Institute for Global Health

Pre-exposure prophylaxis use among men who have sex with men who have engaged in chemsex

PhD in Global Public Health

Steven Maxwell

Student declaration

I, Steven Maxwell confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Signature: Steven Maxwell **Date:** 31 May 2021

Abstract

Background: Men who have sex with men (MSM) in the United Kingdom are one of groups most effected by HIV. Due to the multitude of risk behaviours, MSM who engage in chemsex are at heightened risk of acquiring HIV. Pre-exposure prophylaxis (PrEP) reduces the risk of HIV acquisition by up to 99%, although this is dependent on high levels of adherence. There were public health concerns that MSM chemsex behaviour may negatively impact upon PrEP use. The PhD aim was to examine the interface relationship between MSM chemsex engagement and PrEP use. The PhD will inform interventions that improve PrEP uptake/medication adherence amongst MSM who engage in chemsex.

Methods: I used multiple methods that adopted a pragmatic approach with a biopsychosocial perspective on health. Firstly, I completed two systematic reviews: MSM chemsex behaviours and MSM PrEP uptake/medication adherence. Secondly, I performed a quantitative analysis of PrEP use among MSM who experienced problematic chemsex. Finally, I completed a qualitative study of PrEP uptake/ medication adherence among MSM chemsex participants. The cascade approach to HIV prevention and perception/practicalities approach (PAPA) to adherence were used to understand the PrEP use journey.

Results: MSM chemsex participants were at high risk of HIV acquiring as it involved multiple risk behaviours, including drug and sexual activities. MSM who experienced problematic chemsex were at heightened risk of HIV acquisition which was intertwined with complex psycho-social factors. The wider MSM population had high PrEP adherence levels. Chemsex participants' motivation to use PrEP was driven by high perceived HIV risk and necessity to protect against the biopsychosocial consequences of an HIV diagnosis. MSM social discourse and norms influenced chemsex participants candidacy for PrEP. PrEP accessibility was facilitated by free and trustworthy sources from dynamic established providers. Generally, chemsex participants had high PrEP adherence levels. However, a sub-group of MSM who experience problematic chemsex may be at heightened risk of non-adherence. MSM used PrEP to contain the impact chemsex had on their health and psychosocial wellbeing. They used multiple strategies in their day to day lives and chemsex context to promote PrEP adherence.

Conclusion: MSM chemsex participants were at high risk of HIV acquiring and those that experienced problematic chemsex had increased vulnerability. Chemsex participants' motivation to use PrEP was driven by high-perceived HIV risk and biopsychosocial implications of an HIV diagnosis. Their access to PrEP was facilitated by structural opportunities. Chemsex participants had high PrEP adherence levels but there was increased a risk of non-adherence when behaviours became problematic and/or had a negative impact on health. Multi-level strategies were used to promote adherence to PrEP regimens.

Impact statement

The eight recommendations for policy, practice and research have the potential to create a positive impact on the PrEP use journey for MSM chemsex participants. At the time of starting the PhD, I was not aware of any direct literature that explored the interface between chemsex and PrEP. There was a separate evidence base for both contemporary phenomena. Since this time, there has been some joint evidence published but it continues to be limited. This has influenced the type/level of impact my PhD's findings will have on policy, practice and research.

Since I started the PhD, I have published three articles in respected peer review journals. Initially, this included two systematic literature reviews on MSM chemsex behaviours and PrEP uptake/medication adherence. Subsequently a quantitative analysis of PrEP use among MSM who experienced problematic chemsex. The two systematic reviews have been cited within the wider research base, but most notably the chemsex review has been cited over 70 times. This demonstrates that it filled a gap in the evidence base for researchers within the wider field. I anticipate that the work of my thesis will benefit MSM health policy and practice provision. Due to the ongoing paucity of research that explores the interface between chemsex and PrEP, there are limitations in the provision of evidence-based policy and practice. My PhD draws attention to the way that chemsex participants use PrEP alongside a range of other harm reduction interventions. This is in a context of limited holistic harm reduction services provided within sexual health services provide. My thesis findings will provide policy makers and commissioners a basis of evidence which will enable them to support integrated services that adopt an inclusive harm reduction approach.

