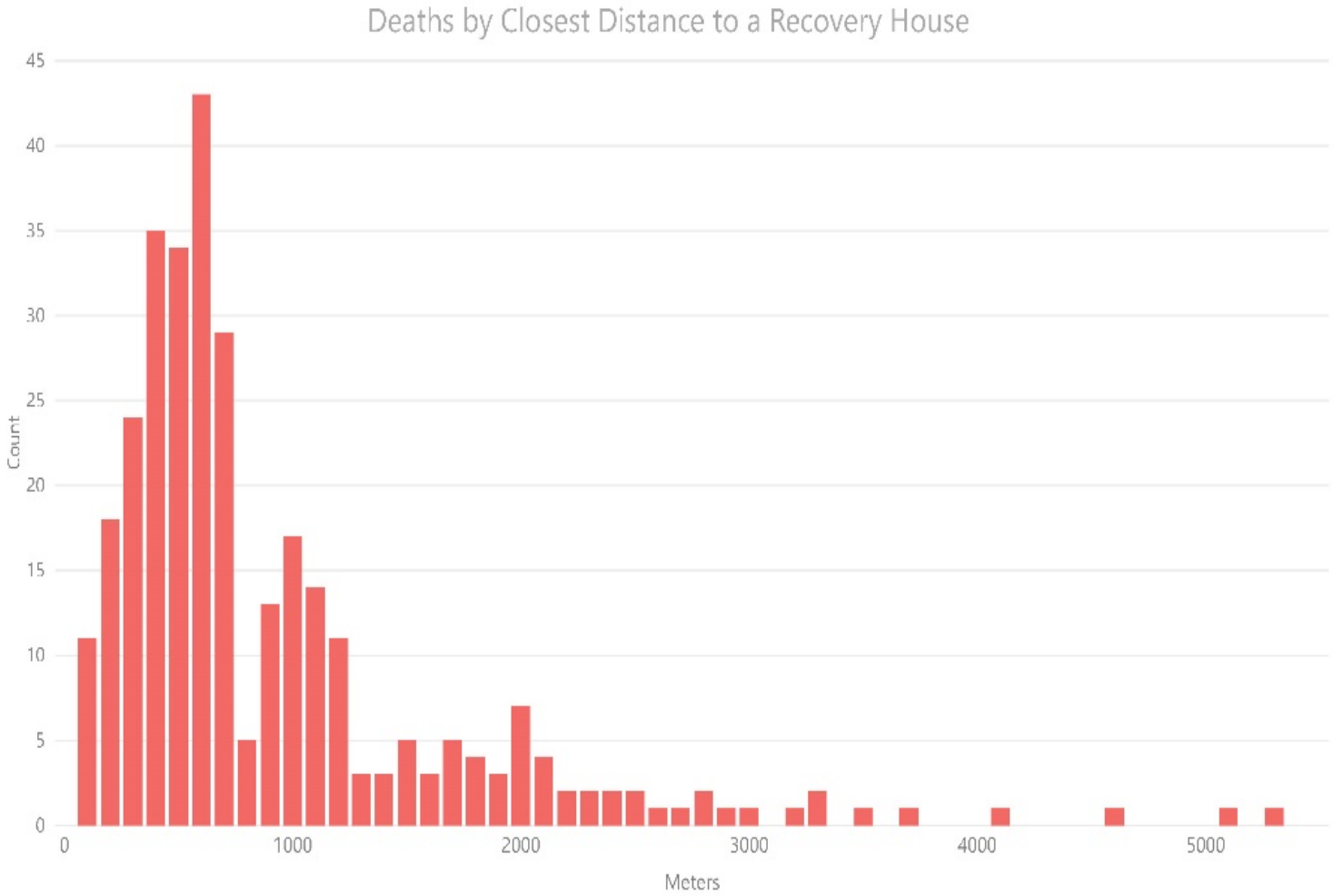
- Background
- Initial research: where and when?
- The “Centre City Problem”
- City Responses
- Outcomes

Where: Things that hang together.


120 ST
128 ST
136 ST
144 ST
152 ST
160 ST
168 ST
176 ST
184 ST
192 ST
196 ST
112 AVE
104 AVE
96 AVE
88 AVE
80 AVE
72 AVE
64 AVE
56 AVE
48 AVE
40 AVE
32 AVE
24 AVE
16 AVE
8 AVE
0 AVE
1
2
3
4
5
6
7
HIGHWAY 10 (58 AVE)
HIGHWAY 10 (56 AVE)
HIGHWAY 15
NO 1 HWY
NO 99 HWY
LEGEND
Recovery House (86)
Overdose Deaths 2016 - July 31, 2017 (175)
Overdoses 2016 - July 31, 2017 (4,420)
Recovery House Buffers
200m
500m

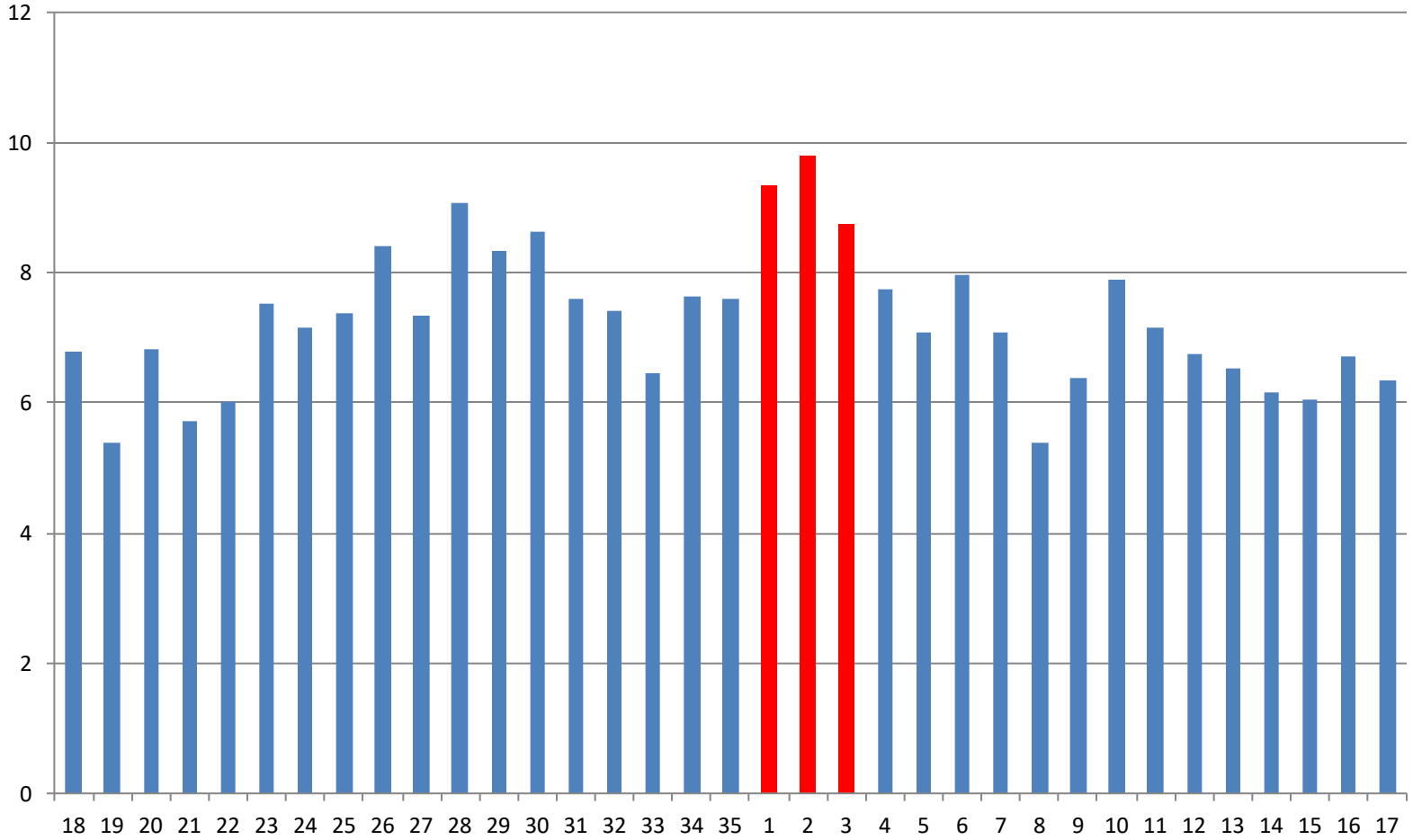

120 ST
128 ST
136 ST
144 ST
152 ST
160 ST
168 ST
176 ST
184 ST
192 ST
12 AVE
112 AVE
104 AVE
96 AVE
88 AVE
80 AVE
72 AVE
64 AVE
56 AVE
48 AVE
40 AVE
32 AVE
24 AVE
16 AVE
8 AVE
0 AVE
Highway 17
No. 1 Highway
Highway 15
Highway 10
No. 99 Highway
Legend
Recovery House (68)
Overdose Deaths 2017 - June 24, 2018 (232)
Overdoses 2017 - October 25, 2018 (4574)
Recovery House Buffers
200m
500m
Overdoses and Overdose Deaths
City of Surrey 2017 & 2018
0 0.6 1.2 1.8 2.4 3 km
SCALE: 1:110000
CITY OF SURREY
This data provided is compiled from various sources and IS NOT warranted as to its accuracy or sufficiency by the City of Surrey
Date Created: February 8th, 2019


Overdoses by Closest Distance to a Recovery House
Count
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
Meters

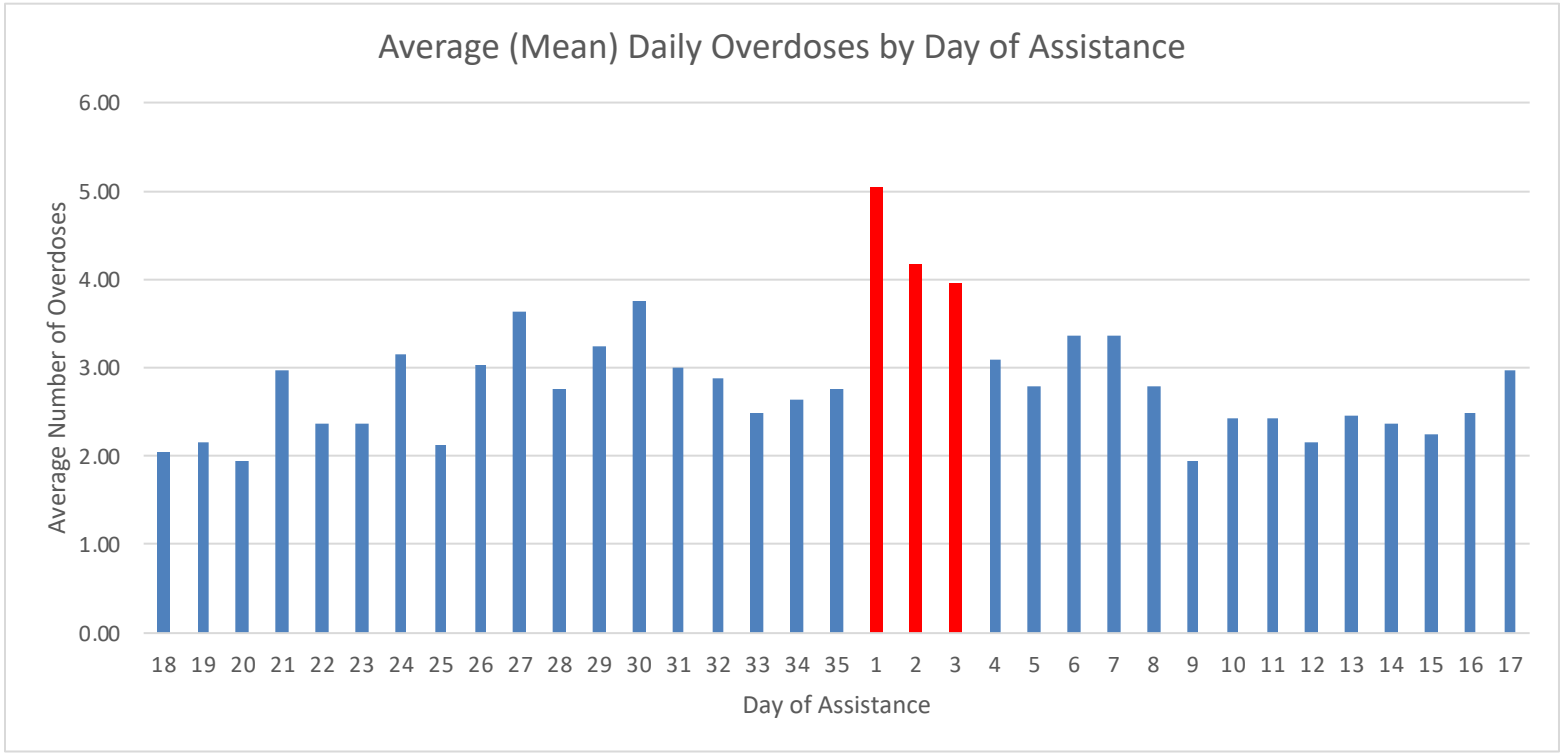

Deaths by Closest Distance to a Recovery House
45
40
35
30
25
20
15
10
5
0
Count
0
1000
2000
3000
4000
5000
Meters

When: The impact of “cheque” day

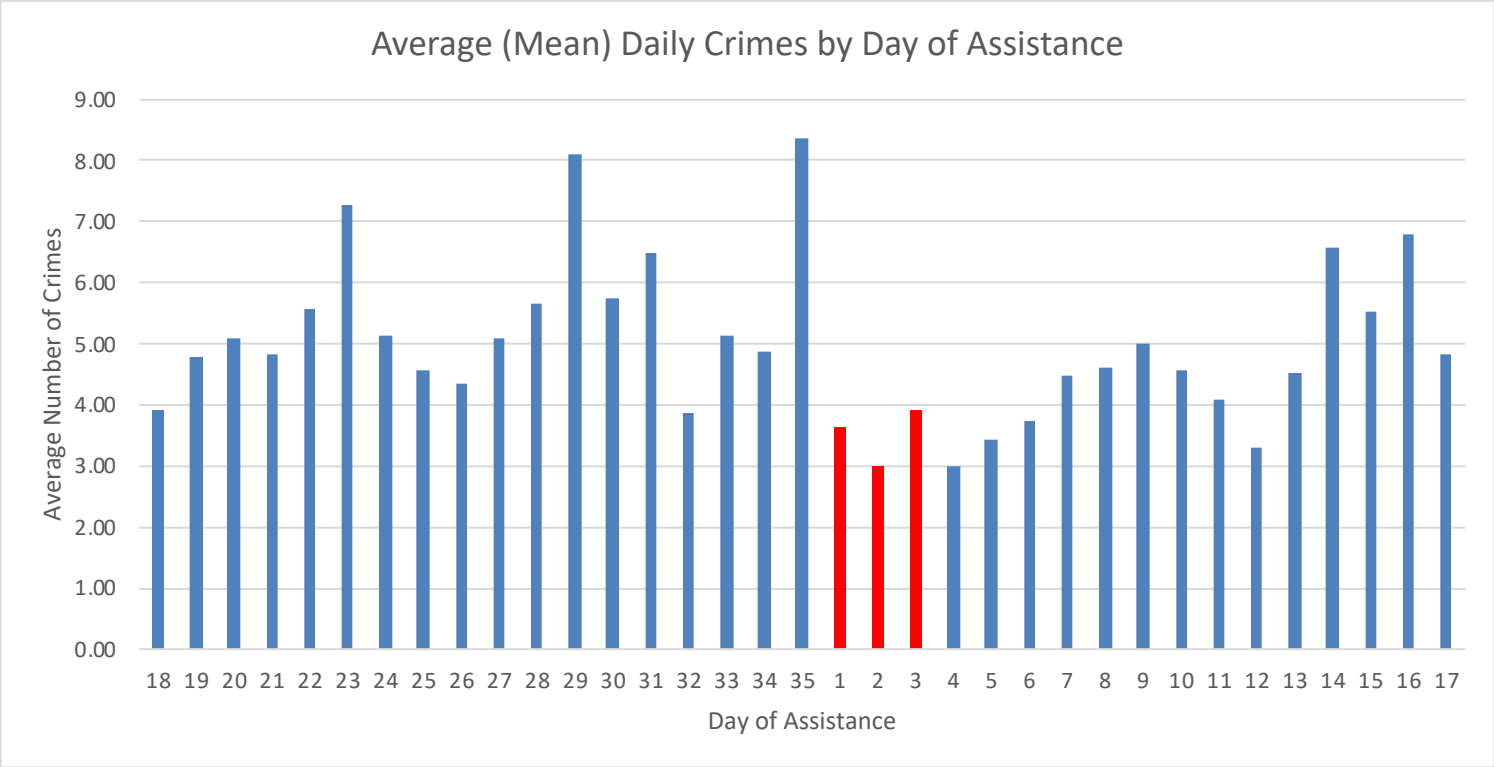
Average (Mean) Daily Overdoses by Day of Assistance
in City of Surrey



Average Daily Overdoses by Day of Assistance in Region 7 (City Centre)



Region 7: Average daily crime by day of assistance



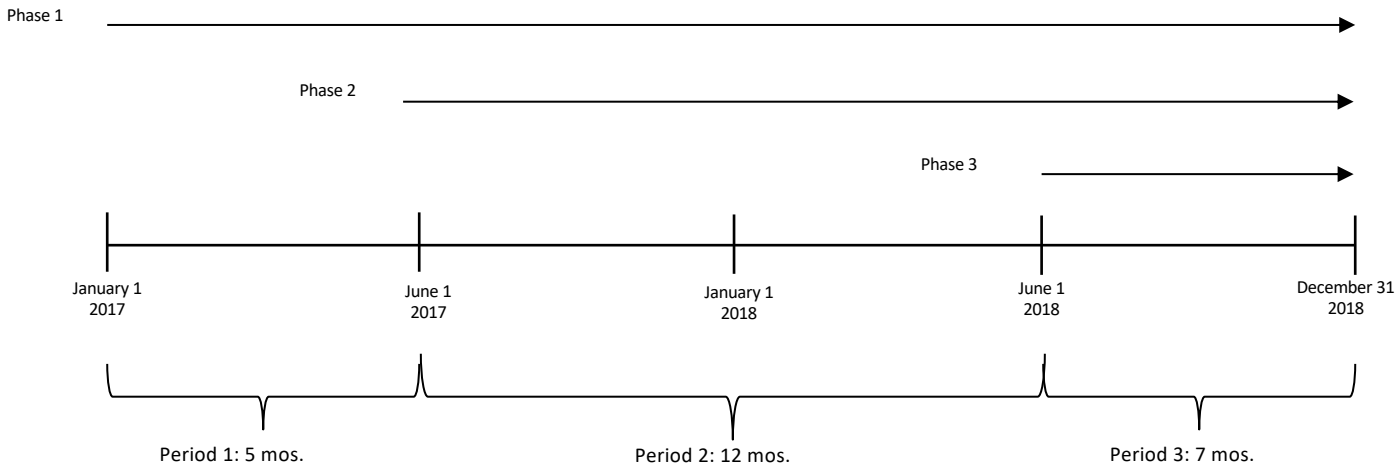
The City Centre Response Plan

Three key intervention phases:

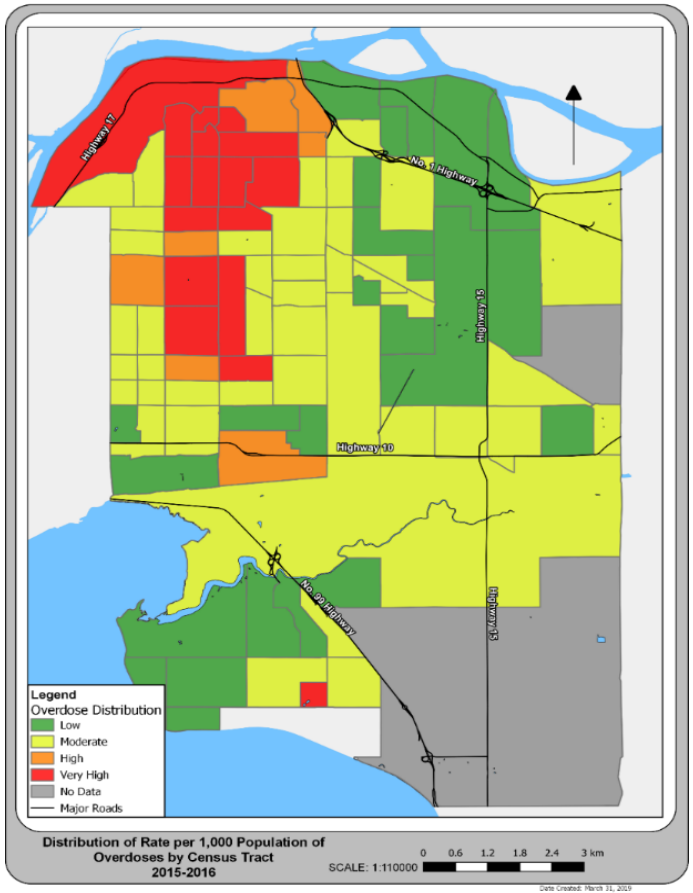
1. January, 2017: Initiation of SOT – Surrey Outreach Team

2. June, 2017: Initiation of SafePoint, a supervised consumption site

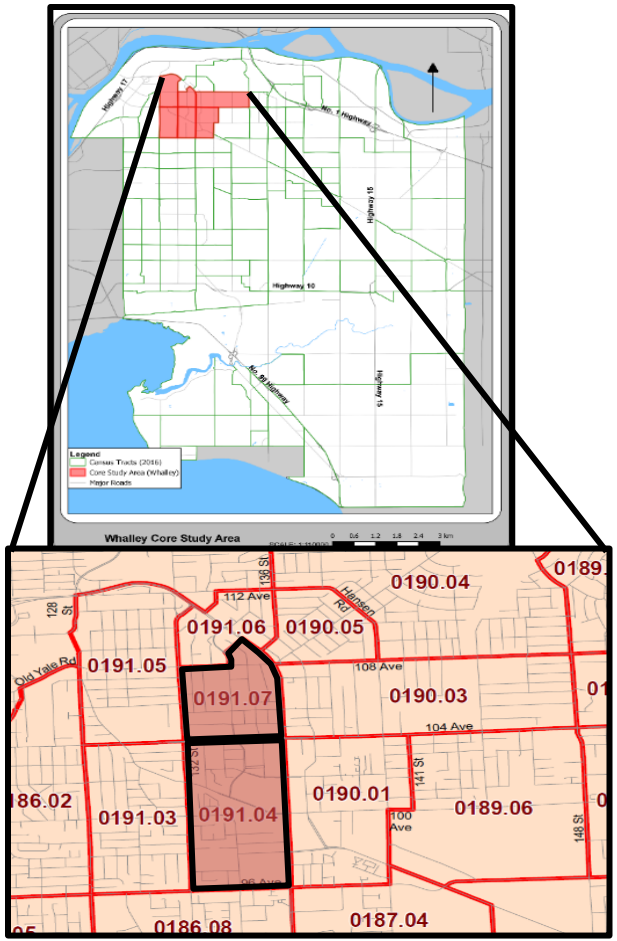
3. June 2018: Creation of Workforce Housing for 200 people



Distribution of Opioid-related Overdoses by Census Tract, 2015-2016

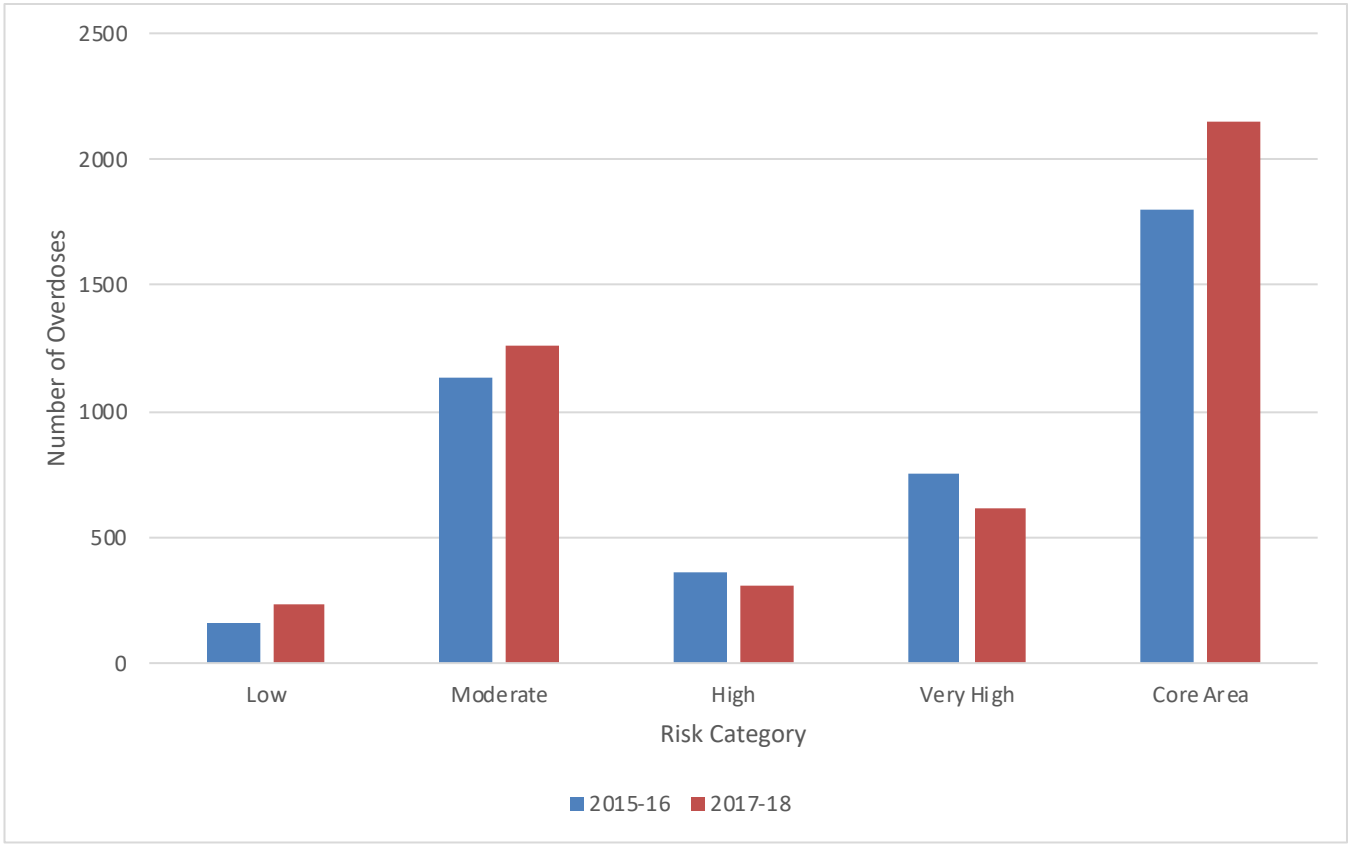


Distribution of Census Tracts in Surrey with “Core Area” Highlighted

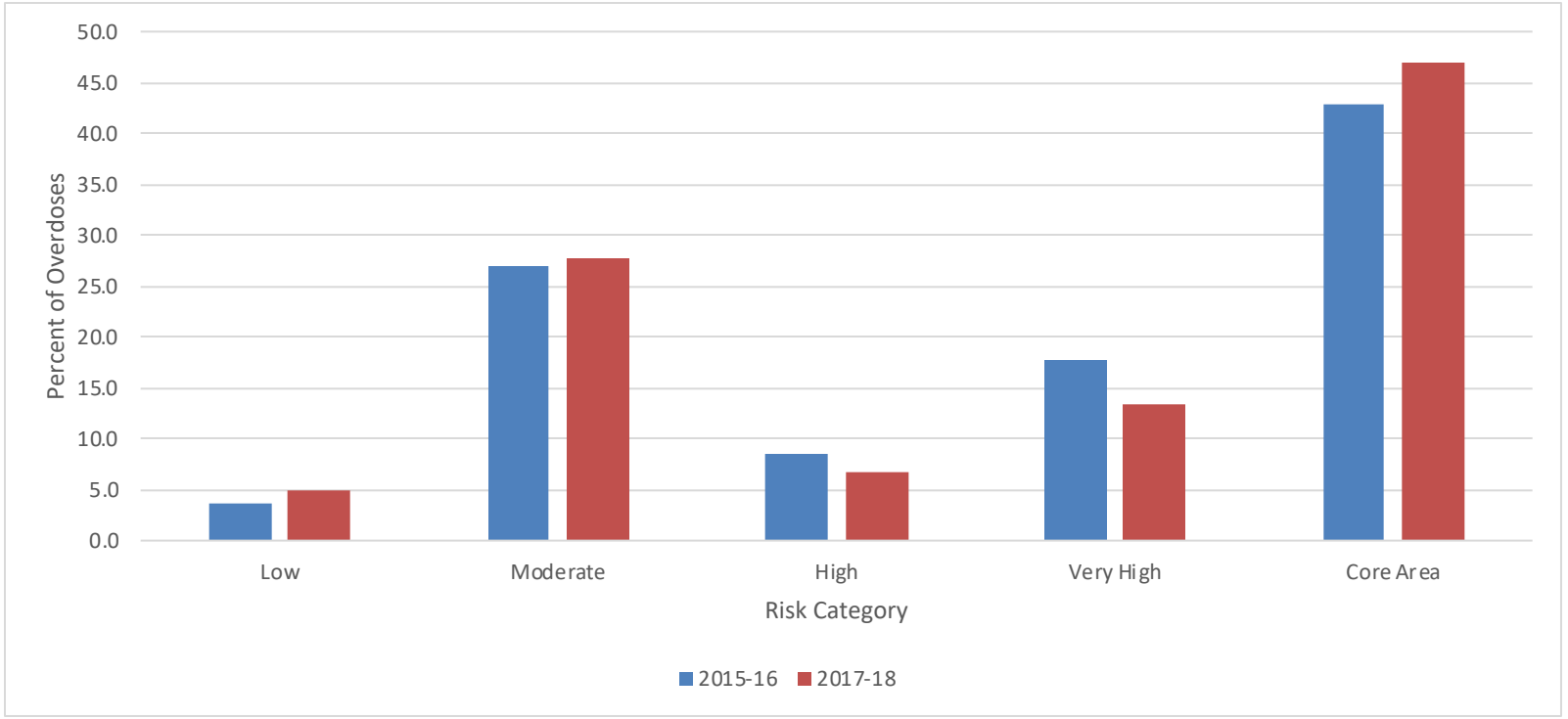


Before and After: Surrey as a Whole

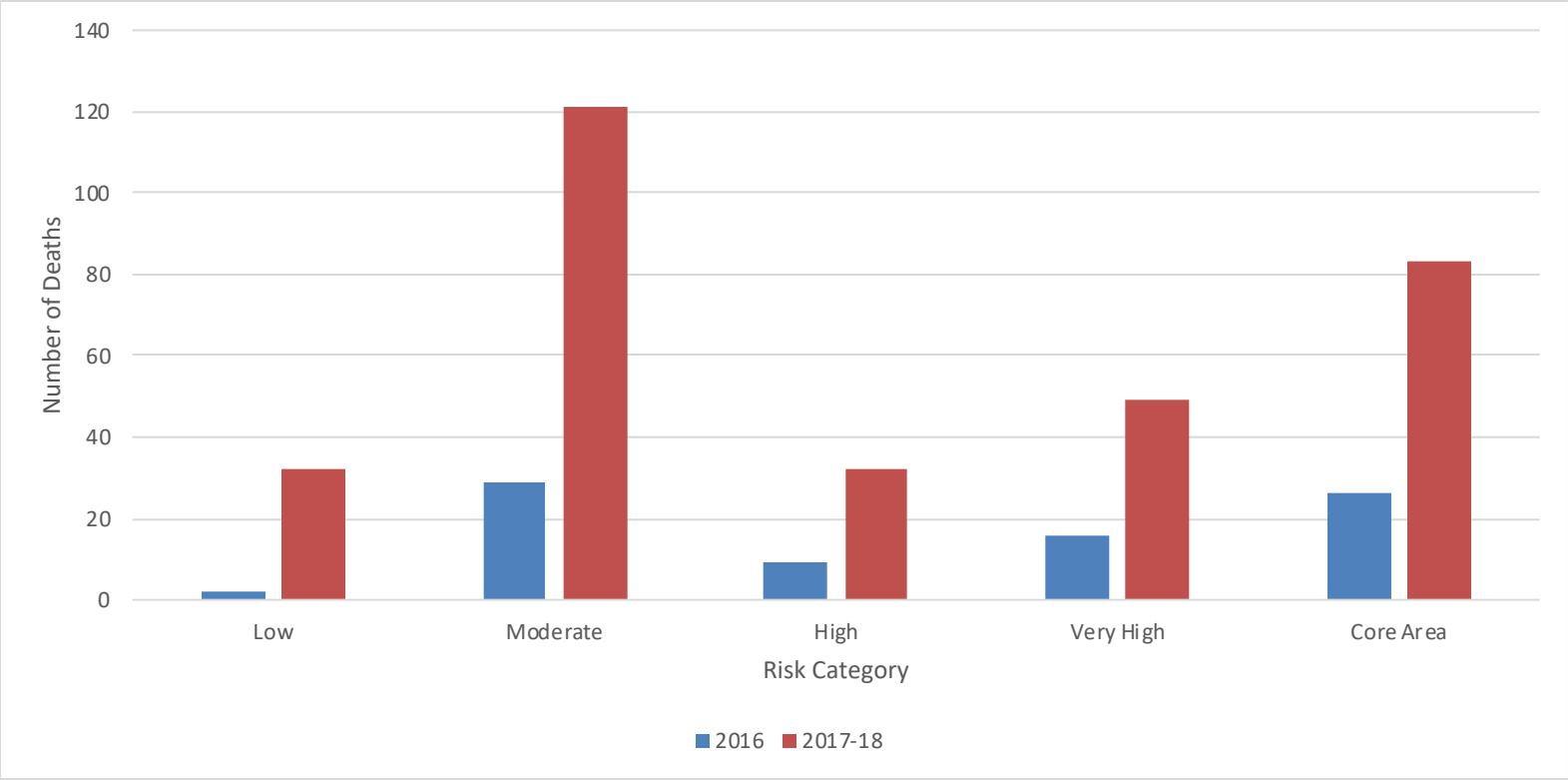
Number of Surrey Drug Overdoses by Risk Category



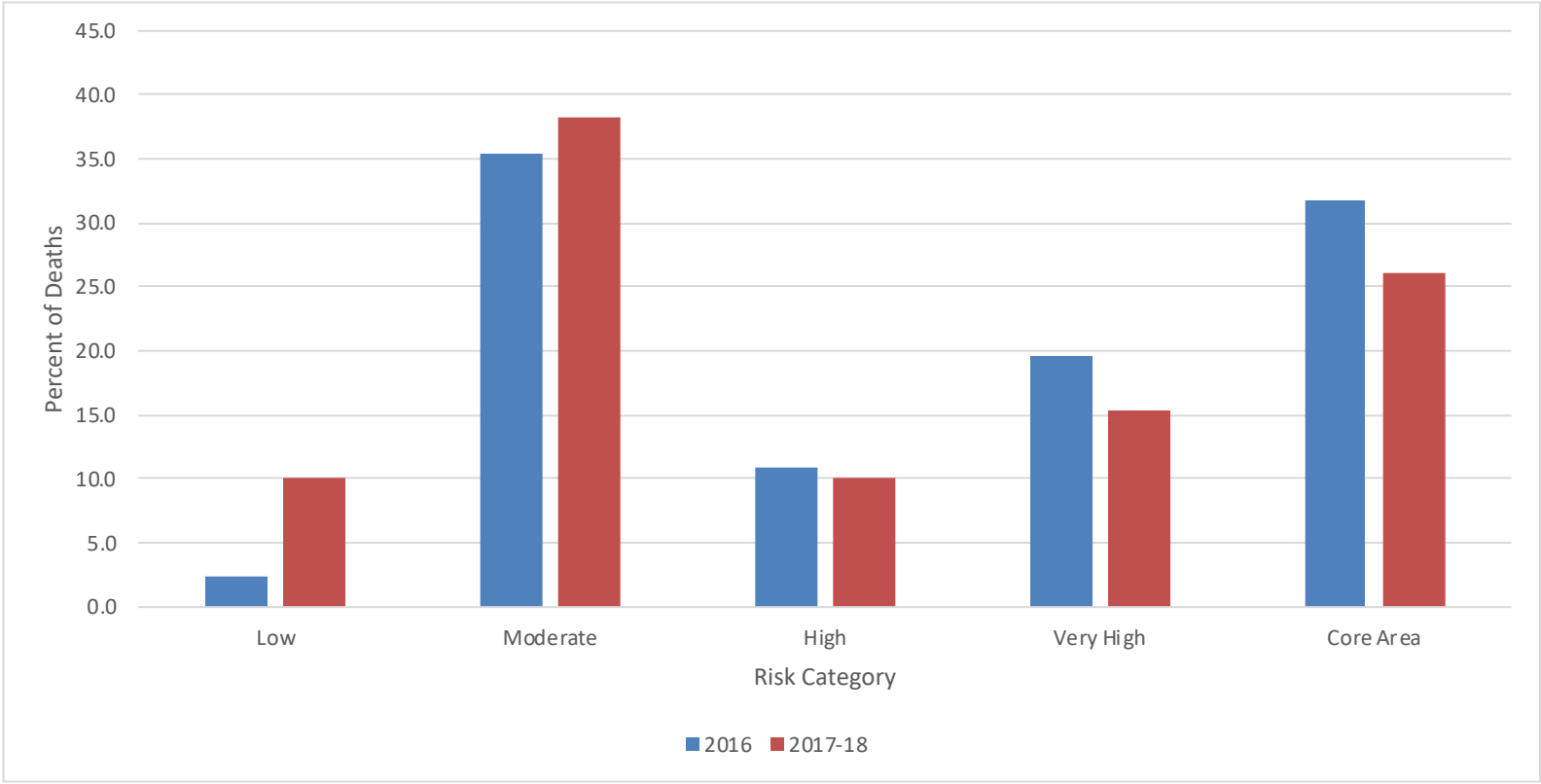
Percent of Surrey Drug Overdoses by Risk Category



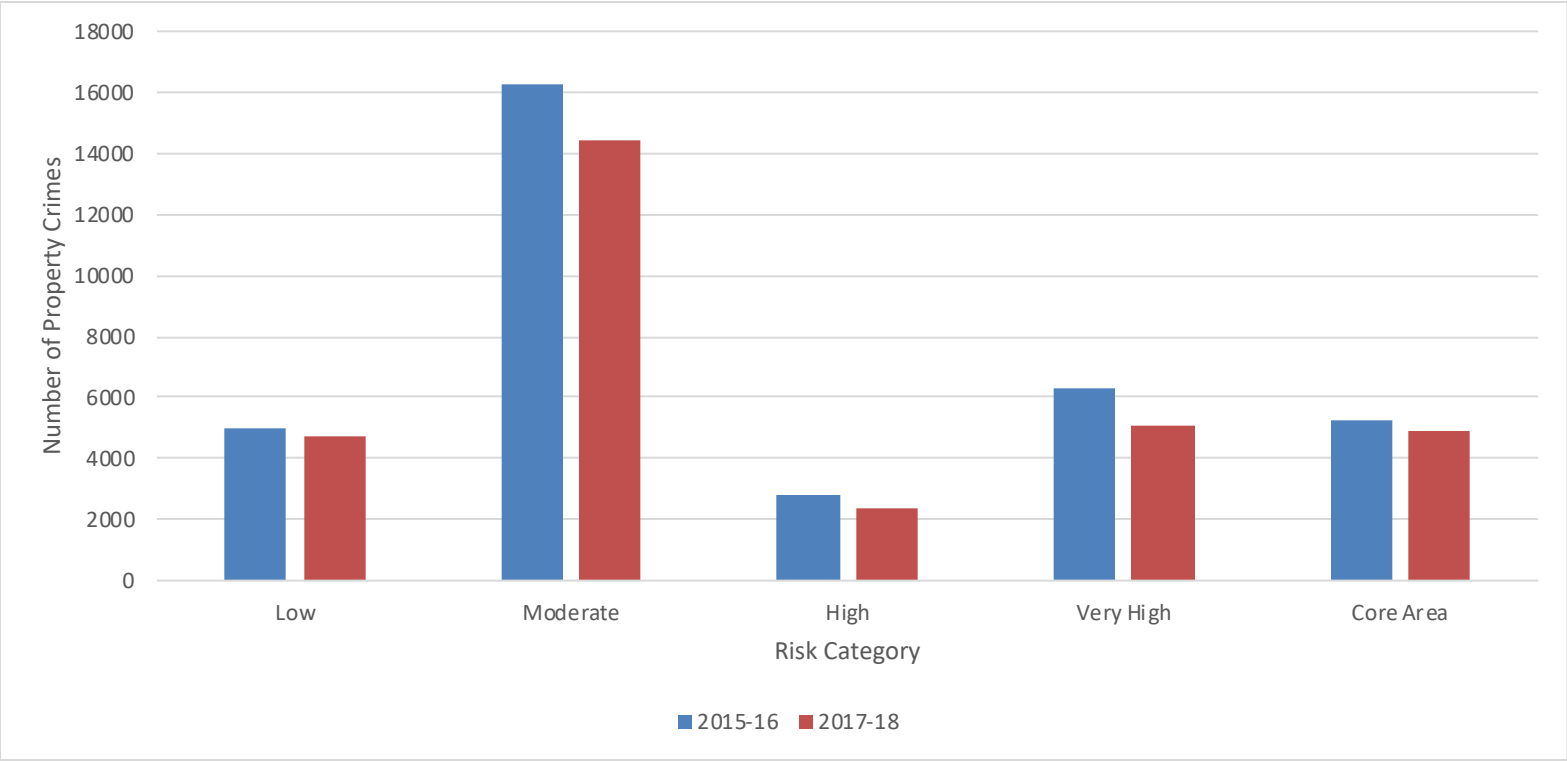
Number of Surrey Drug Deaths by Risk Category



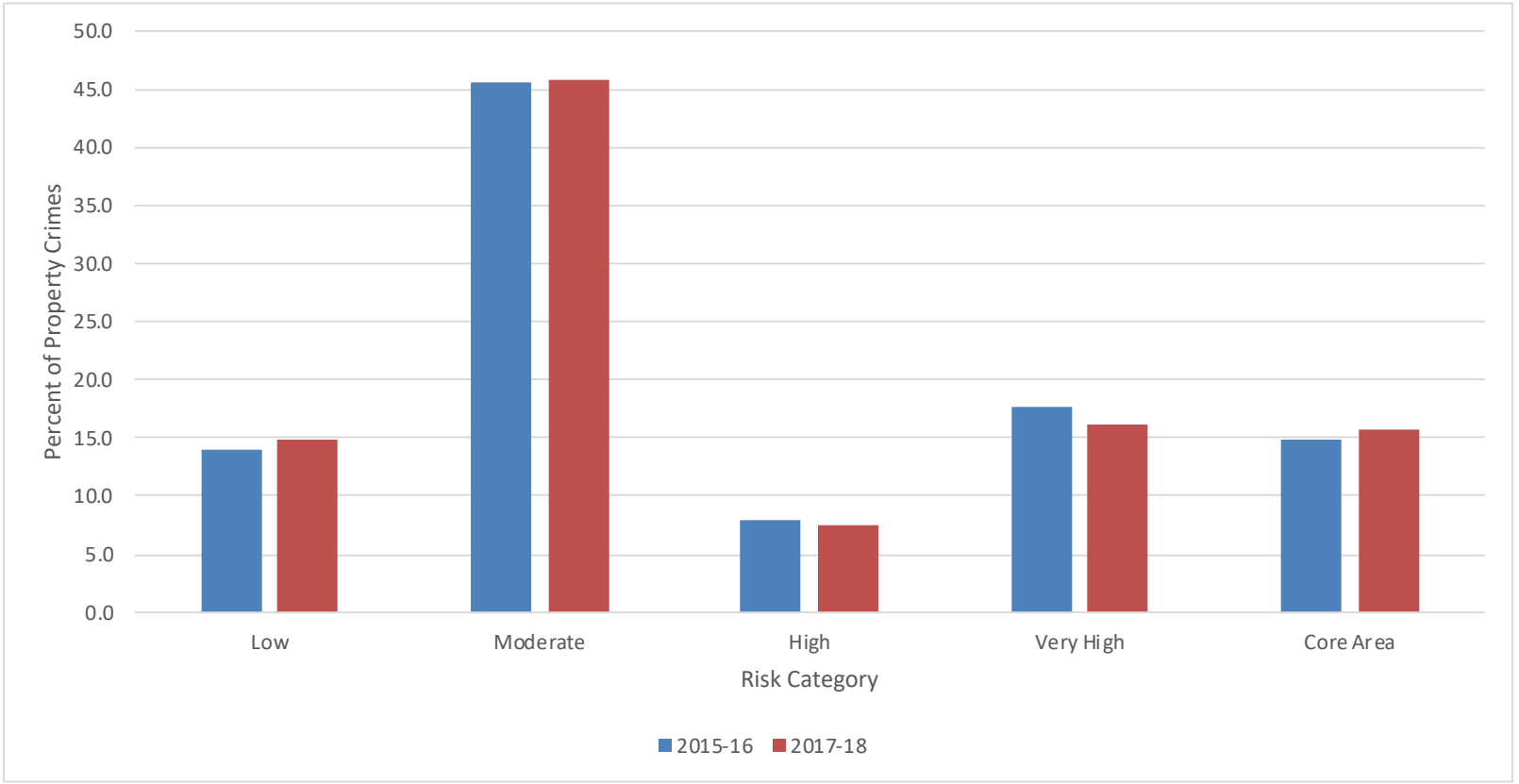
Percent of Surrey Drug Deaths by Risk Category



Number of Property Crimes by Risk Category



Percent Property Crimes by Risk Category



Before and After: City Centre

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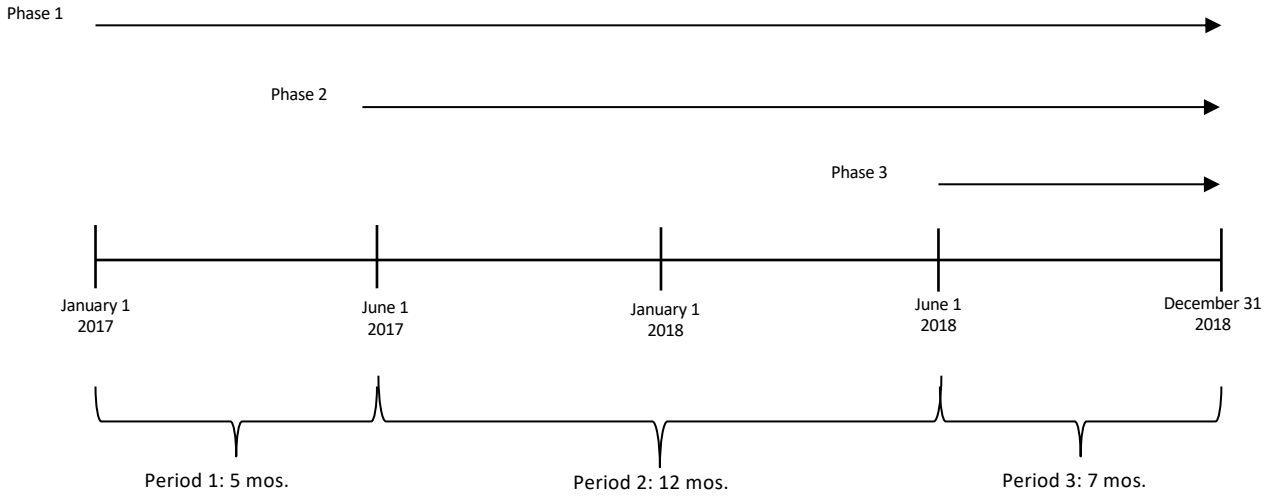
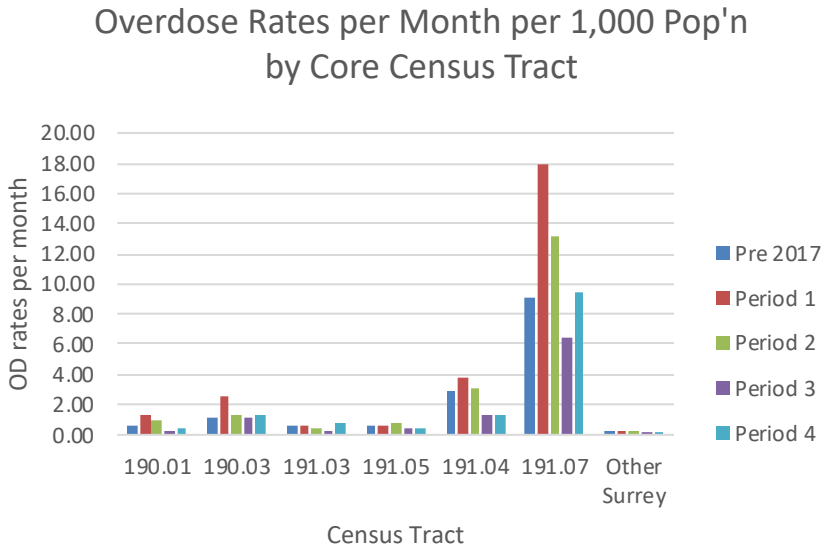


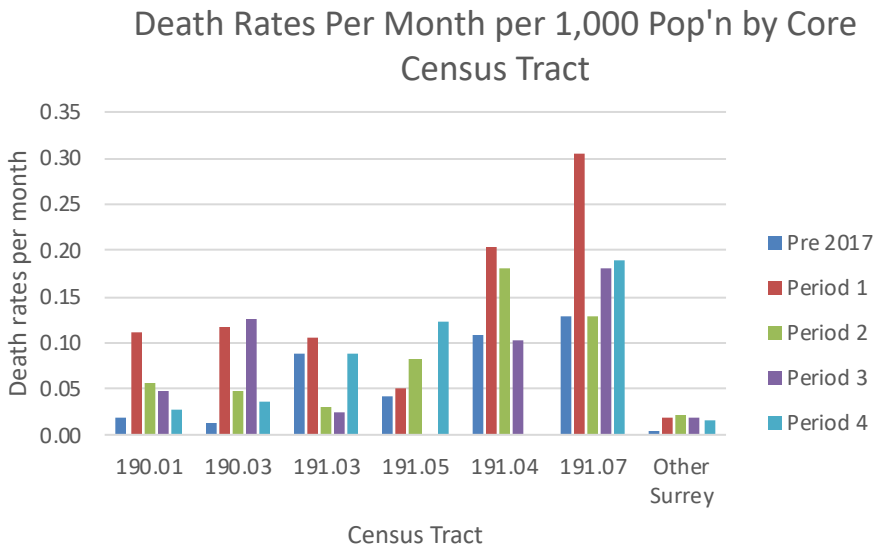
Average Overdoses per Month

Census Tract	Pre 2017	Period 1	Period 2	Period 3	Period 4	Population
190.01	5.6	11.1	8.4	2.4	4.0	9,000
190.03	8.2	17.2	9.4	7.4	9.3	6,895
191.03	3.1	3.2	2.7	1.4	4.0	5,620
191.05	2.1	2.6	3.2	1.7	1.5	4,035
191.04	20.0	26.6	20.8	9.7	8.5	6,925
191.07	36.0	70.4	51.7	25.0	37.0	3,935
Other Surrey	99.6	133.4	116.3	50.4	35.0	481,485



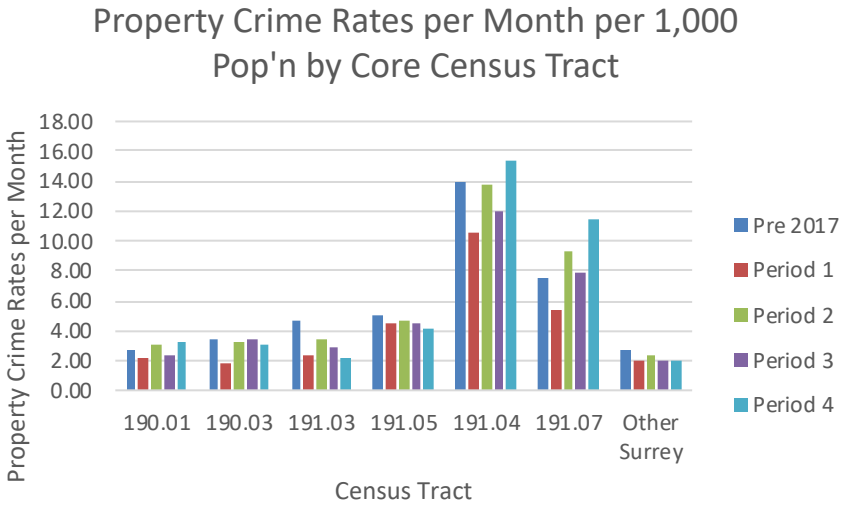
Average Deaths per Month

Census Tract	Pre 2017	Period 1	Period 2	Period 3	Period 4	Population
190.01	0.2	1.0	0.5	0.4	0.3	9,000
190.03	0.1	0.8	0.3	0.9	0.3	6,895
191.03	0.5	0.6	0.2	0.1	0.5	5,620
191.05	0.2	0.2	0.3	0.0	0.5	4,035
191.04	0.8	1.4	1.3	0.7	0.0	6,925
191.07	0.5	1.2	0.5	0.7	0.8	3,935
Other Surrey	2.3	9.4	10.3	9.1	8.3	481,485



Average Crimes per Month

Census Tract	Pre 2017	Period 1	Period 2	Period 3	Period 4	Population
190.01	24	20	28	21	29	9,000
190.03	24	13	22	24	21	6,895
191.03	26	13	19	17	13	5,620
191.05	20	18	19	18	17	4,035
191.04	97	73	96	83	107	6,925
191.07	29	22	36	31	45	3,935
Other Surrey	1,262	989	1,167	951	970	481,485



Surrey Opioid Overdose Cohort: Summary of Results

Lynn Barr-Telford and Anthony Matarazzo

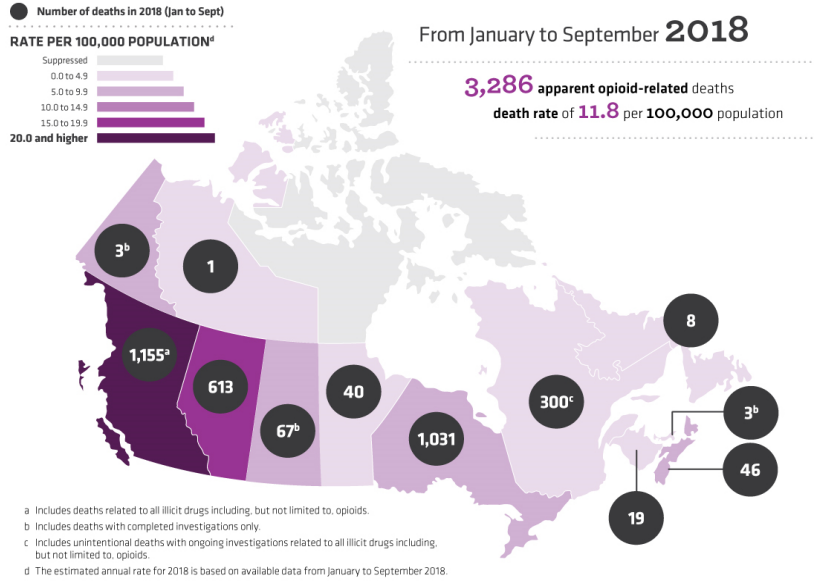
Social, Health and Labour Statistics Field

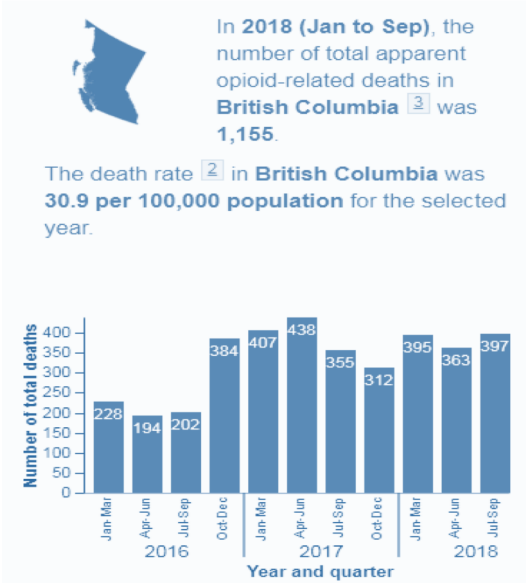
Statistics Canada

Data to Action Summit (Surrey, BC)

June 5th, 2019

Opioid-related Harms in Canada and BC





This means that more than 10,300 lives were lost between January 2016 and September 2018 related to opioids with 3,675 occurring in BC only.