Through my advisory board, clinical academic role within Scotland's MSM health improvement stakeholders and networks across the United Kingdom this PhD will inform policy/practice in the following ways: It will reassure practitioners that generally chemsex did not have a widespread impact on adherence. Moreover, it highlights ways to support chemsex participants identify themselves as suitable candidates for PrEP and practical strategies that support adherence. This will enable practitioners to promote more effective PrEP uptake and medication adherence. Although non-adherence was not a widespread issue, it was influenced by the use of containment strategies and issues with problematic chemsex. My PhD will inform the provision of national/local learning resources that support practitioners provide evidence-based care. I will embed information within the Scottish MSM online training resource and pilot a brief PrEP adherence learning session with Scotland's two largest sexual health clinics.

In the thesis, I recommended key research projects that would optimise the chemsex participant PrEP use journey. The evidence suggested that heightened levels of chemsex behaviours and negative health effects can lead to higher levels of PrEP non-adherence. MSM peer social discourse and medication adherence strategies were important in optimising the PrEP use journey. These findings provide evidence to policy makers that research is needed in these areas, particularly for more vulnerable MSM that experience problematic chemsex. Within my professional role and in collaboration with stakeholders I will actively pursue this research within the relevant MSM health prevention policy/strategic structures.

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Acknowledgments

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Abbreviations

ARV: Anti-retro viral

BBVs: Blood borne viruses

CAS: Condomless anal sex

CDC: Centers for Disease Control and Prevention

Crystal meth: Crystal methamphetamine

EDDs: Erectile disorder drugs

GBL: Gamma butyrolactone

GHB: Gamma hydroxybutyrate

HBV: Hepatitis B

HCV: Hepatitis C

HIV: Human immunodeficiency virus

IDU: Injecting drug use

LGBT: Lesbian, gay, bisexual and transgender

MSM: Men who have sex with men

NCF: Necessities-concerns framework

PAPA: Perceptions and practicalities approach

PEP: Post exposure prophylaxis

PHE: Public Health England

PrEP: Pre-exposure prophylaxis

STIs: Sexually transmitted infections

UK: United Kingdom

USA: United States of America

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Advisory group

An advisory group was set up in early 2018. The aim of the group was to provide expert oversight of the PhD including PhD methods and practical application in producing high quality output. The advisory group consisted of experts from clinical academia, social science academia, statistics, national public health body, LGBT focused service provider and local HIV commissioning.

Meetings were held once per year and three meetings were held in total. The first meeting was in May 2018 and final meeting was held in September 2020. For each meeting, a brief was produced and circulated. These meetings were fundamental in providing critique and advice in shaping the objectives for the literature reviews, methodological development for the quantitative data analysis of problematic chemsex behaviours and shaping the data analysis/write up for the qualitative findings.

List of publications and presentations

Peer-reviewed publications

1. Maxwell, S (lead author). Shahmanesh, M. Gafos, M. (2019) Chemsex behaviours among men who have sex with men: A systematic review of the literature. International Journal of Drug Policy, 63, 74-89.
2. Maxwell, S (lead author). Gafos, M. Shahmanesh, M. (2019) Pre-exposure prophylaxis use and medication adherence among men who have sex with men: A systematic review of the literature. Journal of Nurses in AIDS Care, 30(4), 38-61.
3. Maxwell, S. (lead author) Moncrieff, M. Gafos, M. Shahmanesh, M. Stirrup, O. (2020) A quantitative analysis of PrEP use among MSM who have engaged in chemsex, International Journal of STD and AIDS, 31(5), 474-480.