Source: Special Advisory Committee on the Epidemic of Opioid Overdoses. National report: Apparent opioid-related deaths in Canada (January 2016 to September 2018). Web Based Report. Ottawa: Public Health Agency of Canada; April 2019. https://health-infobase.canada.ca/datalab/national-surveillance-opioid-mortality.html

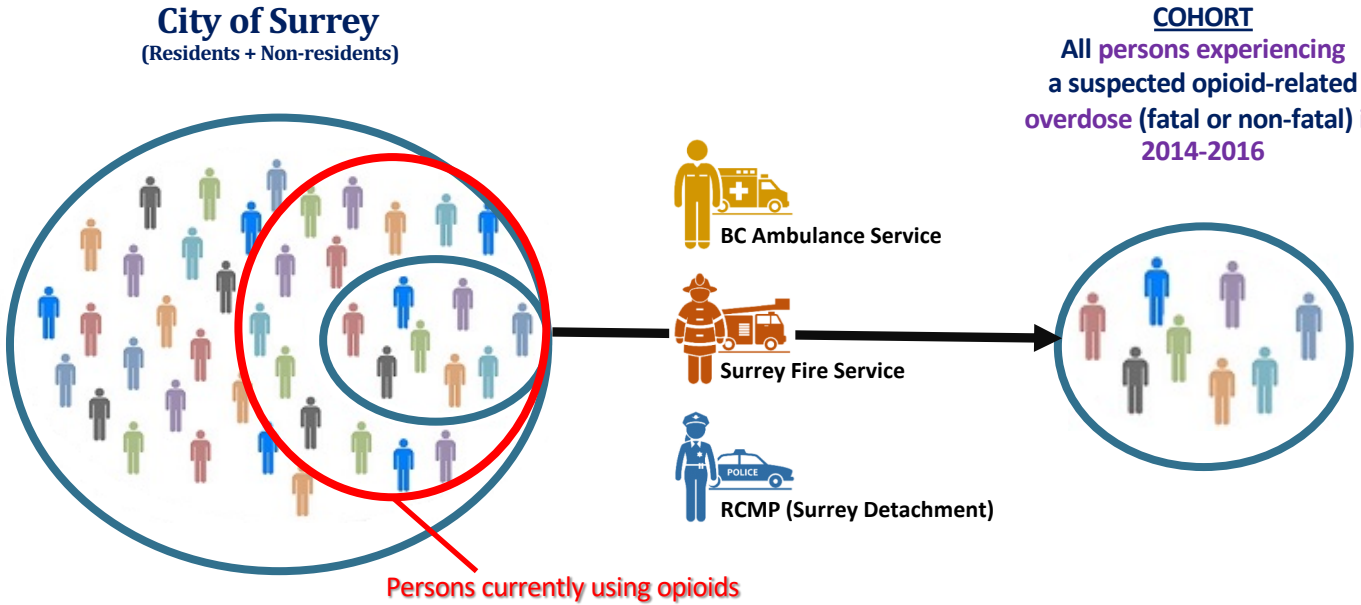
Surrey Opioid Data Collection and Community Response Project

In 2016, British Columbia's Provincial Health Officer declared a public health emergency in response to a rise in opioid-related drug overdoses and related deaths.

Despite continued and heroic efforts across the province, an unprecedented number of drug overdoses and related **fatalities continue** on a **progressive**, **widespread scale**.

- **Demonstration project** bringing together agencies from **all levels of government** and data from **various social domains**
- Collect, analyze and action data to develop **evidence-informed interventions** and **precision programming** and **policy development**
- Considered a **model** for the rest of BC and Canada

Surrey Opioid Project: Building of a Cohort, Understanding the Person



Key Partnerships and Data Providers

City of Surrey — the future lives here.

Public Safety Canada / Sécurité publique Canada

British Columbia Ministry of Health

Fire Service — Surrey

British Columbia Coroners Service

Royal Canadian Mounted Police — Surrey

Provincial Health Services Authority — Province-wide solutions. Better health.

BCStats

fraserhealth

BC Centre for Disease Control

Additional Data Sources from BC Partners

BC Coroners Data
- January 2016 to September 2017
- Key information related to all fatal overdoses

BC PharmaNet Data
- Record of all medications dispensed in community pharmacies in BC
- Medication history and claims history
- 2008 to 2017

Mental Health Services Data File
- Data on mental health services
- Client/Patient Information Management (CPIM) system
- Mental Health Minimum Reporting Requirements (MHMRR) system
- 2008 to 2017

Medical Services Plan (MSP)
- Record of all insured medical fee-for-service and alternate payment services provided by general practitioners and specialists
- Also includes services provided by other health practitioners such as chiropractors, naturopaths, physical therapy, oral & dental surgeons, acupuncturists, etc..
- 2008 to 2017

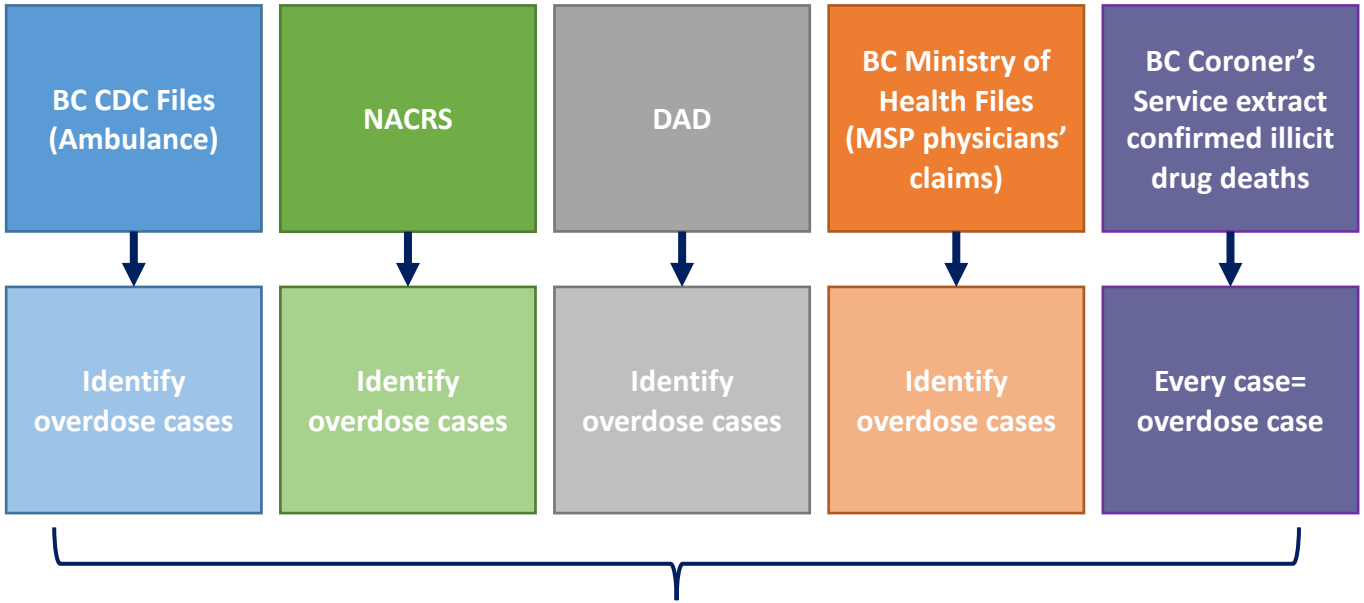
Social Data Linkage Environment (*SDLE*): Facilitating the creation of linked administrative and survey data files for social analysis

Record linkage is conducted at Statistics Canada in a secure environment to ensure we protect the confidentiality and privacy of Canadians.

Potential data sources:

- ✓ T1 Family File
- ✓ T4 (Statements of Remuneration)
- ✓ T5007 (Statement of Benefits)
- ✓ Immigration Landing Database
- ✓ Census
- ✓ Integrated Criminal Court Survey
- ✓ Discharge Abstract Database
- ✓ National Ambulatory Care Reporting System
- ✓ National Marginalization Index

Defining the fatal-nonfatal overdose cohort (2014 to 2016)



5 data sources used

Applied algorithm developed by BCCDC (MacDougall *et al.*, PLOS, 2019)

Linked at the individual level to create a cohort of individuals who are identified as a case from 1 or more of any of the above data sources

Fatal Illicit Drug Overdoses:

Juristat (released May 16, 2019)

Economic Insights (released April 10, 2019)

BC Coroner Cohort - Deeper dive into employment and social assistance

- ***Lower levels of employment compared with the general BC population***
  - Cohort: 48% (men) and 28% (women)
  - BC population: 77% (males) and 73% (females)

- ***Women more economically vulnerable than men*** – lower rates of attachment to the labour force and lower average wages:
  - Employment all 5 years prior to death: **28% of men** vs **14% of women**
  - Average annual earnings: $42,200 (men) vs $22,000 (women).

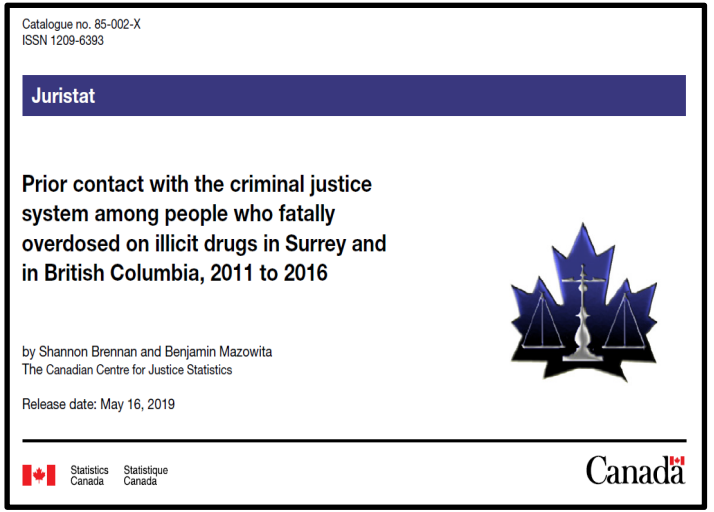
- Steady ***decrease in employment and increase in social assistance*** in the 5 years leading to death – consistent across age groups and gender

- ***Widening earnings gap*** between cohort members and general population over time (men):
  - $1,000 diff at age 20-24 …..by age 29 to 33 gap grown to $27,000

Reference: https://www150.statcan.gc.ca/n1/pub/11-626-x/11-626-x2019004-eng.htm

BC Coroner Cohort - Deeper dive into contact with the criminal justice system

- **The majority (64%)** of those who died of an illicit drug overdose in Surrey between 2011 and 2016 had **no formal contact with police** for a criminal violation in the 24 months preceding their overdose death.
- **Nearly one-quarter (23%)** of decedents in Surrey had **multiple contacts with police** in the 24 months preceding their overdose death, and of those who came into contact with police, 24% fatally overdosed **within three months of their most recent police contact**.
- **Most police contacts (83%)** in Surrey in the 24 months prior to a fatal overdose were for **non-violent crimes**, the most common violations being **shoplifting (17%)** and **administration of justice offences (17%).**
- Those who did have a contact with police **earned less in employment income**, were **less likely to be consistently employed**, and were **more reliant on social assistance** relative to those who did not have contact with police.



Reference: https://www150.statcan.gc.ca/n1/pub/85-002-x/2019001/article/00011-eng.htm

Demographic Characteristics of the Surrey Overdose Cohort

1,952 individuals who experienced opioid overdoses that occurred in Surrey between January 1, 2014 and December 31, 2016

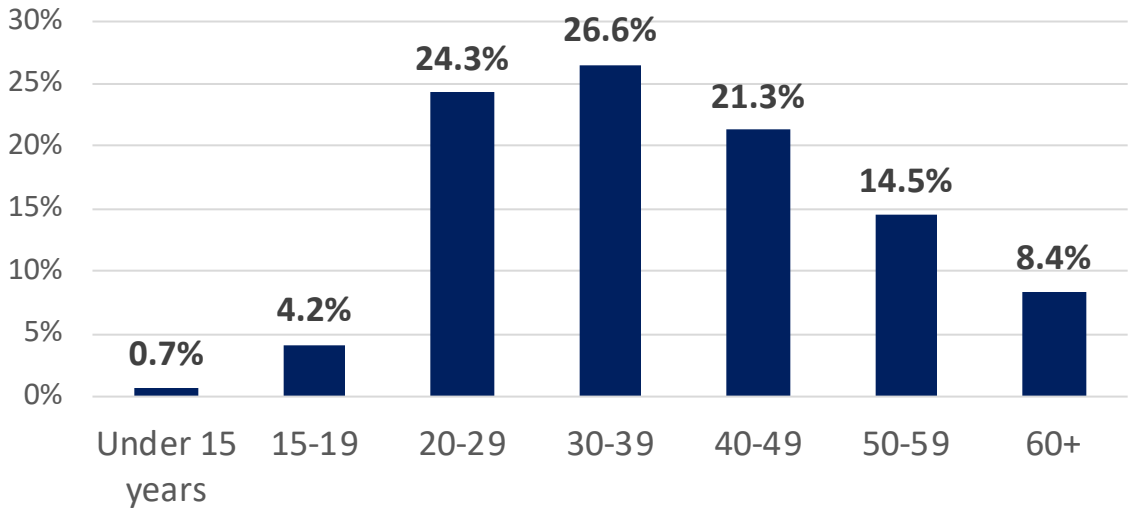
228 individuals who died of illicit drug overdose (Fatal cohort members)
1,724 individuals who did not die of illicit drug overdose (Non-fatal cohort members)

Demographic characteristics

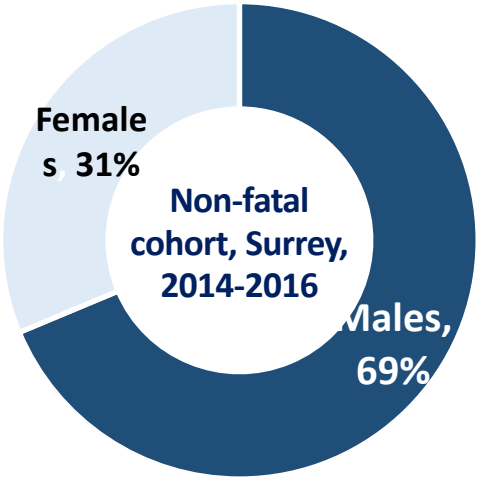
70% of overdose cohort were males

38 average age at first event – 39 years among men 35 years among women

Age distribution of overdose cohort, Surrey BC, 2014-2016

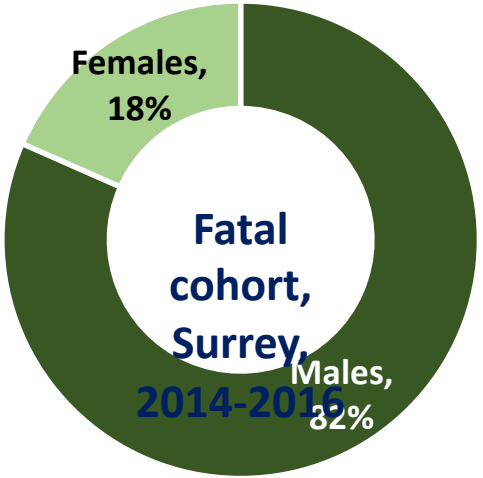


Distribution of Fatal vs non-fatal



12% of cohort members died of their overdose during the observation period (2014-2016)

Men more likely to die of opioid overdose compared with women

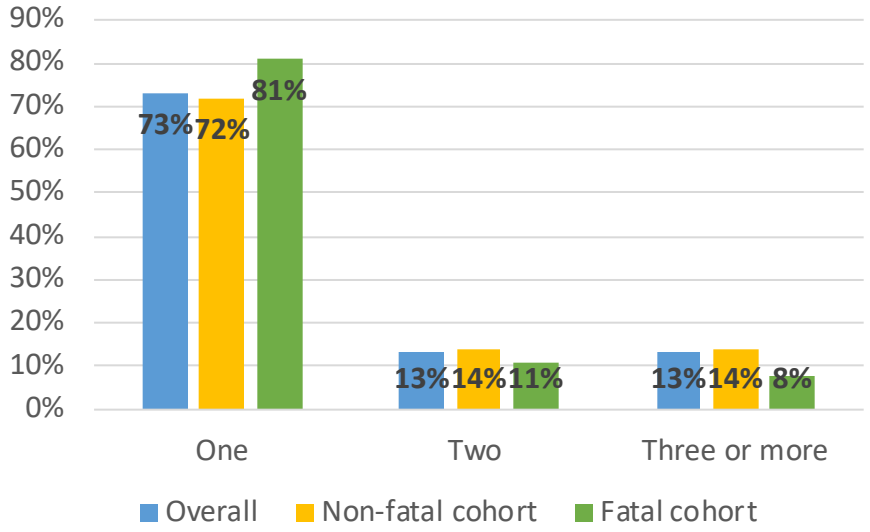


Number of opioid events

73% of cohort members experienced only 1 overdose event between 2014 and 2016

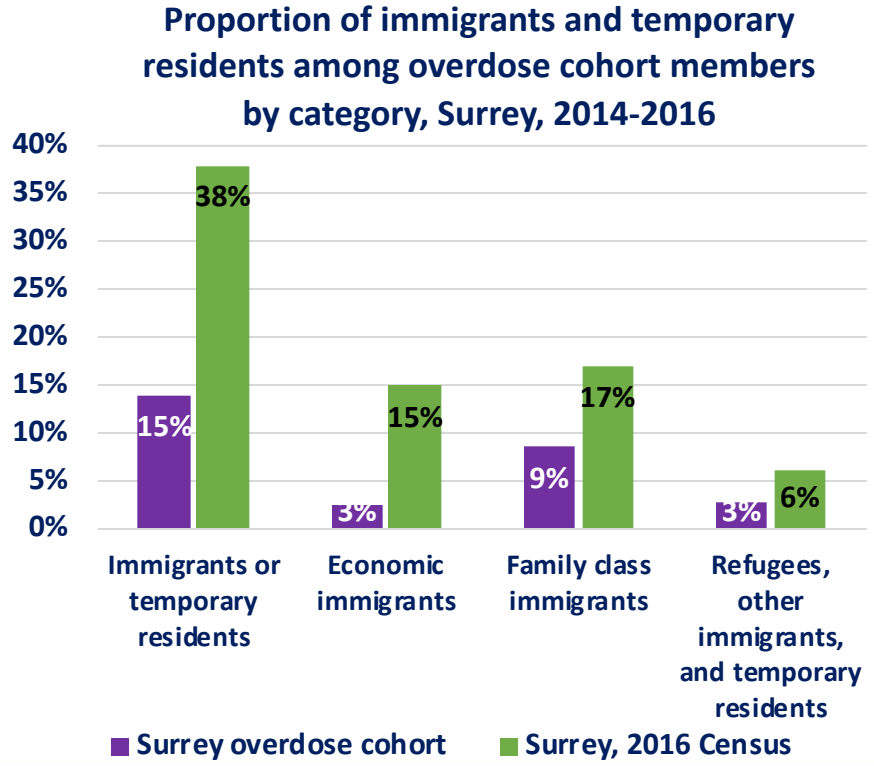
2 average number of opioid overdoses among those aged 20 to 49 years of age

Distribution of cohort member by number of opioid overdoses during the observation period, Surrey, 2014-2016



Immigrant profile of overdose cohort

15% of cohort members were identified as temporary residents or immigrants landing in Canada since 1980 (compared to **38%** of Surrey population in 2016 Census)

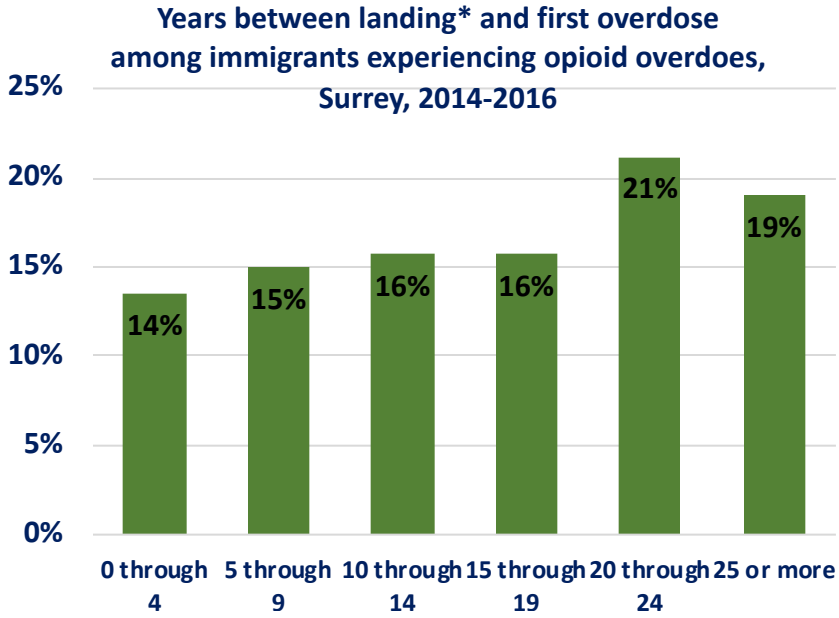


Immigrant profile of overdose cohort

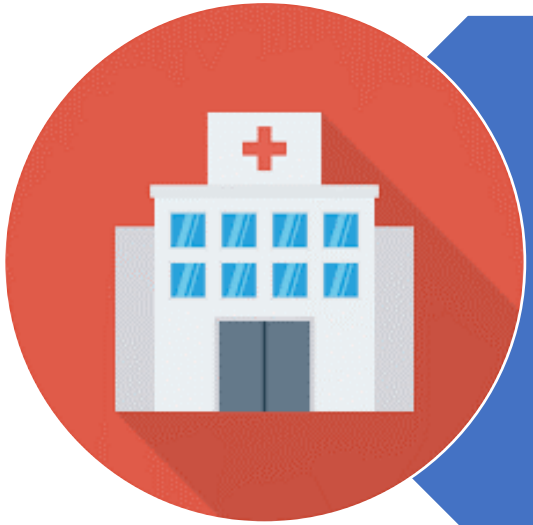
40% of immigrants experiencing an opioid overdose have been in Canada for 20+ years

57% of immigrants experiencing an opioid overdose were born in India

(compared to **37%** of immigrant population in Surrey being born in India)



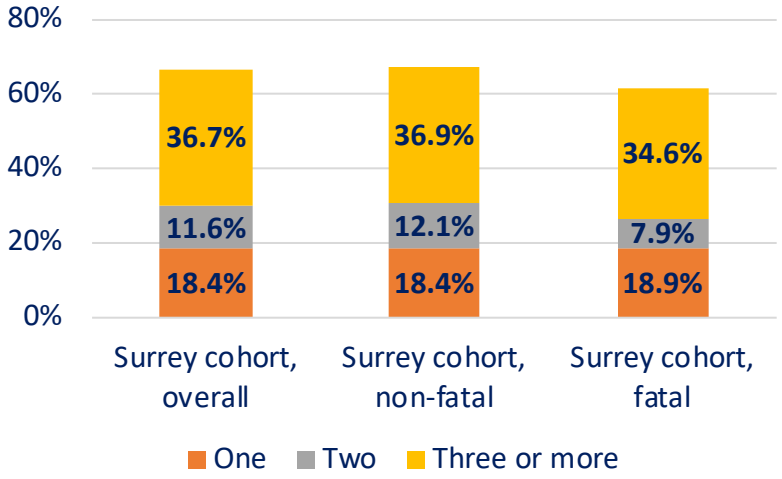
* For landed immigrants, this is year of permanent residence; for temporary residents, this is the first year for which individual had a permit



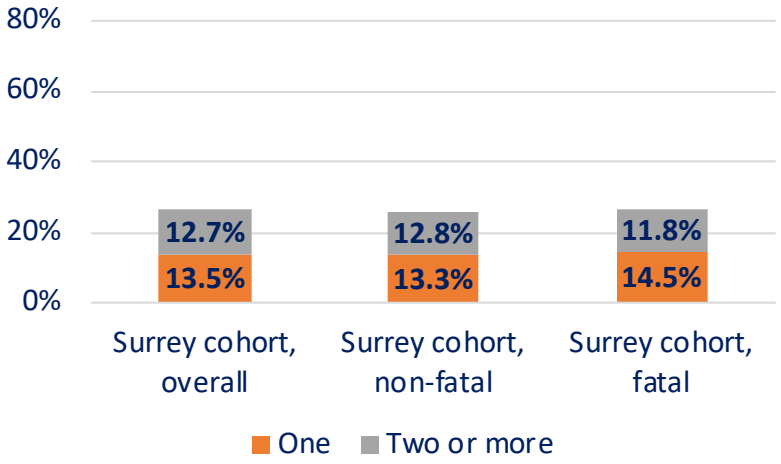
Hospital services & prescriptions

Emergency department & hospital visits

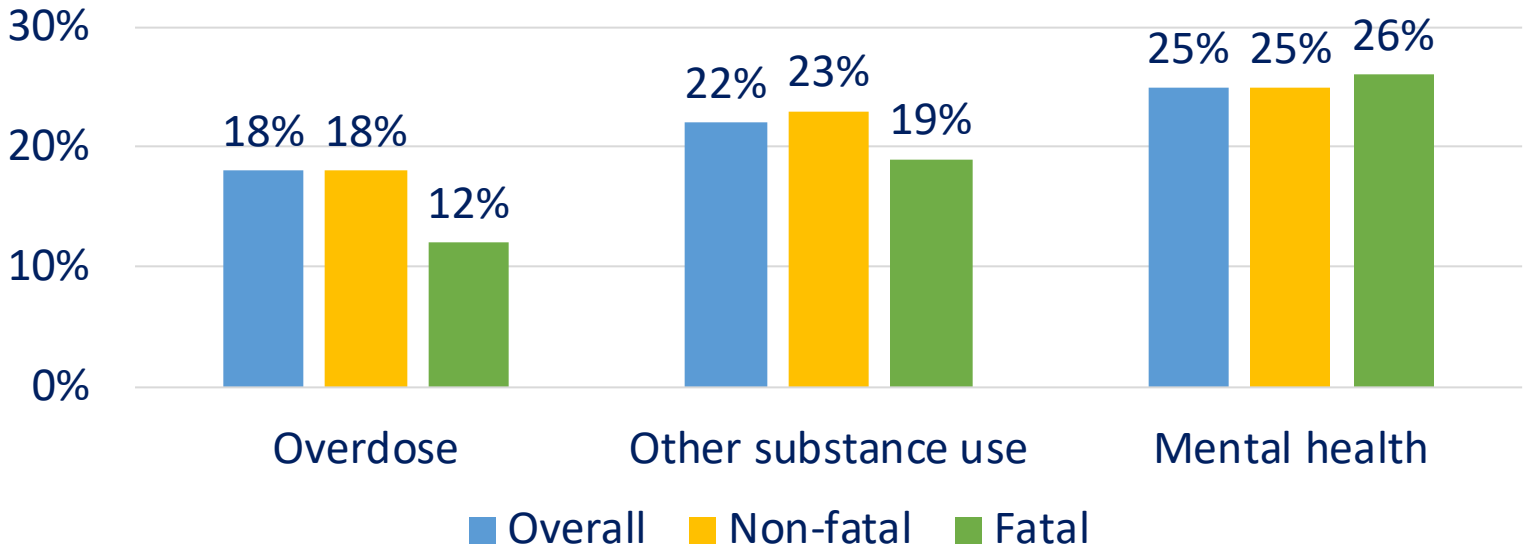
Emergency department visits in year prior to first overdose, Surrey, 2014-2016



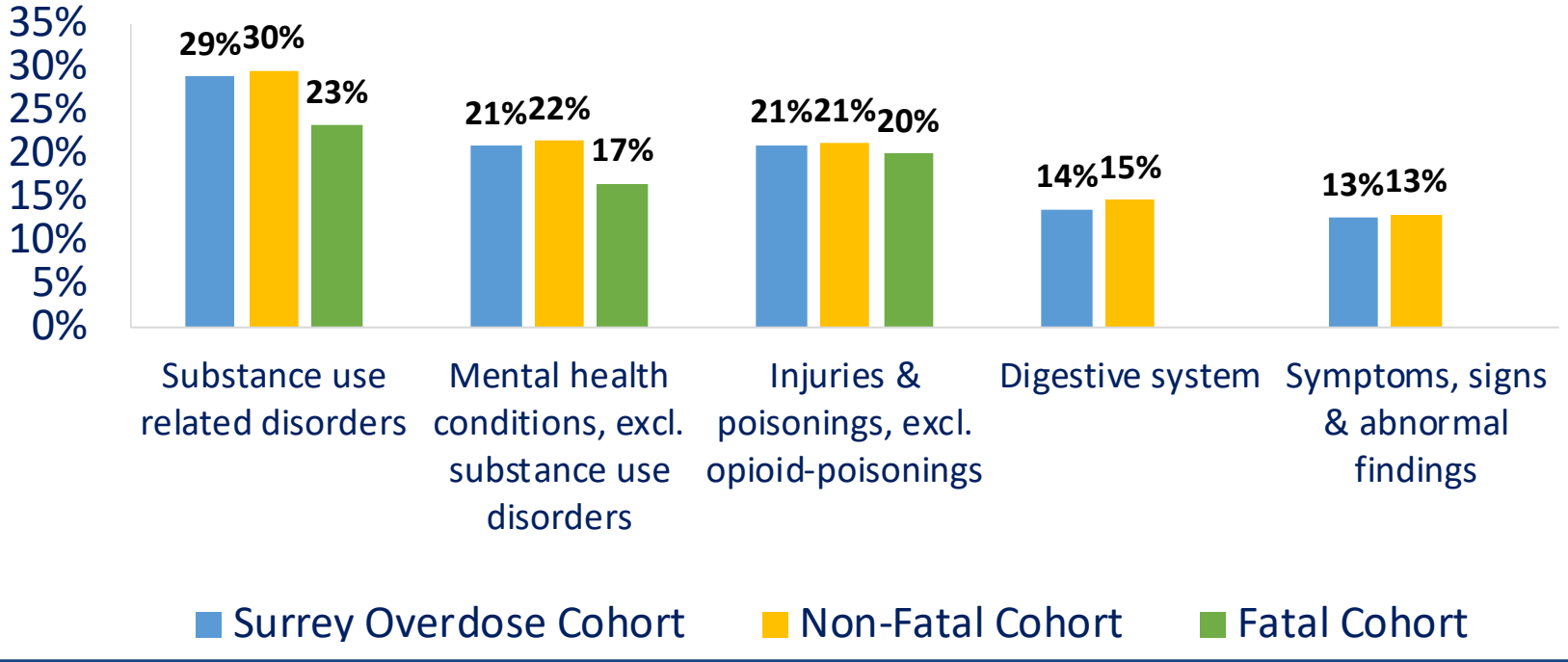
Hospitalizations in year prior to first overdose, Surrey, 2014-2016



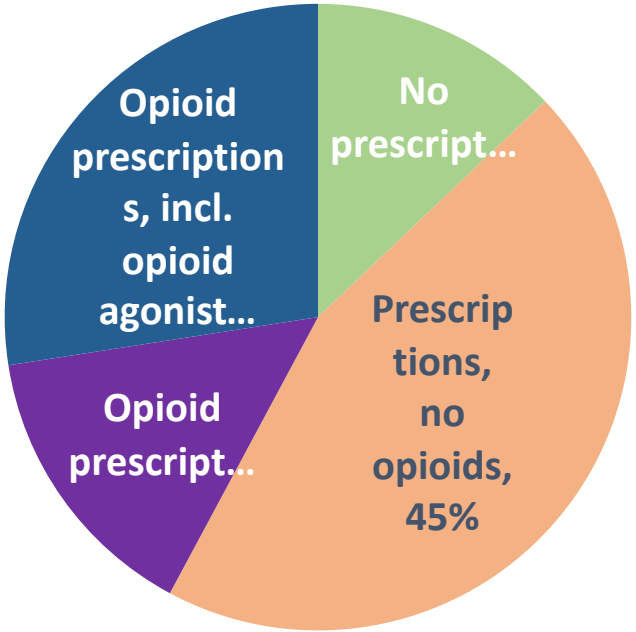
Reasons for ED visit among Surrey overdose cohort (year prior to first overdose)



Reasons for hospitalization among Surrey overdose cohort (year prior to first overdose)



Prescriptions, especially opioids, in the year prior to first overdose, Surrey cohort

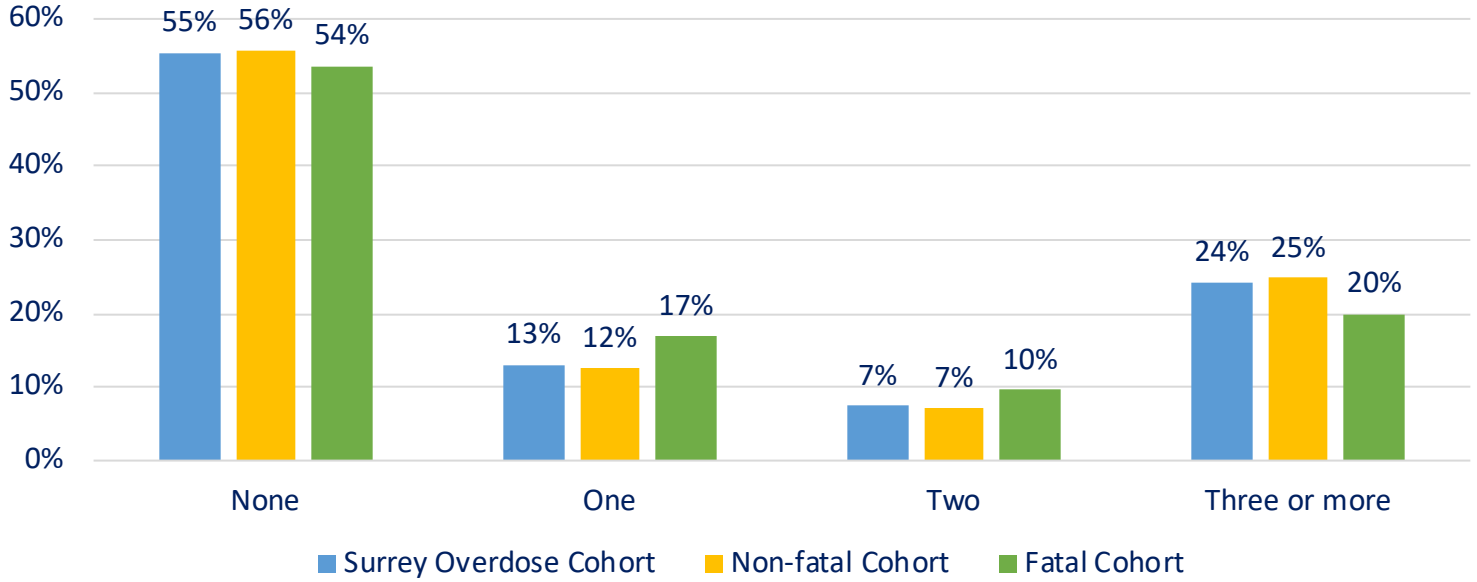


87% of cohort members had at least one Rx in the year prior to first overdose - no difference between fatal and non-fatal

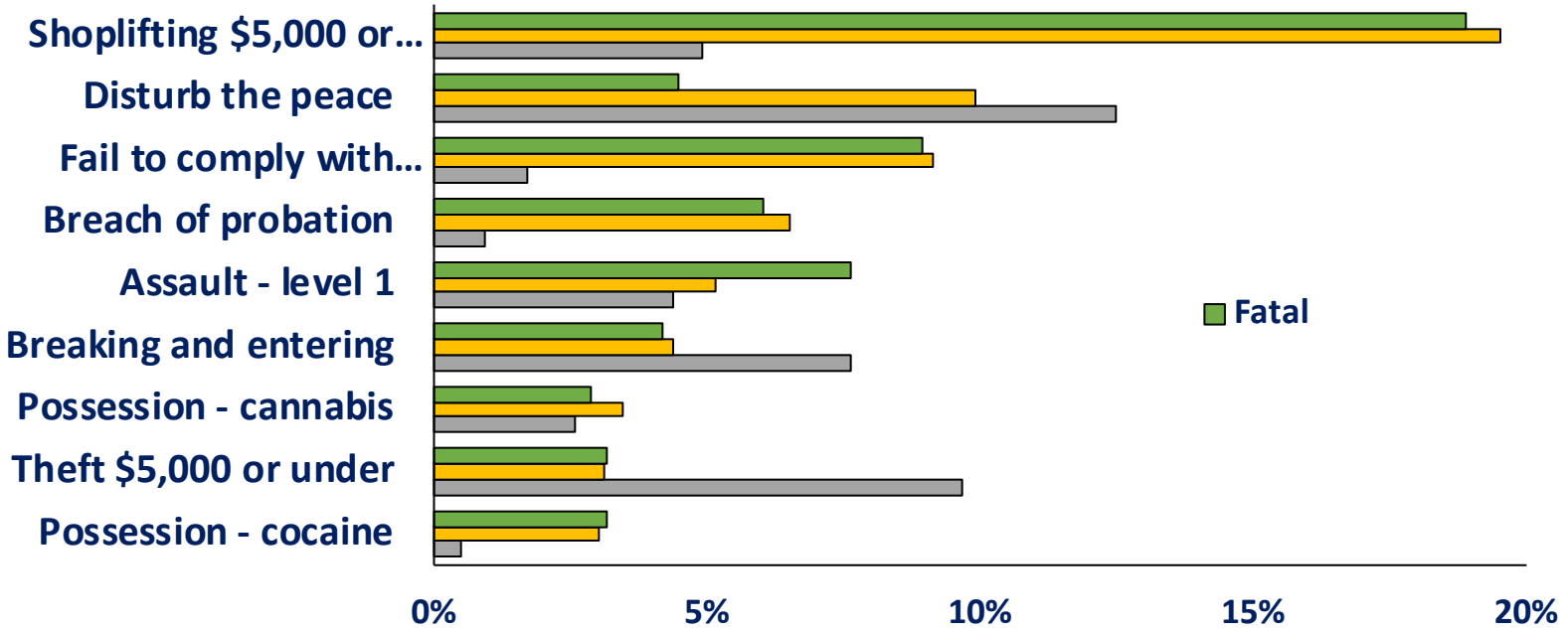
42% of cohort members had at least one opioid related Rx

Contacts with police

Frequency of contact with police in 24 months prior to first overdose, Surrey



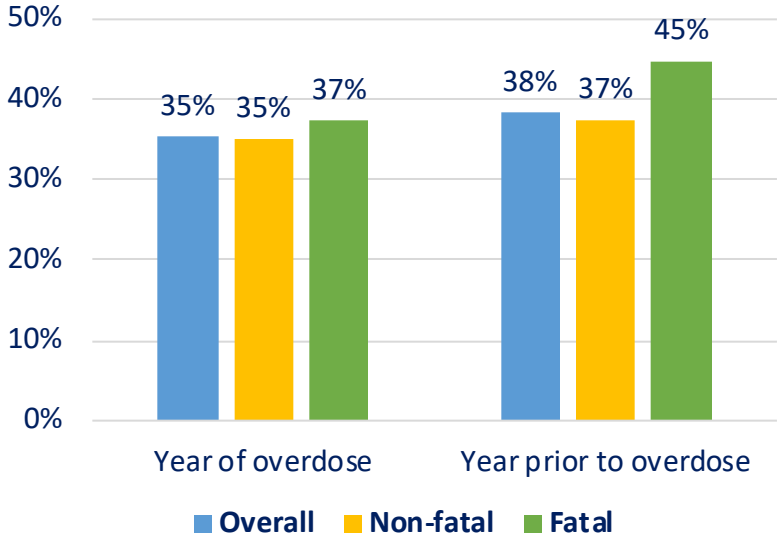
Reasons for contact with police, 24 months prior to first overdose, Surrey



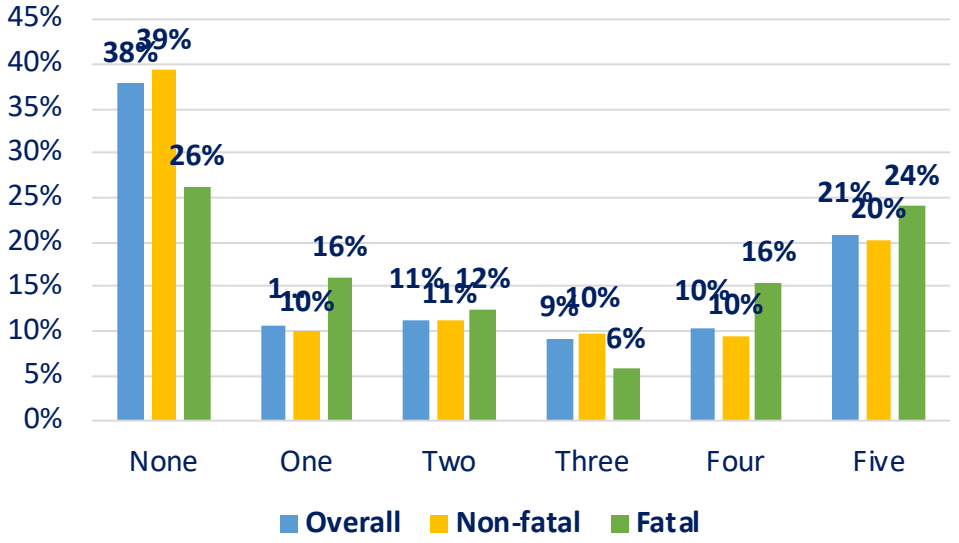
Employment and social assistance

Employment prior to first overdose, Surrey 2014-2016

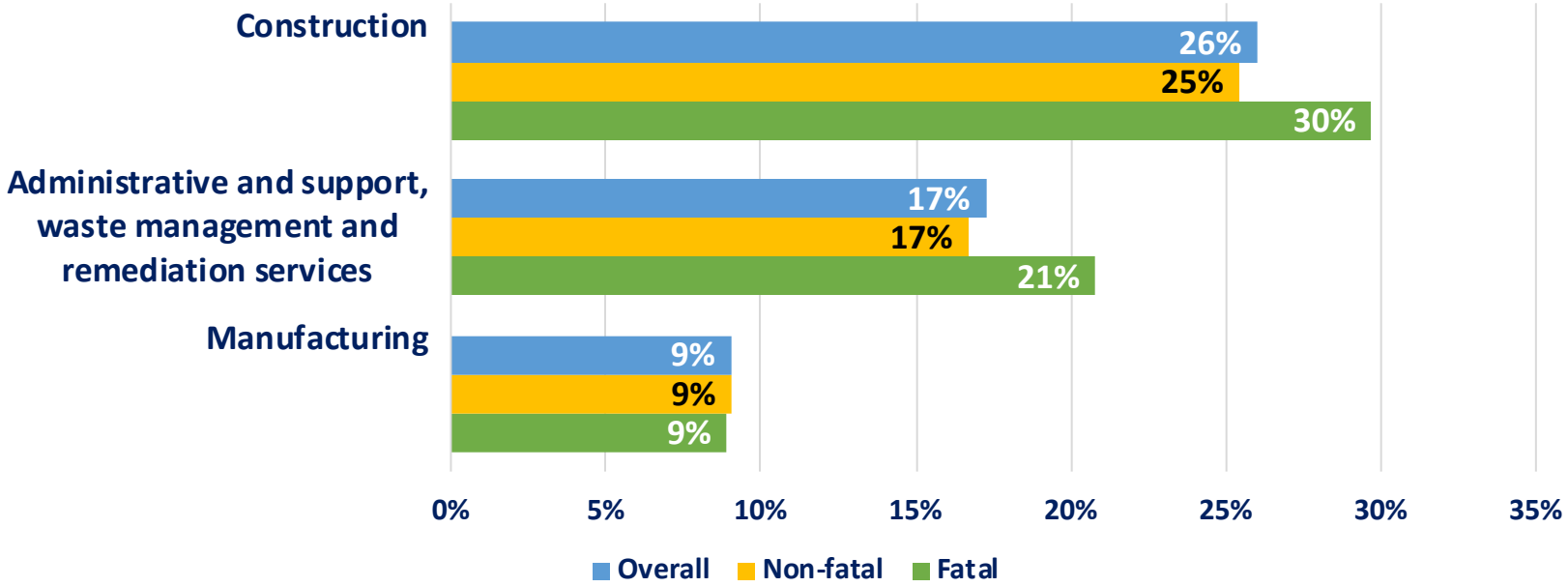
Employment by year



Number of years employed in last 5

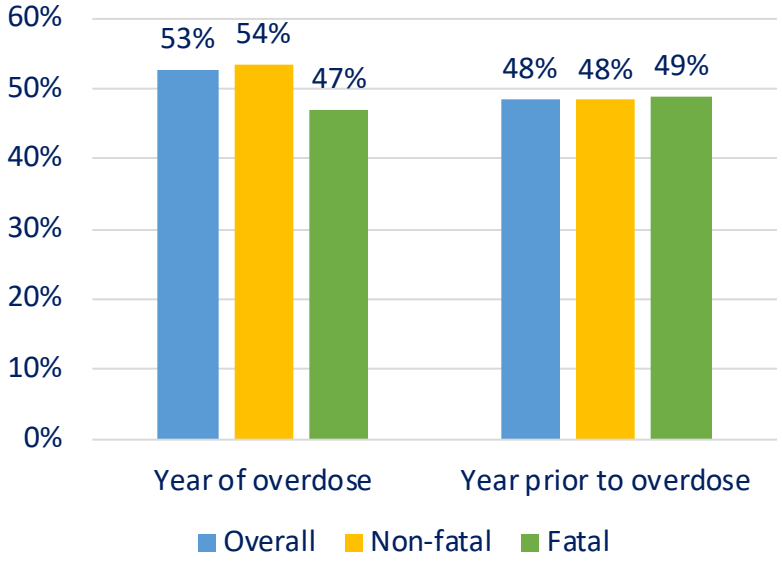


Industry of employment in year prior to first overdose, Surrey 2014-2016

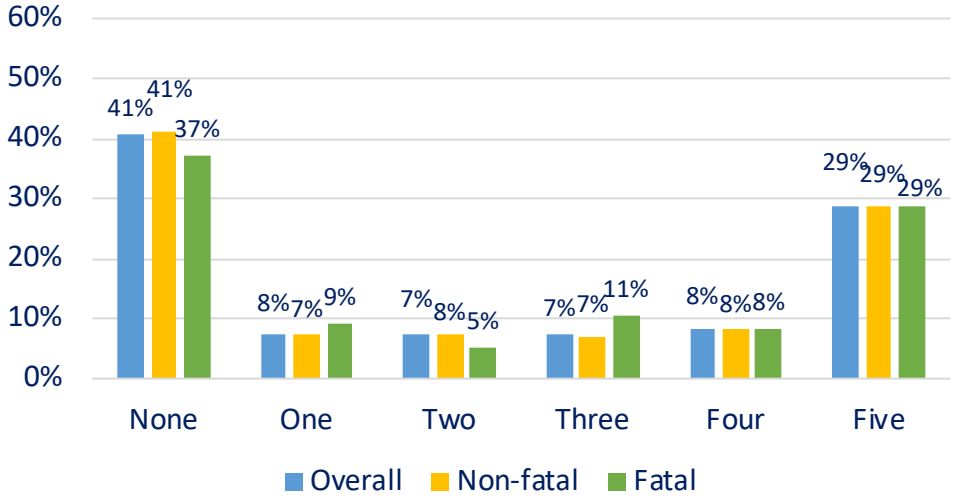


Social assistance prior to first overdose, Surrey cohort

Social assistance by year

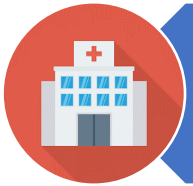


Number of years receiving social assistance in last 5



System Connections

Contacts in the 12 months prior to first overdose

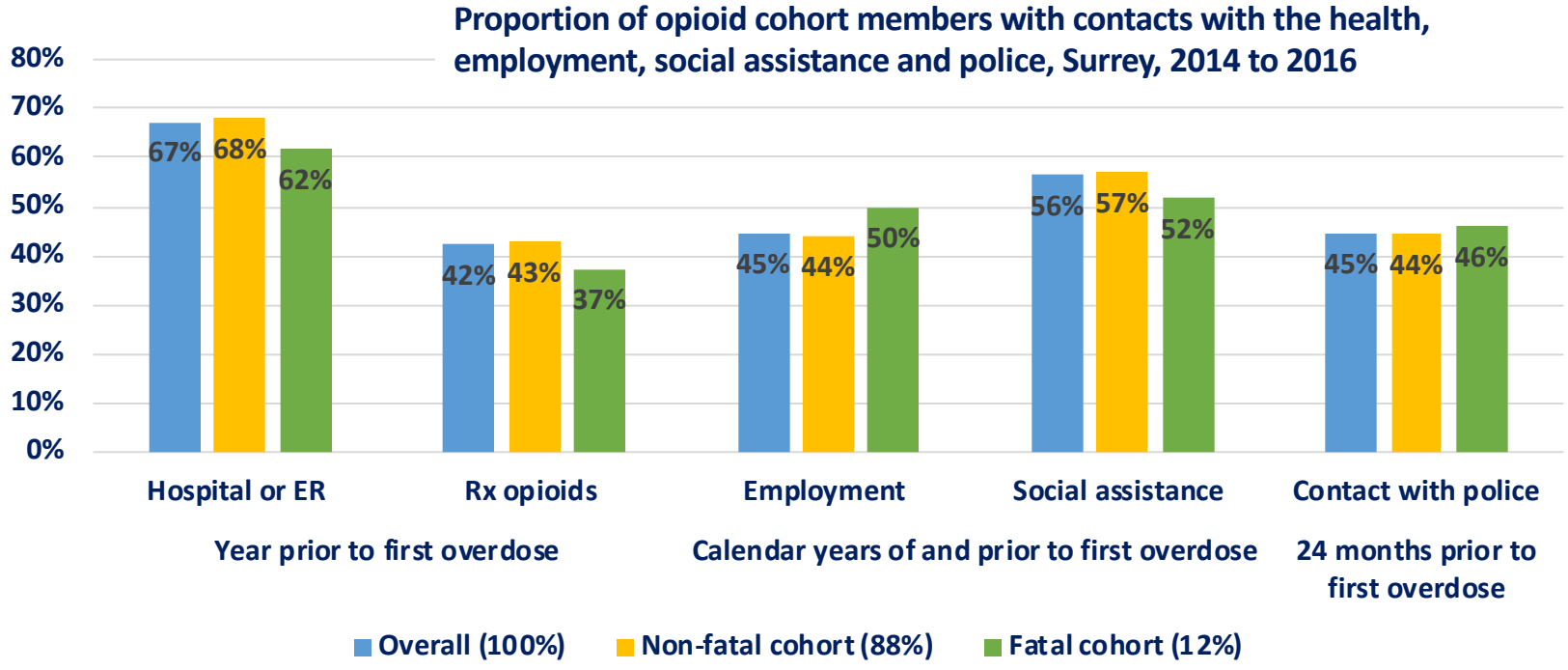


Hospital services & prescriptions

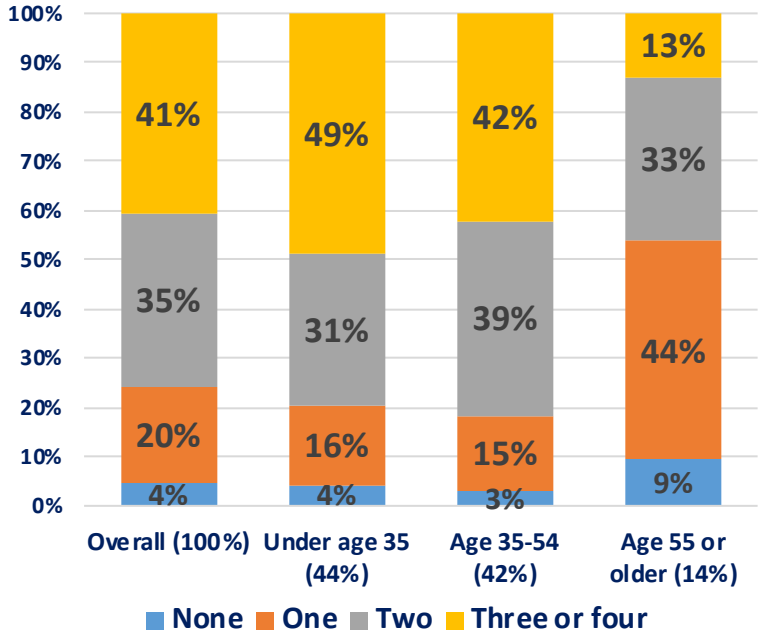
Social assistance and employment

Contacts with police

Who “touched” particular systems prior to first overdose?



Number of systems “touched” prior to first overdose, Surrey



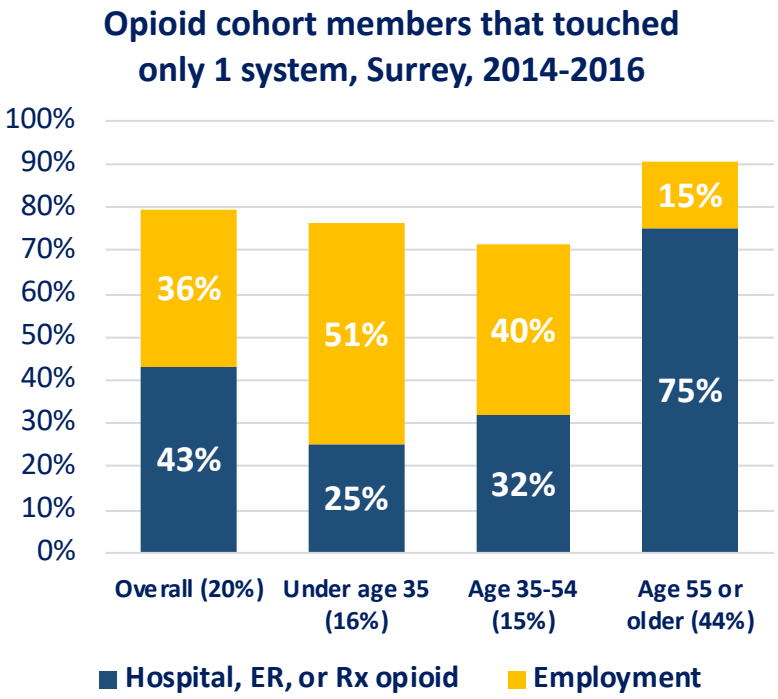
Health (hospital, ER, Rx); Employment; Social assistance; Police

96% of cohort members touched at least **1 system** prior to their first overdose

20% of cohort members touched **only 1 system** prior to their first overdose – highest among oldest members

41% of cohort members touched **3 or 4 systems** – highest among youngest members

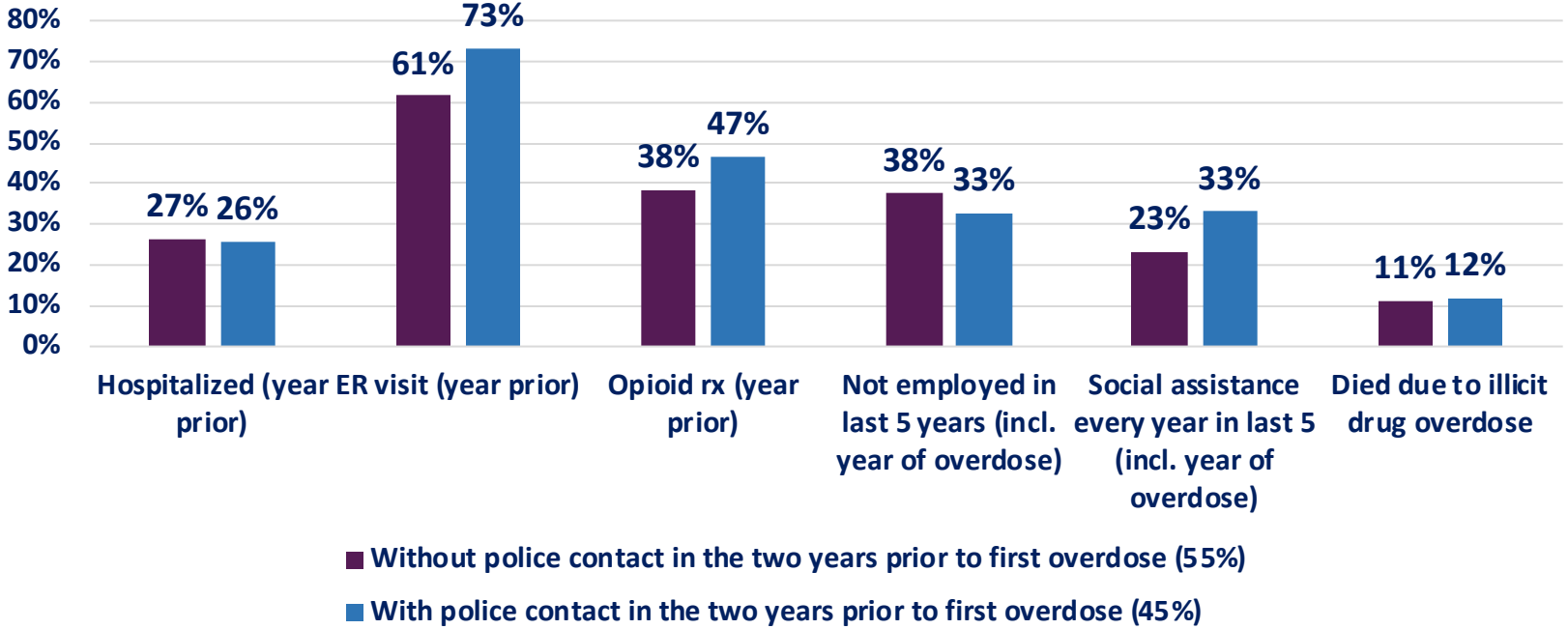
Which systems were touched?



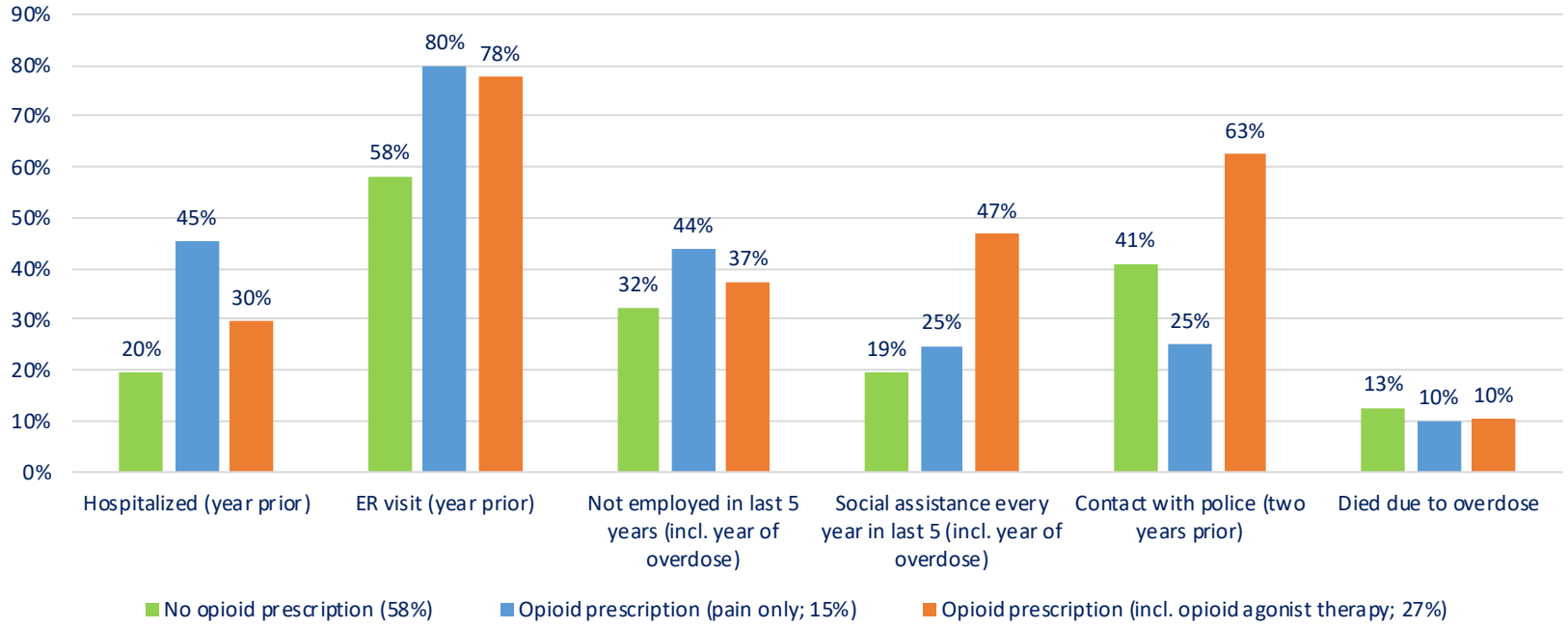
Among those who touched only 1 system prior to overdose ….

- **those under 35 years of age, most likely have touched only employment**
- **those 55 and older, most likely to have only touched health care**

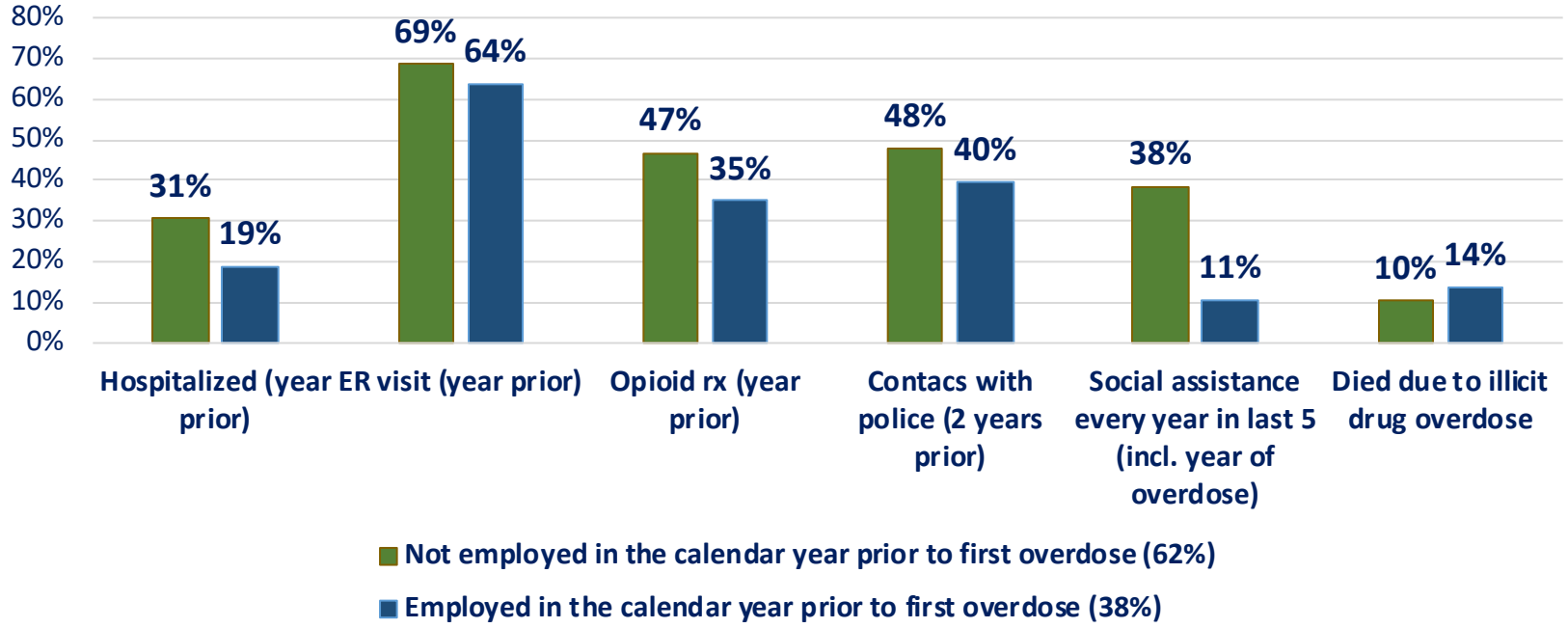
Characteristics of individuals according to whether they had contact with police in the two years prior to first overdose



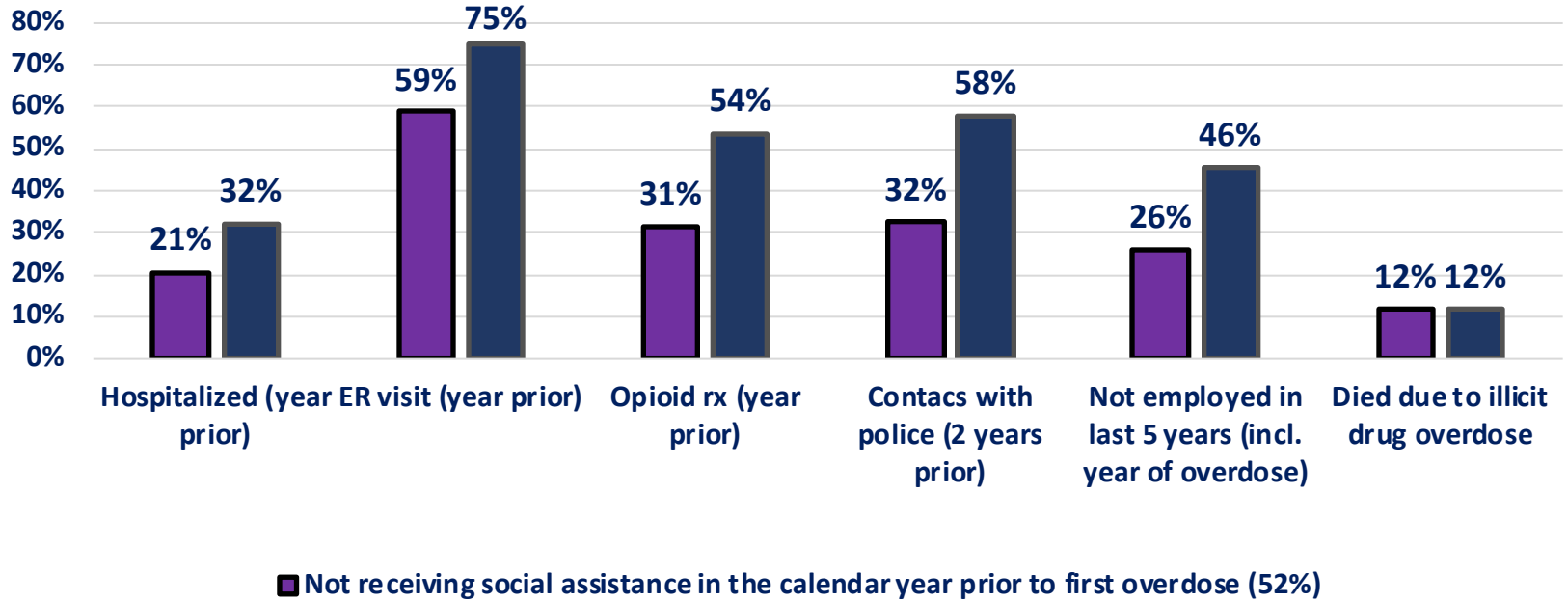
Characteristics of individuals according to whether they had a prescription for opioids in the year prior to first overdose



Characteristics of individuals according to whether they were employed in the year prior to first overdose



Characteristics of individuals according to whether they received social assistance in the year prior to first overdose



THANK YOU!

For more information please visit,
www.statcan.gc.ca

#StatCan100

BC's Overdose Emergency: Fraser Health Experience

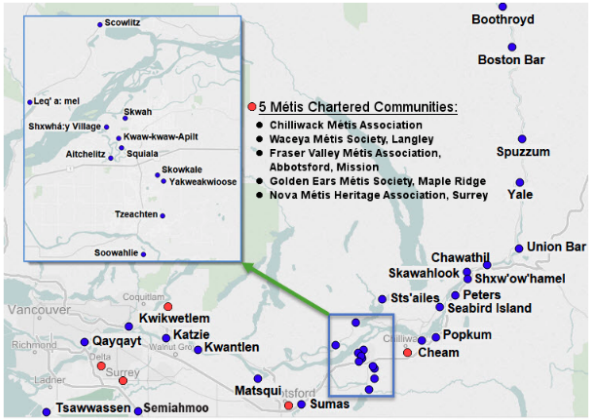
Brooke Kinniburgh, Epidemiologist
Erin Gibson, Regional Harm Reduction Coordinator

June 4, 2019

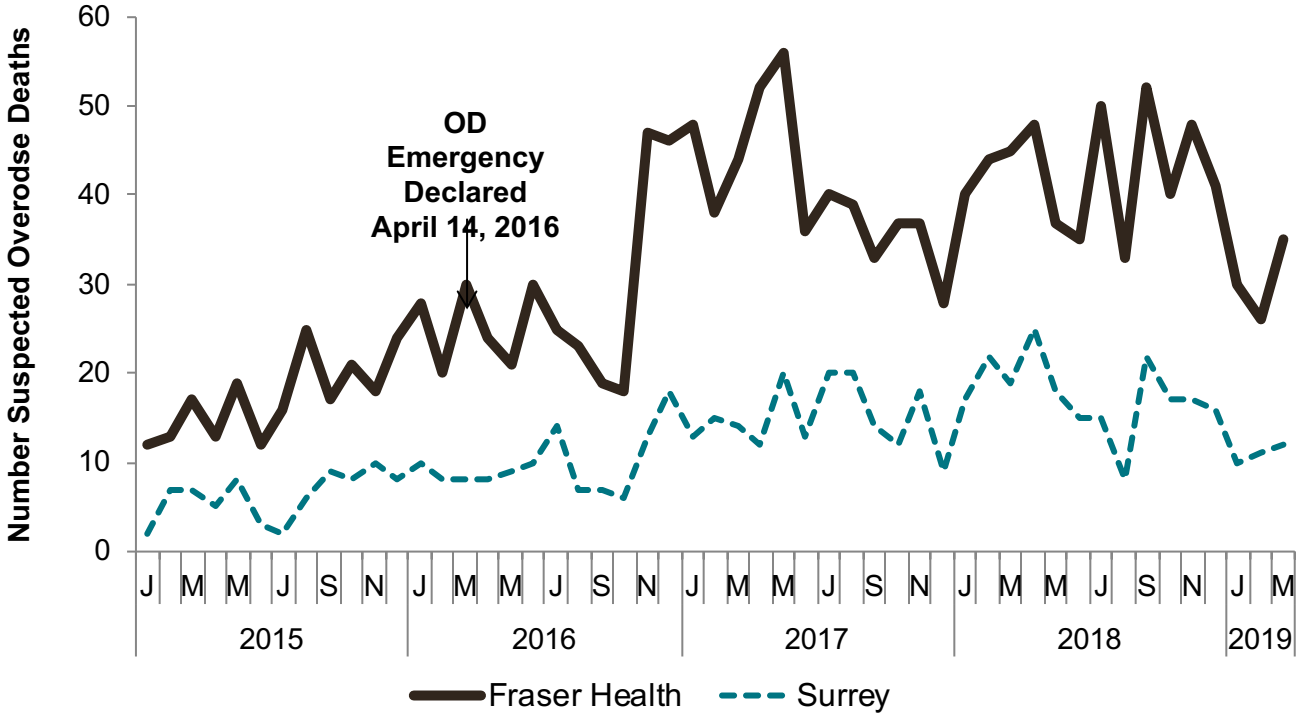
fraserhealth Better health. Best in health care.

Territory Acknowledgment

We would like to recognize that we meet together for the Opioid Summit on the unceded and traditional shared territories of the Katzie, Semiahmoo, Kwantlen, Kwikwetlem, and Tsawwassen First Nations.

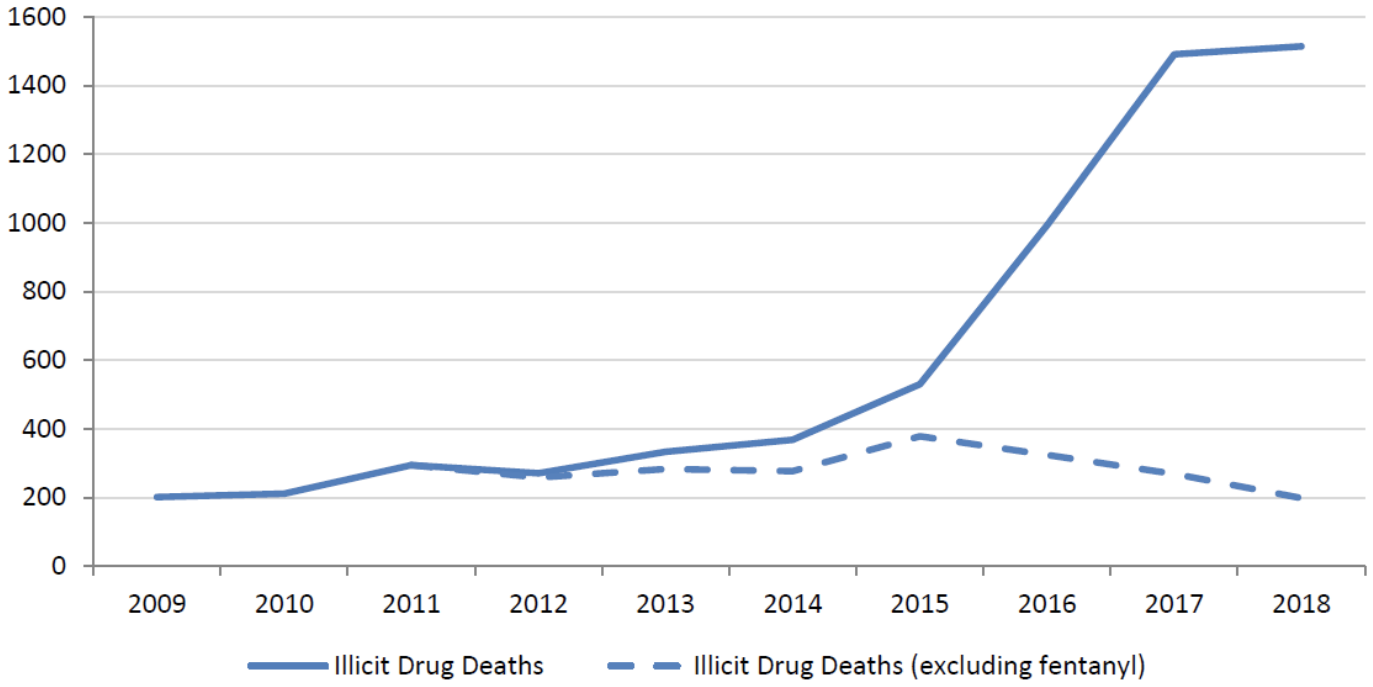


Fatal overdoses by month
Fraser Health & Surrey



Data Source: BC Coroners Service to March 2019. Preliminary data, numbers subject to change. Numbers include both open and closed cases.
Illicit drug overdose deaths reported by BC Coroners Service include illicit drug overdoses involving street drugs (heroin, cocaine, MDMA, methamphetamine, etc.), medications that were not prescribed to the deceased, combinations of the above, with prescribed medications, and those overdoses where the origin of drug is not known.

Fentanyl is driving the increase in fatal overdose events



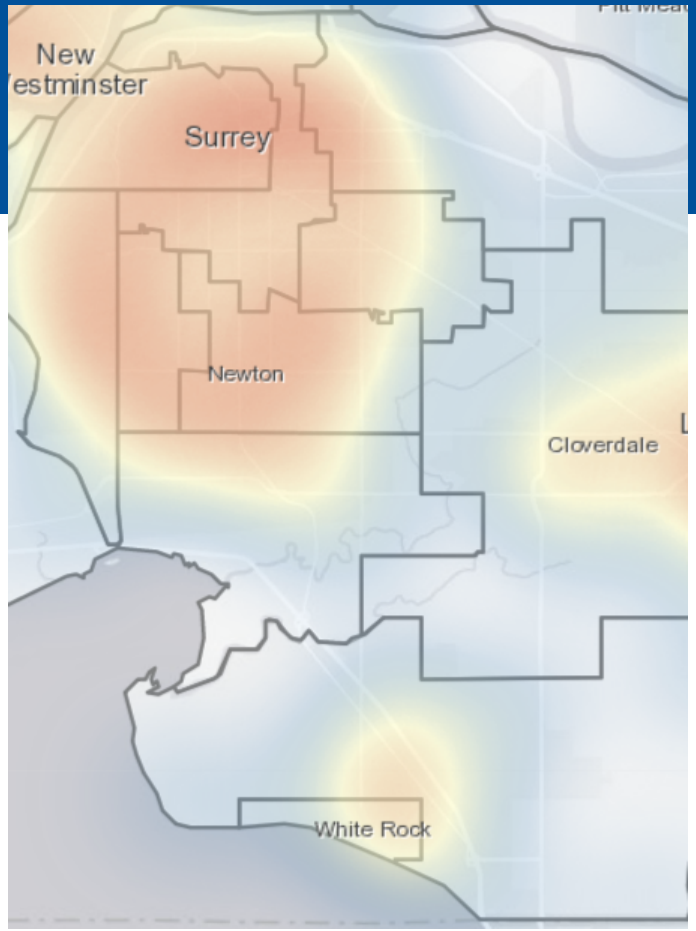
Data Source: BC Coroners Service public report to March 2019. Preliminary data, numbers subject to change. Numbers include both open and closed cases.
Illicit drug overdose deaths reported by BC Coroners Service include illicit drug overdoses involving street drugs (heroin, cocaine, MDMA, methamphetamine, etc.), medications that were not prescribed to the deceased, combinations of the above, with prescribed medications, and those overdoses where the origin of drug is not known.

Most fatal overdoses occur in private residences

Type of location of overdose events, in Fraser Health and BC, which resulted in a death.

	Fraser Health		British Columbia	
Type of Location	2019 YTD	2018	2019 YTD	2018
Inside	83%	87%	88%	87%
Private residence	70%	73%	62%	59%
Other residence and other inside	13%	14%	26%	28%
Outside	14%	12%	11%	12%

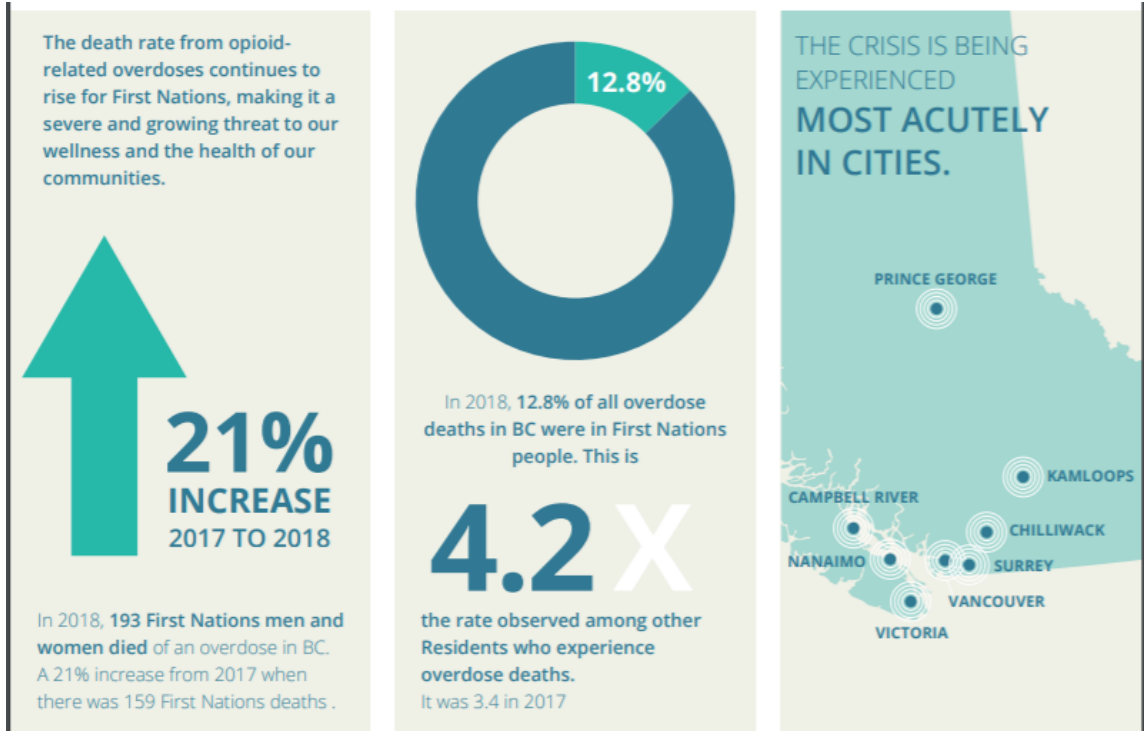
Data Source: BC Coroners Service to March 2019.
Preliminary data, numbers subject to change. Numbers include both open and closed cases.
Illicit drug overdose deaths reported by BC Coroners Service include illicit drug overdoses involving street drugs (heroin, cocaine, MDMA, methamphetamine, etc.), medications that were not prescribed to the deceased, combinations of the above, with prescribed medications, and those overdoses where the origin of drug is not known.



Overdose occurs in all Surrey neighbourhoods

BCAS illegal drug overdoses, Oct 2018 to March 2019
Data prepared by BCCDC

Disparities for First Nations persons are increasing



http://www.fnha.ca/newsContent/Documents/FNHA-Impact-of-the-Opioid-Crisis-on-First-Nations-in-BC-Infographic.pdf

Disparities for First Nations persons are increasing

http://www.fnha.ca/newsContent/Documents/FNHA-Impact-of-the-Opioid-Crisis-on-First-Nations-in-BC-Infographic.pdf

Drug use is common (and likely underreported)

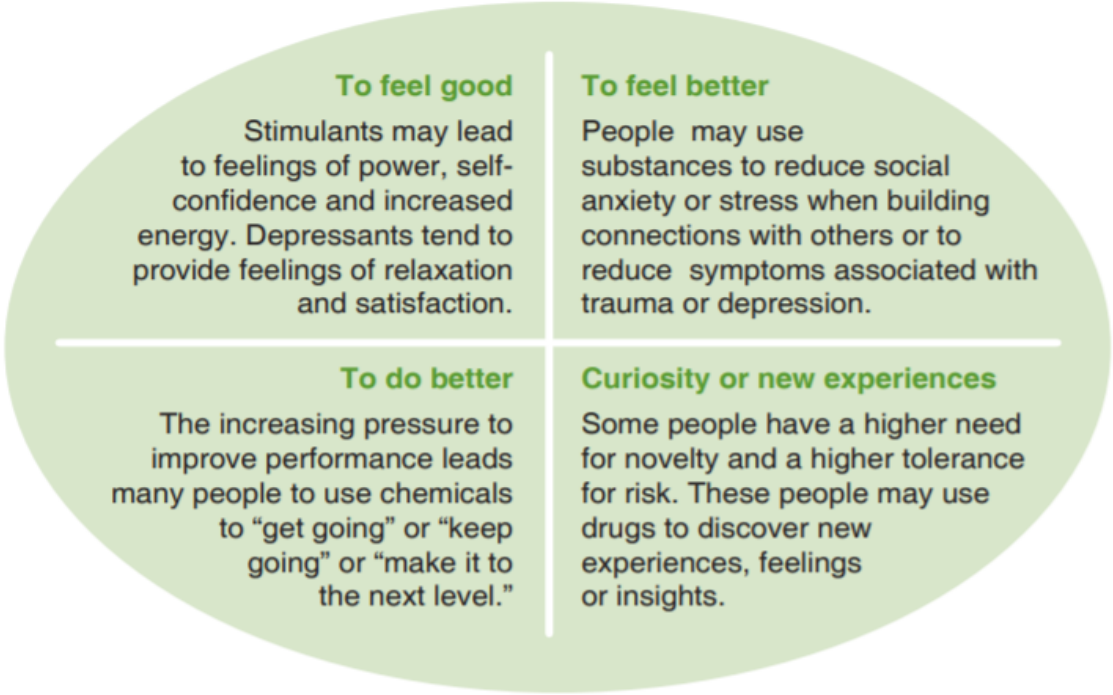
- According to the WHO, 275 million people used drugs at least once in 2016 (5.6% of global population)
  - 31 million people have a substance use disorder (11% of those who use substances)

- Canadian Tobacco, Alcohol, and Drugs Survey:
  - 18.5% of Canadians and 28.3% of British Columbians have ever used cocaine, methamphetamine, ecstasy, hallucinogens, or heroin

https://www.unodc.org/wdr2018/en/exsum.html
https://www.canada.ca/en/health-canada/services/canadian-tobacco-alcohol-drugs-survey/2017-summary/2017-detailed-tables.html

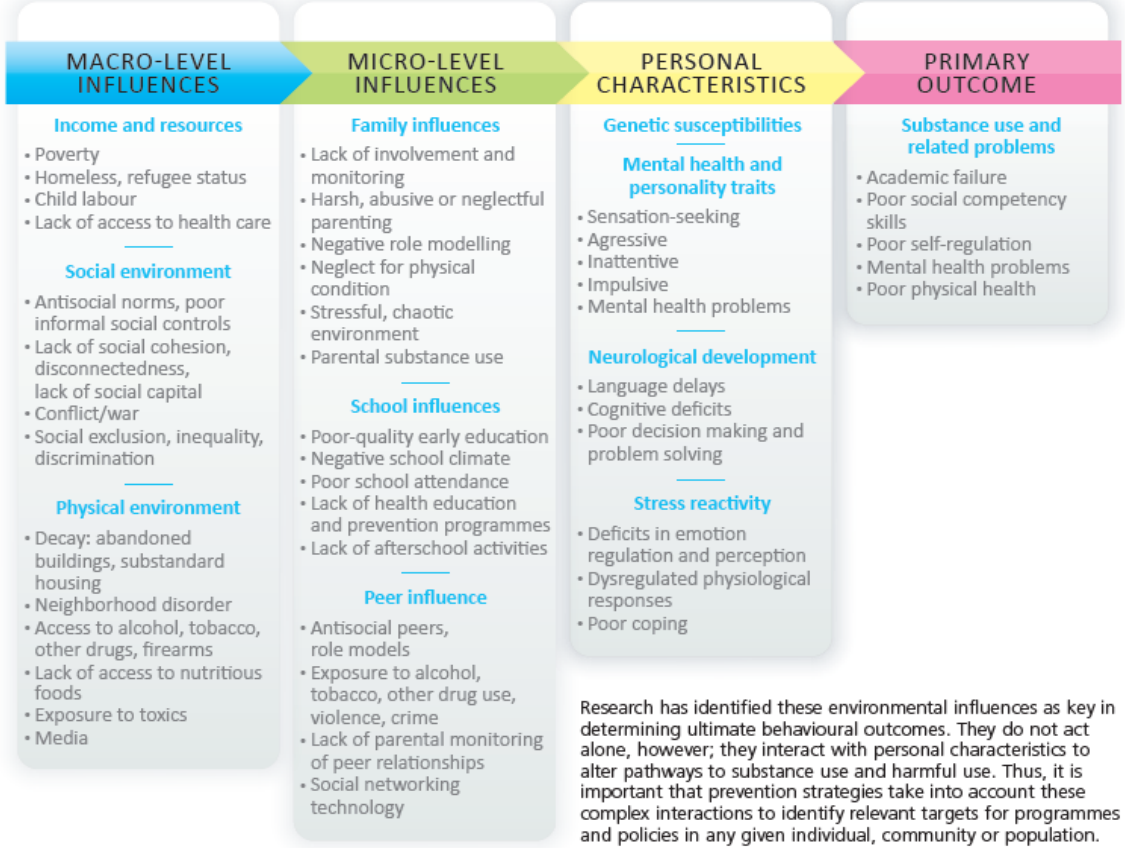
“Drug use is neither a medical condition nor does it necessarily lead to drug dependence.”

- UN High Commissioner for Human Rights, 2015



http://www.heretohelp.bc.ca/sites/default/files/understanding-substance-use-a-health-promotion-perspective.pdf

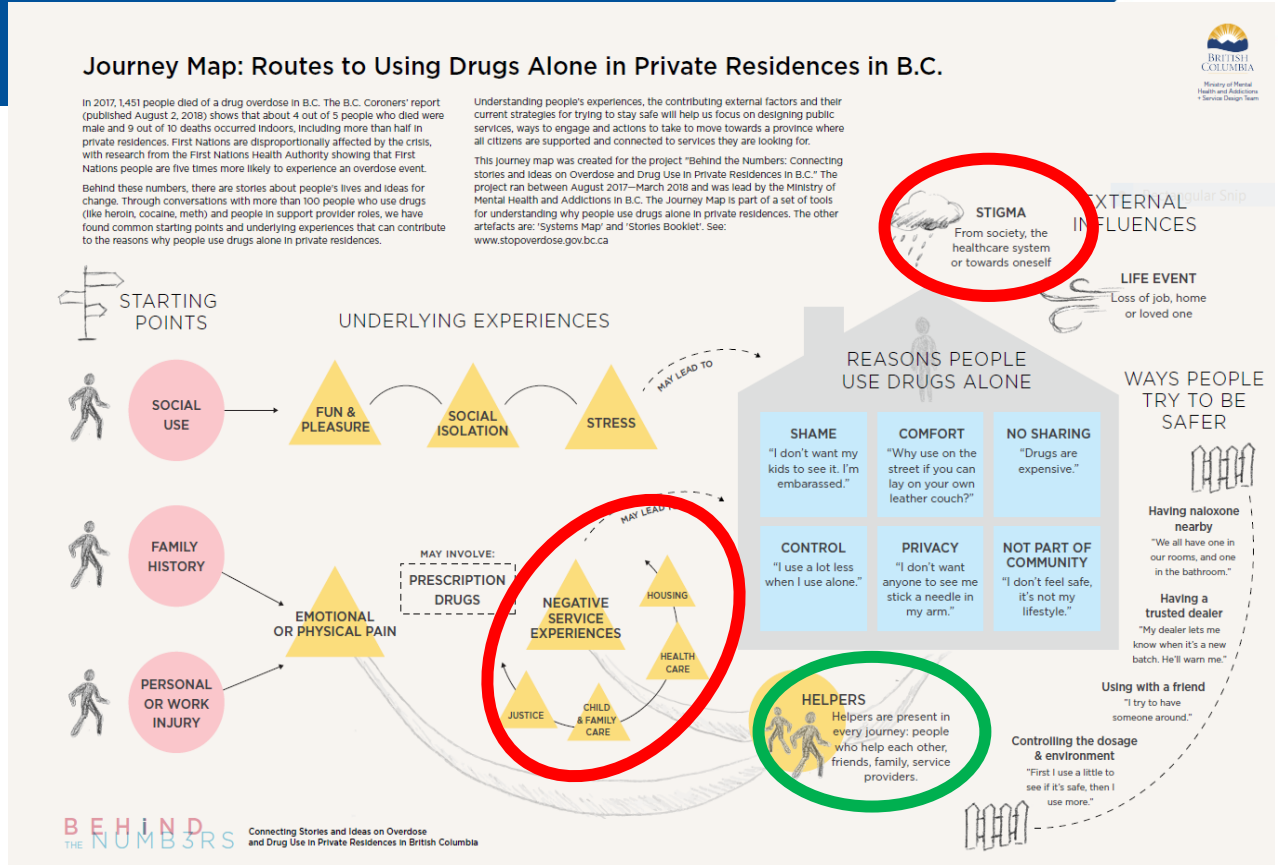
Things that make a difference



Research has identified these environmental influences as key in determining ultimate behavioural outcomes. They do not act alone, however; they interact with personal characteristics to alter pathways to substance use and harmful use. Thus, it is important that prevention strategies take into account these complex interactions to identify relevant targets for programmes and policies in any given individual, community or population.

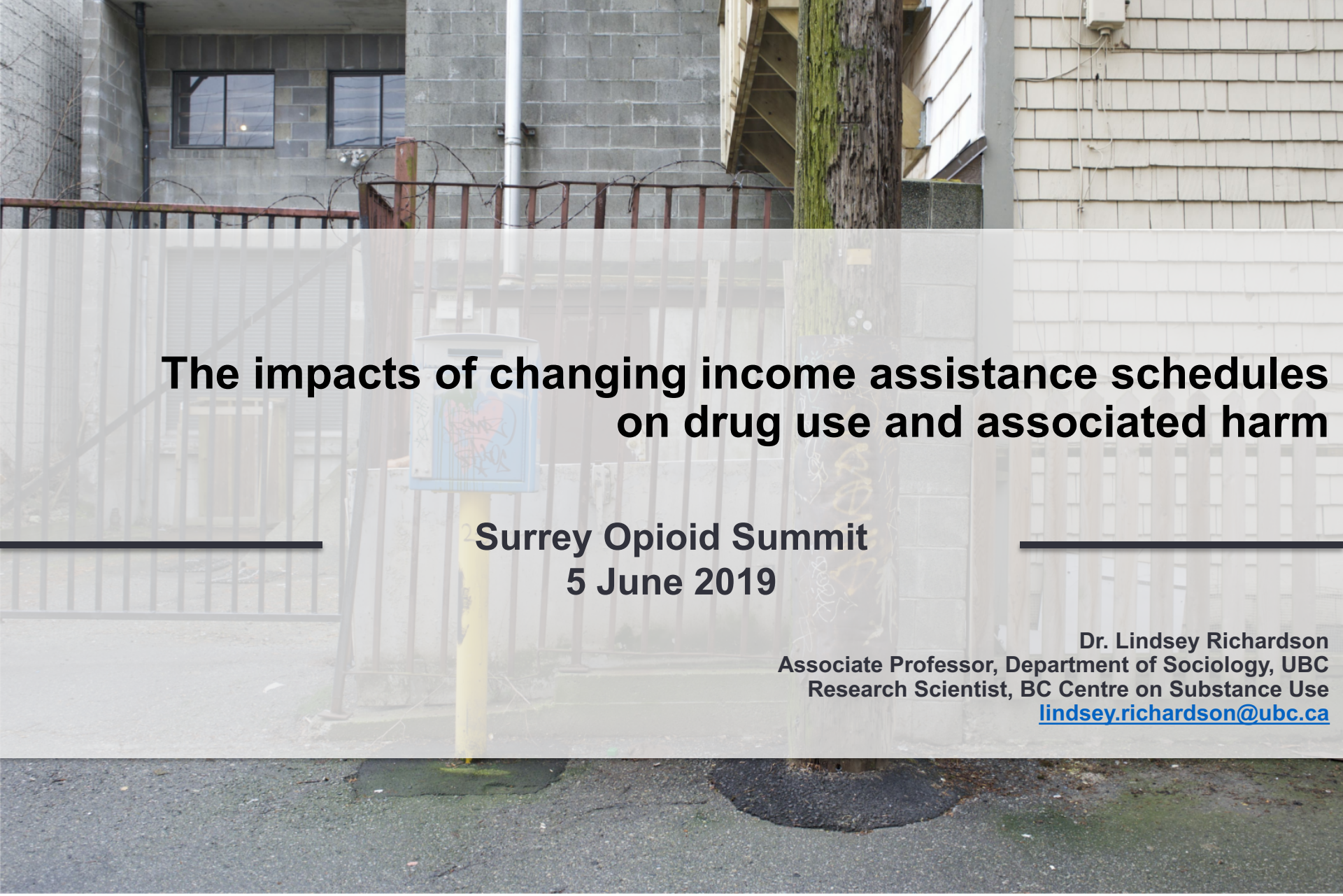
https://www.unodc.org/wdr2018/en/drugs-and-age.html, Figure 9

When we listen to people



https://www2.gov.bc.ca/assets/gov/british-columbians-our-governments/services-policies-for-government/service-design/journey_map_-_aug_2018.pdf

- http://towardtheheart.com/
- http://www.fraserhealth.ca/overdose
- http://www.stopoverdose.gov.bc.ca/



The impacts of changing income assistance schedules on drug use and associated harm

Surrey Opioid Summit
5 June 2019

Dr. Lindsey Richardson
Associate Professor, Department of Sociology, UBC
Research Scientist, BC Centre on Substance Use
lindsey.richardson@ubc.ca

BRITISH COLUMBIA CENTRE ON SUBSTANCE USE
Networking researchers, educators & care providers

a place of mind UBC

phs

PIGEON PARK SAVINGS

CIHR IRSC
Canadian Institutes of Health Research

MICHAEL SMITH FOUNDATION FOR HEALTH RESEARCH
Discover. Connect. Engage.

PWIAS
PETER WALL INSTITUTE FOR ADVANCED STUDIES

PROVIDENCE HEALTH CARE Research Institute

Income assistance and health in Vancouver's Downtown East Side

High low-income rate

- 44% below after tax low income measure in DTES, vs. 20% in Vancouver (2014)

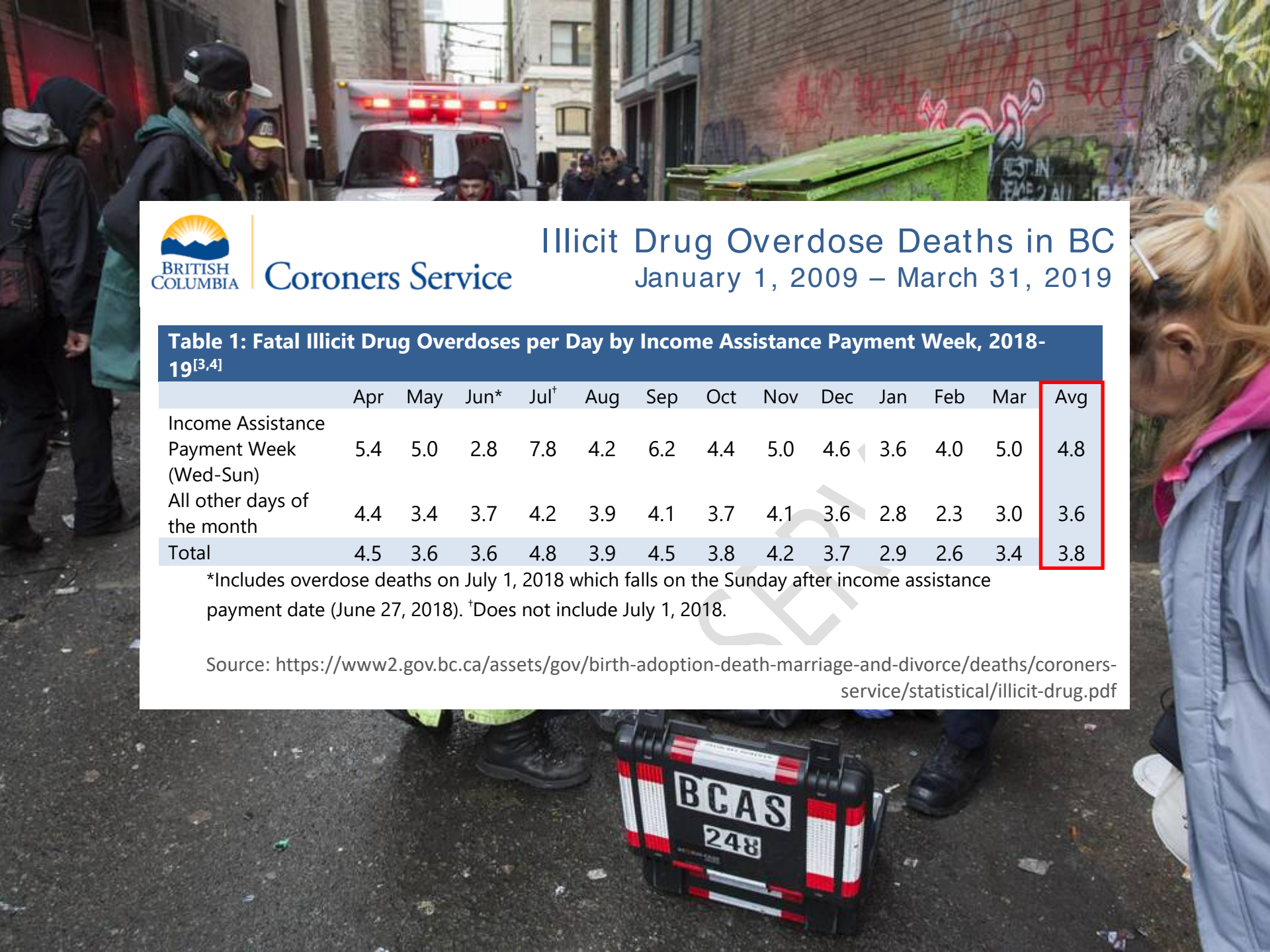
High income assistance receipt rate

- 36% of households receive income assistance, vs/ 7% in Vancouver (2014)

Lower life expectancy

- 76.9 years in DTES, vs. 84.2 years in Vancouver (2015)

Sources: Statistics Canada, TI Family File; BC Statistics, June 2015 estimates
Photo: Dr. M-J Milloy



BRITISH COLUMBIA | Coroners Service

Illicit Drug Overdose Deaths in BC
January 1, 2009 – March 31, 2019

Table 1: Fatal Illicit Drug Overdoses per Day by Income Assistance Payment Week, 2018-19[3,4]

	Apr	May	Jun*	Jul†	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Avg
Income Assistance Payment Week (Wed-Sun)	5.4	5.0	2.8	7.8	4.2	6.2	4.4	5.0	4.6	3.6	4.0	5.0	4.8
All other days of the month	4.4	3.4	3.7	4.2	3.9	4.1	3.7	4.1	3.6	2.8	2.3	3.0	3.6
Total	4.5	3.6	3.6	4.8	3.9	4.5	3.8	4.2	3.7	2.9	2.6	3.4	3.8

*Includes overdose deaths on July 1, 2018 which falls on the Sunday after income assistance payment date (June 27, 2018). †Does not include July 1, 2018.

Source: https://www2.gov.bc.ca/assets/gov/birth-adoption-death-marriage-and-divorce/deaths/coroners-service/statistical/illicit-drug.pdf

THE GLOBE AND MAIL

The downsides and dangers of ‘cheque day’

LINDSEY RICHARDSON
VANCOUVER — Special to The Globe and Mail
Published Sunday, Sep. 04, 2016 7:16PM EDT
Last updated Sunday, Sep. 04, 2016 7:18PM EDT

B.C. marks new overdose call record on “Welfare Wednesday”

Vancouver, BC, Canada / News Talk 980 CKNW I Vancouver's News. Vancouver's Talk
Simon Little
Posted: April 27, 2017 07:54 pm I Last Updated: April 27, 2017 10:50 pm

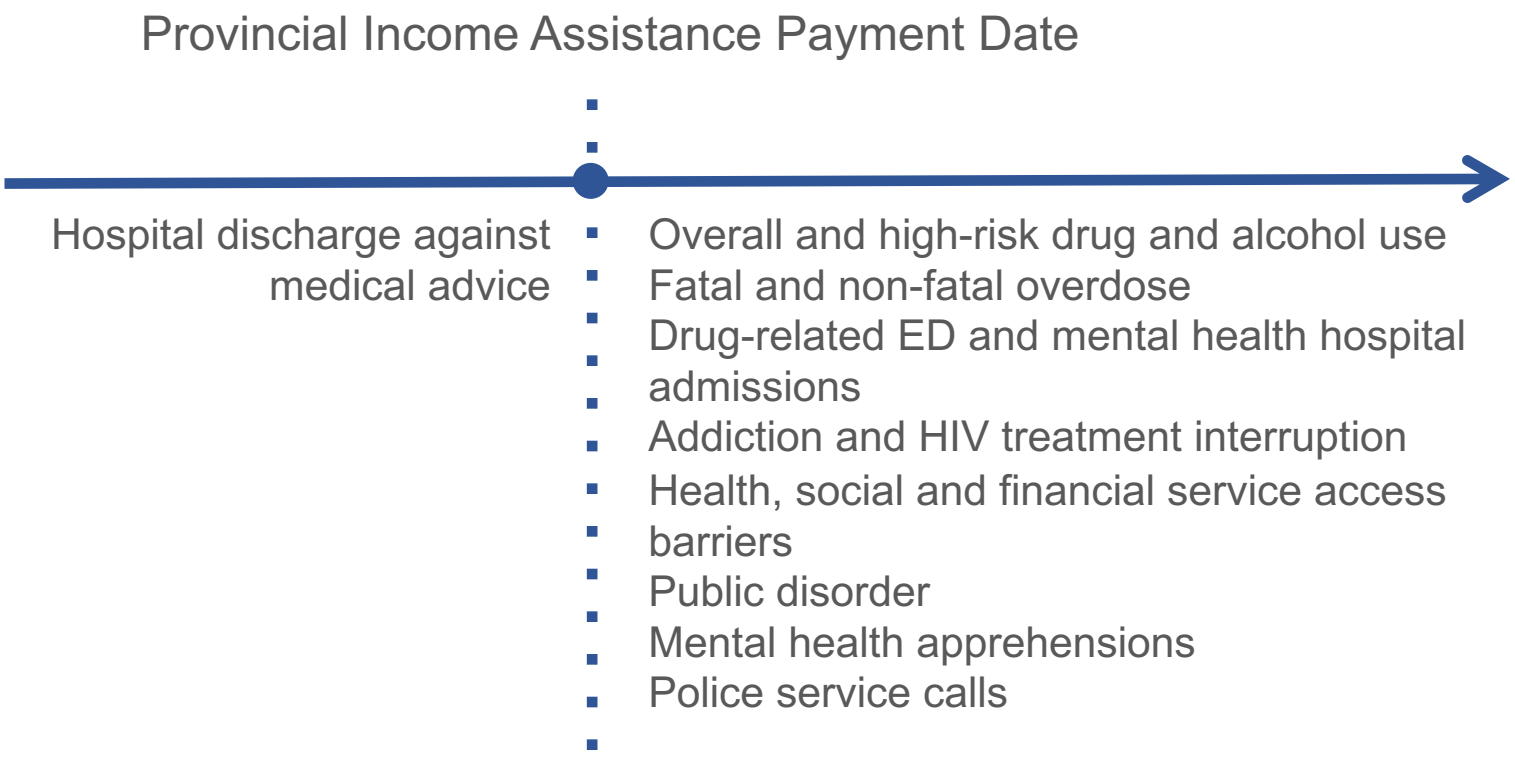
Yet another grim statistic in B.C.’s war on a
workers in a single day.BC Emergency Hea
overdose responses. April 26 was also so-c
distributed.

ency
alls for
ques are

On Thursday, Aug. 25, the day after provincial income-assistance recipients received their support payments, the sirens started: Ambulance, police and fire engines throughout Vancouver were responding to a spike in accidental drug overdoses. Although media reports on overdoses have rightfully focused on the toll caused by fentanyl, a new and more powerful opioid, that particular Thursday is not unique.

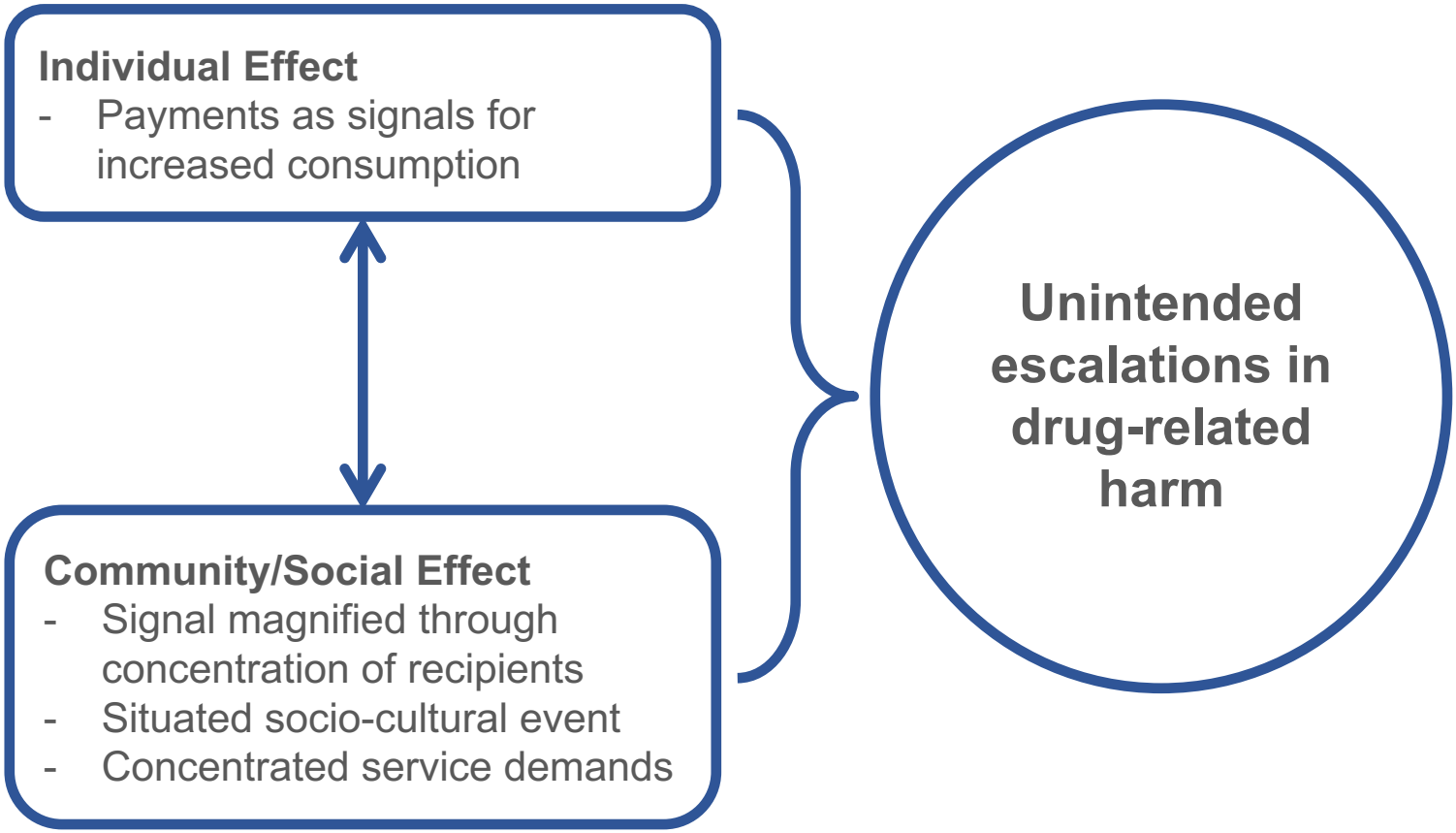
Sirens are heard throughout Vancouver every month on the days after “cheque day,” and are part of a long standing monthly ritual that locals also refer to as “Welfare Wednesday” or “Mardi Gras.” Drug dealers collect outstanding debts. The hashtag #WelfareWednesday is used to advertise drink specials. Community workers hand out fruit to people standing in line at the bank. Thanks to quick action by first responders, family members and health providers, almost all overdoses do not result in death. Some, devastatingly, do.

Income assistance and drug-related harm: Unintended policy impacts



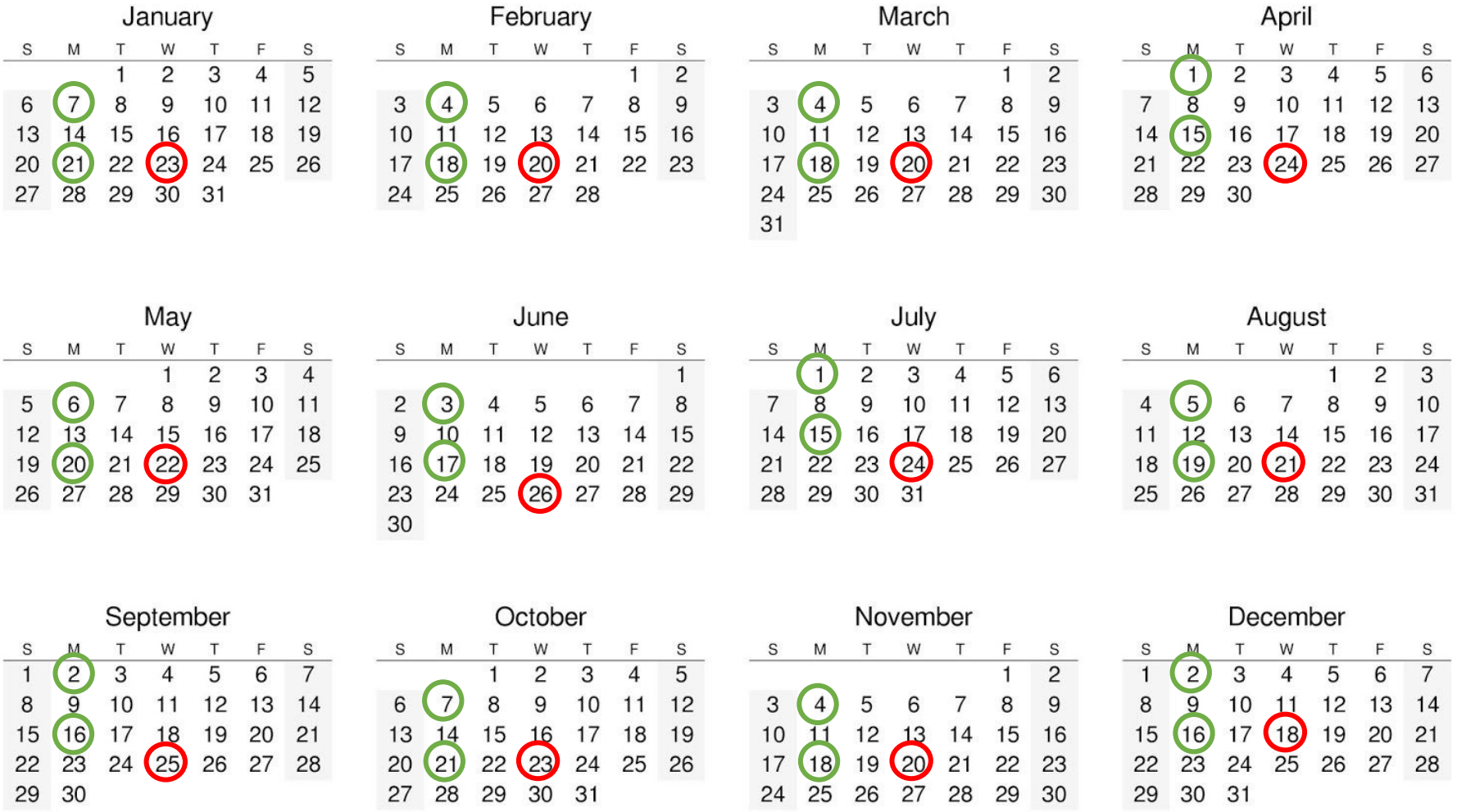
(Dobkin and Puller 2007; Small et al. 2011; Zlotorzynska et al. 2014; Krebs et al. 2016; Verheul et al. 1997; Li et al. 2007; Brunette et al. 1991; Catalano and McConnell 1999; Catalano et al. 2000; Maynard and Cox 2000; Halpern and Mechem 2001; Dobkin and Puller 2007; Anis et al. 2002; Chan et al. 2004; Svikis et al. 1999; Phillips et al. 1999; Riddell and Riddell 2006; Otterstatter et al. 2016)

Drug-related harm and income assistance: Two distinct, interrelated effects

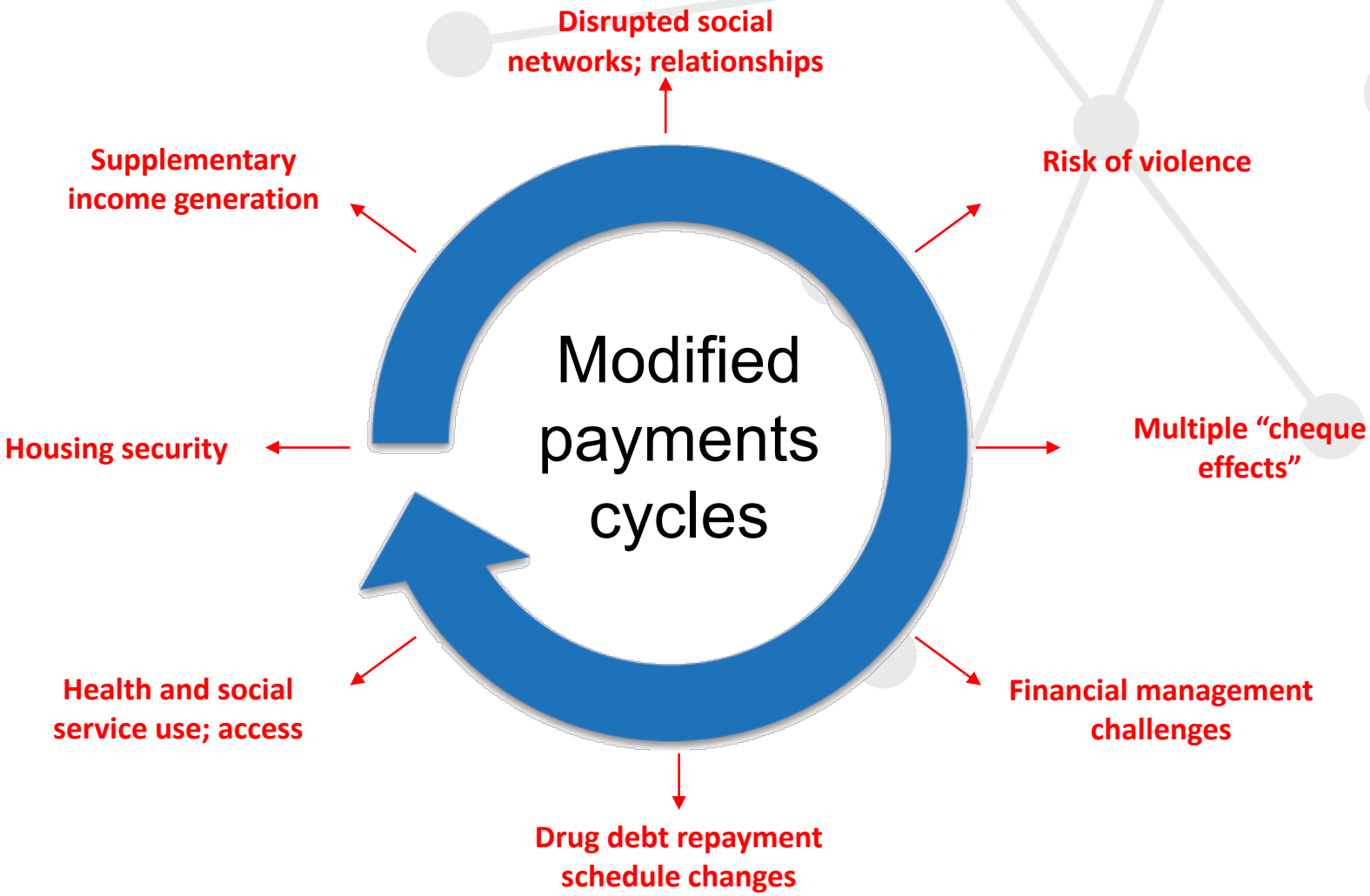


Income assistance in BC

2019



What about the potential for (other) unintended impacts?