Conference presentations

1. 2019: Chemsex behaviours among men who have sex with men: A systematic review of the literature, Association for the Treatment of Sexual Addiction and Compulsivity Annual Conference, London (invitation).
2. 2019: Pre-exposure prophylaxis medication adherence among the men who have sex with men population, Scottish Interdisciplinary Research in Sexual Health Network Seminar, Glasgow (invitation).
3. 2019: Pre-exposure prophylaxis use among men who have sex with men who have experienced problematic chemsex, European Chemsex Forum, Paris.
4. 2020: Pre-exposure prophylaxis use among men who have sex with men who have experienced problematic chemsex, Scottish Interdisciplinary Research in Sexual Health Network Seminar: PrEP, Glasgow (invitation).

Chapter 1: Introduction

Introduction

In this chapter I set the background to the PhD. I introduce the disease HIV. I provide an overview of men who have sex with men (MSM) as a high-risk group. I introduce the concept of chemsex and discuss the emergence of pre-exposure prophylaxis (PrEP). Secondly, I highlight the need for research which explored PrEP use among MSM that had engaged in chemsex. Lastly, I provide the PhD aim/objectives, research questions and rationale for each objective. Due to complexity and scale at the global level for HIV prevention and as the PhD is situated in the United Kingdom (UK), the introduction primarily focuses on the appropriate UK evidence base for MSM.

HIV infection

HIV first became a major public health concern with the emergence of an epidemic in the early 1980's. Individuals presented at health care services in the United States of America (USA) with unexplained diseases linked to severe immuno-deficiency (Hymes *et al.*, 1981). Initially, primarily gay men presented with diseases such as pneumocystis carinii and kaposi's sarcoma, which lead to the Centers for Disease Control and Prevention (CDC) naming the syndrome gay-related immune deficiency (Hymes *et al.*, 1981; CDC, 1981). However, as other groups started presenting with the syndrome, including injecting drug users & people with haemophilia, this was changed to acquired immune deficiency syndrome (AIDS) (Masur *et al.*, 1981; CDC, 1982).

In the mid 1980s, it was identified that AIDS cases were linked to the retro-virus HIV (initially named HTLV-III), which targets and affects the body's immune system. The virus has multiple and complex interface mechanisms within the immune system (Naif, 2013). However, it is understood that the virus destroys the t-helper cell by using it to self-replicate copies of itself. Over time, as the replication process grows, the HIV cell load increases and t-helper cell levels decrease (Naif, 2013). Gradually, the body's immune system becomes incapable of providing an effective protection against other diseases (Wilkins, 2020).

HIV is present in multiple bodily fluids which means it can be transmitted to others via different routes. This includes blood, seminal fluids, vaginal fluids and breast milk. This means that HIV can be transmitted via condomless anal sex (CAS), condomless vaginal sex, sharing of injecting drug use equipment, in vitro to a foetus during pregnancy/during birth and by breast feeding. (Wilkins, 2020)

After initial exposure to the virus, the primary infection stage can last up to 3 months, in which individuals are primarily asymptomatic but can develop flu-like symptoms and lymphedema (Naif, 2013). After initial infection, duration of disease progression and development of symptoms varies between individuals, although they can be asymptomatic for several years (Naif, 2013). As time progresses, when the individual starts to manifest HIV related symptoms' they become susceptible to an array of

opportunistic infections/tumours as per the internationally agreed list of AIDS indicator conditions (Naif, 2013; Wilkins, 2020). For example, pneumocystis carinii, mycobacterium tuberculosis and toxoplasmosis. At this advanced stage and as opportunistic diseases progress, the eventual outcome is death.

HIV is incurable but since the 1990s there has been advancements in biomedical treatments. Currently, HIV can be effectively treated with daily antiretroviral (ARVs) medications which suppress viral load and allow the body's immune system to maintain an effective protection against other diseases (Wilkins, 2020). When ARVs are taken as recommended by healthcare providers, an individual with HIV can nearly live as long as someone without the virus (Katz and Maughan-Brown, 2017). In addition, if the individual on ARV treatment has an undetectable viral load, the risk of sexual transmission is eliminated (Rodger et al, 2019; Katz and Maughan-Brown, 2017). This has been important in recognising the role of ARV treatment as a key prevention measure and launch of the campaign U=U (Undetectable=Untransmittable).