TASA Cheque Day Study Hypotheses: Drug Use outcomes

H1: Payment Timing, Drug Use and Drug-Related Harm

- That desynchronizing income assistance payments will resulting in decreased escalations in drug use and drug-related harm coinciding with government payment days.

H2: Payment Frequency and Drug Use

- That desynchronizing and splitting income assistance into semi-monthly payments will reduce drug use and drug-related harm coinciding with individual payment days

H3: Overall Drug Use

- That desynchronizing and desynchronizing and splitting income assistance payments will reduce overall drug use.

Study partners and stakeholders

phs COMMUNITY SERVICES SOCIETY

BRITISH COLUMBIA Ministry of Health

Vancity Make Good Money.™

BRITISH COLUMBIA | Ministry of Social Development and Social Innovation

Providence HEALTH CARE
How you want to be treated.

VANCOUVER POLICE

W.A.H.R.S. WESTERN ABORIGINAL HARM REDUCTION SOCIETY

VANDU
Vancouver Area Network of Drug Users

Vancouver CoastalHealth
Promoting wellness. Ensuring care.

TASA Cheque Day Study: Study Design

Social Assistance Payment

Shelter Allowance | Support Allowance

Direct to landlord

Direct deposit

Control

- Once monthly payment on cheque day

Staggered

- Once monthly payment, randomly chosen, not during government payment week

Split & Staggered

- Twice monthly payment, randomly chosen, not during government payment week

Key Outcomes:
Cyclical Increases of at least 40% in:

Drug Use Frequency

- Average frequency of use on the 3 days beginning with payment days vs. average on all other days of the month

Quantity of Drugs Used

- Average estimated street value of drugs used (proxy for dose) on 3 days beginning with payment days vs. rest of the month

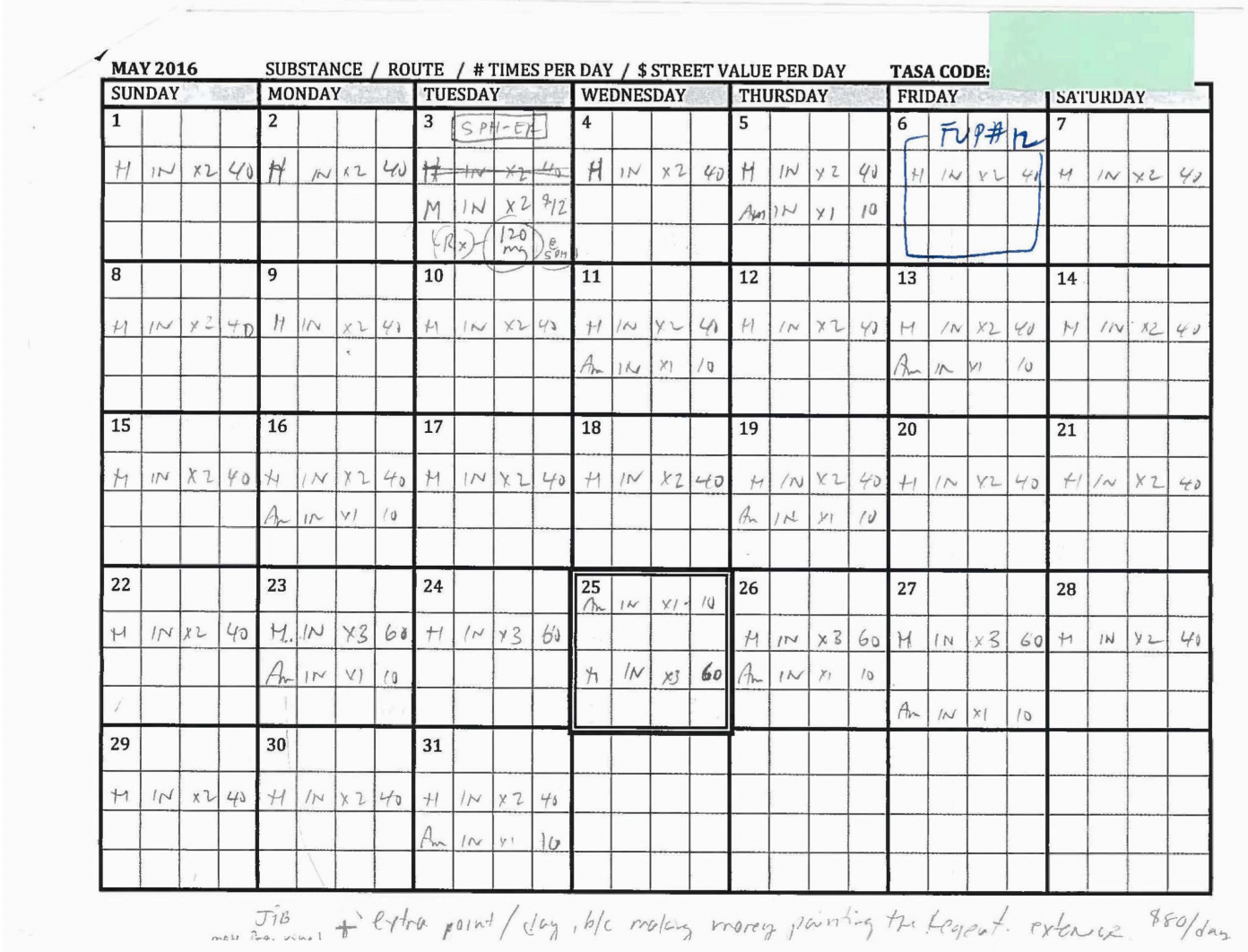
Number of Drugs Used

- Average no. of drugs used (e.g. cannabis, heroin, crack-cocaine) on 3 days beginning with payment days vs. rest of the month

Government Payment Days

Individual Payment Days

Measuring Drug Use: Timeline Follow Back



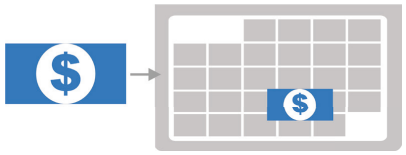
MAY 2016 SUBSTANCE / ROUTE / # TIMES PER DAY / $ STREET VALUE PER DAY TASA CODE:

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1 H IN x2 40	2 H IN x2 40	3 SPH-EX ~~H IN x2 40~~ M IN x2 8/12 (Rx) (120 mg) & SPH	4 H IN x2 40	5 H IN x2 40 Am IN x1 10	6 FUP#12 H IN x2 40	7 H IN x2 40
8 H IN x2 40	9 H IN x2 40	10 H IN x2 40	11 H IN x2 40 Am IN x1 10	12 H IN x2 40	13 H IN x2 40 Am IN x1 10	14 H IN x2 40
15 H IN x2 40	16 H IN x2 40 Am IN x1 10	17 H IN x2 40	18 H IN x2 40	19 H IN x2 40 Am IN x1 10	20 H IN x2 40	21 H IN x2 40
22 H IN x2 40	23 H IN x3 60 Am IN x1 10	24 H IN x3 60	25 Am IN x1 10 H IN x3 60	26 H IN x3 60 Am IN x1 10	27 H IN x3 60 Am IN x1 10	28 H IN x2 40
29 H IN x2 40	30 H IN x2 40	31 H IN x2 40 Am IN x1 10				

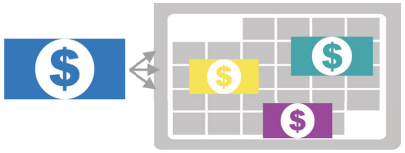
JIB + extra point / day, b/c making money painting the keyent. exterior $50/day

Results:
Randomization and Study Characteristics (n=194)

45
Control Arm



72
Staggered Arm



77
Split & Staggered Arm

89
Women

4
Transgender

79
Indigenous

4
Other Ethnic Minority

Results:
Cheque Day Study Participation Patterns

75.7%

Of scheduled follow up research visits completed

6

Participants deceased during the study for reasons unrelated to their participation

25

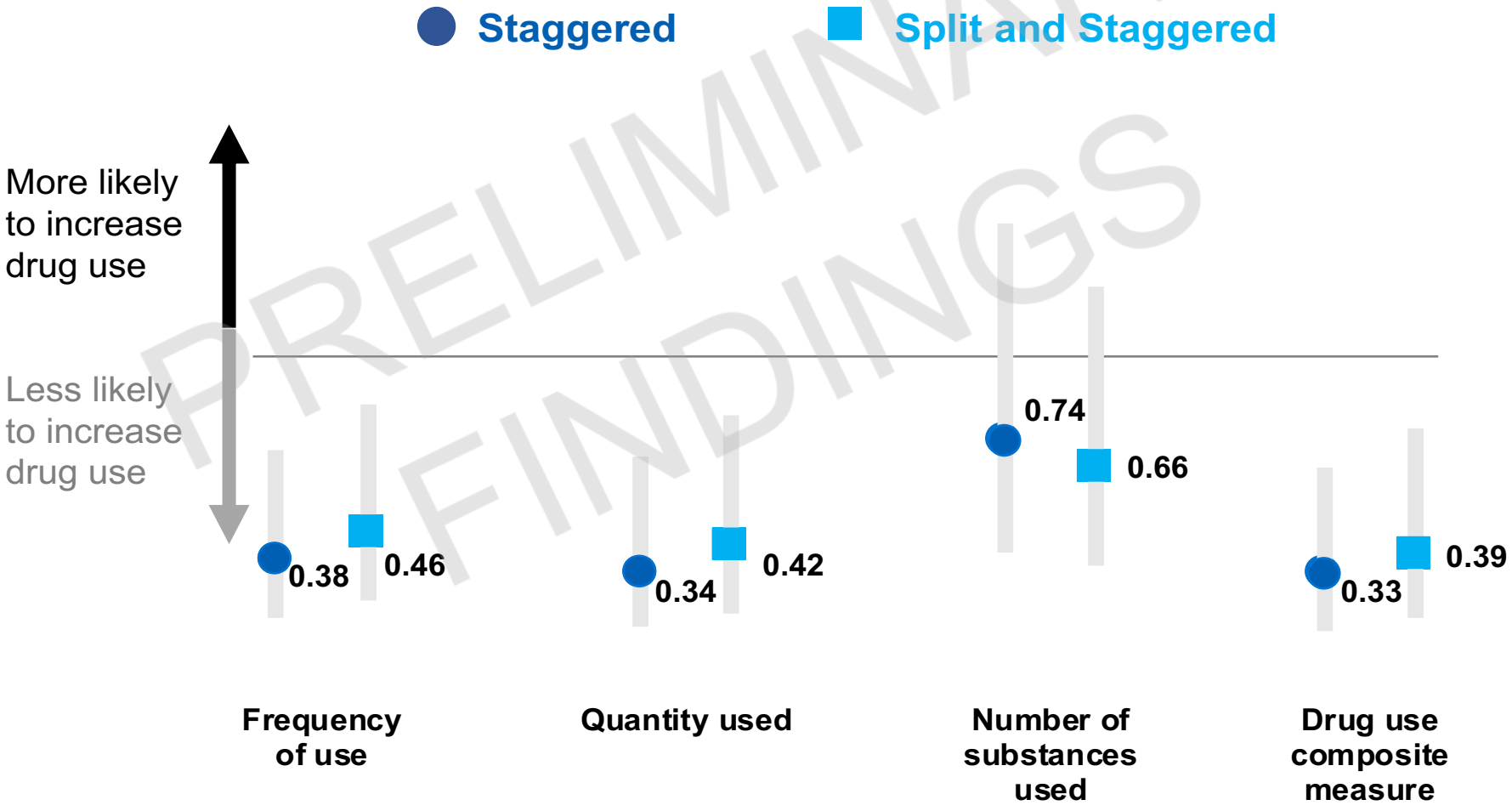
Participants were lost to follow up (12.9%)

29

Formally completed the intervention (105 withdrew)

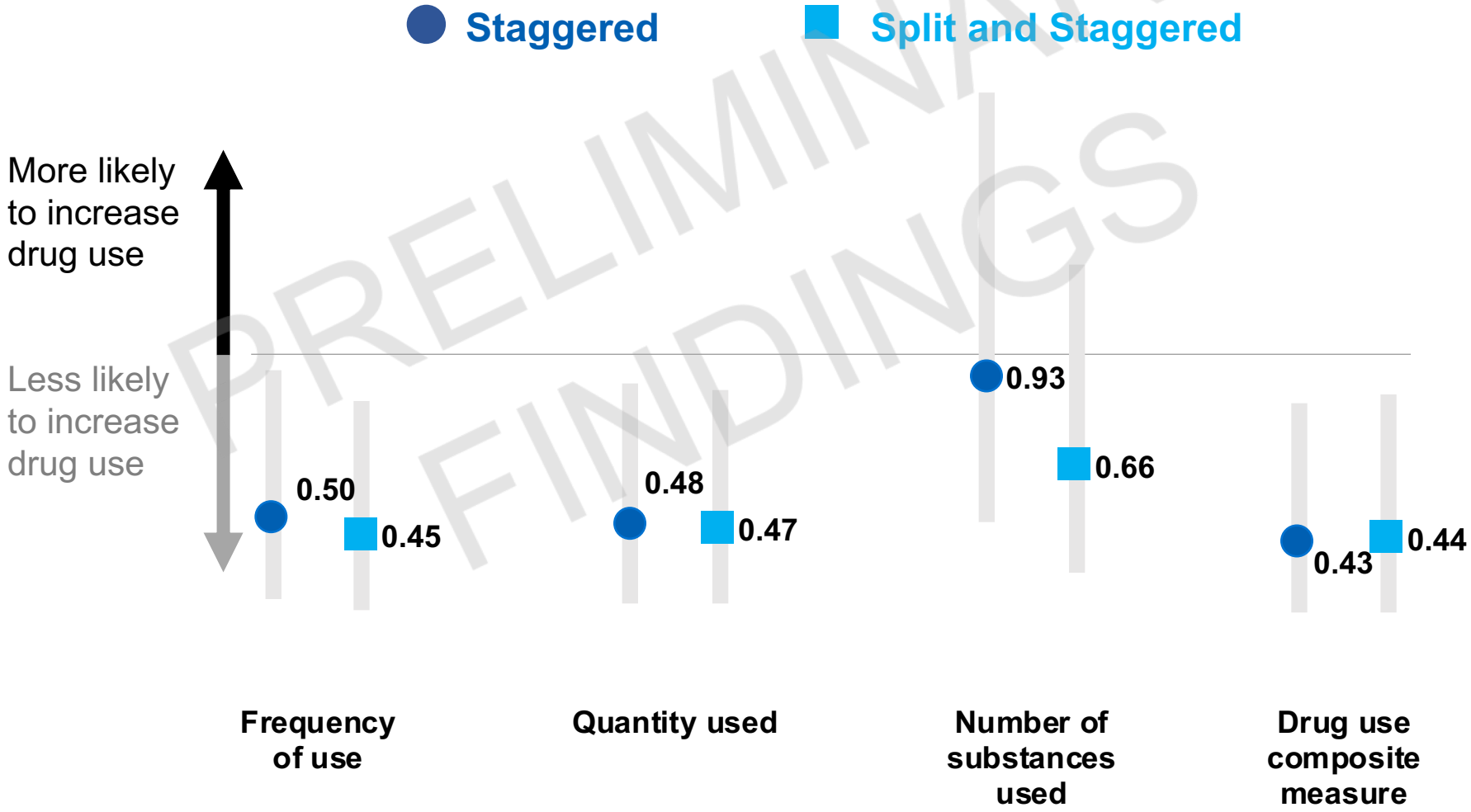
Results: Government Payment Days

Participants in **both study arms** were around **one third** as likely to increase their drug use around government cheque day

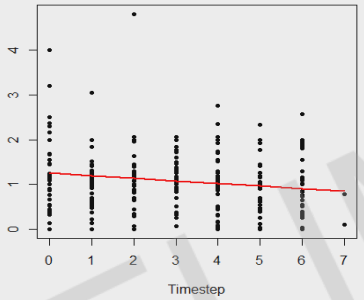
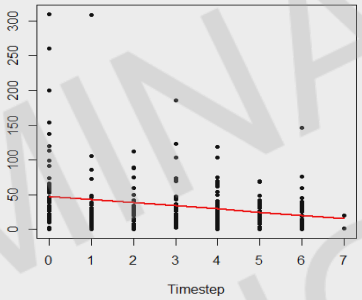
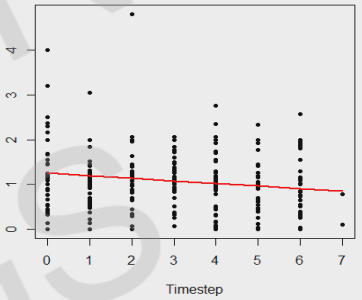
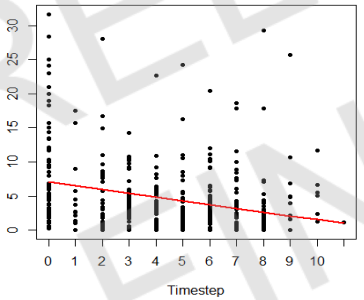
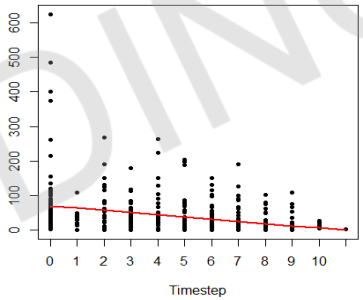
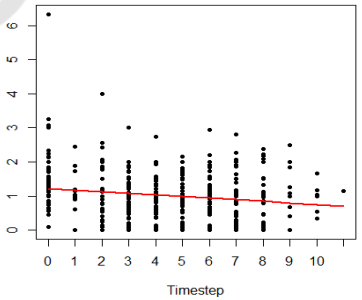
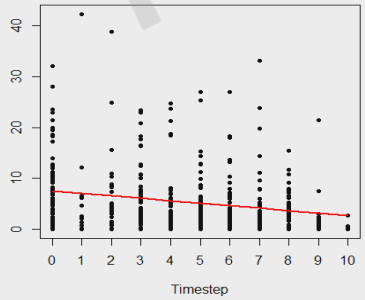
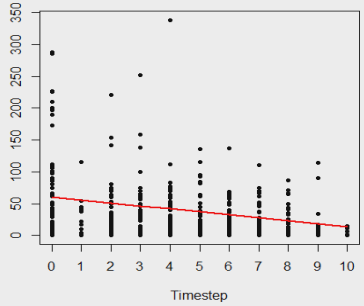
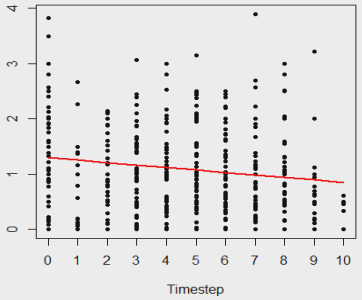


Results: Individual Payment days

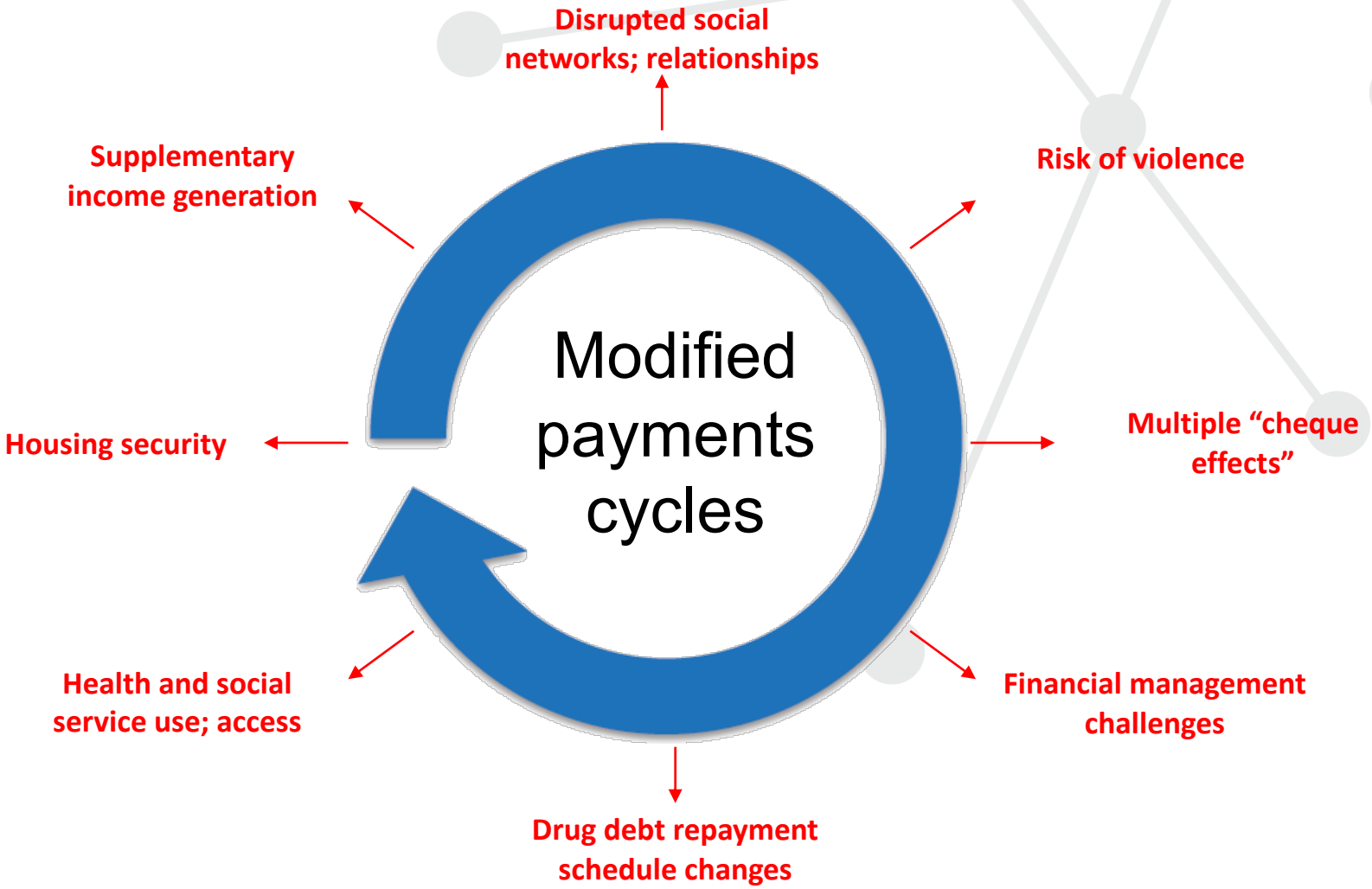
Participants in **both study arms** were around **half** as likely to increase their drug use when they received their income assistance



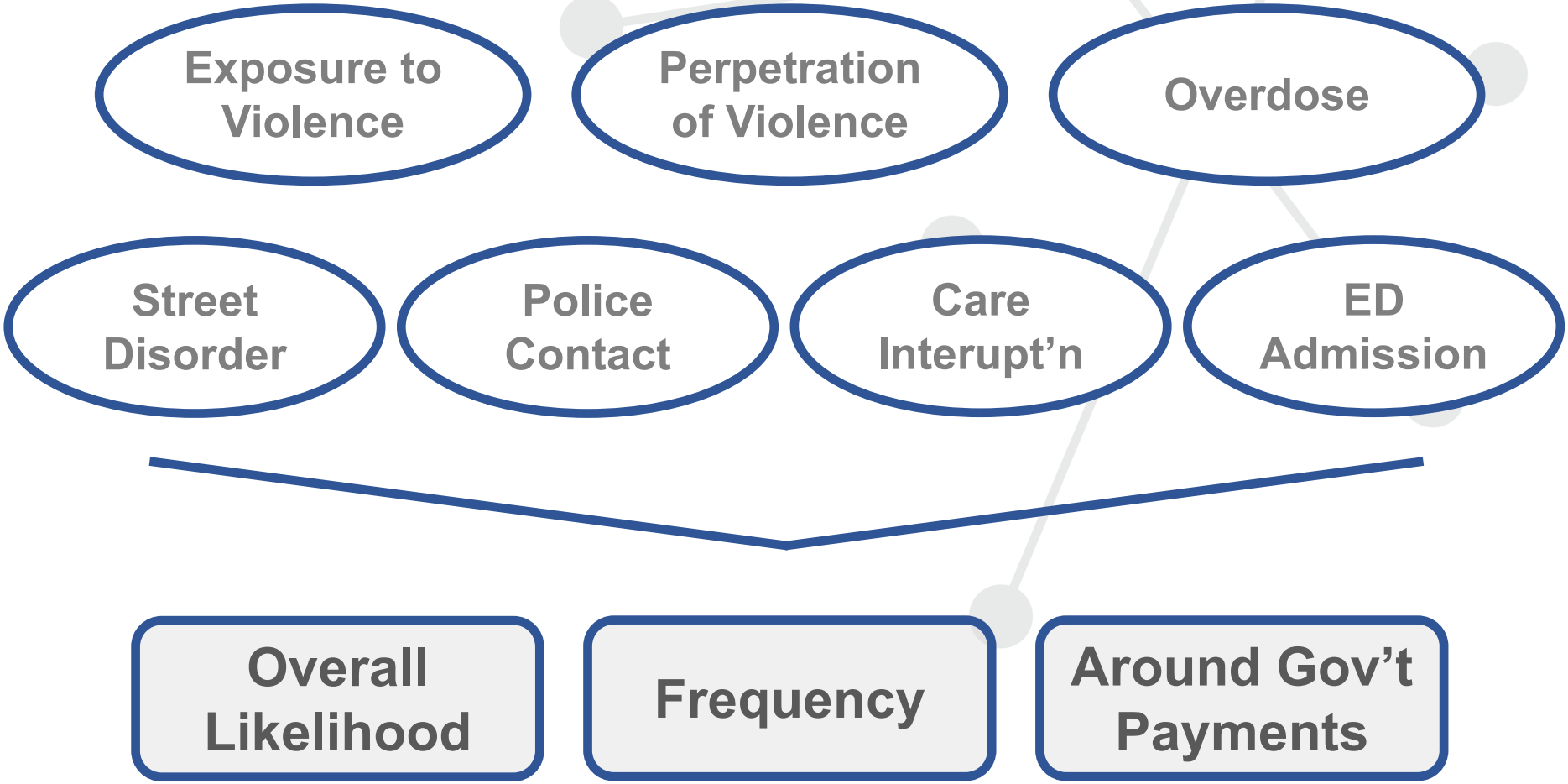
Results: Overall Drug Use

	Frequency	Quantity used	Number of Substances used
Control			
Staggered			
Split & staggered			

What about the potential for (other) unintended impacts?



Secondary outcomes



Secondary outcomes summary

Analyses*		As randomized (according to original study arm)		By effective arm (according to actual payment schedule)	
		Staggered	Split & staggered	Staggered	Split & staggered
Exposure to violence	1	■		■	
	2	■			
	3				
	4				
Perpetration of violence	1				■
	2				■
	3				
	4	■	■		■
Police interaction	1				
	2				
	3				■
Participation in public disorder	1				
	2				
	3				
Illegal activity	1				
	2				
	3				
Non-fatal overdose	1				
	2		■		
	3				
	4	■	■		
Emergency department use	1				
	2				
Health care discontinuation	1				■
	2				■
	3				

* Analyses shown: 1) Multivariable; 2) Multivariable adjusted for baseline; 3) Around government cheque day; 4) Frequency

Secondary outcomes summary: Increases in drug related harm in some analyses

Exposure to violence

- **Staggered arm** (likelihood)

Perpetration of violence

- **Staggered** (frequency)
- **Split & staggered** (likelihood & frequency)

Negative interaction with police

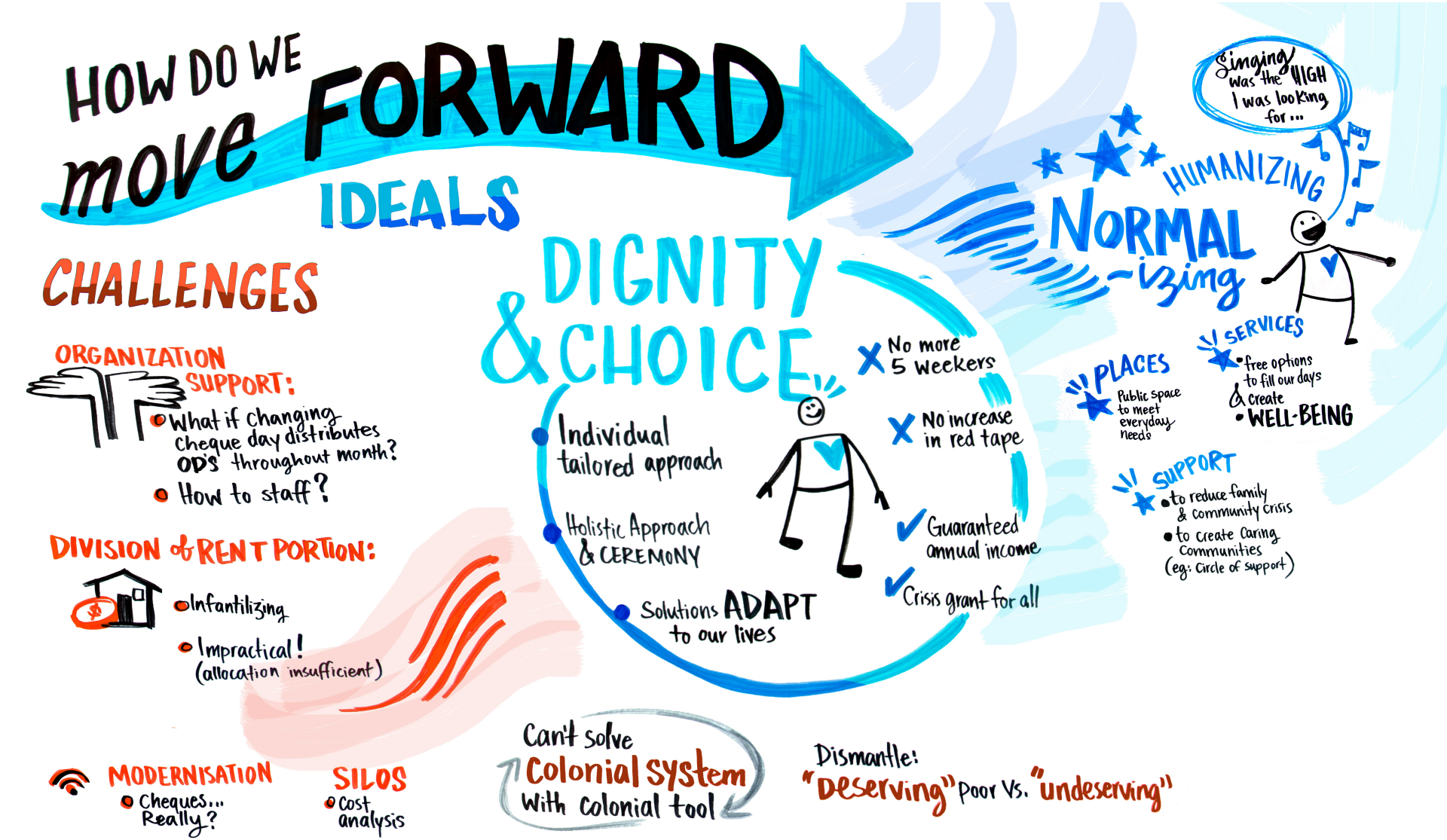
- **Split & staggered arm** (around government payment days)

Non-fatal overdose

- **Staggered** (frequency)
- **Split & staggered** (likelihood & frequency)

Health care discontinuation

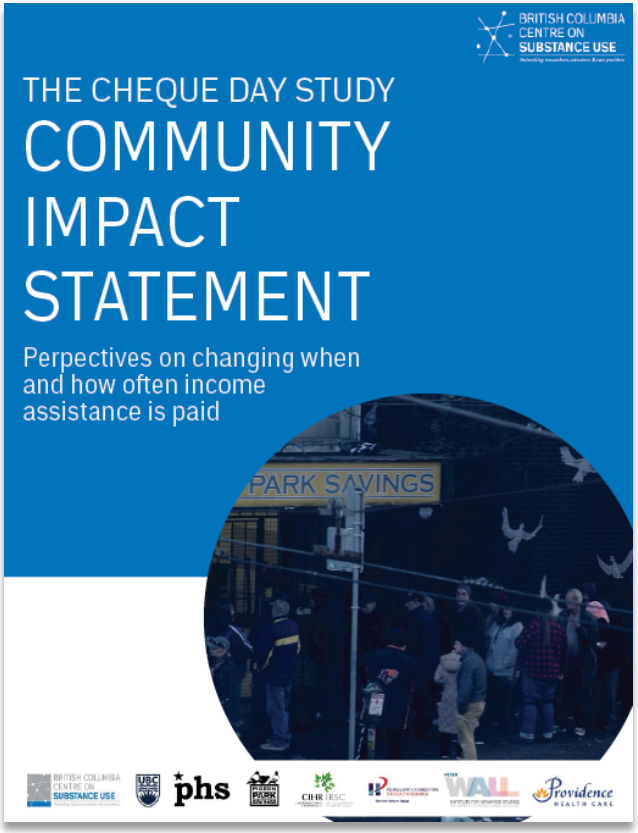
- **Split & staggered** (likelihood)

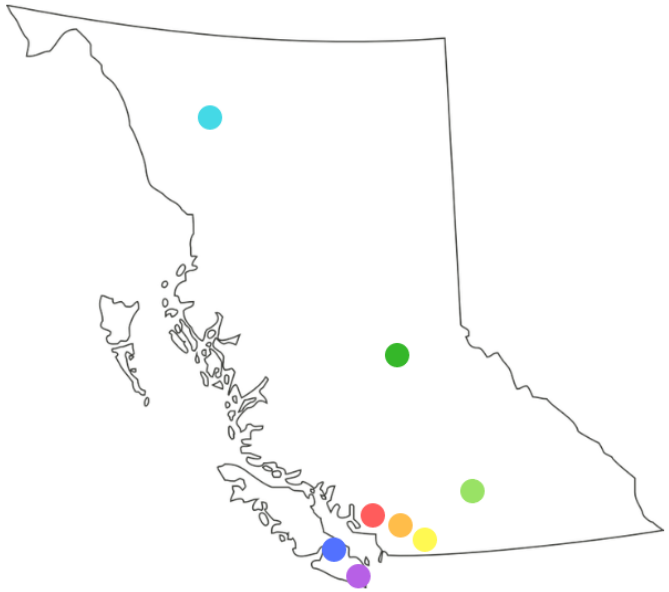


Cheque Day Study, Stakeholder Forum, Sept 2017, Vancouver
unceded traditional territories of the Musqueam, Tsleil-Waututh, & Squamish Peoples

LIVE GRAPHIC RECORDING
Tiaré Jung | Drawing Change

Community engagement

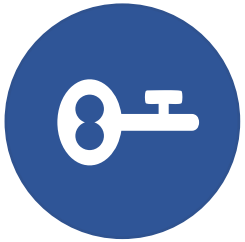




- 500+ individuals
- 50+ organizations
- 8 communities across BC
- First responders: police, fire, ambulance

Key messages from consultation

Values that recipients would like to be enshrined in the income assistance system include **dignity, autonomy,** and **equality.**



Changes must ensure **consistent and equal access** to income assistance regardless of individual drug use patterns.

Support services may need to adapt to meet client needs across the month, which may mean changes to operating hours, staffing, service provision and/or resources.

The potential for **increased vulnerability** if payments are desynchronized requires careful consideration and potential supports.

Key messages from consultation

Low rates of income assistance may exacerbate the problem. Many people shared how poverty and desperation contribute to the amount of substance use around cheque day.

Budgeting might become easier for some or more difficult for others depending on individual financial management practices. Highlighting opportunities for **tailored support, individualized services** and **choice** in how income assistance is paid.

Concerns exist amongst community members and service providers alike regarding the **logistics of administration, adapting to new payment schedules**, and **the payment of rent and bills.**

Recommendations

- Consider policy or programmatic reform that weigh impacts for **individuals, service providers, first responders and communities**
- Allow **individual choice** for income assistance recipients, **provide flexibility** to adapt when circumstances change, and **make change processes client-centered and low-barrier**
- Explore the potential for using the digitized income assistance administration system or private options to **individualize** schedules
- Base any reform in principles identified by community including **autonomy, dignity and equality**
- Ensure that any reform **be evaluated** to watch for unintended consequences

Acknowledgements

Study participants

Study Partners

Pigeon Park Savings
VanCity Savings Credit Union
PHS Community Services Society
Providence Health Care
Vancouver Police Dept.
Vancouver Coastal Health
VANDU
WAHRS
City of Vancouver

BCCSU research and administrative staff

Allison Laing
Joanna Mendell

Co-investigators

Thomas Kerr
Evan Wood
Patricia Daly
Eric Grafstein
M-J Milloy
Will Small
Brandon Marshall

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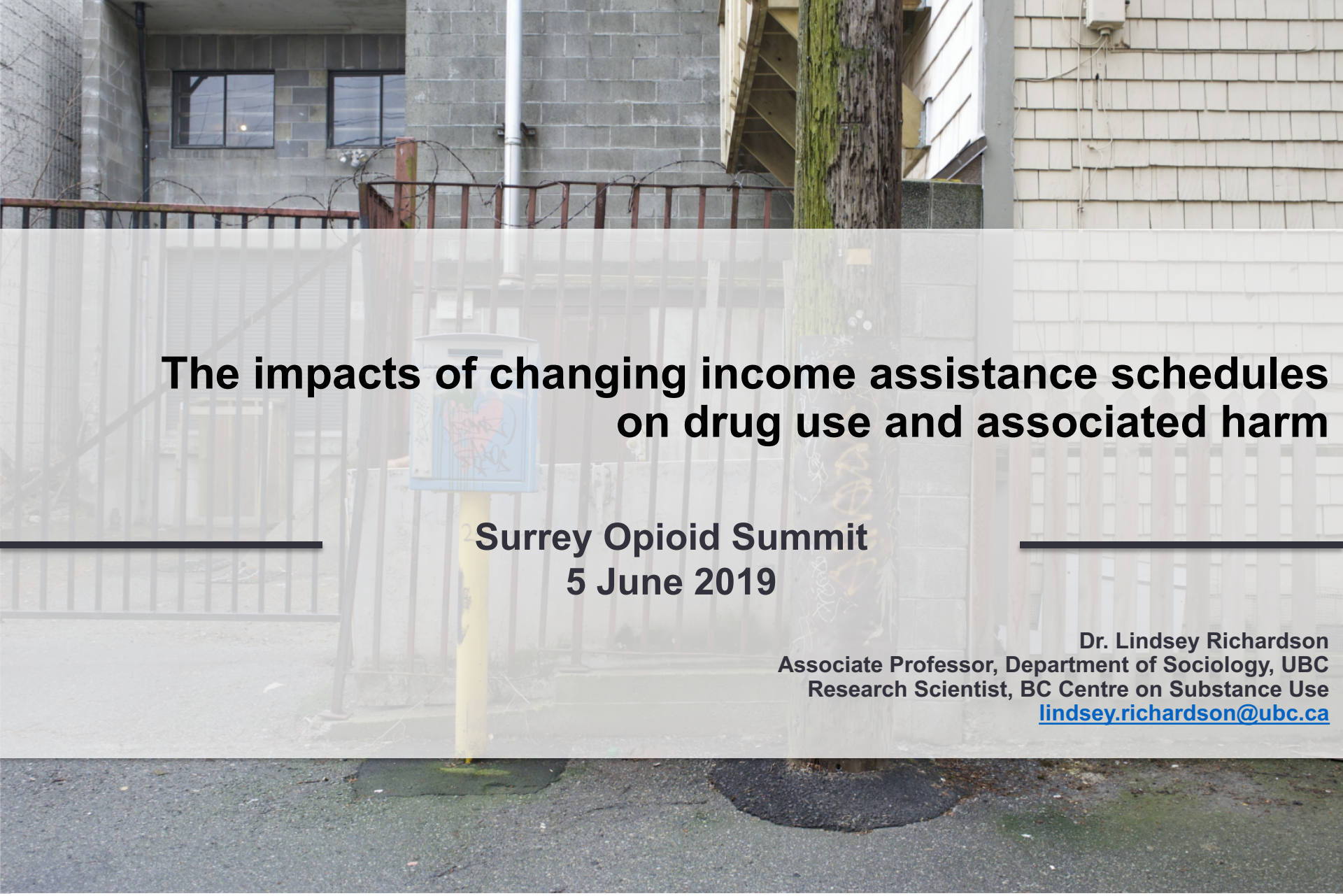
In memoriam

RS	SB
AK	PD
ML	NR
MC	TM



The impacts of changing income assistance schedules on drug use and associated harm

Surrey Opioid Summit
5 June 2019

Dr. Lindsey Richardson
Associate Professor, Department of Sociology, UBC
Research Scientist, BC Centre on Substance Use
lindsey.richardson@ubc.ca

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TASA Cheque Day Study: Study Design

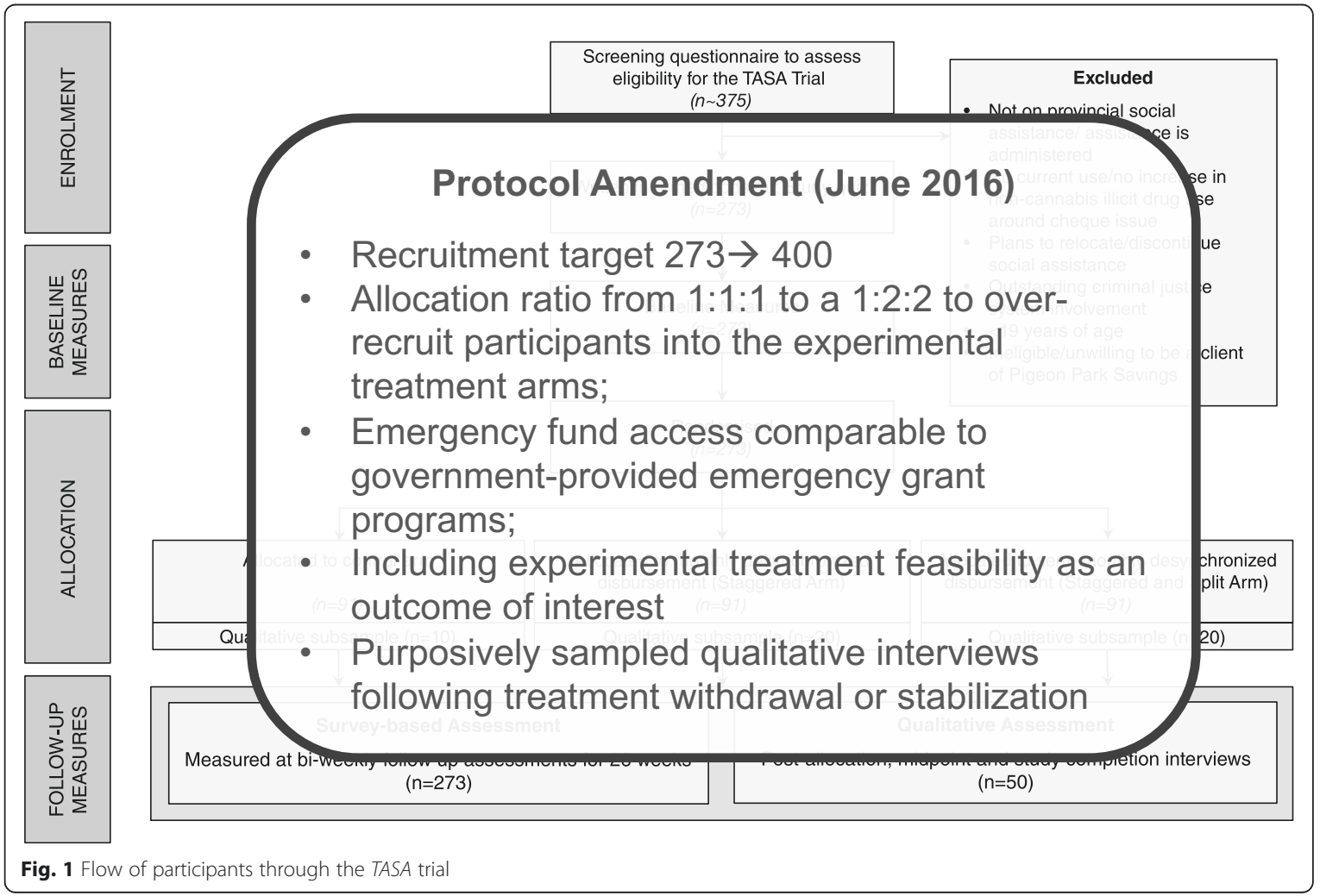


Fig. 1 Flow of participants through the *TASA* trial

Outcome Measures

Secondary outcome variables measures	
Outcome	**Measurement for analyses and Quantification**
Violence, disorder, contact with police	• Self-report • Binary measures of (1) exposure to violence, (2) perpetration of violence, (3) illegal activity (4) involvement in public disorder, (5) negative contact with police, quantified as the proportion reporting each per income assistance cycle • Additionally, counts of the number of events while under follow-up were collected for: (1) exposure to violence, (2) perpetration of violence, and (3) involvement in public disorder
Overdose	• Self-report • Binary measure of whether participant experienced any overdose (OD) symptoms in the two weeks prior to interview • Binary measure of whether participant experienced non-fatal overdose on the three days beginning with government payment days • Counts of the frequency of overdoses in the two weeks prior to interview
Emergency Department (ED) Admission	• Self-report • Binary measures quantified as the proportion of participants reporting ED admission while under follow-up*
Leaving hospital against medical advice (AMA)	• Self-report • Binary measures quantified as the proportion of participants reporting leaving hospital AMA while under follow-up*
Treatment/care discontinuation	• Self-report discontinuation of (1) HIV treatment, (2) addiction treatment (e.g., methadone maintenance), (3) other ongoing care • Binary measures quantified as the proportion of participants reporting missing a treatment while under follow-up*

* "while under follow-up" includes the six-month study follow-up from randomization to month 6 or discontinuation, and excludes the post-study safety follow-up period

Analytic Strategy: Primary Outcomes

Descriptive Assessment

- Study participation and intervention retention patterns
- Establishing pre-treatment equivalence across study arms

Escalations in Drug Use on Government and Individual Payment Days

- General linear mixed models (GLMM);
- Study arm as primary covariate of interest
- Separate models for each part of the primary outcome and composite measure
- Intent-to-treat and modified per protocol specifications

Overall Drug Use

- Linear mixed models (LMM)
- Compare drug use patterns over time for each study arm
- Intent-to-treat and modified per protocol specifications

Analytic Strategy: Secondary Outcomes

Likelihood of drug-related harm

- General linear mixed models (GLMM);
- Study arm as primary covariate of interest
- Separate models for each outcome operationalized as a binary outcome
- Intent-to-treat and modified per protocol specifications

Considerations of time; frequency

- Modified time frame of three days beginning with government payment days
- Events frequency comparisons (e.g. OD)
- Intent-to-treat and modified per protocol specifications

Results:
Sample Characteristics

Table 1. Baseline characteristics of the impact of Alternative Social Assistance (TASA) study sample stratified and compared across experimental study arms (n=194)

	Control Arm (n=45)	Staggered Arm (n=72)		Split & Staggered Arm (n=77)	
		Characteristics N (%)	*vs. Control Arm (OR)*	*Characteristics N (%)*	*vs. Control Arm (OR)*
Sociodemographic Characteristics					
Age (median, IQR)	45 (37-53)	43 (37-53)	0.73	45 (39-51)	1.00
Gender					
Male	20 (44.4)	41 (56.9)	-	40 (51.9)	-
Female	22 (48.9)	31 (43.1)	0.69	36 (46.8)	0.82
Transgender	3 (6.7)	0 (0.0)	4.33**	1 (1.3)	0.17
Ethnicity					
White	25 (55.6)	41 (56.9)	-	45 (58.4)	-
Indigenous ancestry	20 (44.4)	29 (40.3)	0.89	30 (39.0)	0.83
Ethnic minority	0 (0.0)	2 (2.8)	0.05***	2 (2.6)	0.25***
Socioeconomic Characteristics					
Educational attainment					
< High school	20 (44.4)	35 (48.6)	-	44 (57.1)	-
≥ High school	25 (55.6)	37 (51.4)	0.85	33 (42.9)	0.60
Housing status					
Housed	26 (57.8)	34 (47.2)	-	52 (67.5)	-
Homeless	19 (42.2)	38 (52.8)	1.53	25 (32.5)	0.66
Income assistance type					
Employable	8 (17.8)	17 (23.6)	-	19 (24.7)	-
Persistent multiple barriers	7 (15.6)	2 (2.8)	0.14*	4 (5.2)	0.25
Disability	30 (66.7)	53 (73.6)	0.83	54 (70.1)	0.76

OR: Odds Ratio; IQR: Interquartile Range; Tx: treatment; Abbreviations
OR for continuous variables derived from regression, for categorical variables from chi-square estimates and where cell counts are < 5 from Fischer's exact test
Described activities or exposures in the six months prior to baseline interview
Opioid assisted Tx includes methadone maintenance therapy and suboxone treatment
*p<0.05; **p<0.01; ***p<0.001

Results:
Sample Characteristics (2)

Table 1. Baseline characteristics of the impact of Alternative Social Assistance (TASA) study sample stratified and compared across experimental study arms (n=194)

	Control Arm (n=45)	Staggered Arm (n=72)		Split & Staggered Arm (n=77)	
		Characteristics N (%)	*vs. Control Arm (OR)*	*Characteristics N (%)*	*vs. Control Arm (OR)*
Drug use Related Characteristics					
Drug use patterns[a]					
Daily heroin	14 (31.1)	27 (37.5)	1.33	28 (36.4)	1.27
Daily cocaine	3 (6.7)	2 (2.8)	0.40	4 (5.2)	0.78
Daily crack-cocaine	7 (15.6)	7 (9.7)	0.58	7 (9.1)	0.55
Daily amphetamine	6 (13.3)	12 (16.7)	1.30	16 (20.8)	1.70
SUD Treatment Status[b]					
No Tx	18 (40.0)	26 (36.1)	-	21 (27.3)	-
Opioid assisted Tx[c]	19 (42.2)	35 (48.6)	1.28	44 (57.1)	1.98
Other Tx	8 (17.8)	11 (15.3)	0.95	12 (15.6)	1.29

OR: Odds Ratio; IQR: Interquartile Range; Tx: treatment; Abbreviations

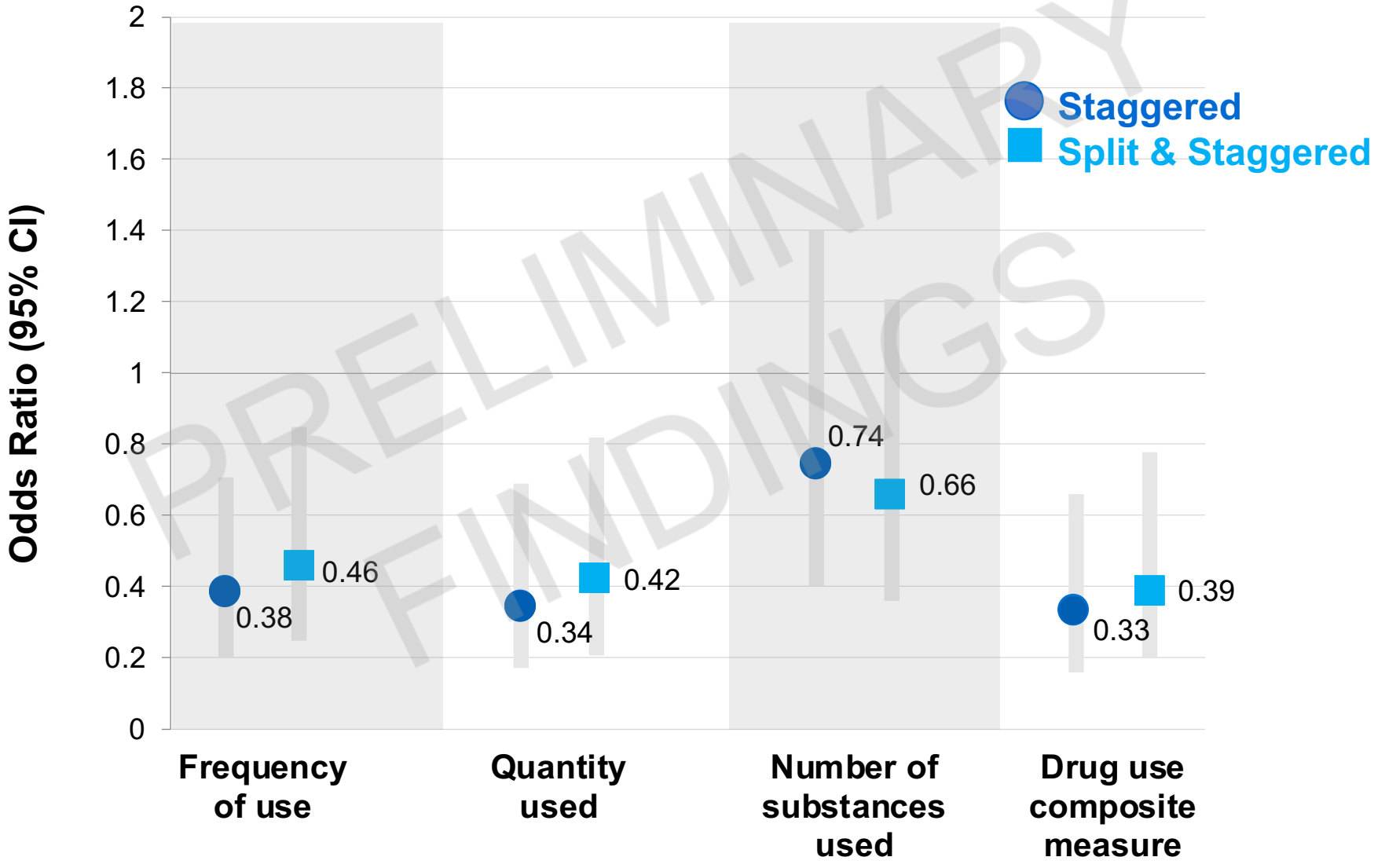
[a] OR for continuous variables derived from regression, for categorical variables from chi-square estimates and where cell counts are < 5 from Fischer's exact test

[b] Described activities or exposures in the six months prior to baseline interview