MSM as a high-risk group

MSM is an epidemiological term that includes gay, bisexual and other men who have sex with men. Public Health England (PHE) identified that as a minority population, MSM in UK are disproportionately affected by wider health inequalities and poorer health outcomes than compared to the general population (PHE, 2014). This includes higher rates of smoking, higher rates of some chronic diseases, double the rates of anxiety/depression and is the group most affected by HIV (PHE, 2014).

In the UK, it is estimated that 105,000 people are currently living with HIV and of this number approximately 45% are MSM (PHE, 2020). From 2014-2018 the diagnosis of new HIV cases among MSM in the UK decreased by 35% (3480 to 2250) (PHE, 2019), although in 2018, MSM still accounted for nearly half of all new HIV diagnosis in the UK (PHE, 2019). The primary route of transmission for HIV among MSM, is via condomless anal sex (CAS) (PHE, 2016). In addition, MSM have a higher prevalence of other sexually transmitted infections (STIs) than compared to the general population (Cohen *et al.*, 2013). This includes bacterial infections such as gonorrhoea and syphilis.

MSM have higher rates of substance use compared to the general population, including being twice as likely to be alcohol dependent (PHE, 2014). Gay and bisexual men in England and Wales are three times more likely to have used an illicit drug in the previous year than compared to the heterosexual population (*Office for National Statistics*, 2014). However, the majority of MSM in the UK do not use illicit drugs and only a minority for sexual purposes. For the group that do use drugs for sexual purposes, it can be intertwined with multiple and wider physical and mental health issues (PHE, 2014).

Chemsex among MSM

In recent years, public health policy makers have had a growing concern about MSMs sexualized use of drugs, specifically the phenomenon termed chemsex (PHE,

2015). PHE defined chemsex as the planned use of psychoactive drugs before and/or during sex to purposively initiate, prolong, facilitate and enhance the sexual encounter (PHE, 2015). The most common drugs associated with chemsex are crystal methamphetamine (crystal meth), GHB/GBL (gamma butyrolactone/gamma hydroxybutyrate) and mephedrone (Bourne *et al.*, 2015). Two drugs which have been used less commonly in chemsex are ketamine and cocaine (Bourne *et al.*, 2015). Drugs used in chemsex can be administered in multiple ways, including snorted, swallowed and injected ('*slamming'*) (Maxwell, 2017). Chemsex usually takes places within a group context, with multiple sexual partners and varying sexual behaviours, including penetrative anal sex, oral sex and toys for anal sex acts (Bourne *et al.*, 2015).

A literature review from the UK reported that prevalence estimates for chemsex among MSM ranged between 17% and 31%, which was dependent on the data collection setting (Edmundson *et al.*, 2018). It highlighted that 17% of MSM attending sexual health clinics had engaged in chemsex, in comparison to 31% of HIV positive MSM inpatients at a specialist hospital unit. In comparison, data from twenty UK sexual health clinics from 2013 to 2014 demonstrated that 1 in 5 HIV negative MSM had used chemsex drugs in the previous three months (Sewell *et al.*, 2017). However, there were limitations and challenges in gauging the accuracy of prevalence levels. This was due to varying definitions of chemsex, limitations in data specifically measuring drug use during sex and variable settings of data collection.

Event level data from two UK studies suggested that between 10%-24% of MSM injected within the chemsex context (Gilbart *et al.*, 2015; Pufall *et al.*, 2018). An Australian study reported that MSM were up to ten times more likely to have injected drugs than the general population (Lea *et al.*, 2013a). An Australian and UK study reported that the most injected drugs among the MSM population were amphetamine/methamphetamines (Hickson, Reid and Hammond, 2016; Lea *et al.*, 2013a; Lea *et al.*, 2013b). PHE (2015) identified that engagement in chemsex can impact on injecting and non-injecting MSMs participants biopsychosocial *(bio: biological/physical health, psycho: cognition/mental health, and social: support networks and environment)* well-being.