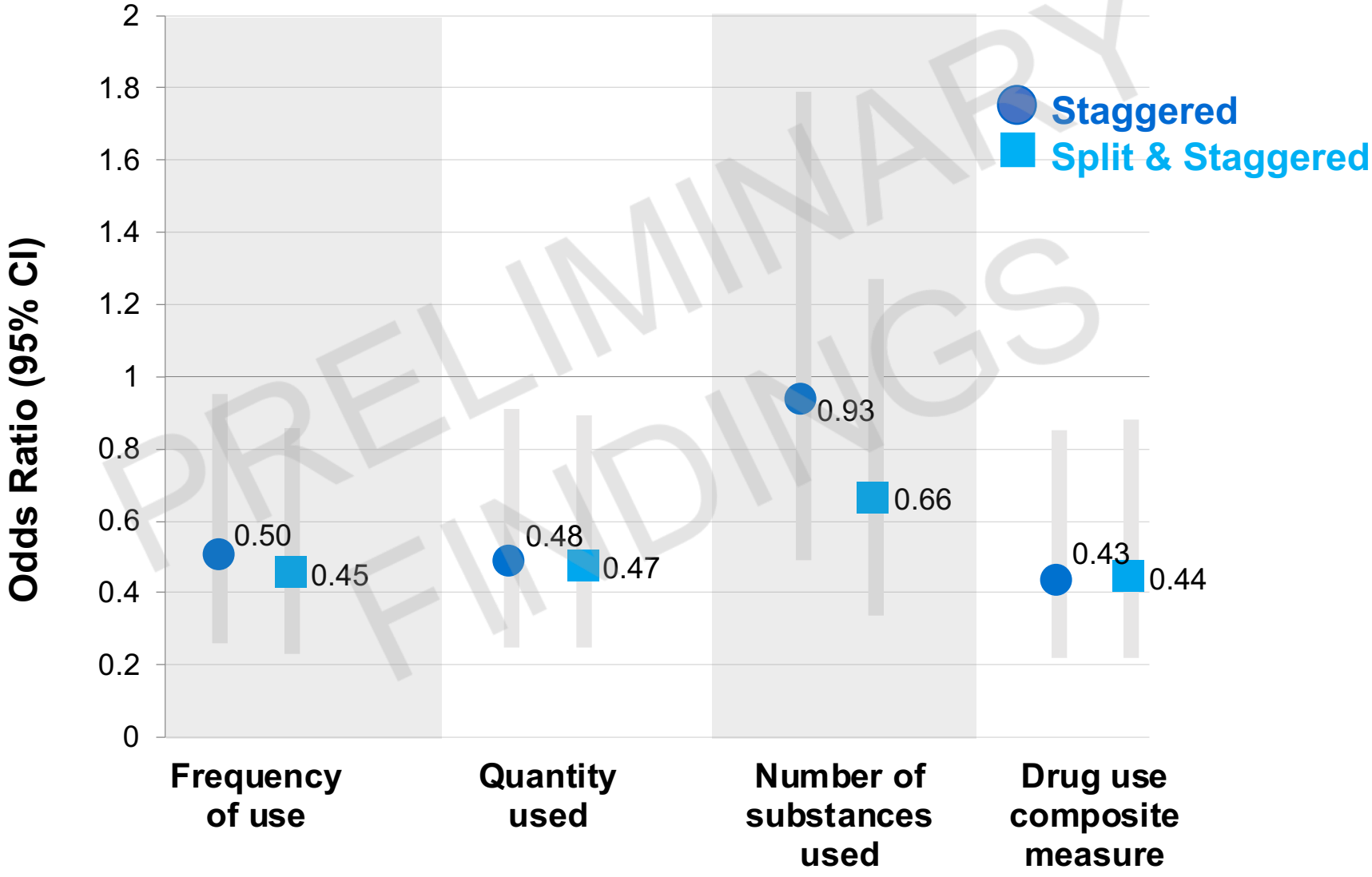
[c] Opioid assisted Tx includes methadone maintenance therapy and suboxone treatment

*p<0.05; **p<0.01; ***p<0.001

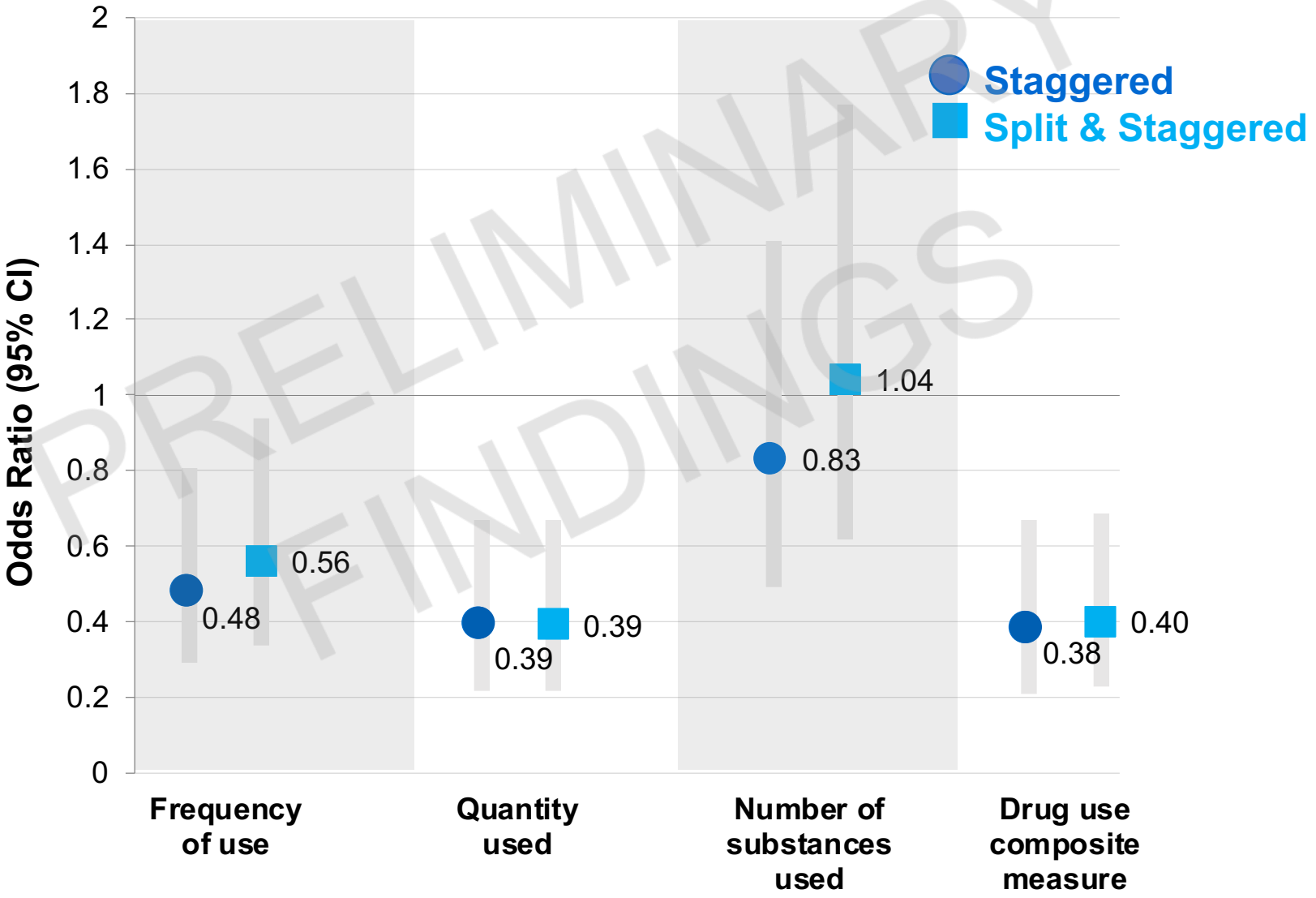
Results:
Government Payment Days



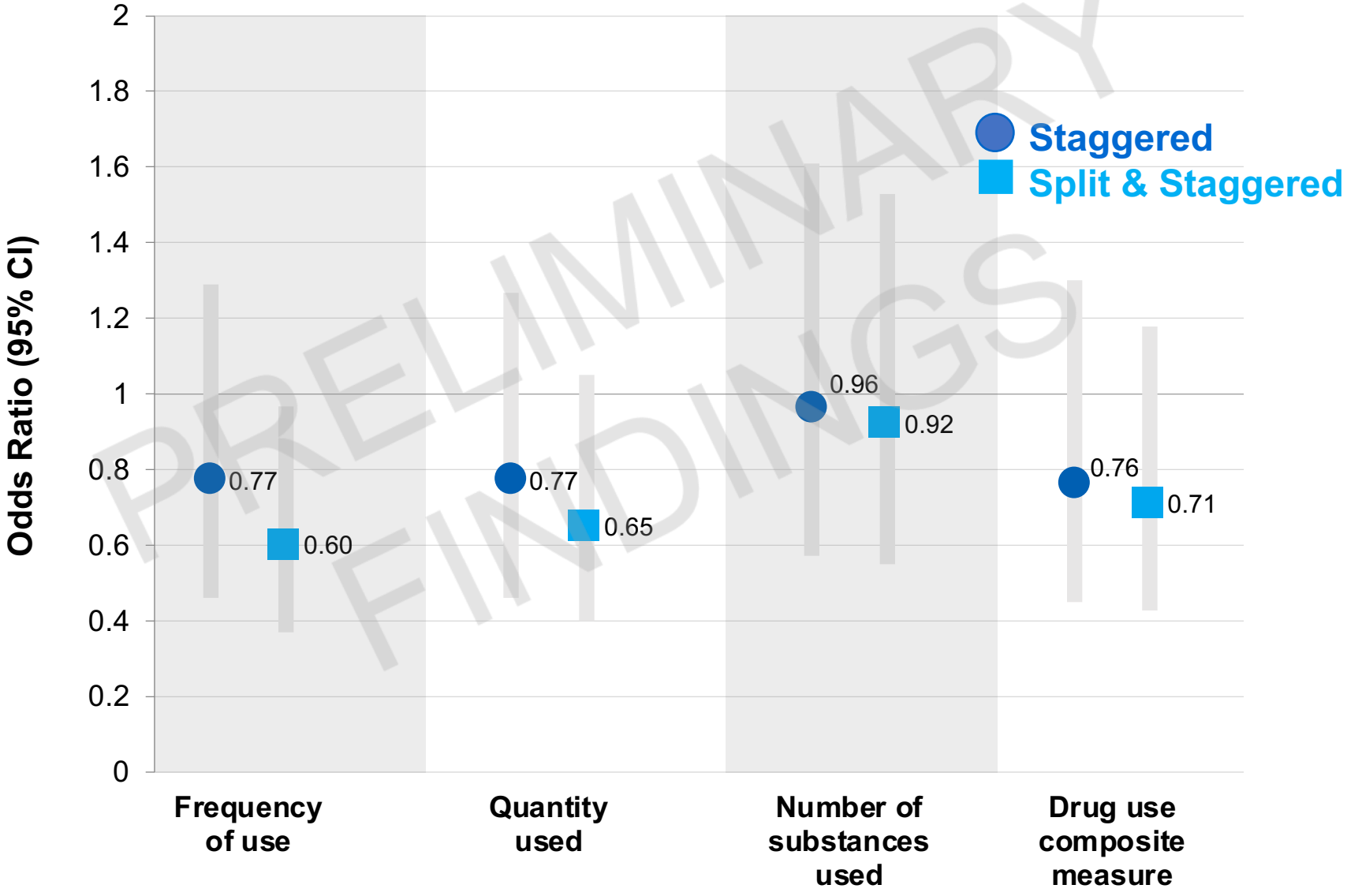
Results:
Individual Payment Days



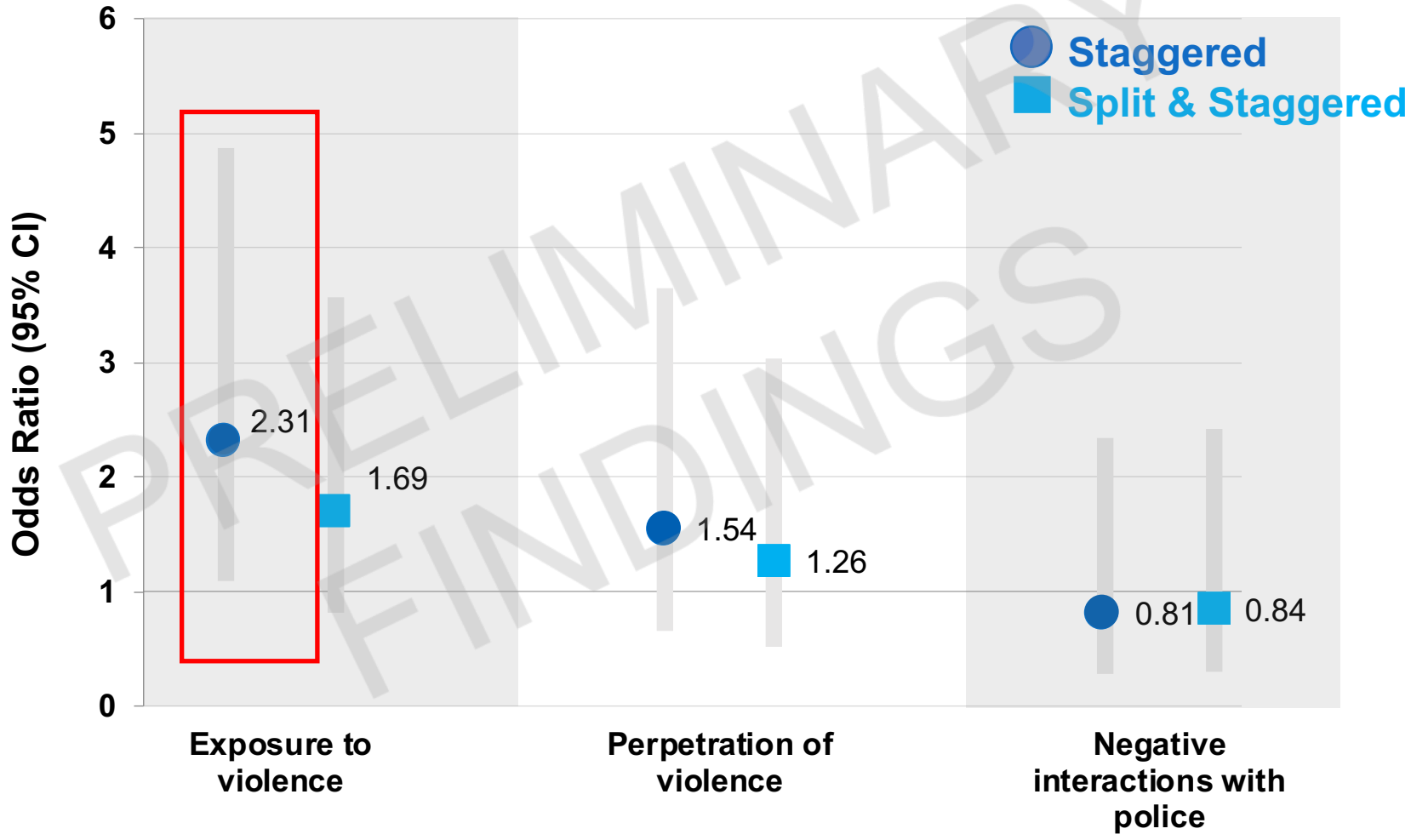
Results:
Government Payment Days (Per protocol)



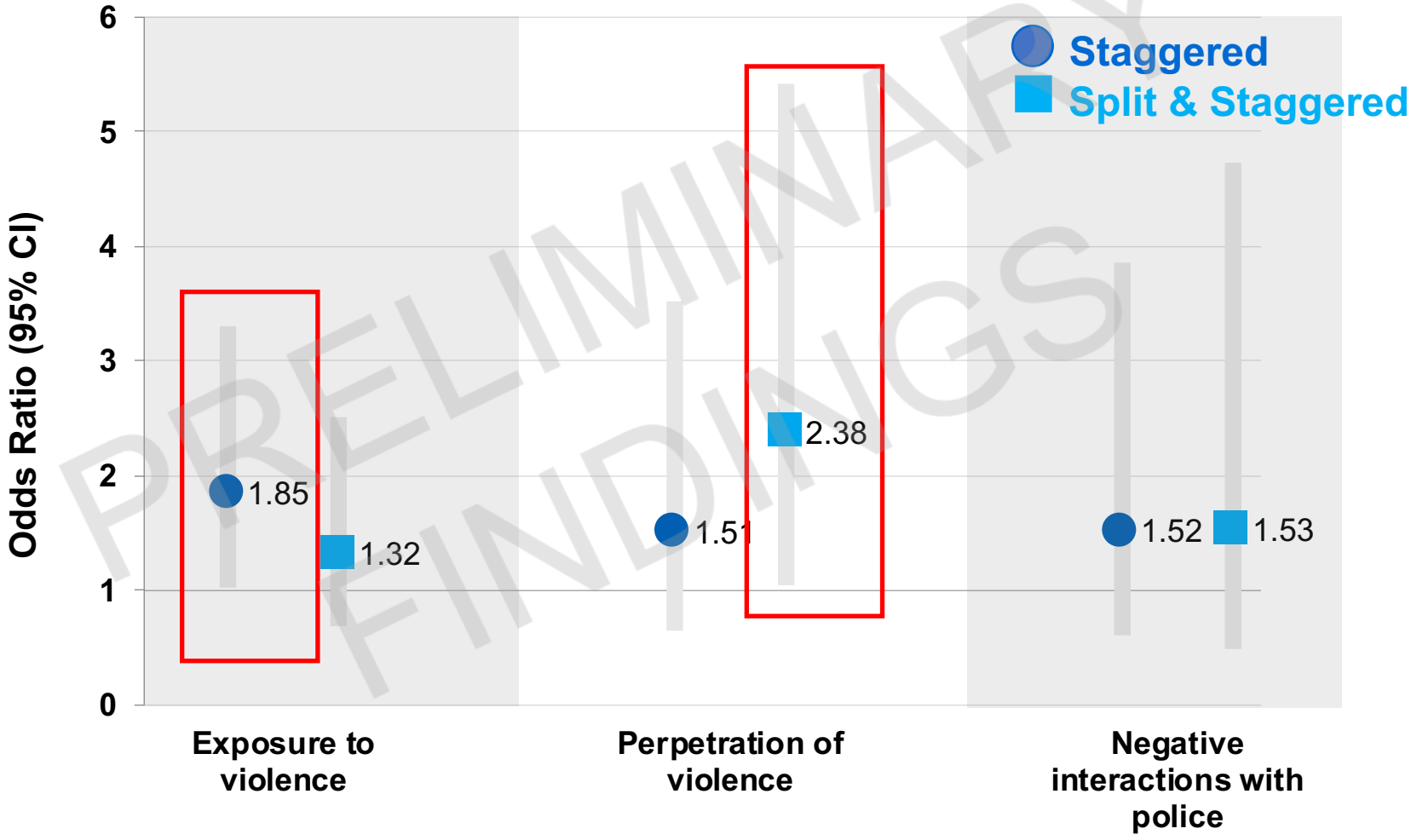
Results:
Individual Payment days (Per protocol)



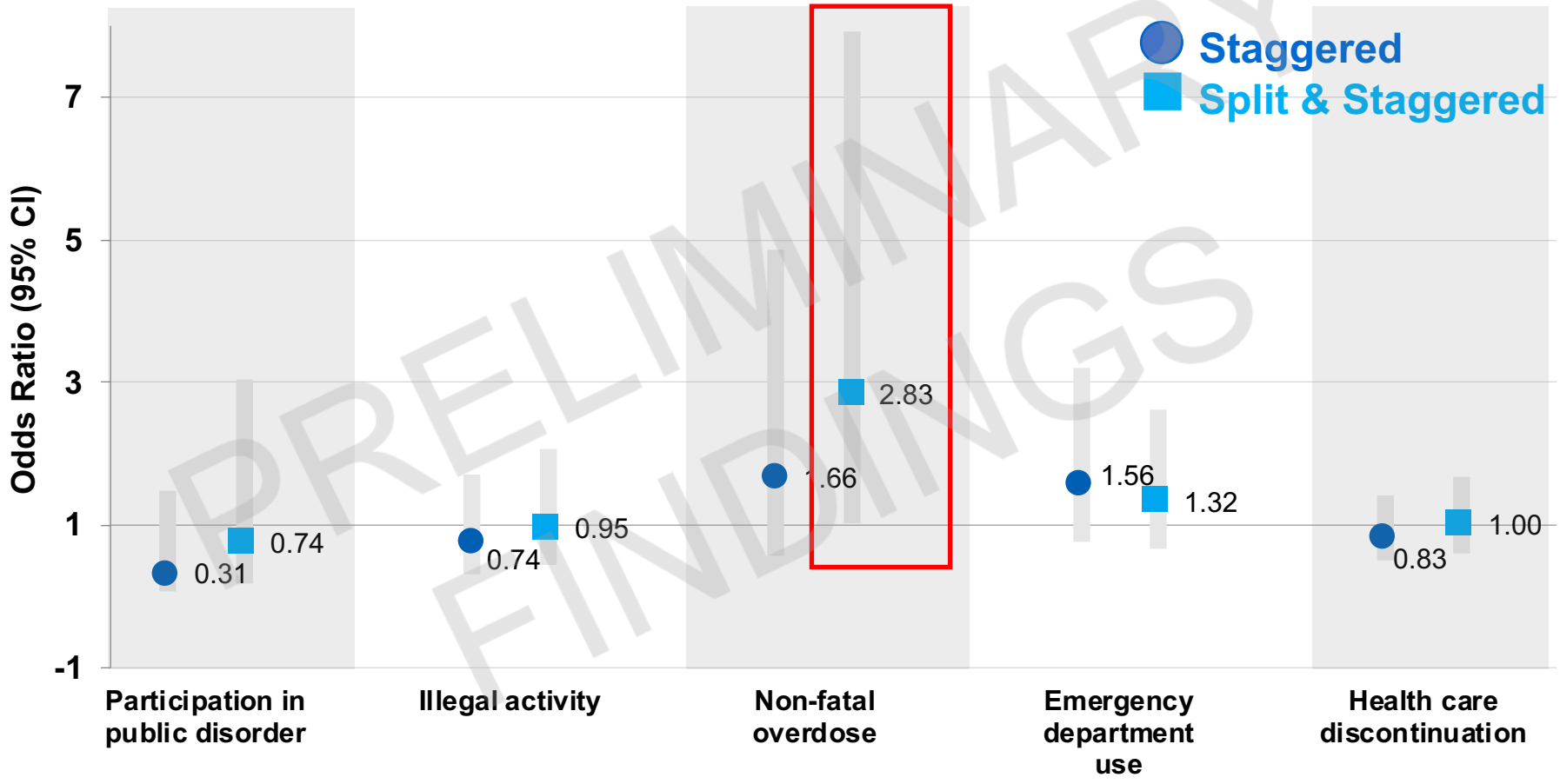
Results:
Physical & Structural Violence Outcomes



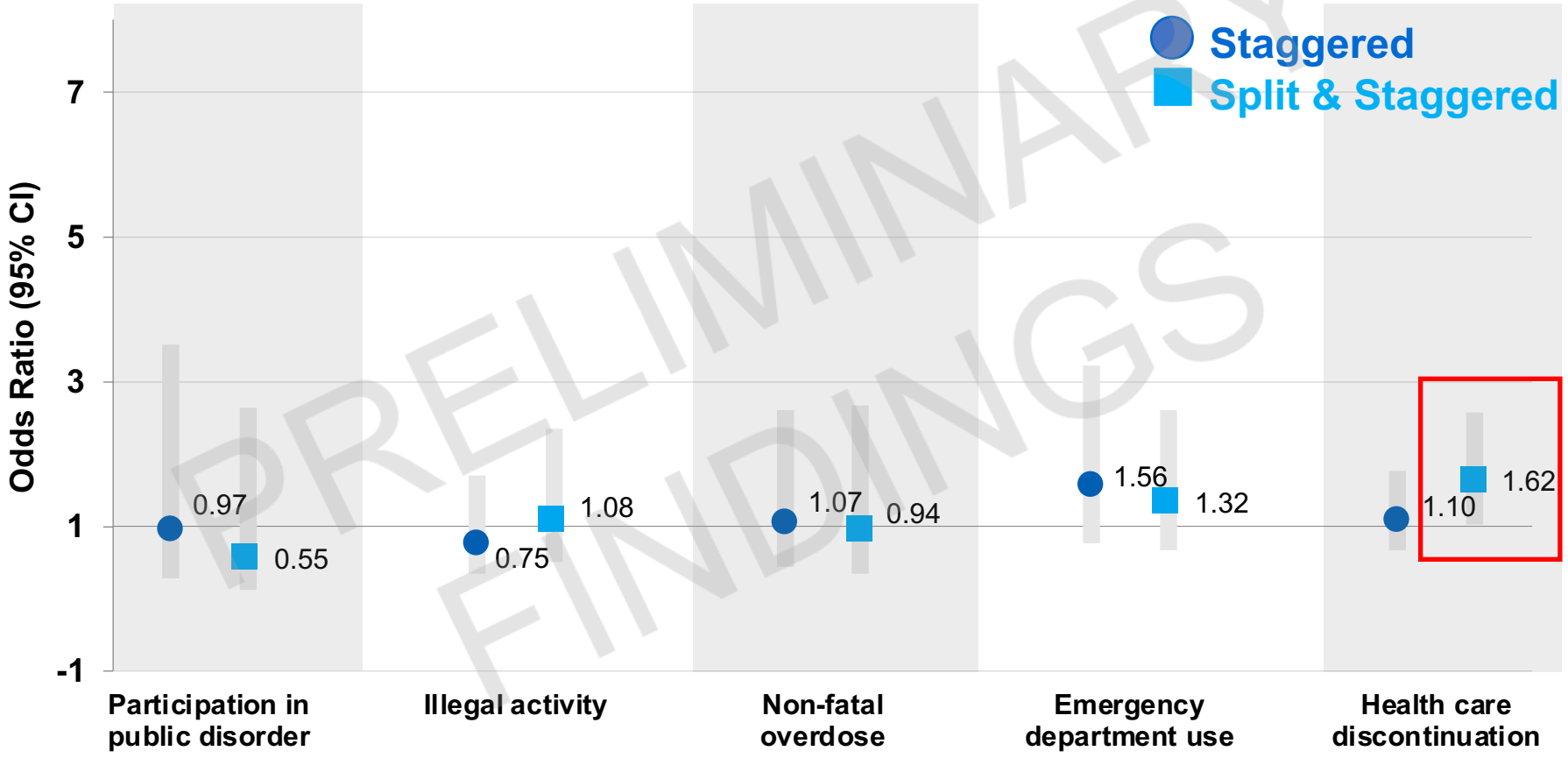
Results:
Physical & Structural Violence Outcomes (PPT)



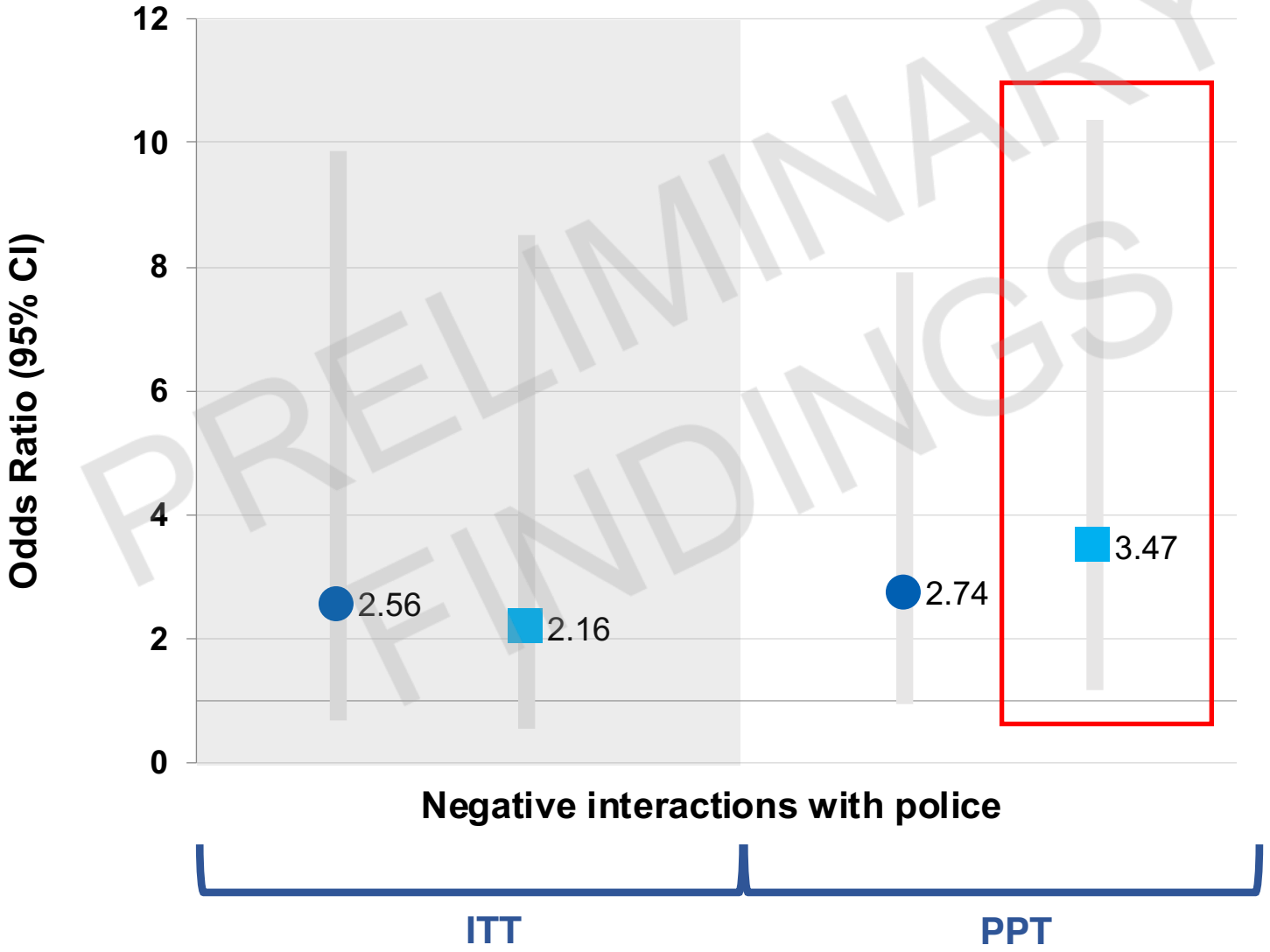
Results:
Other Secondary Outcomes



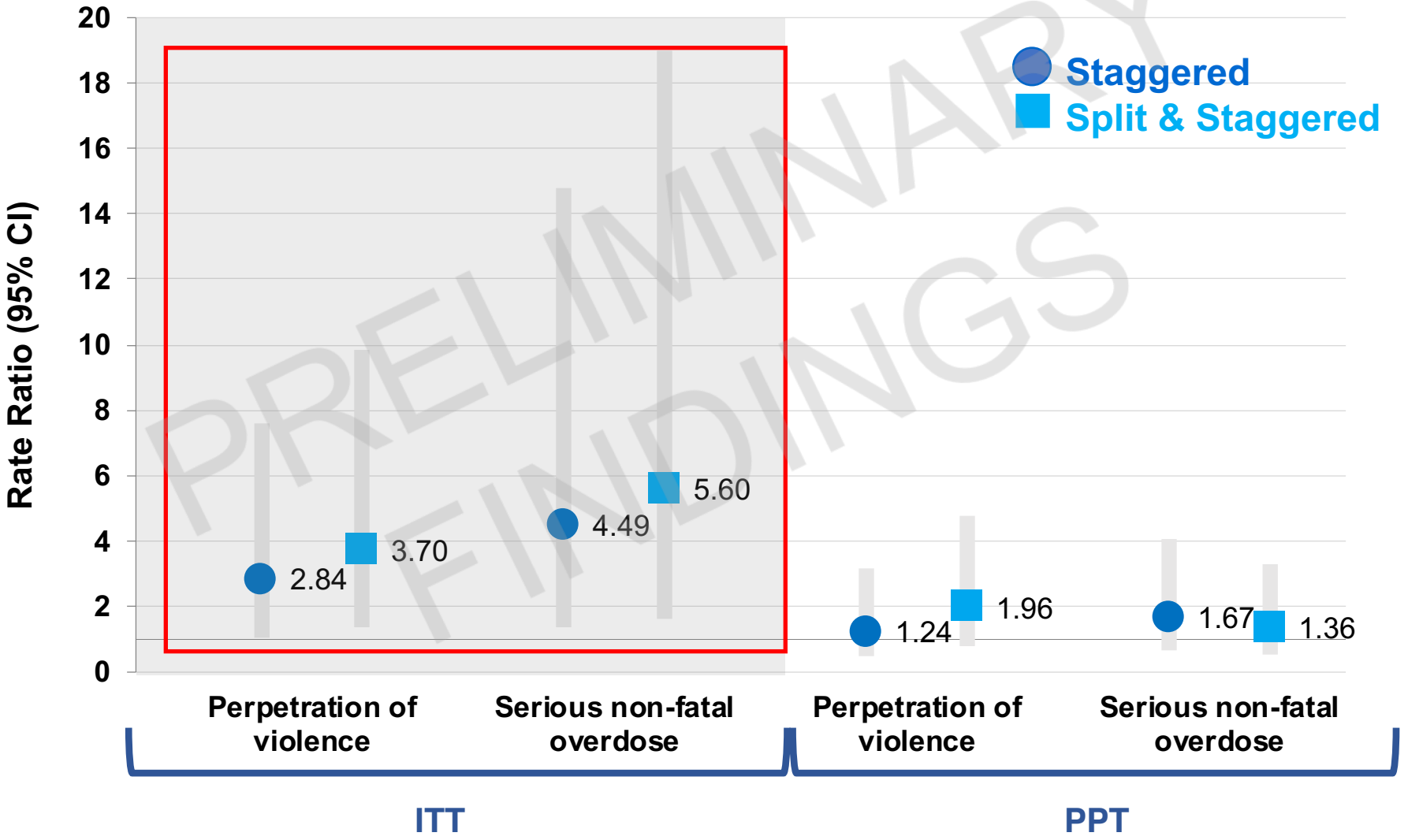
Results:
Other Secondary Outcomes (PPT)



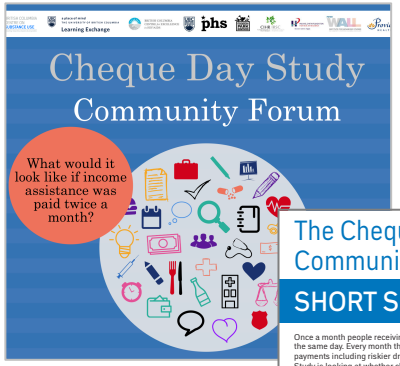
Results:
Police Interaction around Government Payments

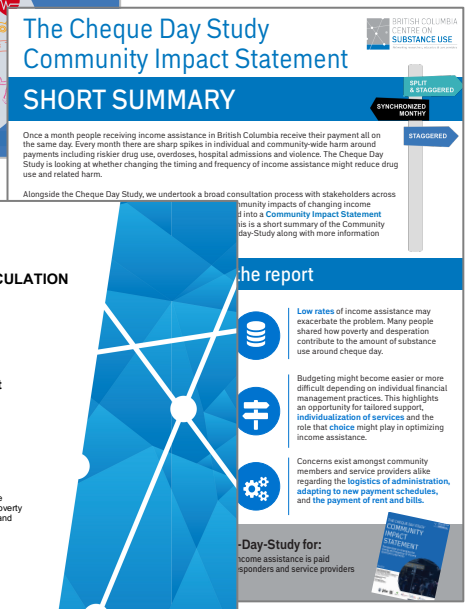


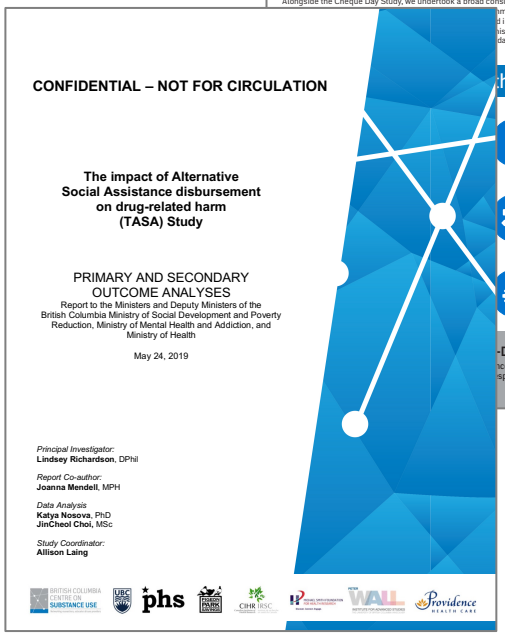
Results:
Frequency of outcomes related to violence

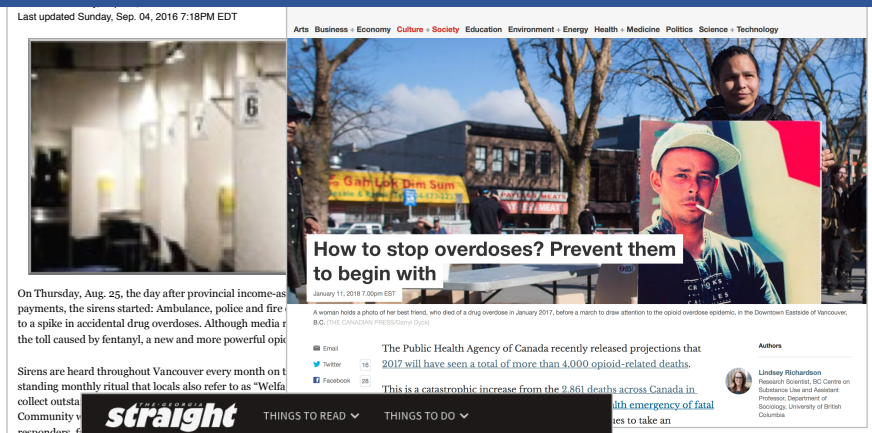


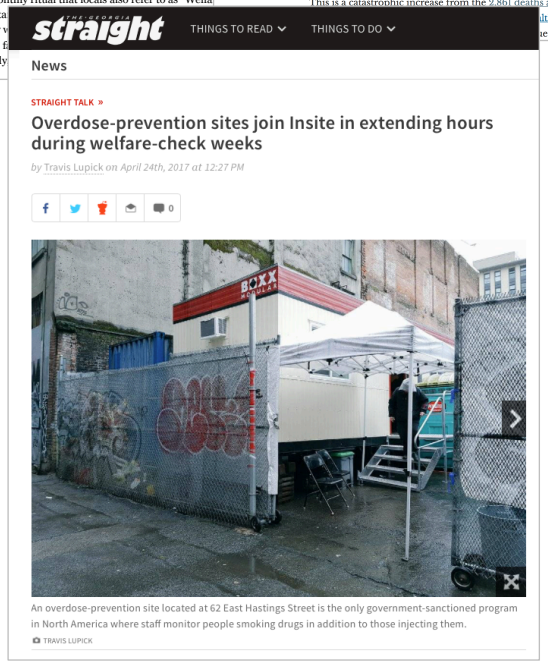
Research, stakeholders and knowledge translation











APPENDIX "III"

Opioid Intervention Strategies in Surrey, British Columbia:

An Evaluation of the Trends and Treatments

Paul Maxim, Len Garis, Chris Biantoro, Andy Fink

May 2019

UNIVERSITY OF THE FRASER VALLEY
SCHOOL OF CRIMINOLOGY & CRIMINAL JUSTICE

UNIVERSITY OF THE FRASER VALLEY
CENTRE FOR PUBLIC SAFETY & CRIMINAL JUSTICE RESEARCH

Contents

Executive Summary

In the past few years, the Province of British Columbia has experienced a substantial increase in the number of opioid-related overdoses and deaths. In absolute numbers, illicit drug overdose deaths related to opioid use increased from 294 in 2010 to 1,489 in 2018. Much of this appears due to the introduction of synthetic narcotics such as oxycontin and fentanyl. The situation became sufficiently dire that the Province declared a public health emergency in 2016 (Otterstatter et al. (2018)).

Second only to downtown Vancouver, the City of Surrey has faced the brunt of that increase. City Centre —a traditional core area of Surrey—has been a prime focal point for those addicted to synthetic narcotics. Recently, the area around 135A Street has seen a dramatic spike in the number of homeless people and the creation of a "tent city." Parallel with this, overdoses, opioid-related deaths and petty crime in the area placed a strain on the City's emergency response services.

In late 2016, the City of Surrey created a "City Centre Response Plan" (CCRP) to address the effects of that crisis. The plan was targeted at the City Centre area with the focus being on and around 135A Street. The CCRP was comprised of three key components: an enhanced service presence based on the *Surrey Outreach Team* (SOT); the Introduction of *SafePoint*, a safe supervised consumption site; and, the initiation of an *Emergency Housing First* program. The plan was implemented in three phases starting January 1, 2017.

The question this study addresses is, to what degree have the interventions had an impact on opioid-related overdoses, deaths and rates of property crime in the targeted area?

Overall, the results of the CCRP intervention are best judged as being ambiguous. While the number of overdoses has deceased in the area, so too did overdoses in the rest of the City. On the other hand, the number of opioid-related ***deaths decreased in the Central Core*** while they continued to rise elsewhere, suggesting that the CCRP might have had some impact along that dimension. Property crimes remained relatively stable both before and after the introduction of the CCRP throughout the entire City.

Complicating matters is the fact that many of the overall trends, both before and after the introduction of the CCRP in City Centre, are mirrored in other parts of Surrey—in areas that had pre-existing high and low rates of opioid-related events. Consequently, it is difficult to identify what impact the CCRP might have had in the targeted area in contrast to broader social trends and other, macro-policy interventions introduced by the City and other levels of government.

In summary, among the key findings, we would note the following. In the past few years, the Province of British Columbia has experienced a substantial increase in the number of opioid-related overdoses and deaths. In absolute numbers, illicit drug overdose deaths related to opioid use increased from 294 in 2010 to 1,489 in 2018. Much of this appears due to the introduction of synthetic narcotics such as oxycontin and fentanyl. The situation became sufficiently dire that the Province declared a public health emergency in 2016.

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In summary, among the key findings, we would note the following.

OVERDOSES

- The relative distribution of overdoses remained reasonably consistent across risk areas although the percentage distribution went up slightly in "Low" risk areas and down slightly in the "High" and "Very High" risk areas.
- The adjacent CTs accounted for an additional 11% of the reported overdoses, with the remainder being spread across the rest of the City
- In general, there was an increase in overdose rates across the entire city from before 2017 to a peak in 2017. In contrast, the Central Core and adjacent CTs saw a slight decline in rates in phase two of the CCRP (Period 2).
- Overall, there was a decrease in overdoses throughout the City in the final six months of 2018. This corresponds to the implementation of phase three of the CCRP (the housing phase). It should be noted, however, that this pattern was replicated throughout the City and not just in the Central Core.

OPIOID-RELATED DEATHS

- There was a dramatic increase in deaths across the three-year period 2016-2018 which was disproportionate to the increased incidence of overdoses.
- As with overdoses, the proportion of deaths increased in the "Low" risk areas relative to the "Very High" risk and Core areas.
- The two Central Core CTs had the highest overall death rates across all periods examined.
- In the City as a whole, all three intervention periods saw higher deaths per month than occurred in the pre-intervention period.
- While the overall death rate increased in the Core and adjacent CTs in the intervention period, none of the core CTs experienced the consistent pattern of increases in deaths that was seen in the rest of the City.

PROPERTY CRIMES

- In the aggregate, the recorded number of property crimes decreased by about 11% in the period after January 1, 2017.
- The distribution of property crimes across drug-risk areas remained proportionately consistent. It is also the case that those areas that had the highest incidences and rates of property crime also had the highest likelihood of opioid-related overdoses and deaths.

Background

Canada has seen a major increase in synthetic opioid use over the past few years (Belzak and Halverson. 2018; British Columbia, 2018; Fischer et al. 2006). In 2017, the national rate for opioid-related deaths was approximately 10.9 per 100,000 population, or about 4,000 deaths in total. In the first six months of 2018, the death rate had increased to an estimated 11.2 per 100,000[1]. . This puts us second only to the United States in terms of known use and deaths (United Nations 2018). British Columbia has experienced the brunt of that pattern with the estimated death rate of 30.9 per 100,000 population for 2017 and 30.6 in 2018. In absolute numbers, illicit drug overdose deaths increased from 294 in 2010 to 1,489 in 2018. The increase in both reported overdose cases and deaths in British Columbia led the Province to declare a public health emergency in 2016.[2]

Much of the increase in opioid fatalities can be attributed to the introduction of new types of synthetic narcotics such as oxycontin and fentanyl. Fentanyl, for example, is a stronger analgesic than traditional opioid painkillers (up to 100 times stronger than morphine) and when incorporated into a time-released patch was initially considered minimally addictive. Drugs such as oxycontin and fentanyl were initially available through a prescription only. In recent years, however, they and analogous compounds have become a major component of the illicit drug trade.

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[1] https://www.canada.ca/en/health-canada/services/substance-use/problematic-prescription-drug-use/opioids/data-surveillance-research/harms-deaths.html

[2] https://news.gov.bc.ca/releases/2016HLTH0026-000568

Users initially learned how to extract and concentrate fentanyl from patches and, more recently, it and several derivatives, such as carfentanil, have become available on the black market in powder and pill form. It has been determined that nearly all street "heroin" sold in Vancouver contains fentanyl (Woo 2018). Regardless, it has been estimated that about one-third of those having died recently due to opioid overdoses had a prescription (Gomes et al. 2018), although current restrictions on opioid-for-pain prescriptions appear to be changing that pattern (Smolina et al. 2019).

Not only are increases in overdoses and deaths associated with opioid abuse, rates of property crime are typically believed to increase as users seek the financial resources to support their habits (Otterstatter et al. 2016; Pierce et al. 2015). Second only to Vancouver, the City of Surrey has faced the brunt of the consequences of that shift in drug use. A traditional core area of Surrey—City Centre—has experienced an inordinate increase in social problems including opioid abuse. In the past couple of years, the area around 135A Street has seen a dramatic spike in the number of homeless people and the creation of a "tent city." Handling the concentration of homelessness, overdoses, opioid-related deaths and petty crime has placed a strain on the City's emergency services.

In 2016, the City of Surrey drew up a "City Centre Response Plan" (CCRP) to help mitigate the effects of that strain, particularly in the City Centre area. The plan was implemented from January 1, 2017 to date. While there are many issues the CCRP tries to address, the questions this report addresses are limited in focus. Specifically, to what degree has that intervention had an impact on opioid-related overdoses, deaths and rates of property crime in the targeted area?

Surrey City Centre Response Plan

The Surrey *City Centre Response Plan* (CCRP) was brought forward and endorsed by City Council in December 2016, to address several issues relating to the public safety situation in the area around 135A Street. At the time, opioid-related overdoses and deaths were spiking, and the area was experiencing a substantial influx of homeless people, many of whom were living in tents on and around 135A Street. Concerns were raised that, among other things, a lack of adequate housing was conflating drug abuse issues.

The Surrey CCRP consisted of three basic components:

1. An enhanced service presence based on the *Surrey Outreach Team* (SOT),
2. The Introduction of *SafePoint*, a safe supervised consumption site; and,
3. The initiation of an *Emergency Housing First* program.

The Surrey Outreach Team was established in January 2017 as a pilot project and consisted of twelve Surrey RCMP officers who are on site and service the area 24 hours a day, seven days a week, along with four Bylaw officers who were available ten hours a day[3] The SOT worked out of a

[3] The SOT worked primarily in the area from 104th to 108th Avenues between City Parkway and King George Boulevard. They operated out of a Command Centre on 135A Street.

construction trailer located on 135A Street. In collaboration with the police officers there are members of Fraser Health and Emergency Health Services to assist in the outreach process. Overall, the outreach team brings together general policing, bylaw enforcement, ambulance, fire, and social services to work with individuals who have settled in the area.

Surrey's first supervised injection site, SafePoint, was opened in June 2017 on 135A Street next to the Gateway Shelter. Safepoint is managed by the Lookout Emergency Aid organization and is open 16 hours a day. The facility is staffed by four individuals including a registered nurse. Subsequently, the Quibble Creek Sobering and Assessment Centre opened for service on 94A Street adjacent to Surrey Memorial Hospital.

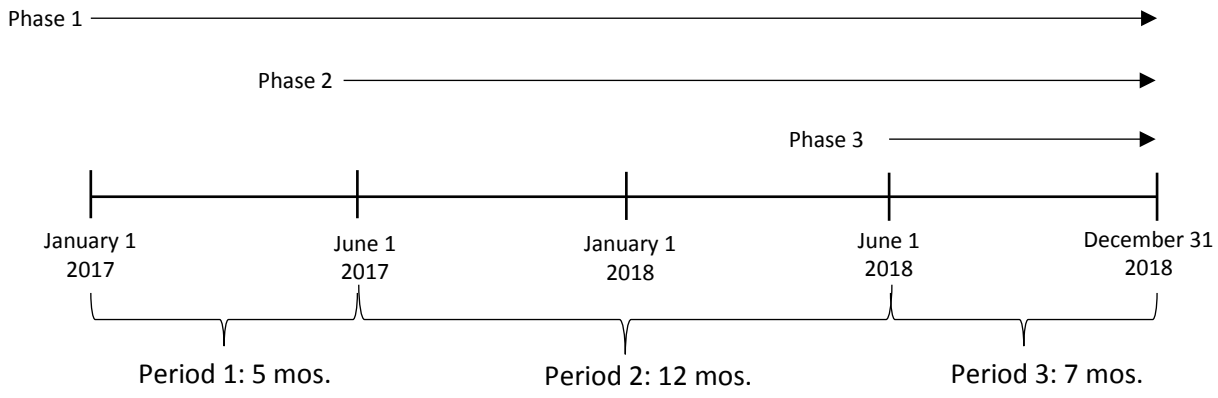
Staff at the City of Surrey began working with BC Housing in the early part of 2017 to address the shortage of accommodation for an entrenched group of homeless individuals within the City. In mid-2017, the Province established a Rapid Response to Homelessness program that involved a partnership between the Province, municipal governments and non-profit housing organizations. Following from that partnership, the City of Surrey identified potential sites to establish 40 to 50 housing units. Emergency Housing was opened in June 2018 and consisted of a series of modular units to accommodate 200 individuals.

To summarize, there are three key intervention phases on which this analysis focuses:

1. January, 2017: Initiation of SOT Surrey Outreach Team
2. June, 2017: Initiation of SafePoint, a supervised consumption site
3. June 2018: Creation of Workforce Housing for 200 people

A graphic depiction of the timelines for these three phases is presented in Figure 1.

FIGURE 1: TIMELINES FOR PROJECT IMPLEMENTATION



Method

TARGET AREAS

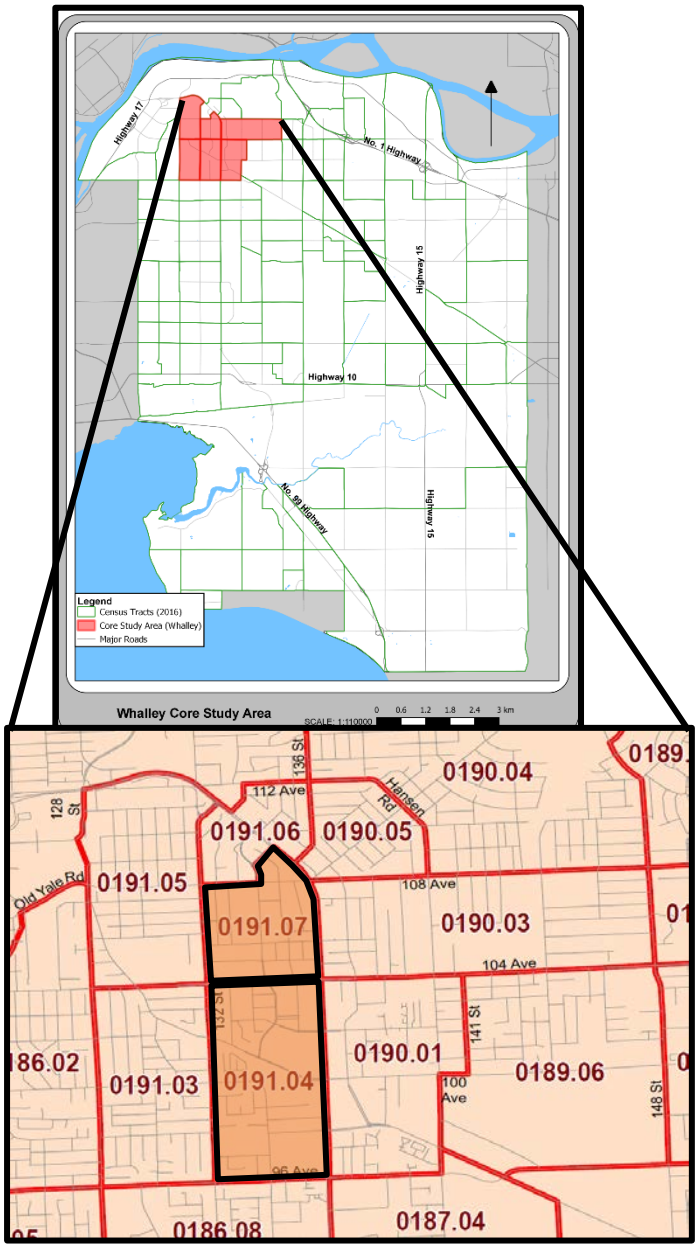
Prior analysis by emergency responders in the City of Surrey noted that several "hotspots" existed within the City where opioid overdoses and opioid-related deaths appeared to be concentrated. The area with the highest concentration corresponded with the primary City Centre region of Surrey, largely corresponding to the historical boundaries of Whalley.

For Census purposes, Statistics Canada breaks down the geographical areas of cities into units known as census tracts (CTs) that generally follow neighbourhoods or reasonably homogeneous areas bounded by major roads or key physical features such as rivers. The boundaries of CTs are determined by a committee of local specialists such as town planners, educators or health officials. Typically, CTs have a population of between 2,500 and 8,000 people.

The primary census tracts relating to City Centre are identified in Figure 2. Overall, the City of Surrey was broken into 95 census tracts in the 2016 Census. For the purposes of this analysis, the key CTs that correspond to both the City Centre and the region with the highest concentration of opioid-related incidents are the six CTs labelled 191.03, 191.04, 191.05, 191.07 to the west of King George Blvd and the tracts 190.01 and 190.03 to the east of King George Blvd. The two primary, or Core, CTs on which we will focus are **191.07** and **191.04**. These are indicated by the darker orange fill in Figure 2. The first tract (**191.07**), is bounded roughly by 108 Avenue in the north and 104 Avenue in the south, and 132 Street in the west and King George Blvd in the east. The second tract (**191.04**), is immediately south of 191.07 and is bounded by 104 Avenue in the north and 96 Avenue in the south, and again, 132 Street in the west and King George Blvd in the east.

The remaining four CTs (191.03, 191.05, 190.01 and 190.03) are immediately adjacent areas that we will use as comparators along with the remainder of the City. These four adjacent areas were selected because they too had higher than average numbers of opioid-related overdose incidents.

FIGURE 2: DISTRIBUTION OF CENSUS TRACTS WITH THE CITY OF SURREY WITH CORE STUDY AREA HIGHLIGHTED



It was because of the confluence of several factors—the extremely high incidence of opioid-related incidents, a large influx of homeless people and high property crime rates—that the City of Surrey created a formal City Centre Response Plan (CCRP) commencing in January 1, 2017.

IDENTIFYING "HOTSPOTS"

It is not uncommon in much geographical analysis to identify so-called "hotspots" or locations of extreme events. These may range from highly localized concentrations of disease in epidemiology, to high crime locations in criminology. Nominally, these locations coincide with the notion of outliers in general statistical analysis. As with the concept of an outlier, there is no formal academic

definition of a hotspot although there are several conventions or rules of thumb that one might apply.

A robust statistical approach to distributing regions is found in John Tukey's box plot approach. Here, we divide the data into quartiles and define outliers as 1.5 times the interquartile range (IQR) beyond the median or second quartile. Specifically, this report uses the data on reported opioid overdoses prior to 2017 to provide a baseline. For the years 2015 and 2016 the number of reported opioid-related overdoses was determined for each CT and divided by the population of the census tract to establish an overdose rate. Those CTs were then divided into four groups or strata identified as having low, moderate, high or very high overdose rates.

Specifically, the four strata were estimated as follows:

- *Low*: below the first quartile of rates of overdoses
- *Moderate*: first to third quartiles or the interquartile range of rates of overdoses
- *High*: third quartile to 1.5 times the IQR above the median or second quartile of rates of overdoses
- *Very High*: beyond 1.5 times the IQR above the median of rates of overdoses These ranges are depicted in Figure 3.

These ranges are depicted in Figure 3.

FIGURE 3: BOX PLOT OUTLINING RISK CUT-POINTS

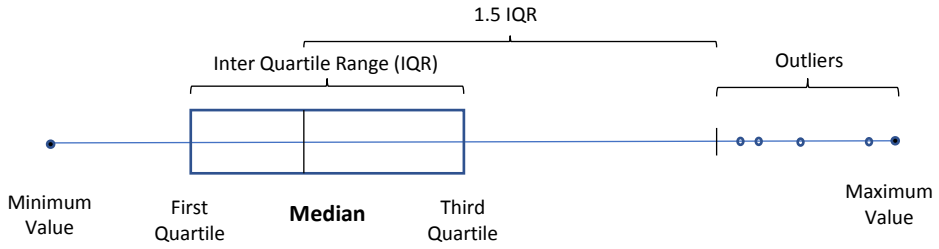
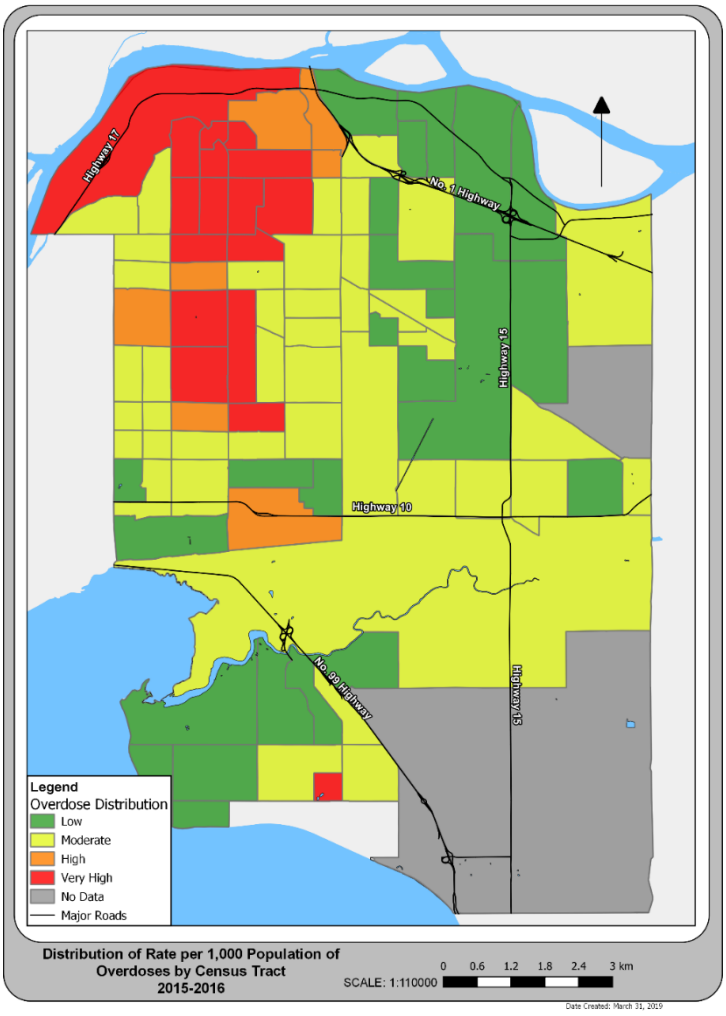


FIGURE 4: DISTRIBUTION OF OPIOID-RELATED OVERDOSES BY CENSUS TRACT, 2015-2016



The 95 census tracts within the City of Surrey are mapped out in Figure 4 based on the reported opioid-related overdose rate per 1,000 population.[4] Using the categorizing schema discussed above, 24 CTs were ranked as "Low" (green); 48 as "Moderate" (yellow); 13 as "High" (orange); and, 10 were ranked as "Very high" (red). Most of the "Very High" areas are in the northern portion of the city, astride King George Boulevard.

As can be seen in Figure 4, the hotspots—those areas marked as red or having "very high" overdose rates—are concentrated in the north and west portions of the city. While the primary focus of

[4] We used opioid-related overdoses as opposed to death to develop an area "risk" typology because, while aggregate deaths were spiking within the City of Surrey, their incidence in any on subarea was quite small. Consequently, there was a much higher rate of statistical instability across areas. Furthermore, the correlation between rates (and numbers) of overdoses and deaths is extremely high. Thus, rates of overdoses provide an excellent proxy for the likelihood of an area also having high rates of opioid-related deaths.

Population data (denominator) for the rates were drawn from the 2016 Census of Canada.

attention has been the City Centre area where the very highest rates of overdoses were recorded, it is evident that rates of overdoses were also high in those areas along the western sections of Highway 17, and on both sides of King George Boulevard going as far south as 96 Avenue. There is also a local hotspot in the southern border of the City bounded by 20 and 16 Avenues on the north-south axis, and 148 and 152 Streets on the east-west axis. Generally, the remainder of Surrey experienced low to moderate rates of opioid-related overdoses.

Since the primary area of concern has been the spike in opioid-related overdoses and deaths in the City Centre area, one might wonder why our analysis includes the remainder of the City. The answer is that to understand what any impact an intervention in City Centre might have had, we need to compare outcomes with what was happening in the City at large. For example, while emergency housing was being provided in the City Centre area in response to the tent city on 135A Street, numerous Recovery Houses were being established in other areas of the City around the same time in an effort to help those with drug problems. Most of those were in the hotpots outside City Centre[5]

Many of those Recovery Houses outside the City Centre area provided services similar to those of the Emergency Housing First program. That is, they provided shelter in a permanent structure, many had onsite naloxone kits, and some of the registered Houses had full or part-time counsellors available. The point being made is that while changes were occurring in the City Centre area, the remainder of the City did not stay static regarding its response to the crisis. As we will see later, the overall question thus becomes whether the impact of the intervention in City Centre is significantly different than what was happening elsewhere in Surrey.

The Broader Context

SOCIAL CHARACTERISTICS

Surrey is the twelfth largest city in Canada having a recorded population count of slightly under 518,000 in the 2016 Census. The landscape is quite varied, encompassing a range of properties from farm lands to suburban residential areas to clusters of retail and industrial development. The City Centre area has become a major downtown core, second only to the City of Vancouver in the lower mainland of British Columbia. As with many other Canadian cities, it is also ethnically and socio-economically diverse.

The geographical distribution of overdoses within the City tends to follow the distribution of several key social-economic characteristics. As with many other large cities, Surrey's primary drug fault lines parallel the social and economic well-being of its residents. Some of the key correlates are presented in Table 1.

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[5] By December 31, 2018, there were 68 service Recovery Houses identified by Surrey Fire Department in the City of Surrey including the 55 that were registered through British Columbia's Assisted Living Registry and were allowed under the City of Surrey's Business License Bylaw (Rehal, J. 2016. "Corporate Report: Recovery Homes Update." edited by Bylaw Enforcement & Licensing Services. Surrey, British Columbia: City of Surrey.) An additional 90 informal or nonregistered Recovery Houses have also come to the attention of the Surrey Fire Department.

Essentially, the overdose rate increases as individual and family income decreases. The highest overdose risk areas also correlate with those areas that have the highest proportions of lone parent households, people living alone and the proportion of low-income households. Those areas also tend to have higher proportions of residents who do not have English as their mother tongue.

TABLE 1: SELECTED SOCIO-ECONOMIC CHARACTERISTICS AND RATES OF OPIOID-RELATED OVERDOSES

Characteristic	Opioid-related Overdose Rate			
	Low	Moderate	High	Very High
Percent population under 14-years	16.9	18.0	18.0	15.8
Percent population over 65-years	16.6	14.3	11.5	14.2
Average age	41.2	39.0	37.6	39.6
Median individual income*	36,496	29,918	26,994	26,051
Median family income*	101,130	81,194	72,620	62,802
Percent English as mother tongue*	56.9	46.6	44.0	44.1
Percent "other" as mother tongue*	39.5	48.5	50.4	50.4
Percent lone parent households*	17.9	22.0	25.0	30.2
Percent living alone*	5.8	7.5	7.8	12.6
Percent low-income households*	8.3	11.3	12.9	19.3

*Statistically significant a p<.05

In these respects, Surrey differs little from other Canadian cities or, in fact, other cities throughout the world that have significant illicit drug-use problems.

OVERDOSES AND DEATHS

Before we focus on the interventions taking place in the target area of City Centre, it is worthwhile examining what was occurring within the City of Surrey as a whole regarding opioid-related incidents during the four-year period under study. Again, the broad context for Surrey's CCRP was that opioid-related overdoses and deaths were spiking during 2015 and 2016. Within the 95 CTs that comprise the City of Surrey, there were 1,584 overdose incidents recorded in 2015 and 2,614 incidents recorded in 2016. The number increased to 2,784 in 2017. At the same time, the number of ascribed opioid-related deaths in 2015 was 82. This would increase to 151 in 2017.[6]

While the latter part of this report will focus on the impact of the CCRP specifically, this section will provide a general overview of what was happening in the City at large over the four-year period of January 1, 2015 to December 31, 2018. Since the CCRP was introduced in January 2017, it is worthwhile taking an overview of what was happening throughout the City before and after the introduction of the CCRP in City Centre.

[6] Unfortunately, we did not have access to opioid-related death statistics for 2015. Informal reports suggest they were lower than in 2016. Regardless, it was clear that just as overdoses were on the increase throughout the City, so were opioid-related deaths.

The number of *overdoses* by risk area is listed in Table 2. For the sake of comparison with the later analysis, the seventeen "Very High" risk areas have been sub divided into the core City Centre and surrounding area (six CTs), and the other eleven "Very High" risk areas.

Together, there were 4,193 overdoses prior to January 1, 2017 and 4,560 afterward. As can be seen, the six CTs that comprise City Centre and the immediately surrounding area experienced the highest absolute number of overdoses. The "Moderate" risk areas ranked second regarding the absolute number of overdoses, but it ought to be recalled that those numbers were distributed over a greater number of CTs (n=47). Two observations regarding Table 2 are most germane: first, in the aggregate, the number of overdoses did not drop post January 1, 2017. Second, the relative distribution of overdoses remained reasonably consistent across the risk categories. The percentage distribution went up slightly in the "Low" risk areas and down slightly in the "Very High" risk areas. The core areas that included City Centre and its surrounding areas saw a proportionate increase in overdoses from 43% prior to January 1, 2017 to 47% afterward.

TABLE 2: NUMBER AND PERCENT OF OVERDOSES BY PERIOD

	Period (Number)		Period (Percent)	
Risk Category	2015-16	2017-18	2015-16	2017-18
Low (n=24)	154	229	3.7	5.0
Moderate (n=47)	1,134	1,264	27.0	27.7
High (n=7)	356	306	8.5	6.7
Very High (n=11)	747	616	17.8	13.5
Core Area (n=6)	1,802	2,145	43.0	47.0
Total	4,193	4,560	100.0	100.0

A similar pattern is seen in Table 3 which presents the number of opioid-related *deaths* in Surrey. It should be noted, however, that Table 3 differs from Table 2 in that mortality data were not available for 2015. The mortality data show a slightly different profile than the overdose data. That is, the proportion of deaths increases in the "Low" and "Moderate" risk areas and proportionately decreases in the "Very High" and Core areas. The increase in the "Low" category is partially a function of the fact that the base number of two ODs in 2016 was so low. Thus, even a small numeric increase would result in a more significant percentage increase.

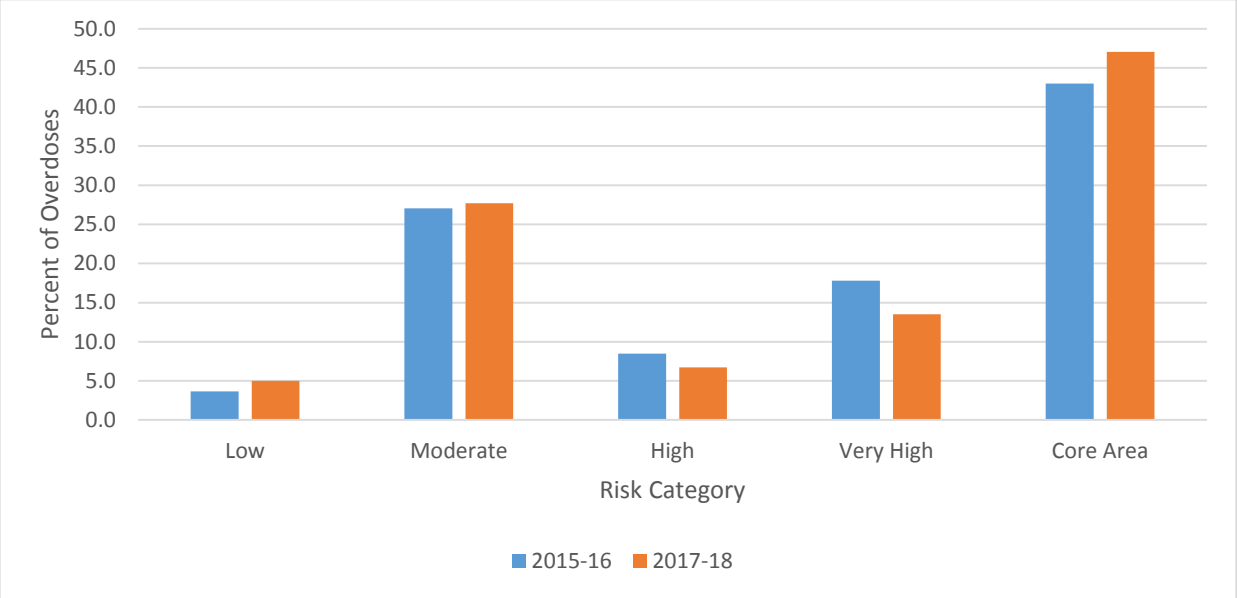
TABLE 3: NUMBER AND PERCENT OF DEATHS BY PERIOD

	Period (Number)		Period (Percent)	
Risk Category	2016	2017-18	2016	2017-18
Low (n=24)	2	32	2.4	10.1
Moderate (n=47)	29	121	35.4	38.2
High (n=7)	9	32	11.0	10.1
Very High (n=11)	16	49	19.5	15.5
Core Area (n=6)	26	83	31.7	26.2
Total	82	317	100.0	100.0

More likely, the proportionate shift to the lesser risk areas may be due to the distribution of resources throughout the City. It is possible that more individuals in the "Low" to "Moderate" risk areas were relative novices to opioid use and consequently less likely to be in a supportive group of more knowledgeable fellow users. Furthermore, services such as Recovery Houses and naloxone kits are less likely to be available in those areas. While it is recognized that opiate use is endemic, community resources are generally directed to those areas known to be proportionately more problematic.

For the sake of clarity, the data in Tables 2 and 3 are replicated in the figures below. Figures 5 and 6 represent both the number and percent of opioid-related overdoses by area risk category. Again, the slight drop in the "High" and "Very High" risk areas and the increase in the Core Areas is noticeable. Determining why this shift has occurred is beyond the analytical scope of this report. The change might simply be due to random fluctuation; it might be due to street uses migrating to the City Centre region where social networks and availability might be more accessible; or, it may be due to other systematic factors.

FIGURE 5: PERCENT OF SURREY DRUG OVERDOSES BY RISK CATEGORY



The data on opioid-related deaths from Table 3 are graphically illustrated below. Again, these charts are not directly comparable to those depicting the overdose patterns due to the unavailability of data for 2015.

FIGURE 6: NUMBER OF SURREY DRUG OVERDOSES BY RISK CATEGORY

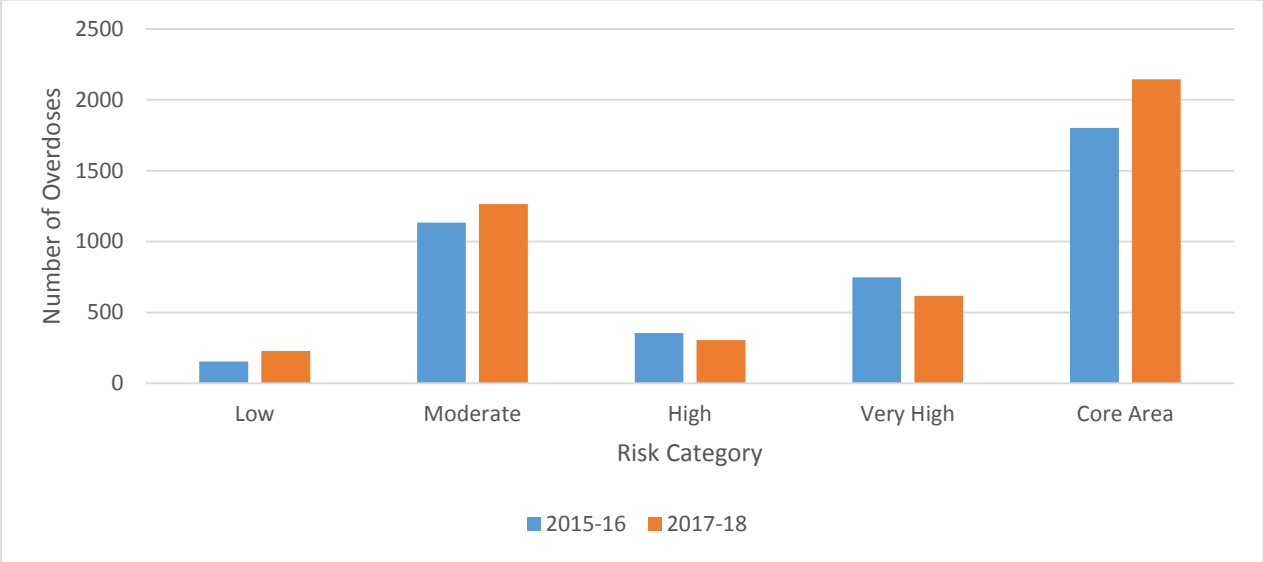
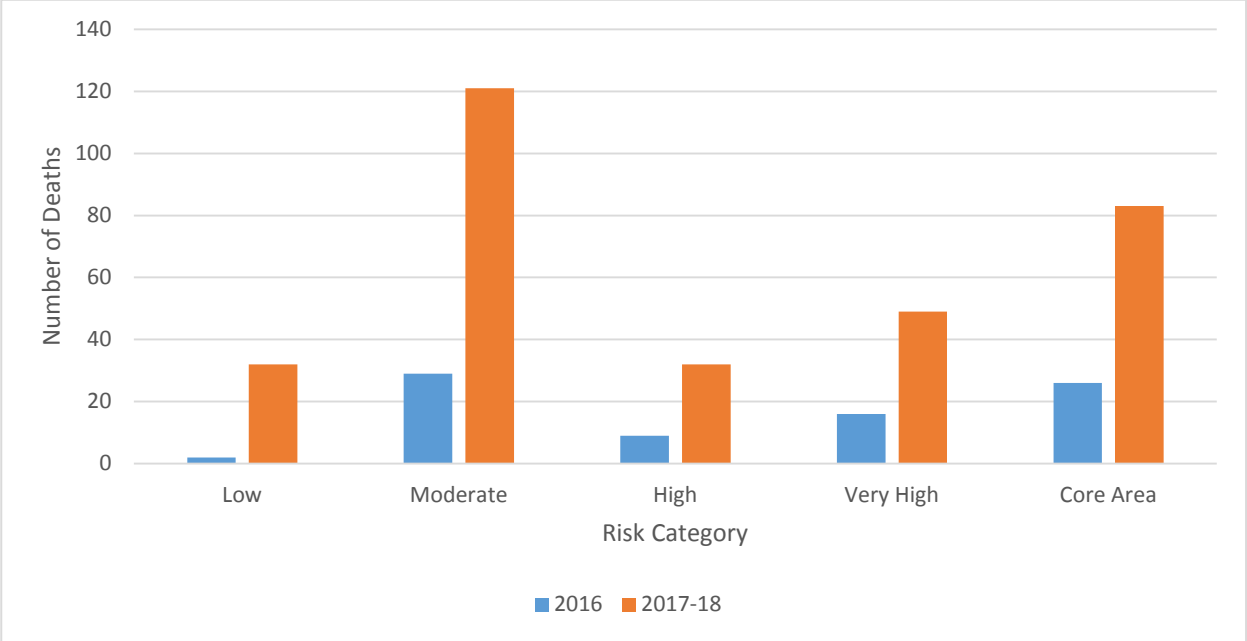


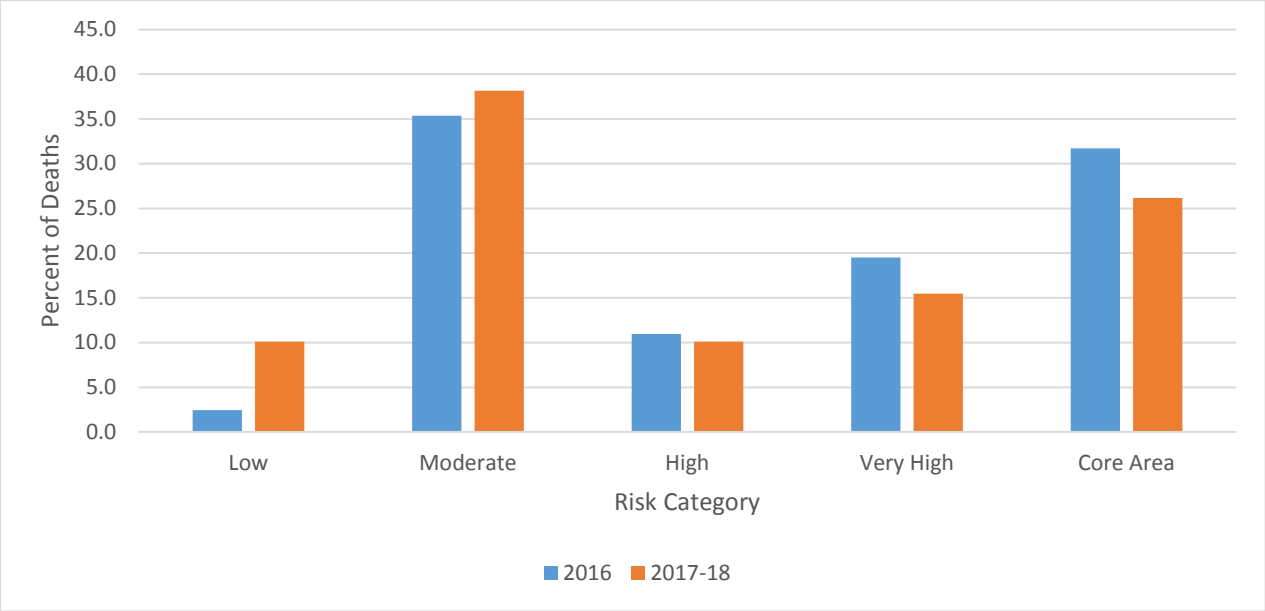
Figure 7 shows the number of deaths both before and after the start of the CCRP intervention. While the before and after time durations are not comparable, it is still evident that there was an increase in deaths post 2017.

FIGURE 7: NUMBER OF SURREY DRUG DEATHS BY RISK CATEGORY



This trend is more obvious in Figure 8 where we can examine the proportionate distribution of deaths across risk areas. What becomes clear from Figure 8 is the trend toward proportionately lower deaths in the higher risk areas, and a proportionate increase in the lower and moderate risk areas. One obvious explanation for this is that programs such as the CCRP, along with the availability of Recovery Houses and, likely, naloxone kits, is greater in the high as opposed to the low risk areas. This would be a reasonable outcome where the distribution of resources tends to be greater in those areas perceived as having a greater need. The consequence may be, however, that lower risk areas tend to be de-emphasized.

FIGURE 8: PERCENT OF SURREY DRUG DEATHS BY RISK CATEGORY



CRIMES

One of the major concerns with the increases in opioid-related deaths and overdoses is that they are a proxy for an increase in the underlying rate of drug use (Otterstatter et al. 2016; Pierce et al. 2015). This, in turn, is suspected to drive property crime rates as users require increased resources to make their purchases (French et al. 2000). This is not an unusual conjecture since it is well known that social pathologies tend to cluster along both social and geo-spatial dimensions.[7]

Data on selected crimes within the City of Surrey were collected for the years 2015 to 2018 inclusive. The crime data are limited to a series of property crimes only: break and entering into a business; residential break and enter; shoplifting; and, motor vehicle thefts. Crimes against the

[7] As far back as the 1920s, social scientists were wondering if there were spatial and temporal patterns to criminal and deviant behaviour. Sociologists at the University of Chicago noted that the application of ecological principles to the distribution of anti-social behaviour explained a substantial amount of the variation in the distribution of such behaviours, including drug abuse (see Park (1967); Hawley (1943); Shaw et al. (1929). For a more recent discussion, see Diplock (2016).

person and other offences are not considered in this analysis. On average, there were approximately five known property crimes per day (around 35 per week) within the City.

Once again, the data were divided into two periods: before and after January 1, 2017. The numbers of crimes were sorted according to the overdose-related risk areas and are presented in Table 4.

Unlike the data relating to overdoses and deaths, the recorded number of property crimes *decreased* by about 11% in the period after January 1, 2017. On the other hand, the distribution of crimes stayed remarkably consistent by risk area across the two periods under consideration. Essentially, the aggregate number of crimes did not vary significantly within each of the risk categories. When the data were analysed based on rates within CTs, those areas that had the highest likelihood of overdoses and opioid-related deaths also had the highest incidences and rates of property crime.

TABLE 4: NUMBER AND PERCENT OF OVERDOSES BY PERIOD

Risk Category	Period (Number)		Period (Percent)	
	2015-16	2017-18	2015-16	2017-18
Low (n=24)	4,977	4,694	14.0	14.9
Moderate (n=47)	16,224	14,428	45.6	45.8
High (n=7)	2,816	2,370	7.9	7.5
Very High (n=11)	6,268	5,094	17.6	16.2
Core Area (n=6)	5,289	4,940	14.9	15.7
Total	35,574	31,526	100.0	100.0

The patterns exhibited in Table 4 can be more clearly seen in the following figures. As Figure 9 shows, the number of crimes reported decreased in all the regional risk categories. The proportional distribution, however, remained both substantively and statistically consistent as illustrated in Figure 10.

FIGURE 9: NUMBER OF PROPERTY CRIMES BY RISK CATEGORY

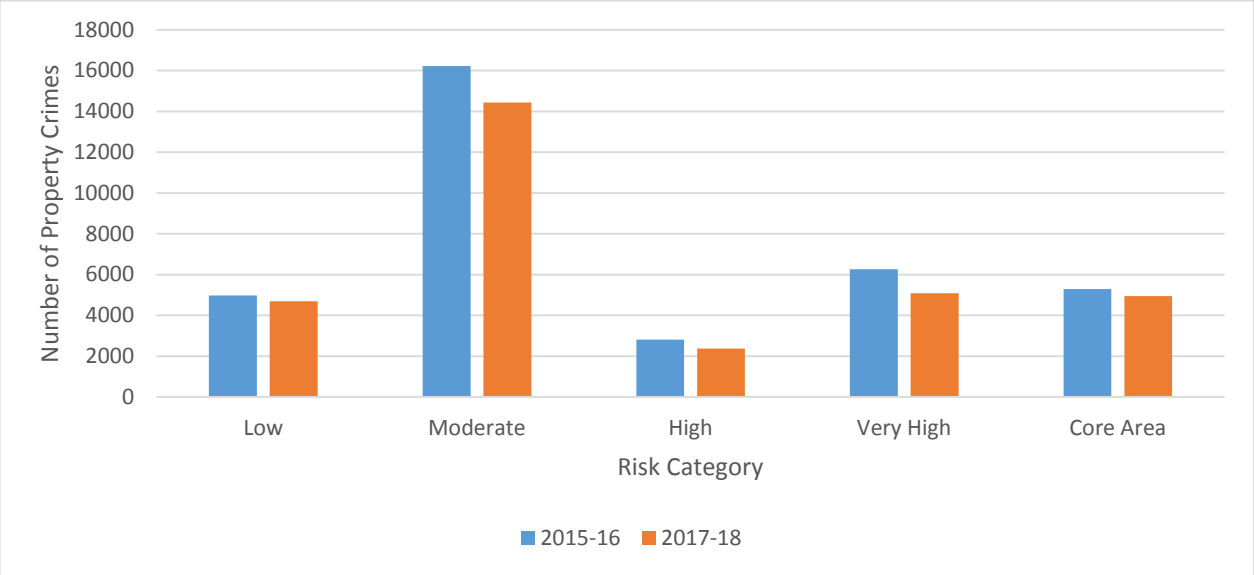
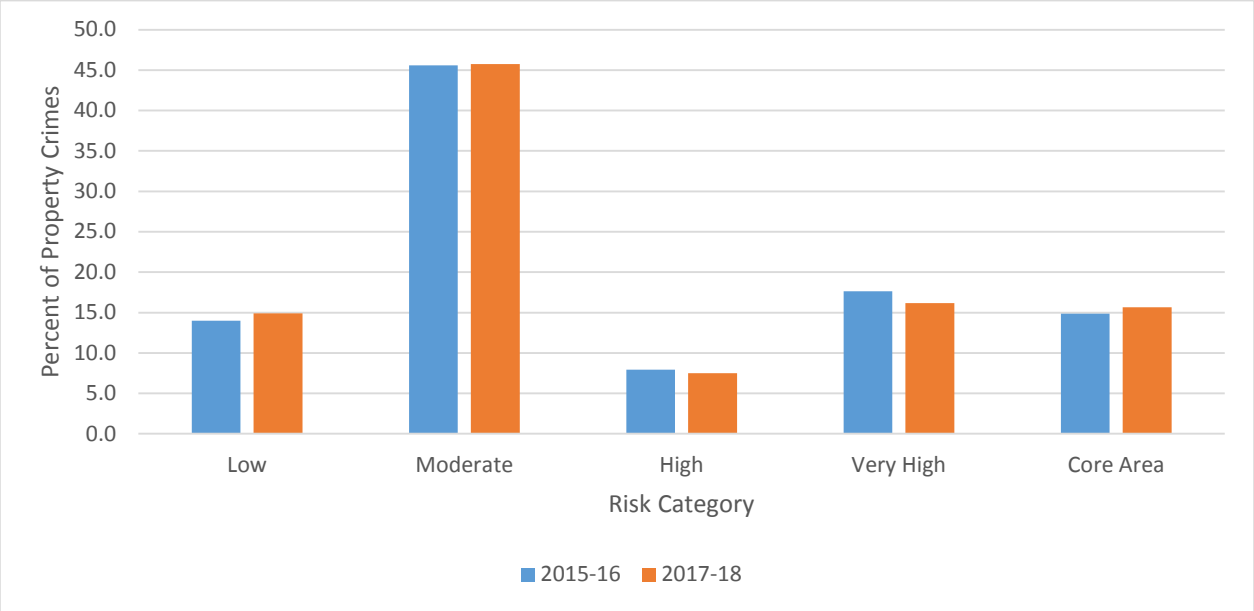


FIGURE 10: PERCENT PROPERTY CRIMES BY RISK CATEGORY



SUMMARY

The City of Surrey, along with the East side of Vancouver have experienced the worst of the opioid crisis. Over the four years for which we have data, it is evident that opioid-related incidents have not abated substantially. When we take a macro perspective looking at the period prior to and after 2017, several things become evident. Specifically, regarding overdoses:

- The aggregate number of overdoses increased across the city from prior to, to after January 1, 2017.
- The relative distribution of overdoses remained reasonably consistent across risk areas although the percentage distribution went up slightly in "Low" risk areas and down slightly in the "High" and "Very High" risk areas.

Regarding deaths:

- There was a dramatic increase in deaths across the three-year period 2016-2018 which was disproportionate to the increased incidence of overdoses.
- As with overdoses, the proportion of deaths increased in the "Low" risk areas relative to the "Very High" risk and Core areas.

The pattern for property crimes differed somewhat from that of overdoses and deaths. That is:

- In the aggregate, the recorded number of property crimes decreased by about 11% in the period after January 1, 2017.
- The distribution of property crimes across drug-risk areas remained proportionately consistent. It is also the case that those area that had the highest incidences and rates of property crime also had the highest likelihood of opioid-related overdoses and deaths.

Opioid-related Incidents in Surrey

As indicated previously, the geographical focus of the City's intervention corresponds broadly to a Core Area containing two central census tracts identified as CTs **191.04** and **191.07**. In this analysis, we examine whether there has been a change in the incidence of opioid incidents over the period of the intervention within those zones.

To reiterate, there are three key intervention phases on which this analysis focuses. These are:

1. January, 2017: Initiation of SOT Surrey Outreach Team
2. June, 2017: Initiation of SafePoint, the supervised consumption site
3. June 2018: Creation of Workforce Housing for 200 people

As part of a comparative design, we can use these three intervention points to create four periods for analysis. The initial or base period is *prior* to the City of Surrey's CCRP intervention which was initiated on January 1, 2017. The first intervention starts on January 1, 2017 at which point the SOT is put into service. The second intervention period starts June 1, 2017 after which the safe consumption site was operationalized in conjunction with the SOT. The third intervention period starts June 1, 2018 with the implementation of the Workforce Housing project. Again, this last intervention is in addition to the previously implemented SOT and safe consumption site interventions.

To summarize, observations were taken over four periods—the baseline and three intervention phases:

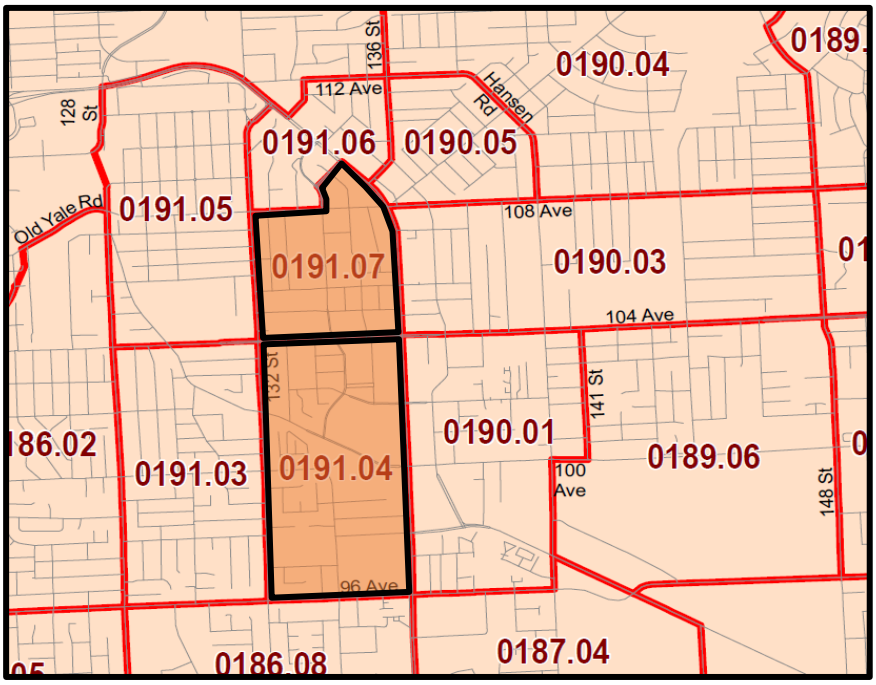
- Period 0 (2015 and 2016);
- Period 1 (January 1, 2017 to May 31, 2017);
- Period 2 (June 1, 2017 to May 31, 2018); and,
- Period 3 (June 1, 2018 to December 31, 2018).

It is only possible to understand the impact of an intervention when it is compared to something else. Typically, in true experimental designs, the comparison is generally known as a control group. The control group is one which is not exposed to the intervention. Since the current situation does not constitute a true experimental design, we resort to an alternate approach which is to contrast the experimental or target group with a series of comparators. In this case, to provide a context for interpreting the data in the Core Areas (CTs 191.04 and 191.07), data are provided for four neighbouring census tracts (190.01, 190.03, 191.03 and 191.05). All six of those areas were identified as "Very High" risk in the previous sections of this report. The second comparator we use consists of all other CT areas within the City of Surrey (that is, the remaining 89 census tracts).[8]

[8] For a discussion of various approaches to evaluating nonexperimental design, see Gertler et al. (2016); Khandker et al. (2010); and Province of Ontario (2007)

For reference, the locations of the two core and four adjacent CTs are identified in Figure 11. The two core areas are highlighted in a darker orange.

FIGURE 11: WHALLEY CORE CENSUS TRACTS



OVERDOSES

The number of opioid-related overdoses by census tract is reported in Table 5. There are two key items to note from Table 5. First, the two Core Area census tracts account for slightly more than one-third of the total number of recorded overdose incidents over the four-year period (2,942 out of 8,753). The adjacent CTs account for an additional 11% of the reported incidents and the remaining 55% of incidents are spread across the rest of the city.

A second point to note is that while the total number of incidents varies across CTs, the overall pattern across time remains remarkably similar regardless of location

TABLE 5: NUMBER OF OPIOID-RELATED OVERDOSES IN TARGET AREA (CTS)

	Period				
Core Area	**Period 0**	**Period 1**	**Period 2**	**Period 3**	**Total**
191.04	481	133	250	68	932
191.07	863	352	620	175	2,010
Total	1,344	485	870	243	2,942
Adjacent Area	**Period 0**	**Period 1**	**Period 2**	**Period 3**	**Total**
190.01	135	57	101	17	310
190.03	197	86	113	52	448
191.03	75	16	32	10	133
191.05	51	13	38	12	114
Total	458	172	284	91	1,005
Surrey (Other)	**Period 0**	**Period 1**	**Period 2**	**Period 3**	**Total**
Remaining CTs	2,391	667	1,395	353	4,806

As might be expected, the total number of overdoses in Period 0 (the pre-intervention phase) is greater than for the other three segments since it incorporates data from the two previous years, 2015 and 2016. Similarly, there is a "bump" in incidents in Period 2. This is also not unexpected since Period 2 covers a 12-month duration while Periods 1 and 3 are only 5 and 7 months in duration respectively.

To correct for the differences in time across the intervention periods, incident rates *per month* were calculated and presented in Figure 12. The base population (denominator) for the rates is taken from the 2016 Census. Arguably, the population figures are somewhat problematic since many of the incidents of overdosing were among transient individuals who may not have been captured by the Census. While the inclusion of transient individuals into the population count may be an issue, it is likely that the resident population still provides a reasonable base from which to compare relative rates across geographical zones (CTs)

In Figure 12, the bars represent the number of reported overdoses per month per 1,000 population for each of the four periods. This corrects for the differing durations of the periods under consideration. What Figure 12 indicates is that there was an overall increase in the rate of overdoses from before 2017 to peak in 2017, and then decrease in the final seven months of 2018. When a statistical test was conducted on the pattern of overdoses over time across the three comparator regions (Core Area, Adjacent CTs and the remainder of Surrey), there is a statistically significant differences using a commonly accepted probability level of .05.[9]

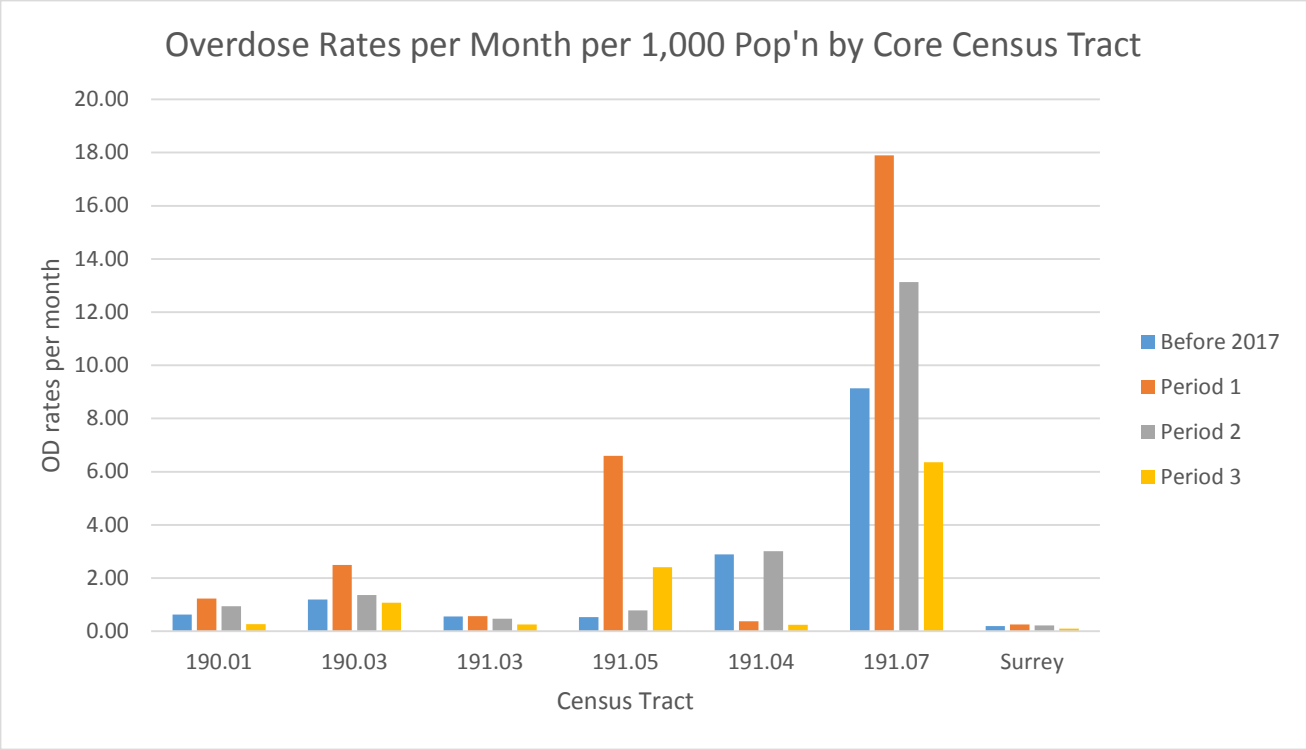
The overall pattern is a little complex but an examination of standardized residuals suggested that while all three regions experienced an *increase* in overdoses in Period 1, both the Core Area and the Adjacent CTs saw a *drop* in overdoses in Period 2 while the remainder of the City continued to

[9] Chi-square 15.3; 15 d.f.; p-value=0.018

experience a relative increase. There was, however, a substantial decrease in both the absolute and relative number of overdoses in Period 3 in all parts of the City.

From the perspective of the intervention, the results are not unambiguous. All parts of the City saw a significant drop in overdoses in Period 3. In the Core and Adjacent areas, however, it appears that the decline started to occur in Period 2 (the 12 months from June 1, 2017 to May 31, 2018).

FIGURE 12: OVERDOSES PER MONTH PER 1,000 POPULATION BY CORE CENSUS TRACT



DEATHS

Beyond reducing the number of overdoses, it was hoped that the CCRP intervention would reduce the number of opioid-related deaths which were occurring in the City. As indicated in the previous sections of this report, the number of deaths generally increased in tandem with reported overdoses. With deaths, we should recall that the pre-intervention exposure period (Period 0) consists only of the calendar year 2016 since data from the previous year were unavailable for analysis.

Over the three-year period (2016-2018 inclusive) there were 399 identified opioid-related deaths for which locational data were available.[10] While that number is clearly tragic, it should be noted that breaking down the statistics by place and time can soon result in small numbers. Consequently, we would advise some caution when drawing conclusions from these data.

[10] There was a total of 403 deaths identified; however, a census tract location could only be assigned to 399. Consequently, the latter tally was used in this analysis.

A breakdown of the number of deaths is presented in Table 6. This parallels the format of Table 5 which provides information on overdoses. As with overdoses, however, the Core area and surrounding CTs experienced an inordinate number of fatalities in comparison with the rest of Surrey. Again, because of durational differences in the intervention periods, it is easier to interpret the results if we look at deaths per month.

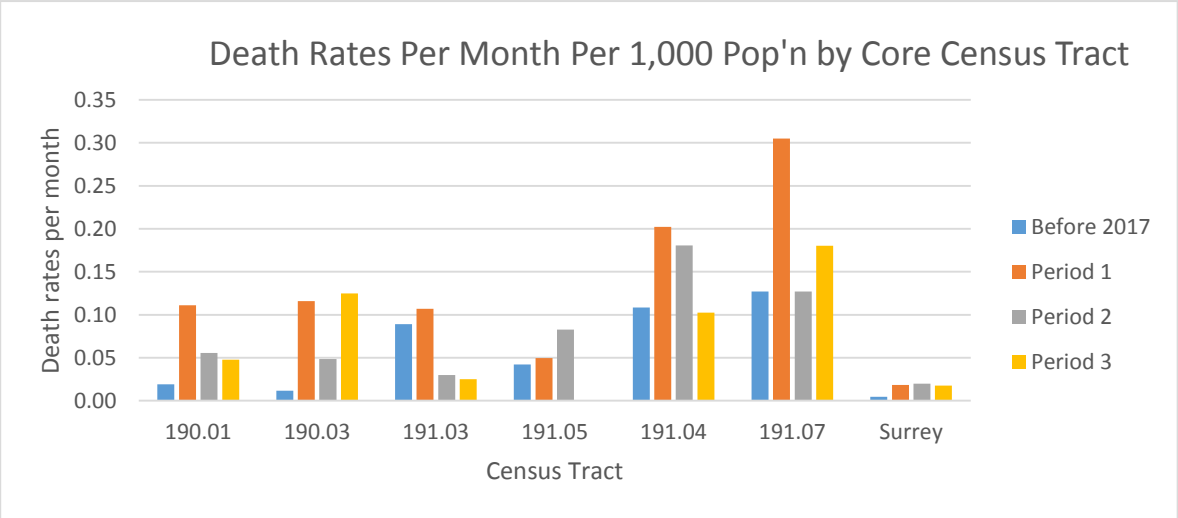
TABLE 6: NUMBER OF OPIOID-RELATED DEATHS IN TARGET AREA

	Period				
Core Area	**Period 0**	**Period 1**	**Period 2**	**Period 3**	**Total**
191.04	9	7	15	5	36
191.07	6	6	6	5	23
Total	15	13	21	10	59
Adjacent Area	**Period 0**	**Period 1**	**Period 2**	**Period 3**	**Total**
190.01	2	5	6	3	16
190.03	1	4	4	6	15
191.03	6	3	2	1	12
191.05	2	1	4	0	7
Total	11	13	16	10	50
Surrey (Other)	**Period 0**	**Period 1**	**Period 2**	**Period 3**	**Total**
Remaining CTs	56	47	123	64	290

In Figure 13, the bars represent the number of reported overdoses *per month per 1,000 population* for each of the four periods. This corrects for the differing durations of the intervention periods. What we see in Figure 13 is that there is a substantial amount of variability across census tracts. This is again a function of the relatively small numbers. However, a couple of consistent patterns emerge. The first is that among the cluster of "Very High" risk CTs around the Central Core, the two primary CTs (191.04 and 191.07) generally have the highest death rates per month. In all instances, the intervention periods see higher death rates per month than we find in the pre-2017 period. Within the three intervention periods, however, there does not appear to be any systematic trend. That is not the case for the remaining parts of Surrey where the number of deaths per month increased from the pre-2017 period through the three intervention periods.

Again, the numbers of deaths are relatively few, so it is inadvisable do draw an incontrovertible statistical conclusion at this point. If there is an emerging pattern, however, it is that none of the core CTs experienced the consistent pattern of increases in deaths over the intervention period (2017-2018) that is seen in the rest of the City.

FIGURE 13: DEATHS PER MONTH PER 1,000 POPULATION BY CORE CENSUS TRACT



PROPERTY CRIMES

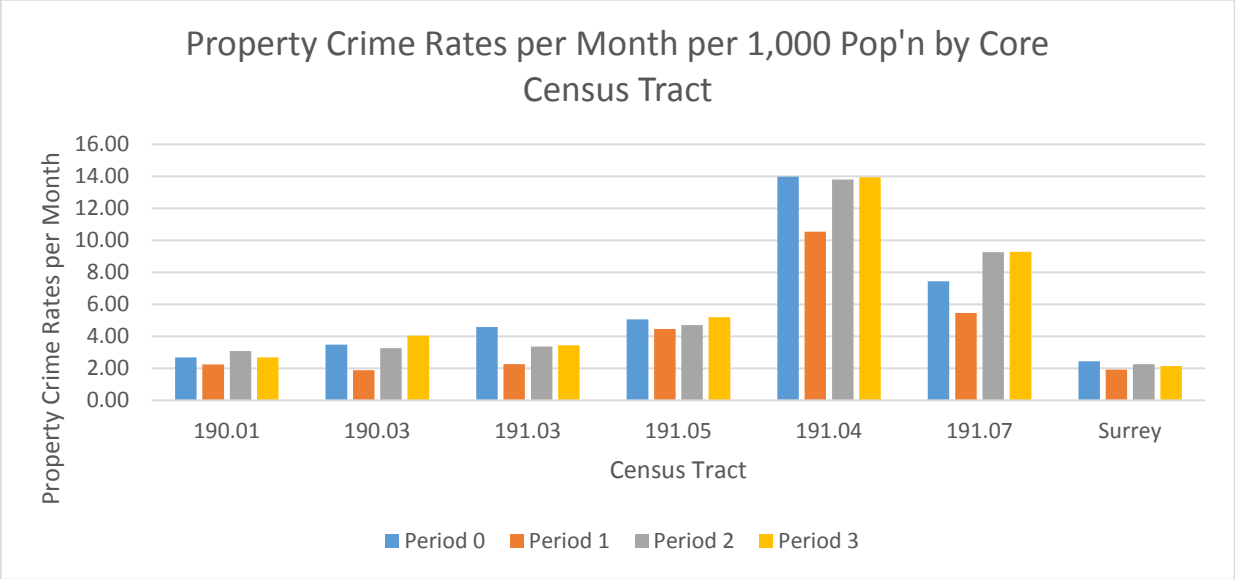
The third element under consideration beyond opioid-related overdoses and deaths is property crimes. The number of reported crimes during the period under consideration is presented in Table 7. As with opioid-related overdoses and deaths, property crimes within Surrey are reported disproportionately in the core area of the City.

Again, due to the differing durations of the interventions, the number of reported crimes *per month per 1,000 population* were calculated and presented in Figure 14. The remarkable aspect of Figure 14 is that, despite the substantial variations in opioid-related overdoses and deaths illustrated in Figures 12 and 13, property crime rates appeared remarkably consistent with time.

TABLE 7: NUMBER OF PROPERTY CRIMES IN TARGET AREA (RATES PER 1,000 POPULATION IN PARENTHESES)

	Period				
Core Area	**Period 0**	**Period 1**	**Period 2**	**Period 3**	**Total**
191.04	2,323	438	1,146	579	4,486
191.07	702	129	437	219	1,487
Total	3,025	567	1,583	798	5,973
Adjacent Area	**Period 0**	**Period 1**	**Period 2**	**Period 3**	**Total**
190.01	580	121	333	145	1,179
190.03	576	78	269	167	1,090
191.03	618	76	226	116	1,036
191.05	490	108	227	126	951
Total	2,264	383	1,055	554	4,256
Surrey (Other)	**Period 0**	**Period 1**	**Period 2**	**Period 3**	**Total**
Remaining CTs	30,285	5,934	13,998	6,654	56,871

FIGURE 14: PROPERTY CRIMES PER MONTH PER 1,000 POPULATION BY CORE CENSUS TRACT



SUMMARY

This section provides a more refined examination of the impact that the CCRP may have had on the rates of overdoses, deaths and property crimes in the Central Core or target area. To more fully appreciate the impact that the CCRP may or may not have had on what was happening in the Core, we contrasted patterns in those two key CTs with a series of adjacent CTs that had been identified as "High Risk" zones, and the remainder of the City.

While the overall pattern we find in this analysis differs little from the macro "before-after" analysis of the previous section, there are some nuances that become more evident. To summarize the results, for overdoses, we find that:

- The two Core Area census tracts experienced slightly more than two-thirds of the total number of recorded overdoses over the entire four-year period
- The adjacent CTs accounted for an additional 11% of the reported overdoses, with the remaining 55% being spread across the rest of the City
- In general, there was an increase in overdose rates across the entire city from before 2017 to a peak in 2017. In contrast, the Central Core and adjacent CTs saw a slight decline in rates in phase 2 of the CCRP (Period 2).
- Overall, there was a decrease in overdoses throughout the City in the final seven months of 2018. This corresponds to the implementation of phase three of the CCRP (the housing phase). It should be noted, however, that this pattern was replicated throughout the City and not just in the Central Core.

Regarding deaths:

- The two Central Core CTs had the highest overall death rates across all periods examined.
- In the City as a whole, all three intervention periods saw higher deaths per month than occurred in the pre-intervention period.

- While the overall death rate increased in the Core and adjacent CTs in the intervention period, none of the core CTs experienced the consistent pattern of increases in deaths that was seen in the rest of the City.

Unlike overdoses and deaths, while there were annual fluctuations, property crimes remained relatively consistent across all parts of Surrey.

Demographics of Opioid-Related Deaths

Unfortunately, limited information is available on where opioid-related deaths occur and on the personal characteristics of the victims. Over the three-year period, 2016-2018 inclusive, 403 deaths were recorded within the City of Surrey.[11] This analysis will focus on the known characteristics of those victims.

GENDER

Consistent with other data relating to opioid-related mortality, most victims in Surrey are males. What does stand out, however, is the dramatic proportionate increase in male deaths in comparison to females over time. As Table 8 indicates, while the number of female overdose victims increase by about 60% (32 v. 20) over the three-year period, the increase in the number of male victims increased by about 114% (136 v. 63). Consequently, while the male to female death ratio was about 3.15:1 in 2016, it increased to 4.25:1 in 2018. Male deaths not only increased in absolute numbers, they also increased at a much greater rate than deaths among females.

TABLE 8: GENDER OF VICTIM BY YEAR

Gender	Year		
	2016	2017	2018
Female	20	21	32
Male	63	131	136
Total	83	152	168

AGE

The variation in age among victims is quite wide. As Table 9 illustrates, for the three years under investigation, victims have ranged from those in their mid-teens to senior citizens. Most, however, are individuals around 40 years of age. Unlike gender, the age profile of the victims has been relatively stable with time.

[11] A total of 403 opioid-related deaths were recorded in Surrey. This number is contrasts with the previous geographical analysis where there was census tract information on the location of 399 cases.

TABLE 9: AGE OF VICTIM BY YEAR

Age	Year		
	2016	2017	2018
Minimum	19	14	17
Maximum	67	81	66
Average	39.4	41.9	38.5
Standard Deviation	10.4	13.0	11.7
No. of Cases	83	152	168

RACE

Table 10 provides a breakdown of victims by race. Most of the victims of opioid-related overdoses are classified either as "Caucasian," South Asian or Aboriginal. This is not surprising since those groups are highly proportionate to the overall population in the Surrey area. The biggest increases in deaths has occurred among Caucasians, where the number jumped by close to 100% from 2016 to 2017 and 2018 (53 to 101 and 94 respectively). A similar pattern can be found among South Asians where there was a doubling in the number of deaths from 2016 to 2017 (13 to 27) and a further 60% increase from 2017 to 2018 (27 to 43). While the proportion of deaths is quite small in relation to Caucasians and South Asians, the pattern among other ethnic/racial groups in the area appears stable over time. This is also the case for Aboriginal people who compose the third largest identifiable group of victims.

TABLE 10: RACE OF VICTIM BY YEAR

Race	Year		
	2016	2017	2018
Aboriginal	12	10	17
Asian	0	5	4
Black	4	6	5
Caucasian	53	101	94
Hispanic	1	0	3
Middle Eastern	0	1	1
South Asian	13	27	43
Unknown	0	2	1
Total	83	152	168

LOCATION OF DEATH

Limited information is also available on the location where the victim was located.[12] As Table 11 illustrates, about three-quarters of the victims, are found in a residence of some type. An additional 10% are found outside on a "street" location. The remainder are found in a variety of locations from parks to motor vehicles to hospitals. What is not known, with perhaps the exception of a hospital setting, is whether the victims were alone or in the company of others when they overdosed.

TABLE 11: LOCATION OF DEATH BY YEAR

Location	Year		
	2016	2017	2018
Barn	0	1	0
Commercial Residence	0	8	6
Commercial Washroom	1	1	1
Government Institution	0	0	1
Hospital	1	4	8
Residence	63	117	126
Street	13	14	14
Vehicle	3	5	8
Wooded Area-Field/Park	2	1	4
Total	83	151	168

SUMMARY

Limited information was available on overdose victims. In summary, however:

- The majority of victims were male. Mortality increased substantially in 2017-2018 over 2016, with deaths among women increasing by about 50% while those among men doubled.
- The average age of victims was about 40 years-of-age, although there was considerable variation from those in their late teens to individuals beyond retirement age.
- Most victims were identified as "Caucasian" and mortality among that group doubled after 2016. South Asians were the second largest racial group with their mortality doubling from 2016 to 2017 and further increasing by 60% from 2017 to 2018. There was no identifiable pattern among the other groups identified.
- Three-quarters of the victims were discovered in residences with an additional 10% found on a "street" location.

[12] Information was missing on one victim in 2017; hence, the total of 151 as opposed to 152 in the previous tables.

Conclusions

The "opioid crisis" has taken a substantial toll on the citizens of Surrey and of British Columbia as a whole. Beyond the human tragedy resulting from overdoses and deaths, opioid dependency has placed a strain on the City's resources and on the broader social fabric. Overall, it is a social tragedy for which there appear to be few easy policy solutions. It is also evident that opioid addiction and its consequences are complex phenomena that require a significant amount and diversity of resources if they are to be addressed successfully. While opioid addiction cuts across all social strata, it is perhaps among the itinerant poor that it is most evident.

In British Columbia and, increasingly, throughout much of the rest of Canada, local municipalities are trying to respond in a significant manner. Typical responses include such developments as the establishment of safe consumption sites, increasing the number of Recovery Houses, better training for first responders to deal with overdose situations, and the broader distribution of naloxone kits. All of these efforts and more are taking place within Surrey.

The establishment of a "Tent City" in City Centre merely highlighted how the problem was focused in one area of Surrey. In response, City Council created Surrey's Centre City Response Plan to try to mitigate some of the consequences of street-level drug use. The plan consisted of three main components: an enhanced service presence based on the *Surrey Outreach Team* (SOT); the Introduction of *SafePoint*, a safe supervised consumption site; and, the initiation of an *Emergency Housing First* program. The plan was implemented in three overlapping phases starting January 1, 2017.

Looking at the data, it is not unambiguously evident that the CCRP had an impact above and beyond the other activities that were occurring within the City more broadly. It is the case that in the Period 3 (the final six months of 2018), the number and rate of *overdoses* in the City Centre area declined substantially. Then, again, they simultaneously declined throughout most of the rest of the city.

On the other hand, the rate of opioid-related *deaths* appeared to stabilize or even decline in the Core Area while they increased in the rest of the City. This was particularly the case in Period 3 when the Emergency Housing First component was implemented. It is still too early to conclude that the Emergency Housing component of the CCRP was responsible for the decline in opioid-related deaths. Six months is a short duration particularly since part of that time involved putting the housing units in place. A longer follow-up would help to provide more insight into the impact of that implementation. The collection of on-site, qualitative research would also be of substantial benefit in determining the relationship between the resources expended by the City, how people took advantage of those resources, and what impact they had on drug use and its consequences.

The third component examined—property crimes—appeared to be relatively time-invariant across all regions of the City. Areas with high reported crime rates continued to have high rates while areas with lower rates continued to report lower rates.

It should also be noted that the impact of the CCRP might extend beyond the three indicators examined in this study. Again, further monitoring over a longer duration and a detailed collection of qualitative data would assist in that assessment.

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Author Biographical Information

Paul Maxim obtained his MA in criminology at the University of Ottawa and his PhD in sociology at the University of Pennsylvania where he specialized in criminology and research methods. He is formerly a professor in the Department of Economics and the Balsillie School of International Affairs at Wilfrid Laurier University in Waterloo, Ontario and is a Professor Emeritus in the Department of Sociology at Western University in London, Ontario. His primary areas of research interest are population and labour economics. Contact him at pmaxim@wlu.ca

Len Garis is the Fire Chief for the City of Surrey, British Columbia, an Adjunct Professor in the School of Criminology and Criminal Justice & Associate to the Centre for Social Research at the University of the Fraser Valley (UFV), a member of the Affiliated Research Faculty at John Jay College of Criminal Justice in New York, and a faculty member of the Institute of Canadian Urban Research Studies at Simon Fraser University. Contact him at Len.Garis@ufv.ca.

Chris Biantoro, Ph.D, is the strategic planning analyst for the City of Surrey Fire Service, BC. He has a background of operations research with 10 years of working experience in advanced analytics, data science, and statistical modeling. He possesses a Doctorate degree in Operations Engineering from the Technical University of Berlin, Germany. Contact him at chris.biantoro@surrey.ca

Andrew Fink is a student at the University of British Columbia (UBC) completing a bachelor's degree in Geographic Sciences in May of 2019, and a former member of the Data Science for Social Good (DSSG) research fellowship at the UBC Data Science Institute. Contact him at andy.fink55@gmail.com

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Appendix

OVERDOSES PRE-2017

FIGURE 1A: NUMBER OF OVERDOSES BY CENSUS TRACT

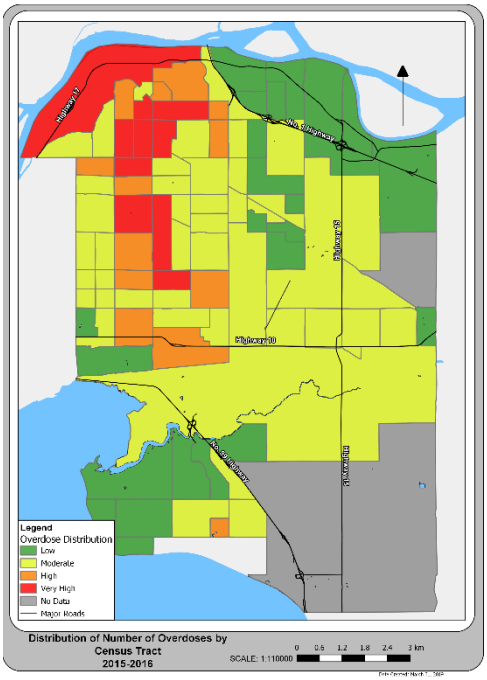
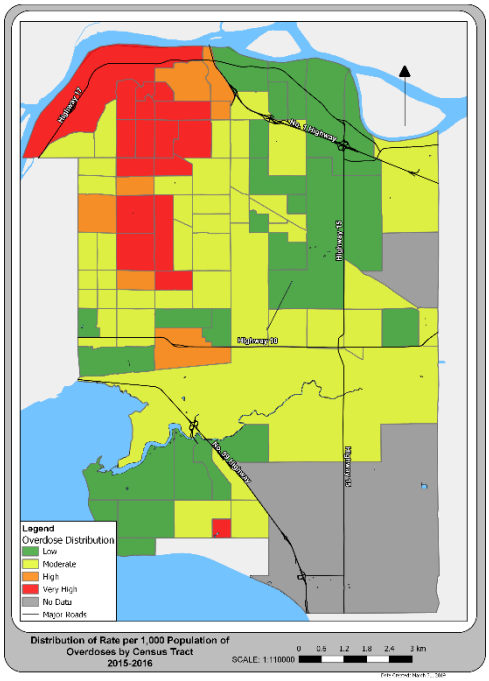


FIGURE 1B: RATE OF OVERDOSES BY CENSUS TRACT



OVERDOSES POST-2017

FIGURE 2A: NUMBER OF OVERDOSES BY CENSUS TRACT

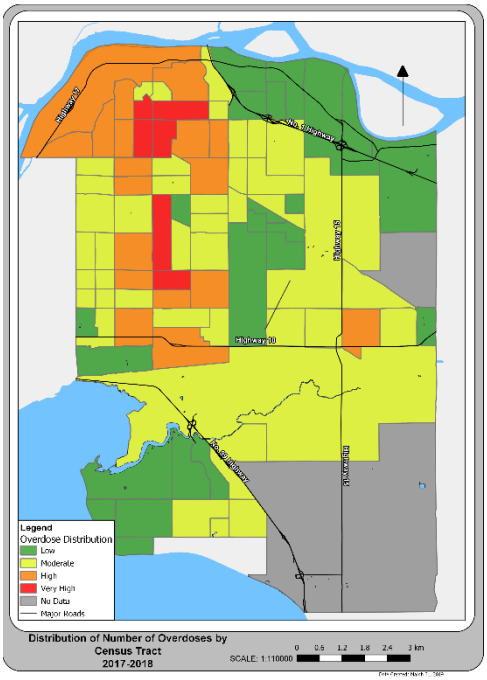
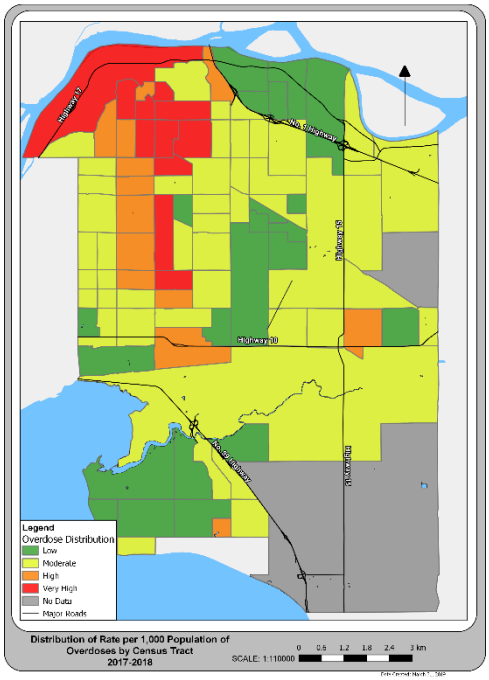


FIGURE 2B: RATE OF OVERDOSES BY CENSUS TRACT



DEATHS PRE-2017

FIGURE 3A: NUMBER OF DEATHS BY CENSUS TRACT

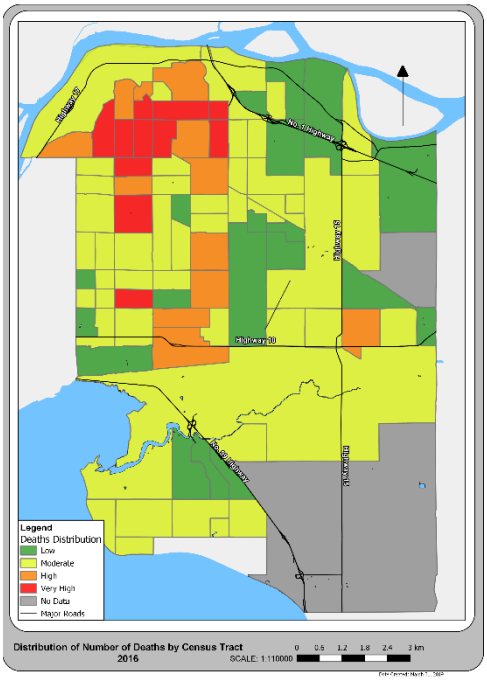
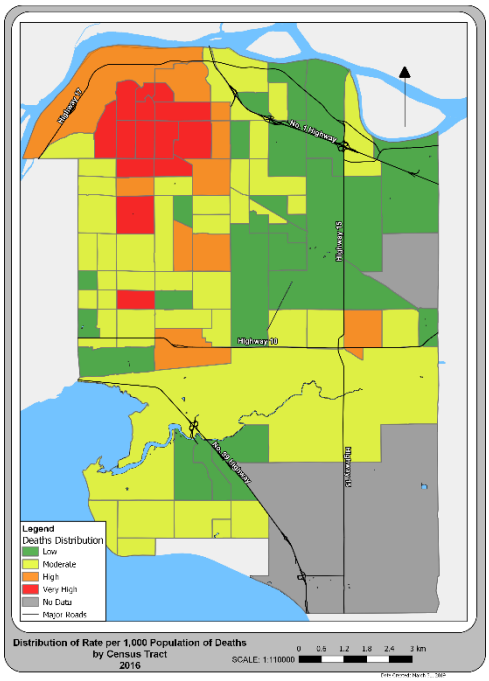


FIGURE 3B: NUMBER OF DEATHS BY CENSUS TRACT



DEATHS POST-2017

FIGURE 4A: NUMBER OF DEATHS BY CENSUS TRACT

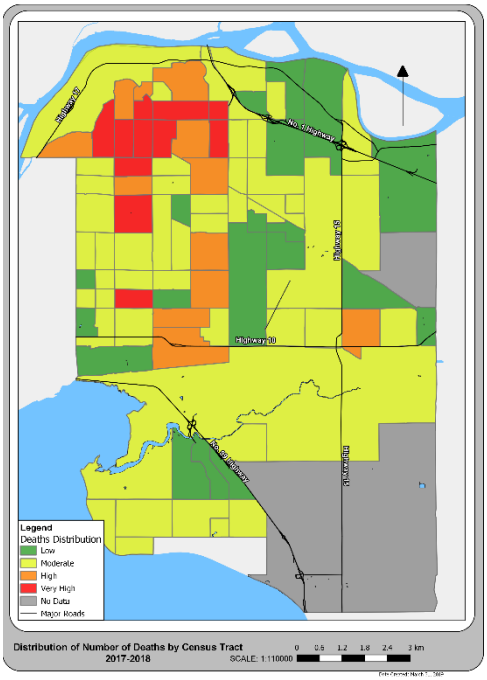
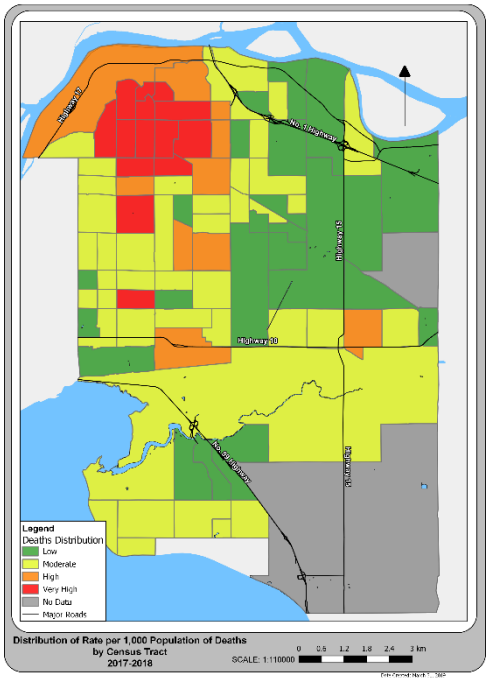


FIGURE 4B: RATE OF DEATHS BY CENSUS TRACT



CRIMES PRE-2017

FIGURE 5A: NUMBER OF CRIMES BY CENSUS TRACT

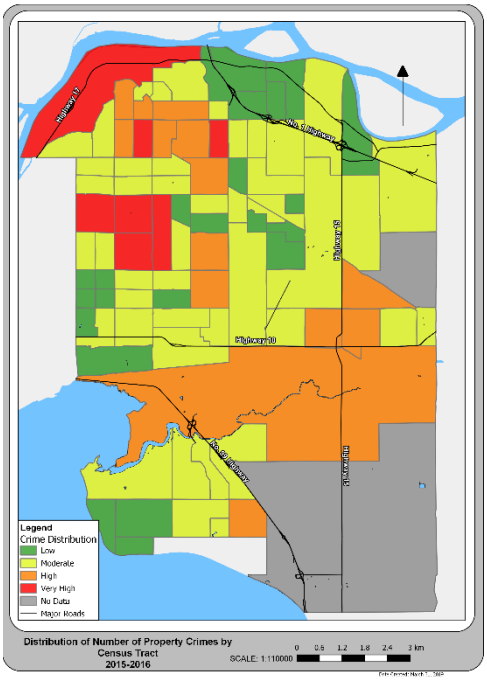
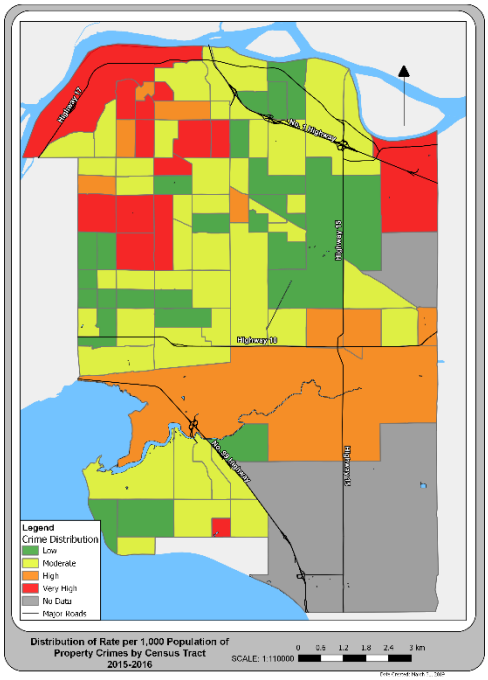


FIGURE 5B: RATE OF CRIMES BY CENSUS TRACT



CRIMES POST-2017

FIGURE 6A: NUMBER OF CRIMES BY CENSUS TRACT

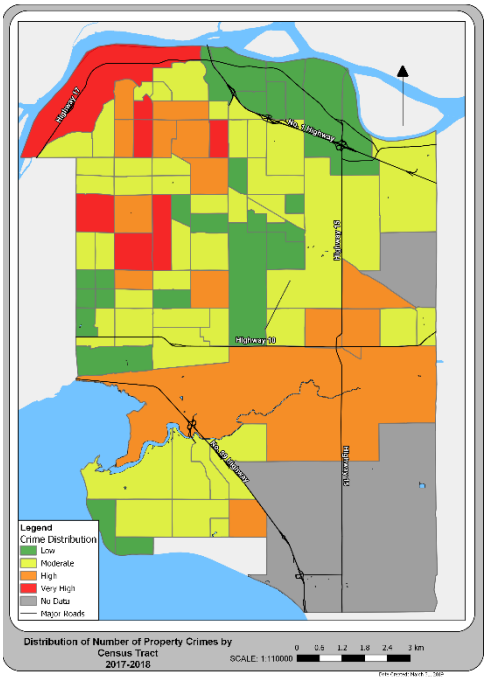
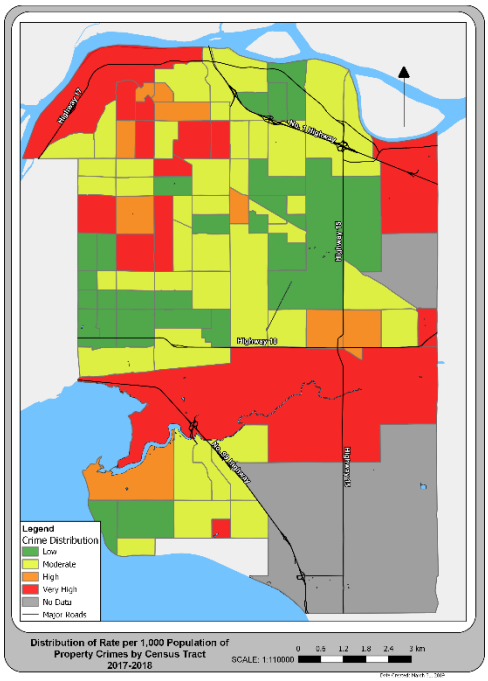


FIGURE 6B: RATE OF CRIMES BY CENSUS TRACT



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Predicting Illicit Opiate Drug Overdoses in the City of Surrey

Impacts of Opioid use in Neighbourhoods

Paul Maxim, Len Garis, Joseph Clare, Hubert Duan, Andrew Fink

February 2019

UNIVERSITY OF THE FRASER VALLEY
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Executive Summary

This study examines the spatial and temporal distribution of the incidence of overdoses and deaths attributable to opioid abuse within the City of Surrey from 2016 to 2018. As the general epidemiological literature reports, the distribution of overdose incidents and deaths is neither random in space nor time. Spatially, these incidents tend to cluster around specific nodes and pathways within a city. In this regard, the City of Surrey is no different. There is also a strong association with the time of day when these occurrences take place and the day in the month when social assistance payments are made.

In the first part of the analysis, we find an association between the incidence of overdoses and deaths and the location of both regulated and unregulated recovery homes. Most overdose incident events are clustered in the northwest section of the City and along the King George Boulevard corridor bordered between 108 Avenue and 64 Avenue. This is where there is a disproportionate clustering of both recovery houses and addicts. Recovery houses are generally located close to where their potential clients exist and, in turn, potential clients are attracted to those same locations.

The micro-spatial association between overdoses, deaths and the location of recovery homes is complex, however. Perhaps the best way to visualize the relationship is to imagine a doughnut. There is a depression in rates of overdoses and deaths in the center of the doughnut (that is, where the house exists). Beyond that centre, there is a steep rise in incidents and then a gradual tapering off. Most overdoses and deaths occur within 500 meters of a recovery house.

In the second part of the analysis, a strong relationship is found between overdoses, deaths, crime and the distribution of social assistance payments. Overdoses and deaths peak within the first three days of the distribution of payments. Inversely, monthly property crime rates decline during that period. This pattern replicates findings from studies in both Vancouver and the United States where a significant “cheque effect” has been found and provides an opportunity for policy reform.

The third part of this analysis addresses the question of whether it is possible to use these findings to assist in the construction of a predictive model of when and where overdoses and deaths are likely to occur. While the results are preliminary in this instance, there is evidence to suggest that efforts to build a predictive model may pay dividends.

The study concludes with a series of policy recommendations based on the above findings.

Introduction

The incidence of deaths due to opioid overdoses in Canada has increased substantially in the past few years (Fischer et al. 2006). In 2017, the national rate for opioid-related deaths was approximately 10.9 per 100,000 population, or about 4,000 deaths in total. In the first six months of 2018, the death rate had increased to an estimated 11.2 per 100,000.[1] British Columbia has experienced the brunt of that pattern with the estimated death rate of 30.9 per 100,000 population for 2017 and 30.6 in 2018. In absolute numbers, illicit drug overdose deaths increased from 294 in 2010 to 1,489 in 2018. The increase in both reported overdose cases and deaths in British Columbia led the Province to declare a public health emergency in 2016 (Otterstatter et al. 2018).

A major driver of that increase in opioid deaths has been the introduction of synthetic narcotics such as oxycontin and fentanyl. Fentanyl, for example, is a stronger analgesic than traditional opioid painkillers (up to 100 times stronger than morphine) and when incorporated into a time-released patch was initially considered minimally addictive. Originally, fentanyl was available through a prescription only but, in recent years, it has become a major component of the illicit drug trade. Users initially learned how to extract and concentrate fentanyl from patches and, more recently, it and several derivatives (e.g., carfentanil) have become available on the black market in powder and pill form. It has been estimated that nearly all street "heroin" sold in Vancouver contains fentanyl (Woo 2018). Regardless, it has been estimated that about one-third of those having died recently due to opioid overdoses had a prescription (Gomes et al. 2018), although current restrictions on opioid-for-pain prescriptions appear to be changing that pattern (Smolina et al. 2019).

The Province has responded in various ways including providing greater availability to Opioid Antagonist Therapy (OAT). In September 2018, more than 21,000 prescriptions were written for an opioid antagonist such as naloxone. This is an increase from slightly more than 15,000 prescriptions written in September 2015.[2] Besides widening the availability of OATs in pharmacies, ambulance attendants, firefighters and police officers have increasingly been supplied with naloxone to respond to overdoses. Unfortunately, some of the more recent opiate analogues such as carfentanil, are sufficiently toxic that they could pose a health risk to emergency responders who might come in physical contact with the substances.

To help curtail the upward trend in opioid overdoses, Health Canada approved two supervised consumption sites in Surrey in 2017. The first, *Safepoint*, is located at 135A Street and the second, the *Quibble Creek Sobering and Assessment Centre*, is located near King George Boulevard and 94 Avenue. The location of supervised consumption sites is often subject to debate due to trade-offs in the needs of users, and local residents and property owners. In the case of *Safepoint*, substantial consideration was given to input from potential users of the site.

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[1] https://www.canada.ca/en/health-canada/services/substance-use/problematic-prescription-drug-use/opioids/data-surveillance-research/harms-deaths.html

[2] http://www.bccdc.ca/resource-gallery/Documents/Educational%20Materials/Epid/Other/BC_OD_Response_Monthly_Infographic.pdf

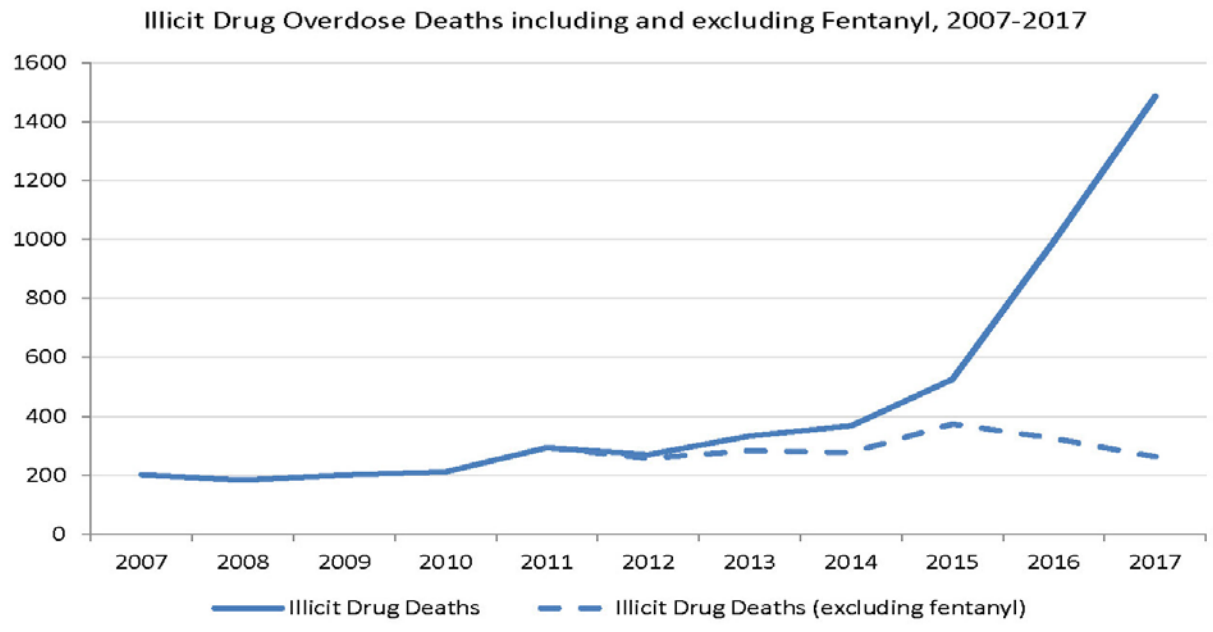
The social implications of opioid dependency and drug use in general go well beyond the impact on individual users: addiction affects the entire community. In this study, we focus on the impact of opioid use on neighbourhoods. Specifically, we will examine three questions. That is,

i. What is the relationship between the location of recovery houses and the location of opioid overdoses in conjunction with a soft treatment?
ii. Is there a relationship between social assistance, opioid overdoses and property crime?
iii. Can the neighbourhood or geo-spatial distribution of overdoses be predicted?

Background

Until recently, the geo-spatial analysis of opioid deaths by epidemiologists and healthcare researchers had been limited to higher geographical aggregates such as cities or, more often, provinces and states (Cordes 2018). The primary reason for this is that, historically, opioid deaths were significantly fewer than is currently the case and rates often varied little from year to year. The introduction of higher potency opioid-based narcotics such as oxycontin and, more recently, fentanyl, acted as a major disruptor to that pattern. Evidence for this can be seen in Figure 1 which illustrates the increased rate in opioid-related deaths in British Columbia from 2007 to 2017 (BC Coroners Service). Currently, BC appears to have the highest rates for both opiate overdoses and deaths in Canada. As previously indicated, the absolute numbers known to public health officials increased from 294 in 2010 to approximately 1,489 in 2018.

FIGURE 1



Source: BC Coroners Service Illicit Drug Overdose Deaths in BC January 1, 2008 to December 31, 2018

Within Canada, British Columbia has faced the brunt of that increase. However, the steep incline in opioid-related deaths is not limited to BC or Canada for that matter. Several parts of the United States have become "hotspots" for synthetic opioid use in recent years. Much of this was due to the relative availability of oxycontin which soon gained the moniker, "hillbilly heroin." Because of the spike in usage in parts of the US, some micro spatial analysis has been used for policy purposes in an attempt to mitigate opioid-related deaths. For example, Dodson et al. (2018) examined the impact of differentially supplying pharmacies with naloxone in Pittsburgh. Here, the researchers identified cases of suspected nonfatal opioid overdoses where naloxone was administered from April 2013 through December 2016 by the city's Bureau of Emergency Medical Services. They used spatial modeling to identify peak use areas to optimize naloxone distribution among pharmacies in the city. Pharmacies were differentially selected to create a geographical solution that minimized travel cost and increased accessibility for communities hit hardest. According to the authors, "this reconfiguration shaved roughly more than two tenths of a mile off the average distance to the closest pharmacy offering naloxone, which may not sound like much, but [it] provides crucial minutes for acquisition and administration."

Analogous research in San Francisco by Rowe and his associates (2016) also confirmed the benefits of having lay-person access to naloxone in selected areas as a key element in reducing overdose-related mortality. On the other hand, the researchers noted that alternative delivery methods appear necessary to address overdoses that occur in areas with a less concentrated risk, such as suburban and rural localities.

Similarly, Des Jarlais and colleagues (2018) identified injection "hotspots" in New York City to focus on HIV and Hepatitis C virus (HCV) transmission. While they concluded that HIV transmission was likely to be a random occurrence largely because it is at an "end of epidemic" stage, HCV transmission still appeared concentrated in certain locations. Using this information, the authors suggested, could allow for a more targeted use of resources to address disease transmission associated with intravenous drug use.

More pertinent to the current analysis, Heavey et al. (2018) examined the impact of New York State allowing police officers and firefighters to administer naloxone in addition to EMS personnel. The study was conducted in Erie County, NY which includes the City of Buffalo. The analysis focused on over 600 instances where either police officers or firefighters were first responders to an overdose incident. Overall, the "results suggest that police and fire personnel are effectively evaluating the scene upon arrival at an overdose and are administering naloxone within the recommended indications."

The study also indicated that while interventions by police or fire personnel were effective in stabilizing patients, secondary or follow-up responses by EMS personnel were often required to fully resuscitate the patient.

Obviously, locating where opioid use and opioid overdose is most likely to occur is a key element to conducting an adequate spatially-focused response to the problem. Some earlier research used calls to poison control centres to obtain that information (Smith et al. 2008). A somewhat different tact was taken by Bearnot and his colleagues (2018). These researchers used crowdsourced data to identify discarded needle hotspots in Boston.

Most recent studies reported in the literature use calls for service (such as through 911) as a primary tool to identify specific neighbourhoods or locations where opioid overdoses are most likely to be concentrated. Tracking 911 calls makes sense because, as the BC Coroners' Service (2018) has noted, over 86% of overdose deaths occurred indoors; 58 % in private residences; 24% in other residences including social and supportive housing, shelters and hotels; 4% in other inside locations; while 12% occurred outside in vehicles, sidewalks, streets, parks and other public spaces.

Theory Directed Responses

To provide an organizational framework to our thinking about how to respond to where and when drug overdoses take place and some of the consequences of drug-taking behaviour, we can turn to a body of theory generated by sociologists over the past century. As far back as the 1920s, social scientists were wondering if there were spatial and temporal patterns to criminal and deviant behaviour. Sociologists at the University of Chicago noted that the application of ecological principles to the distribution of anti-social behaviour explained a substantial amount of the variation in the distribution of such behaviours, including drug abuse (see Park (1967); Hawley (1943); Shaw et al. (1929)) .

One theoretical stream that has descended from the social ecology framework is what is now referred to as crime-pattern theory. Here, the key assertion is that individuals are largely opportunistic and take advantage of easy criminal opportunities as part of their daily routines. As Diplock (2016) notes: "offenders will commit crimes along their typical daily routes (known as paths) between their houses, places of work or school, recreational locations, and other hang-out areas (known as nodes)."

Typically, crimes are not spatially random events but occur near nodes and gradually taper off as the distance from the node increases. This insight illustrates the importance of knowing where crimes occur and where offenders normally travel, in order to strategically target crime prevention interventions (Diplock 2016). Practical responses to this insight range from differential police patrolling, to the greater physical and electronic surveillance of high crime-prone neighbourhoods, to neighbourhood watch schemes. Wilson and Kelling's broken-windows theory reinforces this notion (Kelling and Coles 1997). By fixing broken windows, cleaning up graffiti and removing other signs of "social disorder," a message is sent to potential offenders that crime and other activities are not acceptable in that area.

It has been suggested that such interventions may lead to crime displacement where offenders travel further to commit crimes (Gallagher and Wilcox 2013). However, displacement also imposes a cost that many potential offenders appear not willing to pay. As Cornish and Clark (1986) noted, offenders tend to be rational actors who examine their environment and immediate situation to estimate a balance of perceived rewards and risks. In the case of drug users, some may find the increased cost an incentive to seek a treatment or maintenance program that alleviates the requirement of raising funds to purchase drugs from street vendors. Recent research examining evaluation studies suggests that the magnitude of displacement effects is over emphasized and that when they do occur, their impact is minimal (Guerette and Bowers 2009).

There is good reason based on the existing research and theory to assume there will be a non-random pattern to the overdose problems even in a small geographic area. There is a likelihood that

this is related to 'nodes' that drug users are moving between, which is likely to include recovery houses. Understanding more about the spatial relationships between these patterns is fundamental to undertaking targeted prevention-focused interventions that simultaneously aim to maximize the utility of City resources and minimize the potential for loss of life.

Geographical Distribution of Overdoses: Recovery Houses and the Location of Opioid Overdoses

As indicated in the literature review, drug use and consequent drug overdoses are not randomly distributed in most cities. Significant proportions of overdoses and overdose-related deaths tend to be clustered in certain locations or neighbourhoods. Thus, for example, Dodson et al. (2018) and Rowe (2016) are able to explore models for the optimal distribution of naloxone supplies based on patterns of overdoses.

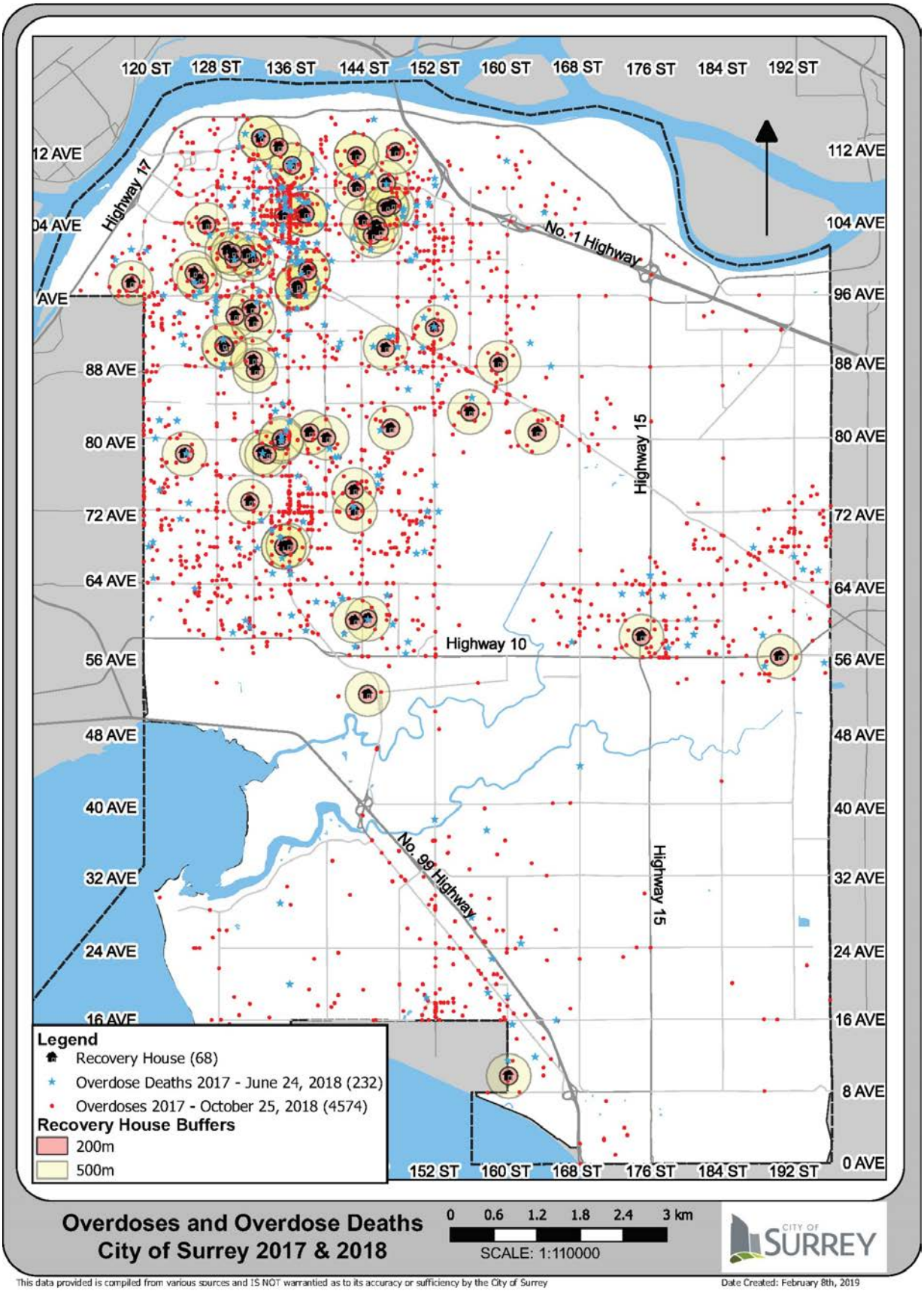
Figure 2 shows the distribution of 4,574 overdoses during the period January 1, 2017 to October 25, 2018, and 232 opioid-related deaths during the period January 1, 2017 to June 24, 2018, in the City of Surrey (the red dots and blue stars respectively). While incidents occur in all residential areas of the City, there is a higher preponderance of events in the northwest sector of the City and along the King George Boulevard corridor bordered between 108 Avenue and 64 Avenue. It is in those areas that responses need to be disproportionately, although not exclusively, focused.

Impact of Recovery Houses

Figure 2 also indicates where recovery houses are located (the black house icons). The relationship between illicit drug use and recovery houses is complex: some have referred to it as the “chicken and egg” situation. On the one hand, agencies tend to locate recovery houses in sections of a city where their potential clients are located. On the other hand, those houses act as a magnet for users seeking assistance. The result is that a strong geo-spatial correlation develops between the location of drug users and recovery houses, and that relationship further strengthens with time. An analysis of data from City of Surrey Fire Services demonstrates that in 2016 and 2017, approximately 70% of reported overdose incidents occurred within 500 meters of recovery houses. Additionally, over 90% of overdose deaths occurred within the same distance Griffioen (2018).

In Figure 2, we have created 200-meter and 500-meter circles around where recovery houses are located (the pink and yellow circles respectively). The recovery houses are identified by the small house icons at the centre of the circles. From this, it is relatively easy to see the clustering of incidents of both overdoses (red dots) and deaths (blue stars). Again, the relationship between recovery houses and overdoses (and deaths) is complex. One of the advantages offered by many recovery houses is that there are staff members who offer programing and oversight of the residents. These staff are also trained to administer naloxone in many instances. Consequently, while overdose calls for service cluster around recovery houses, there is a decrease in incidents within the space immediately adjacent to the houses themselves.

FIGURE 2


120 ST
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184 ST
192 ST
12 AVE
04 AVE
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88 AVE
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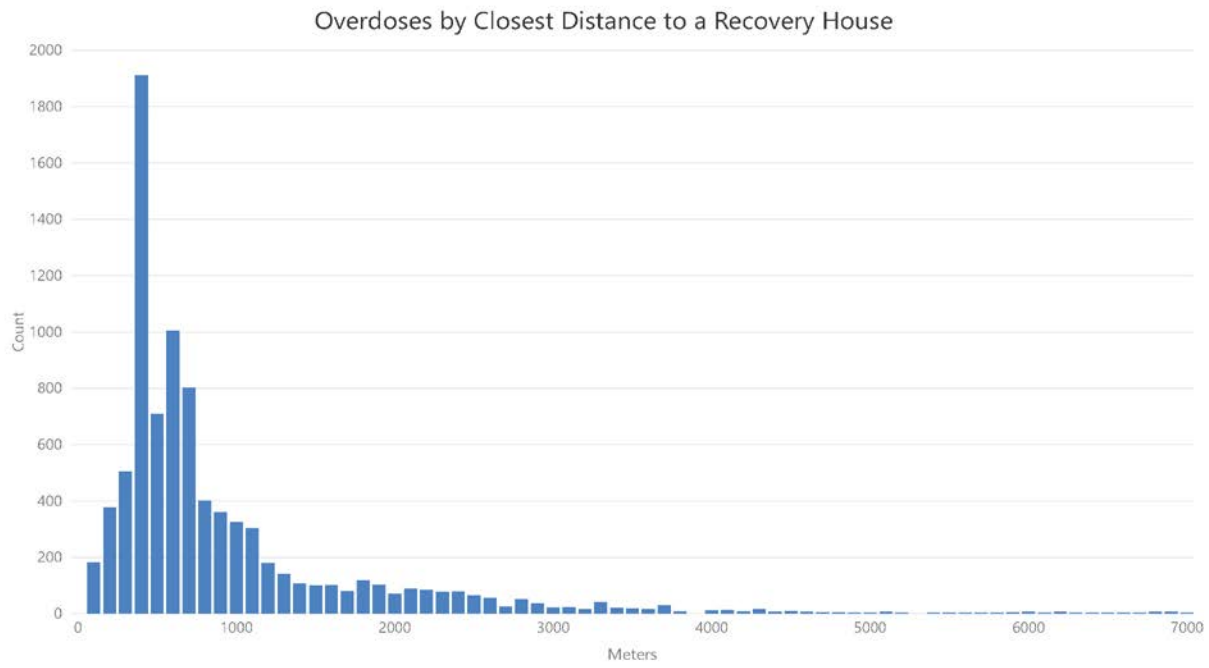
72 AVE
64 AVE
56 AVE
48 AVE
40 AVE
32 AVE
24 AVE
16 AVE
112 AVE
104 AVE
96 AVE
88 AVE
80 AVE
72 AVE
64 AVE
56 AVE
48 AVE
40 AVE
32 AVE
24 AVE
16 AVE
8 AVE
0 AVE
Highway 17
No. 1 Highway
Highway 15
Highway 10
No. 99 Highway
Highway 15
Legend
Recovery House (68)
Overdose Deaths 2017 - June 24, 2018 (232)
Overdoses 2017 - October 25, 2018 (4574)
Recovery House Buffers
200m
500m
Overdoses and Overdose Deaths
City of Surrey 2017 & 2018
0 0.6 1.2 1.8 2.4 3 km
SCALE: 1:110000
CITY OF SURREY
This data provided is compiled from various sources and IS NOT warrantied as to its accuracy or sufficiency by the City of Surrey
Date Created: February 8th, 2019

As part of the analysis, we measured the point-to-point distances between the exact location of overdose incidents and where they occurred relative to the location of the known recovery houses.[3] From that, we could find the shortest distance between the incident and the *closest* recovery home.[4]

That distribution is illustrated in Figure 3. The bottom or X-axis of Figure 3 presents the distance in meters from the closest recovery house in multiples of 100 meters.

As Figure 3 shows, the first 100 meters in and around the recovery house has few calls to respond to an overdose incident. Overdose incidents, however, spike in the next 100 meters and tend to drop consistently thereafter. This pattern is not uncommon where patterns of events are "accidental" as opposed to systematic. It is also consistent with what we know about the distribution of opioid use as outlined in the theory section above. These results are also consistent with previous studies such as that by Griffioen (2018).

FIGURE 3



We can also examine the spatial distribution of deaths due to overdoses. Again, we are looking at the point-to-point distance from where the death reportedly occurred to the closest recovery house. Figure 4 shows this distribution. Overall, the pattern is very similar to that observed in

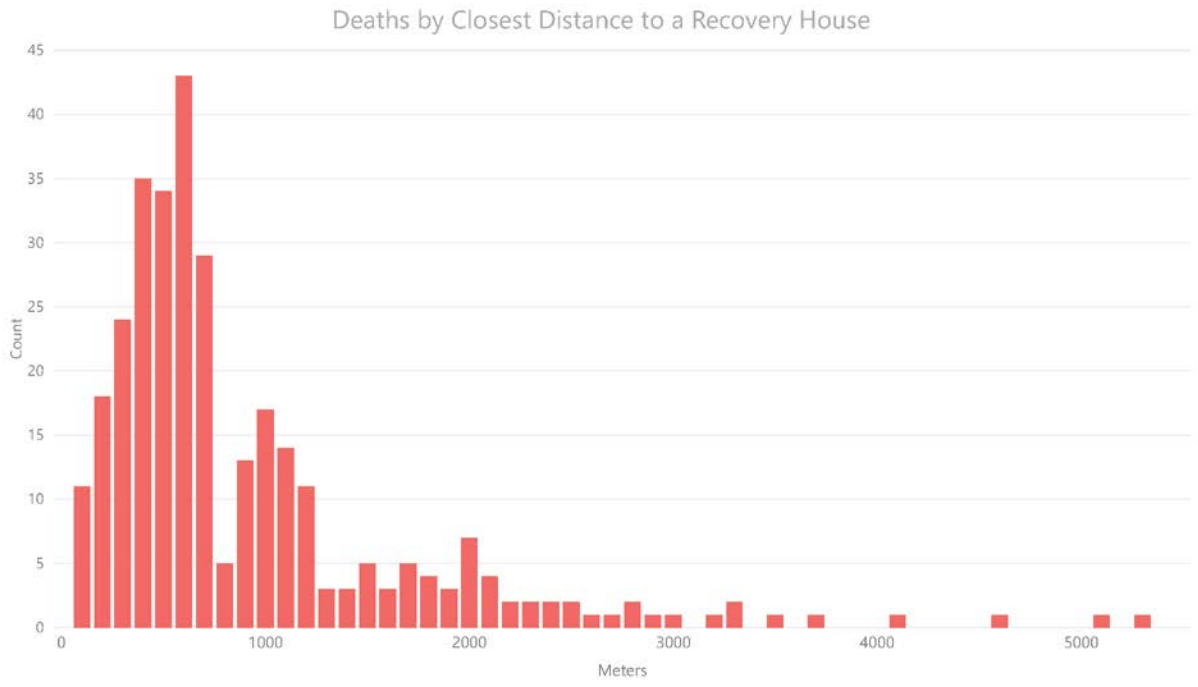
[3] We used the 68 service recovery houses identified by Surrey Fire Department in the City of Surrey including the 55 that were registered through British Columbia's Assisted Living Registry and were allowed under the City of Surrey's Business License Bylaw (Rehal, J. 2016. "Corporate Report: Recovery Houses Update." edited by Bylaw Enforcement & Licensing Services. Surrey, British Columbia: City of Surrey.)

[4] Distances are measured using the Haversine formula as the shortest between two points on the map or, to use the vernacular, "as the crow flies." An alternate approach could include driving or street distances as one sees on Google Maps and other mapping applications. Distances between an overdose event and each of the 55 recovery houses in the city were calculated with the shortest absolute distance being selected.

Figure 3, with the main differences being that the number of deaths is significantly smaller than overdose incidents and the peak number of occurrences tends to be somewhat further away from the nearest recovery house.

Both analyses—the one relating to overdoses and the one relating to deaths—suggest that a greater potential exists to use the location of recovery houses as a variable or factor to help mitigate the likelihood of overdoses and opioid-related deaths. The "doughnut hole" phenomenon of fewer than expected events at or immediately proximal to the recovery houses examined in this analysis suggest that the services provided by many recovery houses (such as the availability of counsellors and naloxone) might be having an impact in the immediate geographical area. As we indicated previously, there is a chicken and egg phenomenon relating to the location of recovery houses. Initially, some houses were located in known hotspots where there were significant concentrations of illicit opioid users. This was an attempt to bring a service to potential clients and, clearly, many do so. On the other hand, the presence of a recovery home may serve as a magnet to attract drug users to that general locale.

FIGURE 4



So far, the analysis has focused on formal recovery houses that meet the requirements of British Columbia's Assisted Living Registry. There are an additional 90 houses that have come to the attention of the Surrey Fire Department, largely through random inspections. Some of these houses may have been full-service locations at one point. Most, however, are primarily lodging spaces for addicts with no on-site staff.

The distribution of overdoses (Figure 5) and deaths (Figure 6) in proximity to these "nonrecovery" houses show a similar pattern to the previous sample of full-service homes. The incidence of both overdoses and deaths are relatively low within the immediate proximity of the residence and then

climb steeply to about a half kilometer away. After that point, both overdoses and deaths taper off with distance.

FIGURE 5

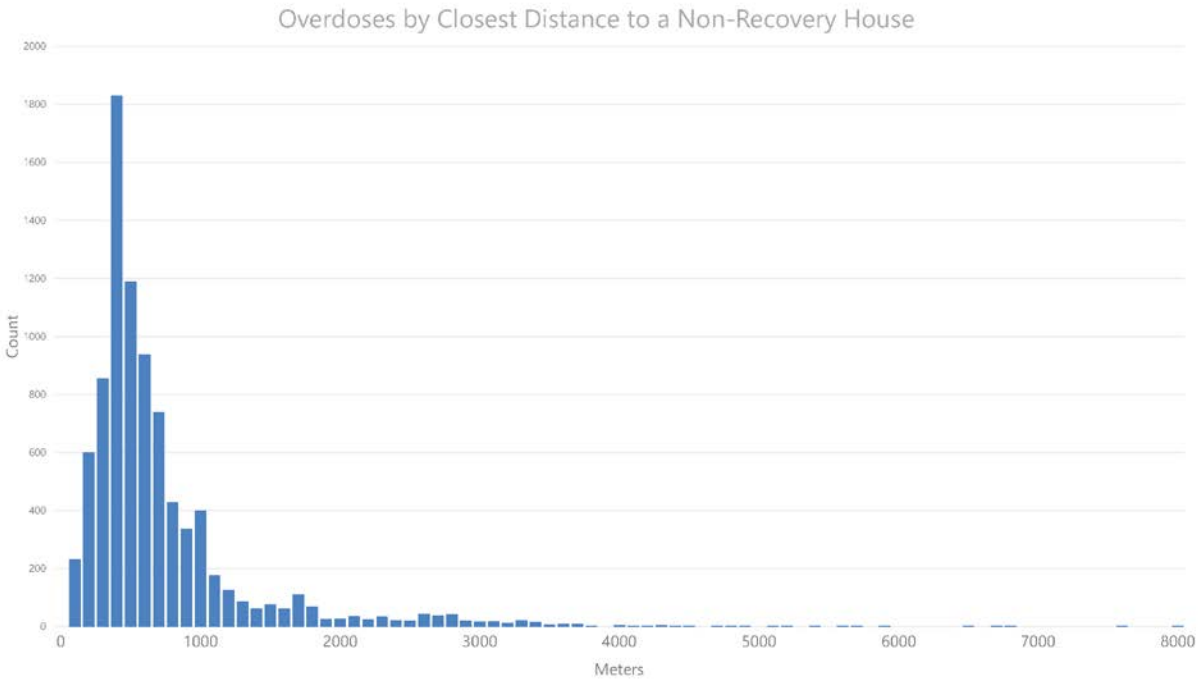
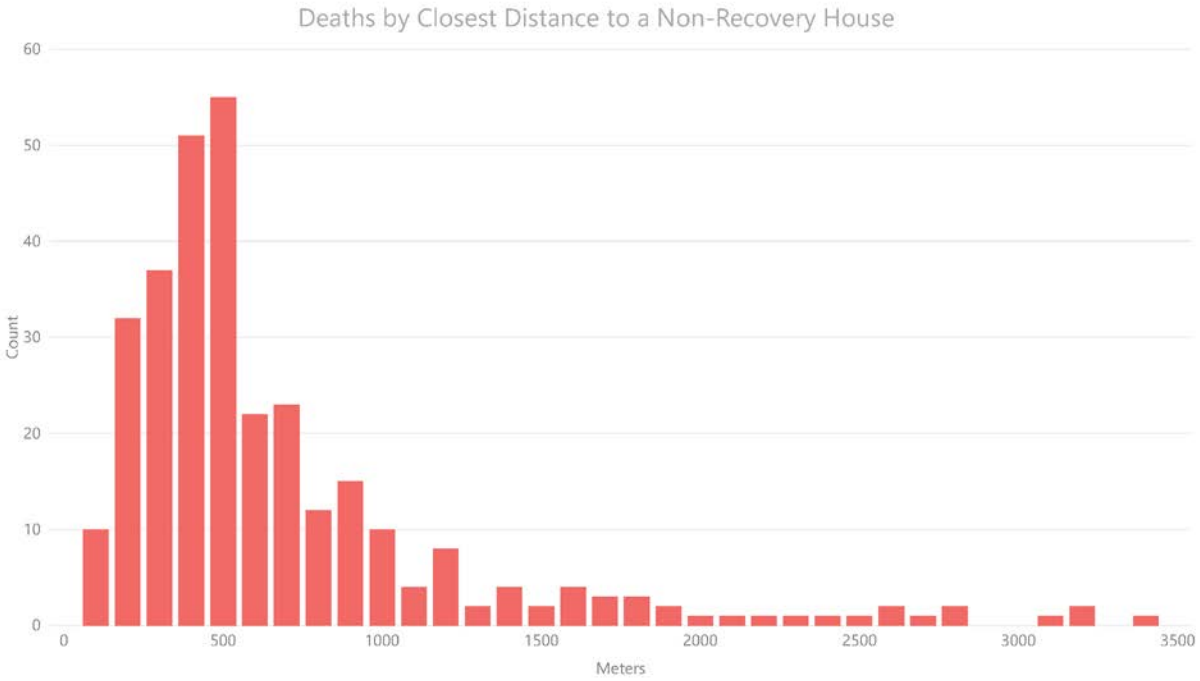


FIGURE 6



The question we might now pose is, theoretically, how can we account for this pattern of overdoses and deaths around recovery houses? Previously in this report, we focused on crime-pattern theory as a model for explaining why addicts might cluster in certain locations within a city. That perspective is a specific element within the broader theoretical context known as routine activities theory.

Routine activity theory as outlined by Cohen and Felson (1979) suggest that three key conditions are required for a crime to occur: a motivated offender, a suitable target or victim, and the absence of a capable guardian. It is the convergence of these three elements, according to Cohen and Felson, that result in a criminal event. Building on this framework, Eck (2003) suggest there is a role for a "handler" and a "place manager"– people or institutions that can exert control over potential offenders and possible crime locations. This theoretical framework can be extended to inform our understanding of the behaviour of addicts and drug consumption sites. Specifically, within the current context, Eck's model suggests that the insertion of a handler could mitigate the behaviour of addicts and a capable guardian can oversee site locations.

Simply put, handlers can influence offenders (or, in this instance, addicts); place managers can control places. Drawing from this perspective, it is possible to see recovery houses and their staff as playing the role of the handler who intervenes with addicts and a "place manager" that provides oversight of the surrounding locale.

The first application of this perspective allows us to appreciate what we have termed the "doughnut" pattern of overdoses and deaths around recovery houses. In their roles as handlers and place managers, recovery houses and their staff have an impact on the behaviour of addicts near their immediate location. The broader implication is that expanding the outreach role of recovery houses could further influence the likelihood of overdoses and deaths in the broader neighbourhood. That is, consideration should be given to expanding the roles and capacities of recovery houses beyond their immediate settings.

Analysis of Incidents Proximal to Pre and Post-Health and Safety Intervention

A "soft intervention" was made by what Eck would refer to as "super controllers"[5] to enhance the capacity of existing recovery houses in being more effective and enhancing their reach. For a sample of recovery houses, inspections were made by Surrey Fire Services in conjunction with a Fraser Heath public health nurse. Standards and by-law infractions were noted by Fire Services and assistance was provided to the site to mitigate any infractions. This included recommendations to improve the overall safety standards of the site as well as providing information and training on such relevant matters as the use of OATs by the Fraser Health public health nurses.

In all there were 166 care workers supervising 565 persons residing in these homes despite having a capacity of 863. Regarding the fire inspections, most of the registered houses were satisfactory on

[5] "Super controllers" are external agencies that have more and significantly broader powers of oversight. Formal super controllers exercise their authority "within an established institutional setting that defines who influences whom, in which ways, and under what circumstances" (Sampson et al. 2010: 41).

most items. For example, of 58 houses, an average of 84% of the inspection items were rated as being "satisfactory." Among the items deemed "unsatisfactory", however, were such things as not having a fire safety plan in place (48% unsatisfactory); where required, the unavailability of a fire department connection (46% unsatisfactory); issues with laundry rooms (39% unsatisfactory); smoke alarm issues (37% unsatisfactory); fire alarm panel issues (36% unsatisfactory); emergency lighting problems (26% unsatisfactory); exit sign and light issues (18% unsatisfactory); and, occupancy load issues (13% unsatisfactory).

Fire Department inspectors were also accompanied by public health nurses from Fraser Health. As with the fire inspectors, they found most homes to be functioning relatively satisfactory. Approximately 93% of the houses had naloxone on site although as part of their inspection activities, the public health nurses distributed an additional 204 kits, or about 3 per location. On a more problematic note, 73% of the houses did not have a training regimen in place. Consequently, training was provided to a total of 256 individuals or about 3.8 per site.

The underlying notion was that this "soft treatment" or intervention approach would improve the effectiveness of the recovery houses by reducing instances of overdoses and mortality at and in the immediate vicinity of the site.

We endeavored to conduct an exploratory study to retrospectively see whether those interventions might have had any impact on overdose and mortality outcomes. In doing this, the data were divided into pre and post-treatment records. That is, we examined the relative incidence of overdose and mortality events at or near the houses before the inspection by Fire Services and the incidence after the inspection. The distribution of overdoses both pre and post intervention is depicted in Figure 7. The results of the quantitative analysis are presented below in Tables 1 and 2 which relate to overdoses and deaths respectively.

TABLE 1: OVERDOSE INCIDENTS BY DISTANCE, PRE AND POST-INTERVENTION

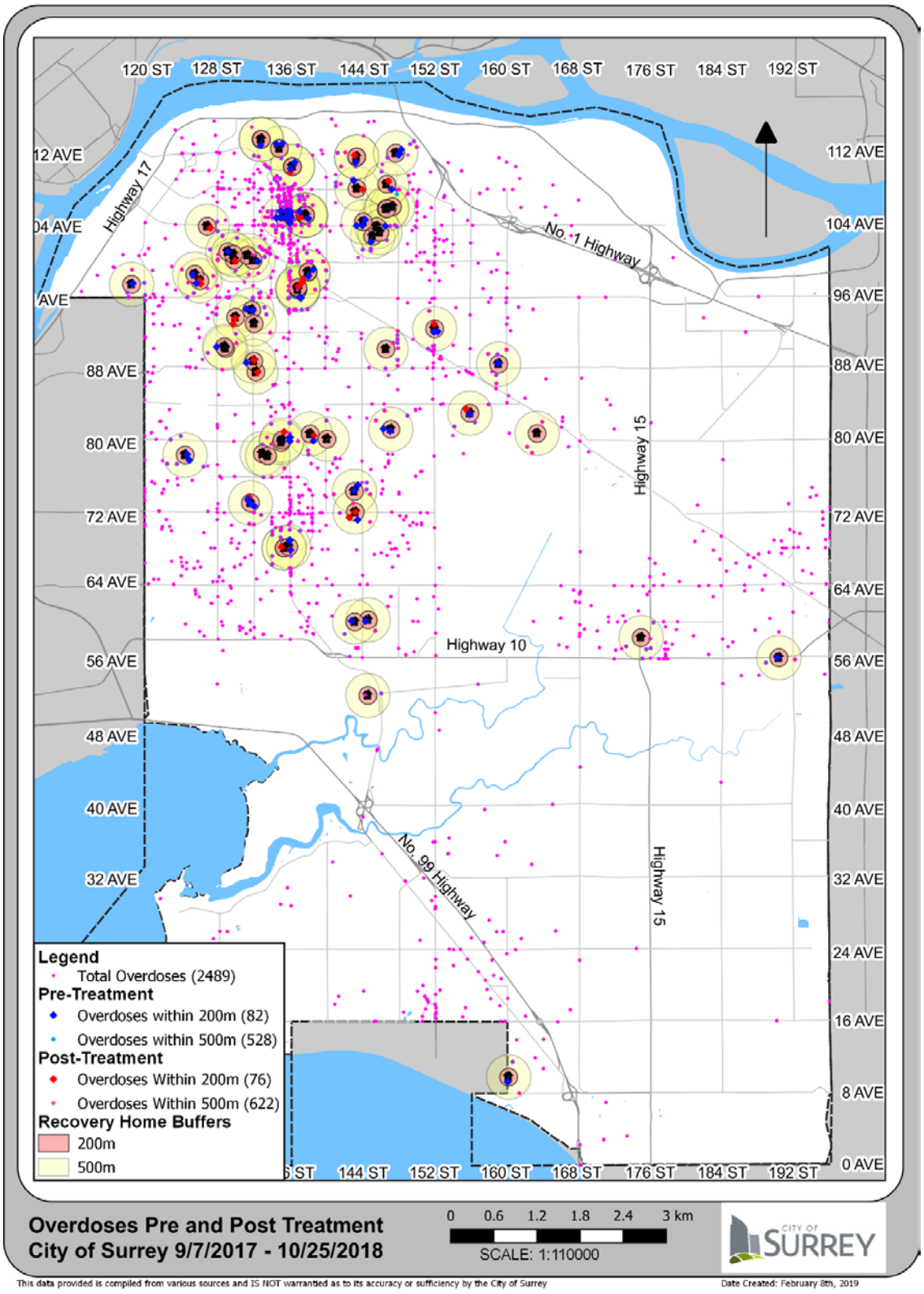
Category	Count	Percent of Total
Incidents Pre-intervention Within 200m	82	6.1
Incidents Post-intervention Within 200m	76	5.7
Incidents Pre-intervention Between 200-500m	446	33.3
Incidents Post-intervention Between 200-500m	546	40.8
Incidents Pre-intervention Within 500m	528	39.4
Incidents Post-intervention Within 500m	622	46.5
Incidents Beyond 500m	189	14.1
Total Incidents Over Period (9/7/17-10/25/18)	1339	100.0

TABLE 2: DEATHS BY DISTANCE, PRE AND POST-INTERVENTION

Category	Count	Percent of Total
Deaths Pre-intervention Within 200m	3	5.4
Deaths Post-intervention Within 200m	5	8.9
Deaths Pre-intervention Between 200-500m	13	23.2
Deaths Post-intervention Between 200-500m	14	25.0
Deaths Pre-intervention Within 500m	16	28.6
Deaths Post-intervention Within 500m	19	33.9
Deaths Beyond 500m	21	37.5
Total Deaths Over Period (12/7/17 - 6/24/18)	56	100.0

Overall, from this analysis, it does not appear that the intervention had the planned effect since there was no appreciable pattern decrease in either the incidence of overdoses or deaths within the vicinity of the recovery houses. For overdoses within 200m of a house, there was a reduction of about 0.4% (82 v. 76). In all other instances, however, the number of incidents increased in the post intervention period. We are somewhat constrained in our conclusions, however, as there was no planned comparison or control group within the analysis. That is, since the observations were made over time, it is not clear if the post period incidences might not have been even higher had the intervention not taken place. We do know, however, that the overall rates of opioid-related overdoses and deaths increased in British Columbia over the period of observation.

FIGURE 7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104 AVE
96 AVE
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80 AVE
72 AVE
64 AVE
56 AVE
48 AVE
40 AVE
32 AVE
24 AVE
16 AVE
8 AVE
0 AVE
Highway 17
No. 1 Highway
Highway 15
Highway 10
No. 99 Highway
Legend
Total Overdoses (2489)
Pre-Treatment
Overdoses within 200m (82)
Overdoses within 500m (528)
Post-Treatment
Overdoses Within 200m (76)
Overdoses Within 500m (622)
Recovery Home Buffers
200m
500m
Overdoses Pre and Post Treatment
City of Surrey 9/7/2017 - 10/25/2018
0 0.6 1.2 1.8 2.4 3 km
SCALE: 1:110000
CITY OF SURREY
This data provided is compiled from various sources and IS NOT warrantied as to its accuracy or sufficiency by the City of Surrey
Date Created: February 8th, 2019

Social Assistance, Overdoses and Property Crime

This section examines the relationship between overdoses, selected property crime incidents and income assistance payment dates. Across the City of Surrey and within the Province of British Columbia more generally, the media have reported on large spikes in overdoses which have occurred shortly after the distribution of social assistance payments. The Canadian Press (2018), for example, reported on a spike in drug overdoses occurring on Friday, October 26, 2018, only two days after an income payment date the previous Wednesday, October 24, 2018.[6]

While the literature on the relationship on the timing of social assistance payments and drug overdoses is not extensive, a group of researchers in Vancouver has examined some aspects of the issue (see: Zlotorzynska et al. (2014); Krebs et al. (2016); Wang (2016); and, Otterstatter et al. (2016)). Using data relating to intravenous drug users at Vancouver's *Insite*, Zlotorzynska et al. (2014) found a significant relationship between the rate of nonfatal overdoses and the issuance of assistance payments. Overall, the risk of an injection resulting in an overdose doubled during the three days beginning with the issuance of the assistance payments.

While not focusing on overdosing specifically, the analysis of Krebs et al. (2016) of prospective cohorts of HIV-positive and HIV-negative illicit drug users discovered a strong relationship between social assistance payments and the *intensity* of drug use. As these researchers noted, while the intensity of drug use increased immediately after the receipt of a social assistance payment, there was "a lower likelihood of increased drug use intensity in the 7–10 days prior to cheque issue."

Further analysis by Otterstatter et al. (2016) confirmed this temporal pattern of drug use at the aggregate or provincial level. Using BC Coroner's data for the period 2003-2013, Otterstatter and his colleagues concluded that about "77 avoidable deaths were attributable to the synchronized disbursement of income assistance cheques over the five year period." In aggregate, this research makes a strong case for a relationship between when social assistance payments are received, and both the incidence of drug overdoses and deaths.

In parallel with the notion that overdose incidents are related to social assistance payments, there is also evidence that an inverse relationship exists with rates of property crime. The rationale is relatively straightforward: when social assistance payments are received, individuals have access to a legitimate source of funds to support their addictions, so overdoses increase while property crimes decrease. Once their legitimate monetary sources run out, drug users resort to crime to support their addictions. In this section, we explore this proposition in some detail.

The previously cited literature provides strong evidence for a linkage between the timing of when social assistance is received and drug overdoses (the so-called "cheque effect"). In this study, we are providing a complement to this research by looking at an aggregate relationship between these elements for the City of Surrey. *That is, our focus is not on individual drug users but rather on patterns at the aggregate or community level.* Furthermore, we will also examine the aggregate relationship between the receipt of social assistance payments and crime rates.

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[6] For a listing of payment dates, see: British Columbia. 2019. "Income Assistance Payment Dates."

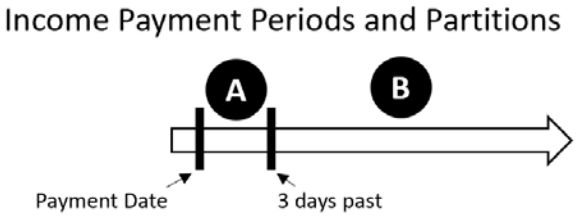
As in the previous analyses, we used overdose data as recorded by Surrey Fire Services. The crime data for the City of Surrey are limited to a series of property crimes only: break and entering into a business; residential break and enter; shoplifting; and, motor vehicle thefts. Crimes against the person and other offences are not considered in this analysis. On average, there were approximately 7.1 known overdoses per day across the city (about 50 per week) and about 45 property crimes per day (around 317 per week). As will be shown in the next section, these statistics vary considerably according to when social assistance payments are made.

We start the next section with a discussion of how a test of the relationship is constructed and then proceed to analyze the relationships between overdoses, crime incidents and social assistance payment dates.

Approach and Hypothesis

There are several ways in which the temporal analysis can be approached. To keep matters relatively straightforward, we chose to partition the daily overdose and crime incidents within the City of Surrey based on income assistance payment dates. That is to say, the data are divided into two temporal segments or partitions. Partition A is the daily incident counts within three days *of* the income assistance payment dates (the payment day plus the three following). Partition B is the daily incidents counts four or more days after those dates (that is, the remainder of the month until the next payment date). Figure 8 illustrates an example of how this partition was created based on the income payment cycles. All incident data would fall either in Partition A or B.

FIGURE 8: EXAMPLE OF DATA PARTITION



City-wide Analysis

For the global date range of October 26, 2016 to October 25, 2018, there have been 5,171 overdoses and 32,454 property crime incidents, during the 2-year period across the entire city of Surrey. This equates to an average of over 7 overdoses and 44 crime incidents a day.

Based on the periodic income assistance payment dates, the daily overdose and crime incident counts are partitioned into A and B as defined in Table 3 across the entire City of Surrey for the global date range of October 26, 2016 to October 25, 2018. Since granularity of the incident counts is at the day level, there are consistent sample sizes for A and B. The sample overdose and crime incident means for A and B are provided in Table 3 as well.

TABLE 3: PARTITION LOGIC FOR CITY-WIDE ANALYSIS

Partition	Logic	Sample Size	Sample Mean (Overdose per day)	Sample Mean (Crime per day)
A	All incidents inclusively within three days of most recent income payment date	98	9.265	38.755
B	All incidents 4 or more days after most recent income payment date until the day prior to next payment	632	6.745	45.342

For example, consider the most recent payment date of January 24, 2018 with the next payment date being February 21, 2018. Incidents occurring inclusively between January 24 to 27 would fall in A, while incidents occurring from January 28 to February 20, 2018 would fall in B. This logic is extended for all payment cycles to partition the crime and overdose data entirely.

In validation of the hypotheses that overdose incidents are higher in A compared to B and that property crime incidents are lower in A compared to B. In other words, we put forward the two working hypotheses:

> For overdose incidents: the mean number of overdoses will be *greater* around the days surrounding assistance payments (A) than the remainder of the month (B).
>
> For property crime incidents: the mean number of crimes will be *lower* around the days surrounding assistance payments (A) than the remainder of the month (B).

Two tests, one parametric and one non-parametric, are used for analysis. The parametric Student's T-Test is considered which relies on the central limit theorem of normality of the mean, though the underlying distribution of incidents need not be normal, e.g. see (Rice, 2006). The non-parametric Wilcox Test is also considered which does not have any normality assumption (Siegel, 1956). Based on Table 3, the sample sizes are sufficient, and there are no concrete social or other indications that we are aware of in terms of questioning variable independence. Thus, assumptions are valid to perform these tests. The R programming language (R Development Core Team, 2008), run through Microsoft's cloud computing analytics platform Azure Databricks (Microsoft, 2018), is used to efficiently and effectively implement these tests.

City-wide Results and Discussion

After partitioning the data, statistical testing was conducted to determine whether there was a significant relationship between social assistance, through income payments, and incidences of drug overdose and crime. The general hypothesis is that within the first three days of the payments being made, the daily overdose counts would be higher in comparison with the remaining days of the month, while inversely, the crime incidents would be lower. This pattern can be visually demonstrated below in Figures 9 and 10, where indicated in red are the first three days of income assistance payments against the remaining days indicated in blue for daily overdoses and crime incidents respectively.

FIGURE 9: AVERAGE DAILY OVERDOSES BY DAY OF ASSISTANCE

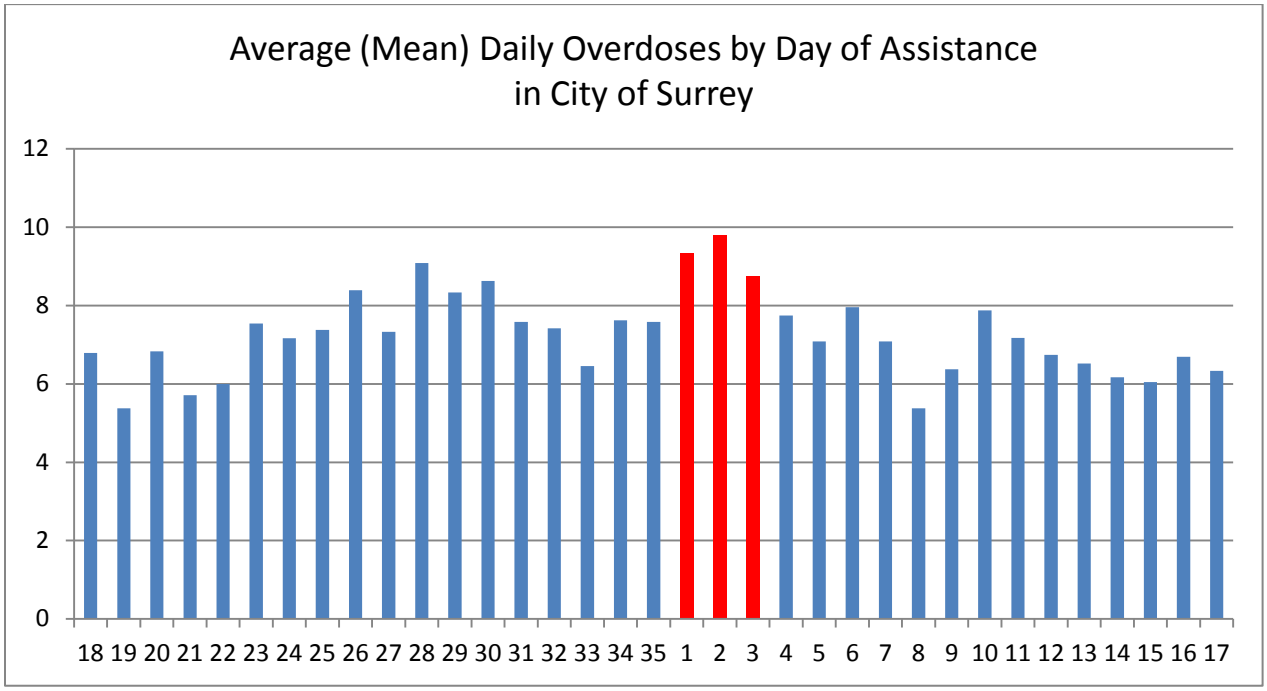


FIGURE 10: AVERAGE DAILY CRIMES BY DAY OF ASSISTANCE

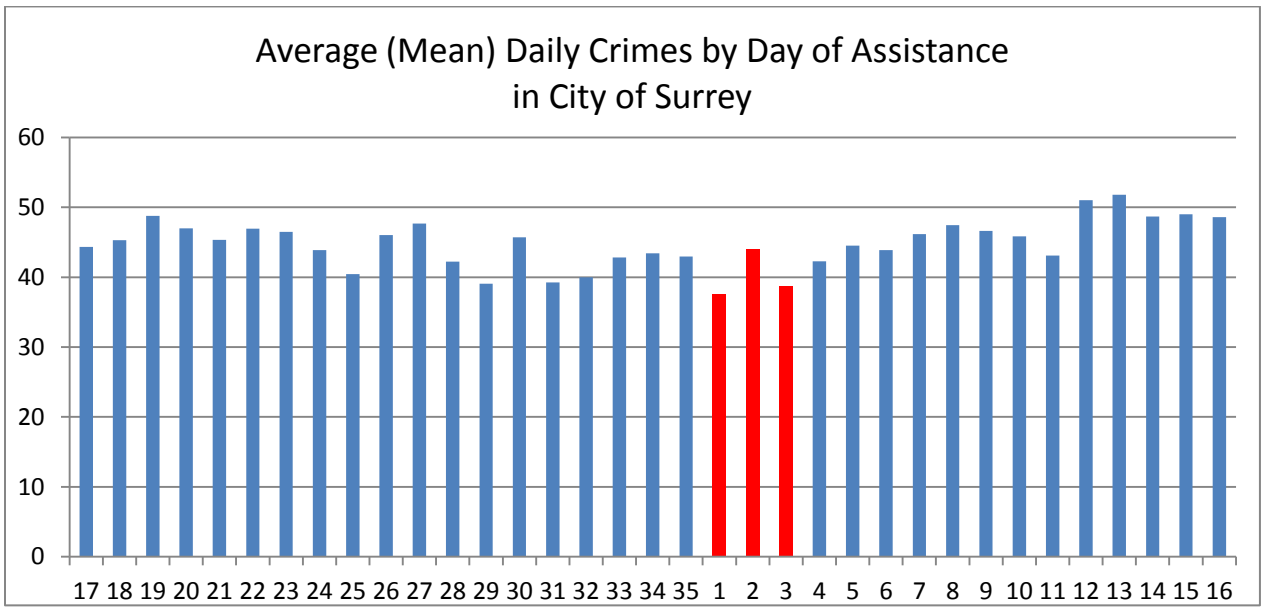
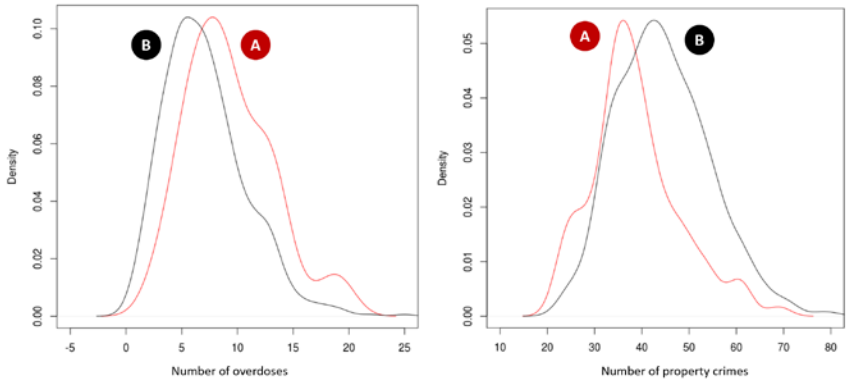


Table 3 shows the difference in sample means. Statistically significant results are found from both the T-Test and Wilcox Test for overdose and property crime incidents. Based on those results, we decided to accept our working hypotheses. That is, overdoses are statistically significantly higher around the days assistance cheques are distributed than in the remainder of the month, while property crimes are significantly lower during the distribution period.

To further illustrate the difference between incident occurrences within three days of income payment dates and occurrences afterwards, Figure11 highlights the density distributions between A and B for overdose and crime daily incidents. These results demonstrate the statistically significant alternative that within the first three days after income payments come out, there are higher overdose and lower property crime incidents across the entire City of Surrey.

In fact, from the statistically significant results found, there is an approximately 37% increase in daily overdoses during the first three days of the most recent income payments. Conversely, there is 15% decrease in daily crime incidents during the three days. These are noteworthy indications on the importance of income payments on overdose and crime rates across the entire city of Surrey.

FIGURE 11: DENSITY DISTRIBUTIONS FOR PARTITION A AND B OF OVERDOSE AND CRIME INCIDENTS



Across the City of Surrey and in the Province of BC, there have been recent media reports on large spikes in overdoses, which have occurred shortly after the assistance payments. One example as noted earlier was the Canadian Press report (Dyck, 2018) on a spike in drug overdoses occurring on Friday, October 26, 2018, only 2 days after an income payment date on Wednesday, October 24, 2018 (BC Government, 2018).

City of Surrey Region-level Analysis

Following city-wide analysis, based on location data as described earlier, specific rectangular regions in City of Surrey are constructed. They are based on varying distributions of recovery houses, as well as well-known concentration areas in Surrey where overdoses occur frequently. The same statistical testing is applied for daily crime and overdose incidents, occurring within each of these zones, partitioned using the income payment dates. The goal would be to determine whether statistically significant results of differing incident rates are present in proximity of recovery houses. This approach is based on report findings from Griffioen (2018).

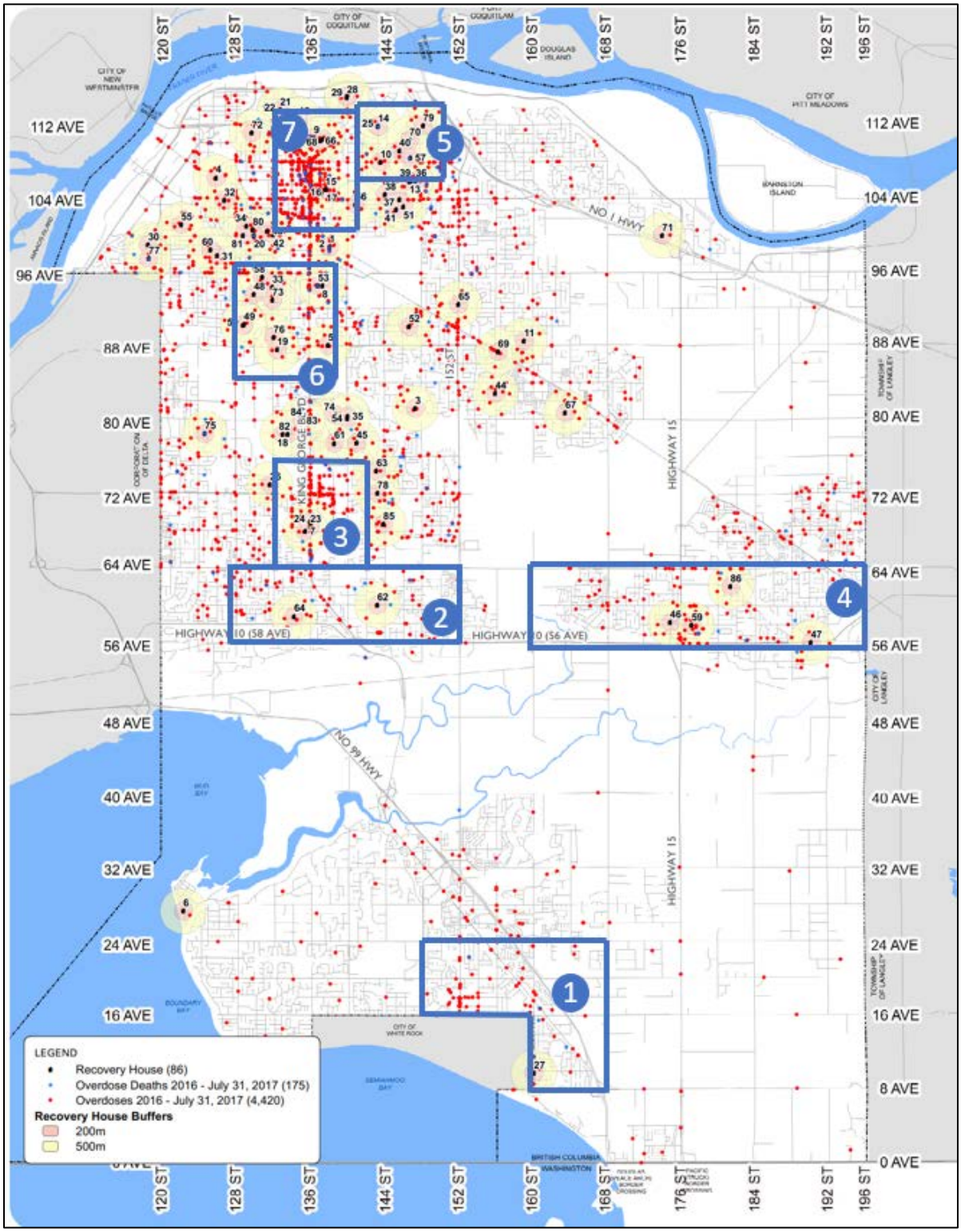
A total of seven regions in the City of Surrey are considered for this analysis. Their descriptions as well as geographical boundaries, given by the upper-left and lower-right boundary points from City of Surrey's COSMOS CAD coordinate system (City of Surrey, 2018), can be found in Table 4. Figure 12 illustrates the boundaries of these regions on a map of Surrey.

TABLE 4: DESCRIPTIONS ON CITY REGIONS CONSIDERED

ID	Upper Left Bound	Lower Right Bound	Approximate area	Description
1	(513722.0, 5432550.8)	(517735.1, 5429343.9)	148 ST / 24 AVE to 168 ST / 8 AVE	1 recovery home
2	(509625.8, 5440728.3)	(514510.4, 5439092.2)	128 ST / 64 AVE to 152 ST / HW 10	2 recovery houses
3	(510421.6, 5443133.6)	(512487.5, 5440735.7)	132 ST / 76 AVE to 142 ST / 64 AVE	3 recovery houses
4	(516124.2, 5440688.3)	(523314.7, 5439117.4)	160 ST / 64 AVE to 196 ST / 56 AVE	4 recovery houses
5	(512183.3, 5450550.8)	(514101.0, 5448778.4)	140A ST / 113 AVE to 150 ST / 104 AVE	7 recovery houses
6	(509624.3, 5447155.6)	(511248.6, 5444766.7)	128 ST / 96 AVE to King George / 84 AVE	10+ recovery houses
7	(510467.6, 5450707.9)	(512077.0, 5448339.7)	132 ST / 113B AVE to 140 ST / 102 AVE	Main King George 104 corridor

For example, Figure 12 illustrates a large concentration of recovery houses and overdoses around the King George corridor between 104th and 108th Avenue. This concentration is contained in Region 7 from Table 4.

FIGURE 12: DISTRIBUTION OF FOCUS REGIONS WITHIN CITY OF SURREY



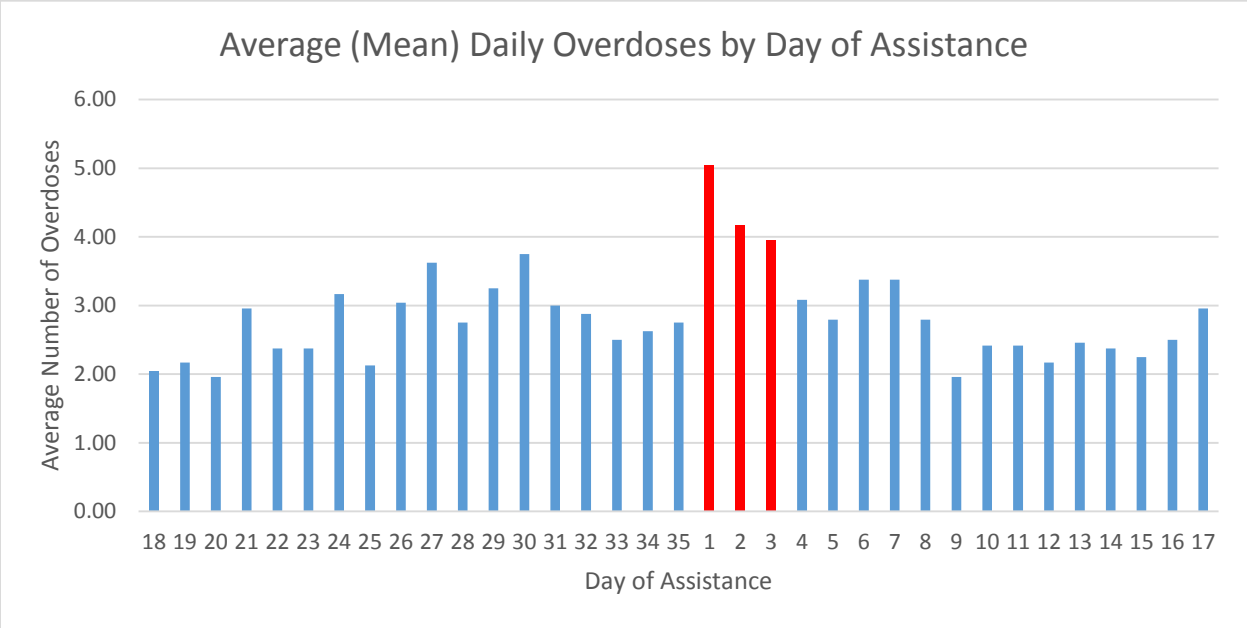
Region 7 Analysis on Overdoses, Crime and Assistance Payment Days

Analysis specific to Region 7, the primary concentration area of overdoses in Surrey, are shown below. A graphical depiction of daily overdose occurrences in this region between the same global date range October 26, 2016 to October 25, 2018, related to assistance payment dates, is illustrated in Figure 13 below. The first three days (social assistance payment date and the two following) are indicated by the red bars while the remaining days of the month are indicated in blue. As Figure 13 suggests, the first three days appear to have higher average overdoses than the remainder of the month. While the overall daily average for overdoses is 2.8, the average for the social assistance period (marked in red in Figure 13) is 4 overdoses per day. That number drops to 2.6 (the blue bars) for the remainder of the month.

From the regular partitions of A and B for daily overdoses in Region 7 as seen in Table 5, our statistical analysis suggests that the difference in the average number of overdoses per day between the partitions is statistically significant.[7]

Despite this difference between the two date partitions, it should be noted that there appears to be considerable cyclical variation from day to day. Regardless, the risk of overdosing is greater on those days associated with the distribution of social assistance payments.

FIGURE 13



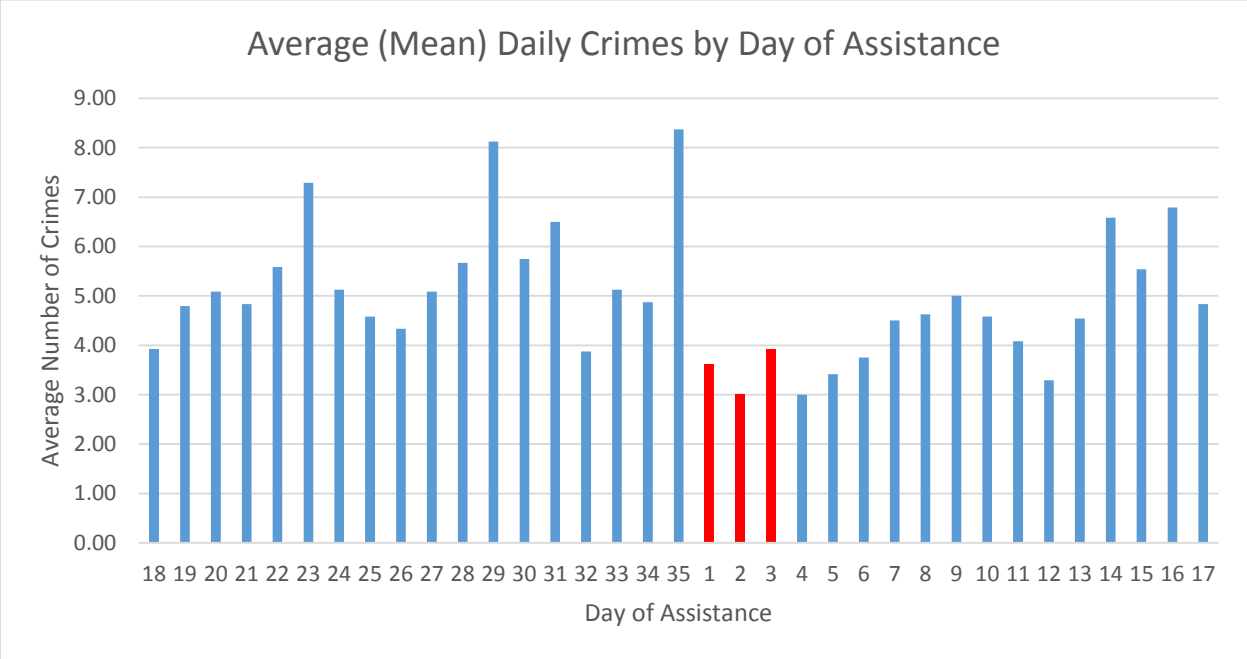
[7] Two-sample t-test, p<.001; Mann-Whitney (Wilcoxon) test, p <.001

TABLE 5: PARTITION LOGIC FOR REGION 7 ANALYSIS OF OVERDOSES

Partition	Description	No. of Days	Mean No. of Overdoses per Day
A	All incidents inclusively within three days of most recent income payment date	98	4.02
B	All incidents 4 or more days after most recent income payment date until the day prior to next payment	632	2.63

Regarding crime rates and income assistance, Figure 14, where as usual red indicates the first three days of income payments and blue the rest, suggests that the crime rates increase as we move beyond the payment dates in Region 7, similar to the city-wide analysis results. The overall trend in Figure 14 is the opposite to the pattern for overdoses.

FIGURE 14: AVERAGE DAILY CRIME BY DAY OF ASSISTANCE



Analysis was performed based on same partition into periods A and B as defined in Table 6 for Region 7. Unlike with overdoses, property crime occurrences increase the further one moves from the assistance payment dates. This is despite the weekday cycle within the data. On average, there are almost 1.5 times more property crime incidents reported in the period of partition B than in partition A. Once again, this difference is statistically significant based on generally accepted criteria.[8]

[8] Two-sample t-test, p<.001; Mann-Whitney (Wilcoxon) test, p <.001.

TABLE 6: PARTITION LOGIC FOR CITY-WIDE ANALYSIS TOTAL PROPERTY CRIMES

Partition	Description	No. of Days	Mean No. of Property Crimes per Day
A	All incidents inclusively within three days of most recent income payment date	98	3.39
B	All incidents 4 or more days after most recent income payment date until the day prior to next payment	632	5.01

All Regions Analysis on Overdoses and Assistance Payment Days

The seven regions for analysis provide a fair representation of the overdose and crime situations in the City of Surrey. Understanding how incident rates change based on income assistance payment dates in these regions, including the main concentration of overdoses in Region 7, could start to provide a generalized foundation with policy implications for the City of Surrey, in different areas or districts with varying socio-economic characteristics.

For regional level analysis, overdose and property crime daily incidents are grouped based on whether they occurred in each of the seven regions, and then partitioned into A and B based on income assistance payment dates. The same null hypotheses and alternatives framework and tests are considered, from the city-wide analysis. The same sample sizes are also present as incident counts are all reported at the day level. Altogether, assumptions for the statistical tests to be applied are valid. Table 7 provides the daily sample overdose and crime incident means for A and B within each of the areas.

TABLE 7: SAMPLE MEANS FOR REGION-LEVEL INCIDENTS

Sample Means Type	Region Partition	1	2	3	4	5	6	7
Overdose	A (pay period)	0.173	0.378	0.490	0.224	0.122	0.265	4.020
Overdose	B (Non pay period)	0.160	0.217	0.487	0.158	0.108	0.178	2.633
Property crime	A (pay period)	1.592	0.969	2.153	1.908	0.561	0.776	3.388
Property crime	B (Non pay period)	1.951	1.274	2.627	2.324	0.698	0.948	5.014

City of Surrey Region-level Results and Discussion

In each of the regions, there is consistently higher sample mean for overdoses in A compared to B, and lower sample mean of crime incidents. After applying the T-Test and Wilcox Test, three out of the seven regions demonstrated statistical significance in rejecting the null hypotheses and favoring the alternative of higher overdose incidents within three days of income payments. Even more, as a conservative measure of needing to reach the same conclusion from both tests, five out of the seven regions demonstrated statistical significant (based on the standard threshold of p = 0.05) in favoring the alternative of lower property crime incidents in A. If only the T-Test is considered, results from all seven regions would favor the alternative. Table 7 lists all the results on analysis for each of the areas.

These results, reported in Table 8, again demonstrate, even at the region-level, the clear data-driven insights that in areas with recovery houses, even ones with varying concentrations and number of houses, individuals are getting regular social assistance payments, presumably through the houses' landlords, to support their drug addictions and then overdosing, particularly in Regions 2, 6, and 7. They do not to turn to crime when legitimate money is available, thus contributing to lower crime rates across all of the City of Surrey, and within most regions within the city as well. As soon as it runs out, a few days from the payments coming in, crime rates go up again. More details on policy implications for these results will be addressed in the final section.

TABLE 8: REGION-LEVEL STATISTICAL RESULTS

Region	Overdose Working hypothesis: A (pay period) = B (Non-pay period)			Property Crime Working hypothesis: A (pay period) = B (Non-pay period)		
	P-Value (T-Test)	**P-Value (Wilcox)**	**Conclusion (p = 0.05)**	**P-Value (T-Test)**	**P-Value (Wilcox)**	**Conclusion (p = 0.05)**
1	0.385	0.372	No significant difference	0.009	0.009	**Statistically significant**
2	0.008	0.003	**Statistically significant**	0.004	0.021	**Statistically significant**
3	0.486	0.239	No significant difference	0.014	0.003	**Statistically significant**
4	0.110	0.112	No significant difference	0.018	0.004	**Statistically significant**
5	0.359	0.507	No significant difference	0.039	0.233	No significant difference
6	0.049	0.008	**Statistically significant**	0.049	0.057	No significant difference
7	< 0.001	<0.001	**Statistically significant**	<0.001	<0.001	**Statistically significant**

Can the Neighbourhood or Geo-spatial Distribution of Overdoses be Predicted?

Predictive Modeling

Part of this project was conducted in conjunction with Microsoft which provided access to their Azure platform to address the question of whether daily overdose incidents could be predicted with any degree of certainty. Predictive modeling techniques are applied for Region 7, which has the main concentration of overdoses in City of Surrey.[9] This paper highlights the high-level steps to perform predictive modeling on overdose incident data. A more extensive overview on the modeling techniques can be gathered from (Duan 2014). The iterative process in applying model techniques can be reviewed at Microsoft (2017) using the Team Data Science Process.

The general goal of predictive modeling is to develop a statistical algorithm or model to predict a specific data field, known as the label. In the case of this paper, the label is the number of daily overdose incidents within a region. A widely used algorithm for this type of analysis is known as Random Forest, which builds an ensemble of decision trees or nodes. The individual trees reflect predictions for specific characteristics or variables through binary logic (such as yes or no). The Random Forest approach provides an overall prediction based on a democratic voting process, known as the ensemble approach (Breiman 2001).[10]

To develop such a model, historical data, known as a training set, is used that contains the known label field along with other variables or characteristics, known as features. The trained algorithm can then be applied to new data to predict the label. In practice, to evaluate and understand how accurate the algorithm performs, historical data are divided into a training and a testing set. The model would be built from the training set and it would make predictions based on the testing data. Since the labels from the testing set are known, they can be compared against the algorithm's predictions to determine accuracy and performance of the overall model.

In the context of this paper, the label or characteristic of interest is the number of daily overdose incidents that take place within a given location. The historical dataset contains daily incident counts along with the following predictive characteristics:

- Seasonality, including month and day
- Day of the week
- Days since last income assistance payment
- Property crime type incident counts (that is, Break and Enter, Shoplifting, Motor Vehicle Theft)
- Total property crime incident counts

[9] A similar approach could be applied for other regions and even for the entire city given sufficient data.

[10] Other examples of algorithms used in industry and academy are linear regression, support vector machines, and neural network, which are usually defined in a mathematical nature. An excellent introduction to these techniques is provided in Bishop, Christopher M. 2006. *Pattern recognition and machine learning*. New York: Springer.

- Crime and overdose incidents for previous day, the previous two days, and the previous week

The training data set is drawn from incidents that occurred from October 26, 2016 to August 31, 2018, while the testing data drawn from incidents that occurred from September 1, 2018 to October 25, 2018. This distinction is illustrated in the following Table 9.

TABLE 9: TRAINING AND TESTING SPLIT INFORMATION

	Split Date Range	Sample Size	Number of Features
Training set	October 26, 2016 to August 31, 2018	675	29 + label
Testing set	September 1, 2018 to October 25, 2018	55	29

A technique known as Random Forest is used as the modeling algorithm and to evaluate accuracy, the absolute difference between daily actual and predicted overdoses is calculated. This difference is known as the error. The analysis was run on Microsoft's cloud computing analytics platform, Azure Databricks (Microsoft 2018), that allows for efficient and effective calculations.[11]

Modeling results and discussion

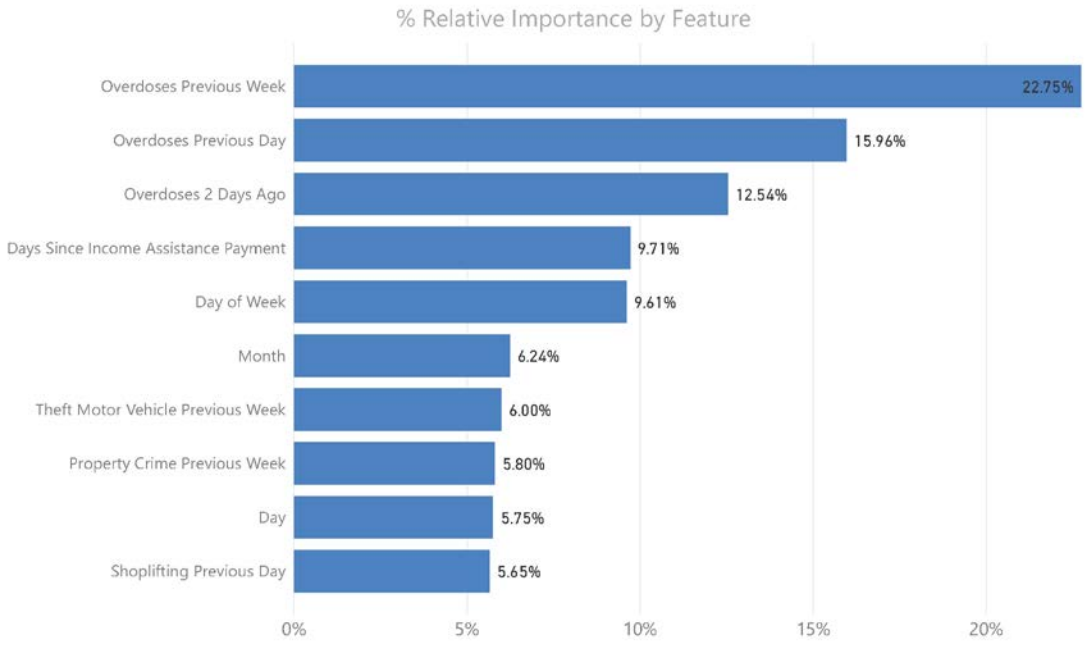
After the predictive modeling algorithm was built from the training set, data from the testing set was applied to the model algorithm. The error, which is the absolute difference between actual and predicted number of events, was then calculated. The predictive modelling error rate was estimated to be **1.13**.

The interpretation of this result is that had the model been used to predict overdoses from September 1, 2018 to October 25, 2018 in Region 7, it would have been only slightly over an overdose off from predicting the actual outcomes. Considering a daily average of approximately three overdoses in this region, and seven overdoses across the city, we feel this is a significant accomplishment. The question remains, however, as to whether this magnitude is sufficient to warrant operational interventions. That is, whether this estimate would warrant the financial and resource costs to have a significant impact on the number of overdose occurrences.

Figure 15 provides the relative importance of the top features in driving opioid overdose prediction as determined by Random Forest. The relative importance score of features are calculated as a function of how often the features are considered in the model's training process of individual Decision Trees that contribute to the most decisive splits in predicting number of overdoses.

[11] The specific routines were drawn from the Random Forest R library (Liaw & Wiener, 2002)

FIGURE 15: MAIN FEATURES RELATED TO OPIOID OVERDOSES



In addition, since the Random Forest model builds several Trees through ensemble modeling, a single Decision Tree can be visualized in order to illustrate the logic flow in starting to understand how Random Forest makes predictive decisions. Figure 16 shows the structure of decision-making that is constructed through a single Decision Tree. Random Forest is more complex since multiple Trees are considered with other variations. This approach is common in attempting to unravel the "black-box" of predictive modeling.

As expected from Random Forest's feature importance rankings, overdoses in the previous week and day, as well as days since last income payments are critical in driving overdose predictions. In addition, the structure of the Decision Tree in Figure 16 also reveals crucial information in splitting thresholds that may have genuine policy impacts. For example, if it is less than 2.5 days since last income payments, there would generally be higher overdoses, which aligns with the significant findings previously noted in this paper.

Below are some key thresholds in determining whether number of overdoses would be high as determined through the Decision Tree structure in Figure 16:

- Over 30.5 overdoses in the previous week
- Over 10.5 overdoses in previous day
- Week of day is Saturday or Sunday
- Over 5.5 property crimes in previous day

FIGURE 16: HIERARCHY OF CHARACTERISTICS RELATED TO OPIOID OVERDOSES

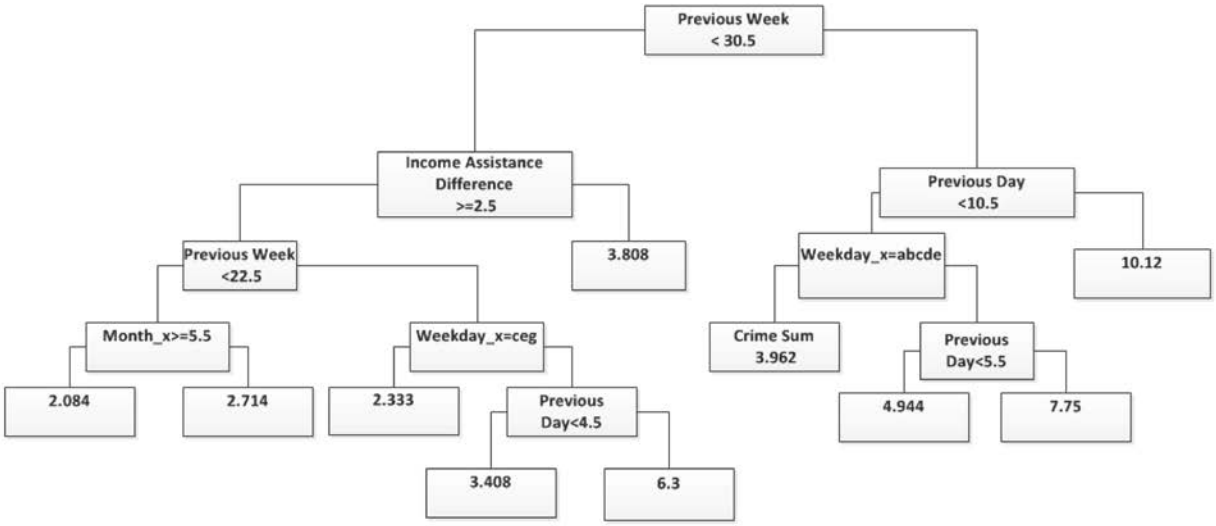
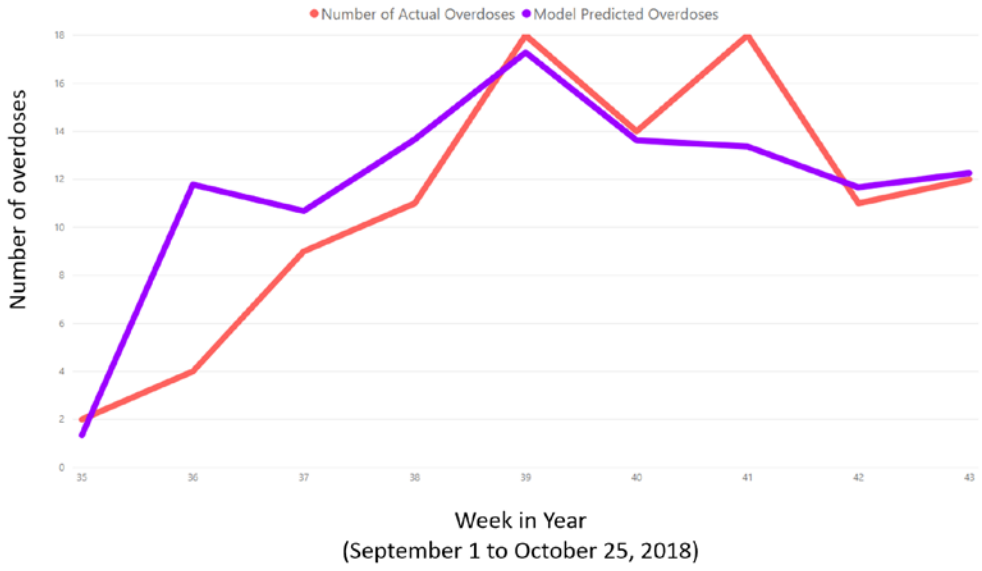


Figure 17 illustrates the weekly average of actual overdose incidents during the period of September 1, 2018 to October 25, 2018 and how the predictions compare. The predictive model can recognize the upward trend of overdoses from September 1 into a peak, namely, the next income payment date. The model can also return key features that contribute to predicting overdose occurrences (Liaw and Wiener 2002). Evidently, seasonality as well as days since last income payment are very important in the algorithm's predictions. Other key drivers include:

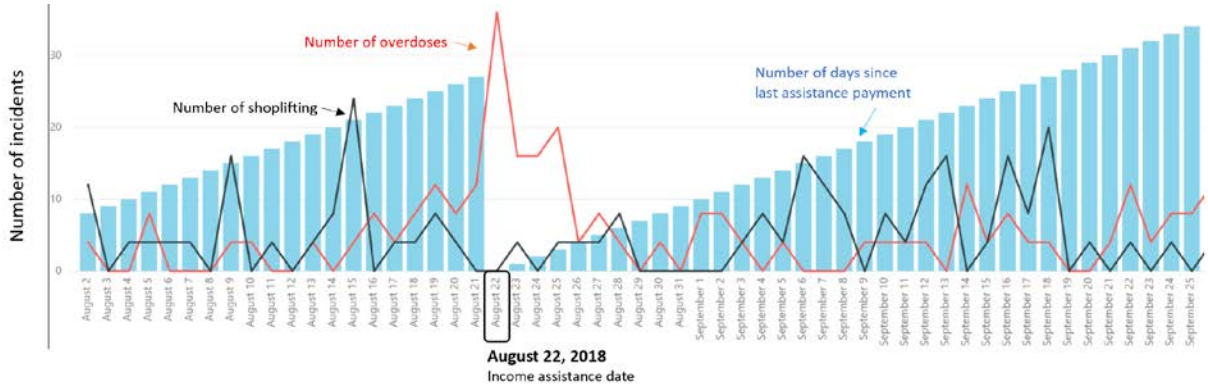
- Day of week
- Overdose incidents occurring in the previous day, 2 days, and week
- Shoplifting incidents
- Property crime incidents occurring in the previous week

FIGURE 17: PLOT COMPARING ACTUAL AGAINST PREDICTED OVERDOSES PER WEEK



The predictive modeling results for Region 7 look to be promising and worthy of future development to improve the model's accuracy and to expand into different regions. These results could be used to foster the start of data-driven discussions on how to enable responders to be more proactive on overdose incidents. Equipping them with possible predictive knowledge on where overdoses may occur next could allow for faster and more effective responses. The ability to marginally increase the accuracy of overdose occurrences predictions at specific locations and regions could enable responders to provide in-advance educational treatments, drop off overdose naloxone kits, or even have ambulances ready for response in high-risk areas.

FIGURE 18: PATTERN OF OVERDOSE AND CRIME



In conclusion, this section has highlighted the unfortunate pattern of income payments, overdose rates, and crime incidents of the opioid crisis in the City of Surrey. Whether it is across the entire city, or localized to specific regions with nearby recovery homes, individuals are overdosing at much higher rates once social assistance payments come in. Property crime rates go down as legitimate sources of money flow into the City. Based on the modeling analysis performed, shoplifting and overall recent property crime incidents are also found to be correlates of overdose occurrences. In other words, as soon social assistance monetary sources run out, crime increases, particularly shoplifting, which would appear to further support drug consumption and sometimes overdosing. Figure 18 illustrates this pattern through a visualization between August 2 and September 25, 2018 in Region 7.

Policy Recommendations

Based on our analysis of the distribution of opioid-related deaths, overdoses and crime, we have concluded that there are several major policy directions that might affect a reduction in incidents.

Social Assistance Payments, Overdoses and Crime

For opioid addicts, there are two major concerns: the first is obtaining a reliable supply of drugs, and the second is obtaining the resources to obtain that supply. For addicts who are at the stage where they wish to make a transition away from harmful opioids such as heroin, oxycontin or fentanyl, we have largely addressed the problem. Methadone therapy is readily provided through clinics nationwide and it is available at a reasonable price. Addicts on methadone maintenance therapy can lead functioning lives by satisfying the craving for alternate opioids.[12] Similarly, current pharmaceutical prices for methadone are not exorbitant even for those on social assistance. Newer therapeutic drugs, such as suboxone, are often less available and somewhat more expensive, but are still available to a substantial proportion of addicts seeking treatment.

The issue we have not addressed successfully is that of addicts who are not at the stage where they are willing or able to make the transition from what we typically refer to as "street drugs." For addicts, obtaining street drugs on the underground economy is fraught with problems relating to availability, quality assurance, and price. In the extreme, quality assurance issues lead to many of the overdose and mortality incidents we have addressed earlier. Price issues force many addicts, even those with regular employment or on social assistance, to seek ways to supplement their income. Typically, drug addicts resort to criminal or other forms of socially dysfunctional behavior to obtain the resources to buy their drugs.

While opioid overdoses and overdose-related deaths are an ongoing phenomenon, it is evident that a "spike" exists in these occurrences following the dates when social assistance payments are made. Similarly, crime rates fall when assistance payments are made. This observation is not unique to Surrey since the pattern has been noted in other jurisdictions. In parts of the US, this phenomenon is known as the "cheque effect."

We also note that in the period immediately prior to the distribution of social assistance payments, property crimes tend to increase. While property crimes are committed by many different types of people for many different reasons, it is logical to assume that some portion of that is due to addicts foraging for resources to support their habits as assistance payments have run out.

While there is currently little empirical evidence to show that altering assistance payments has a major effect, it is conceivable that a redistribution of social assistance payments would mitigate and, to some degree, "level out" the spikes in overdosing and property crime.

We do not know what the optimal distribution of payment might be; however, economic theory would suggest that redistributing payments over more periods would likely serve to smooth out

[12] We recognize the fact that, as opioid drugs themselves, methadone, buprenorphine, and Suboxone all have some inherent potential for abuse. For a substantial proportion of the addict population, however, they do provide a functional treatment option.

opioid purchases. This, in turn, would likely reduce the spike in overdoses. Clearly, a balance needs to be struck between the mechanics of distributing payments and the needs of the recipients. Currently, assistance payments are made monthly. Within the general labour market, however, salary payments are typically made weekly, biweekly, or monthly. A pilot project might be considered where assistance payments are increased to weekly and biweekly periods in tandem with general labour market practices.

Making "regulated" supplies of opiates available to addicts who are not ready to make the transition away from harmful drugs is another alternative. British Columbia has recognized this as a viable alternative with the creation of several safe consumption sites. The number of such sites, however, is clearly not adequate to undermine the underground economy in opiates.[13]

Recovery House Standards

In this study, we noticed that recovery houses appear to act as what Eck would term handlers and site controllers. Consequently, overdoses and deaths are lower in the immediate vicinity of the recovery house locations. Based on this finding, we might suggest that the role and responsibility of recovery houses be extended beyond their immediate confines. This would likely necessitate increasing the capacity of the homes by providing increased functional responsibility and training to staff and others associated with the houses.

Currently, there are two general groups of recovery houses operating in the City of Surrey. There are those that are registered through British Columbia's Assisted Living Registry (n=55) plus another group (n=12) that are allowed under the City of Surrey's Business License Bylaw. There are also houses that are essentially residential locations only that are not regulated (n=90) . While the latter group clearly fulfils a residential need for opiate addicts, greater oversight and regulation of those locations could have an impact on rates of overdose, deaths and crime rates at or near those sites. Besides ensuring that existing municipal and provincial health and safety standards for multiple dwelling units are enforced, standards relating to the availability of OATs, professional counselling, and the availability and disposal of drug paraphernalia might be considered or services be illuminated through active enforcement.

[13] Almost two decades ago, the government of Portugal instituted a policy of decriminalizing drug use and making legal supplies more available. While there have been implementation issues, the program has been considered largely successful. See: Domoslawski, A. (2011) Drug Policy in Portugal: The Benefits of Decriminalizing Drug Use. Warsaw: Open Society Foundation. Available at https://www.tni.org/files/publication-downloads/drug-policy-in-portugal-english.pdf

Authors

Paul Maxim obtained his MA in criminology at the University of Ottawa and his PhD in sociology at the University of Pennsylvania where he specialized in criminology and research methods. He is formerly a professor in the Department of Economics and the Balsillie School of International Affairs at Wilfrid Laurier University in Waterloo, Ontario and is a Professor Emeritus in the Department of Sociology at Western University in London, Ontario. His primary areas of research interest are population and labour economics. Contact him at pmaxim@wlu.ca

Len Garis is the Fire Chief for the City of Surrey, British Columbia, an Adjunct Professor in the School of Criminology and Criminal Justice & Associate to the Centre for Social Research at the University of the Fraser Valley (UFV), a member of the Affiliated Research Faculty at John Jay College of Criminal Justice in New York, and a faculty member of the Institute of Canadian Urban Research Studies at Simon Fraser University. Contact him at Len.Garis@ufv.ca.

Joseph Clare, PhD formerly of the Surrey Fire Service, is a Senior Lecturer in Criminology at The University of Western Australia University, and an international member of the Institute of Canadian Urban Research Studies, Simon Fraser University. Contact him at joe.clare@uwa.edu.au

Hubert Duan is a Technology Solutions Professional at Microsoft, a Canadian Microsoft AI Ambassador, and a professional Data Scientist. His professional area of focus is working with government and commercial organizations to solve business problems through data science and machine learning. Contact him at hubert.duan@microsoft.com

Andrew Fink is a student at the University of British Columbia (UBC) completing a bachelor's degree in Geographic Sciences in May of 2019, and a former member of the Data Science for Social Good (DSSG) research fellowship at the UBC Data Science Institute. Contact him at andy.fink55@gmail.com

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