MSM who engage in chemsex are exposed to potential biological health risk factors. A study indicated that some MSM who had injected chemsex drugs shared injecting equipment and had low levels of knowledge regarding safer injecting practices (Gilbart *et al.*, 2015). This potentially means hepatitis C (HBV), hepatitis B (HBV) and HIV could be transmitted among MSM who engage in 'slamming'. Studies demonstrated that MSM who used drugs for sexual enhancement had engaged in high-risk sexual practices and had high rates of STIs/blood borne viruses (BBVs) (Hegazi *et al.*, 2017; Marongiu *et al.*, 2012). These practices included CAS and esoteric sex, for example fisting. Therefore, MSM who engage in chemsex are a key population to target biomedical risk reduction strategies (PHE, 2015).

In addition to the biological risks, there are concerns about the wider impact on psycho-social well-being. Evidence has indicated that the sexualized use of chemsex drugs had a negative impact on some participants' mental health, employment and family/friends (Kurtz, 2005; Hegazi *et al.*, 2017; Kubicek *et al.*, 2007). MSM that encounter these effects can be viewed as experiencing

'problematic chemsex'. In the substance use field, the term 'problematic' is used when drug use has had a detrimental effect on the users' well-being (Bevan, 2009). Evidence has demonstrated that increased levels of frequency and quantity/type(s) of drug use are features that shape problematic use (Ezzati *et al.*, 2004). This potentially means MSM who experience problematic chemsex have heightened vulnerabilities for acquiring HIV. This may be indicative of increased intensity of engagement in chemsex activities.

As MSM who engage in chemsex are at high-risk of acquiring HIV and broader psycho-social risks; it is important that the uptake of all the available harm reduction interventions is maximised. The recent development of PrEP provides an additional tool which could provide a fundamental shift in HIV prevention for this MSM group.

Bio-medical prevention: emergence of PrEP

PrEP is the use of oral HIV antiretroviral (ARV) medications to reduce the sexual risk of someone acquiring the infection. There are two primary dosing regimens which have been trialled through clinical studies: (1) Daily: used on a continuous basis seven days per week, or (2) Episodically: used intermittently when engaging in sex, two doses 2-24 hours before sex, one dose 24 and 48 hours after the initial doses.

In the UK, prior to the wider spread provision of PrEP (pre-2017), there was a multitude of HIV prevention strategies provided by services and used by MSM. The longest established interventions offered by services were condoms and HIV screening. Between 2007 and 2016 there was over a 3.5 fold increase in the number of MSM HIV tests completed at sexual health services (Nwokolo et al., 2017). However, in more recent years over 80% of MSM newly diagnosed with HIV had not accessed a test in the previous year (PHE, 2020). Some MSM choose their casual/regular partners according to HIV status to reduce the risk of contracting HIV during anal sex (sero-sorting) (Siegler et al., 2013). This practice has potentially contributed towards the stigmatisation of those living with HIV from the wider MSM community. As outlined earlier, in recent years the U=U health message was adopted which reinforces that someone living with HIV who is taking their ARVs cannot pass on the virus (Katz & Maughan-Brown, 2017). In the immediate years prior to the wider availability of PrEP in the UK (2014-2018), MSM HIV incidence levels had significantly dropped but still accounted for nearly 1 in 2 new diagnosis (PHE, 2019). Despite the array of strategies, there was an opportunity for an innovative new intervention such as PrEP to further reduce the HIV burden on the MSM population.

Multiple randomised controlled trials demonstrated that PrEP with tenofovir disoproxil/emtricitabine reduced the MSM sexual risk of acquiring HIV by 90%, although this included varying adherence levels (Grant *et al.*, 2010; Molina *et al.*, 2017; McCormack *et al.*, 2016). Follow up sub-studies have demonstrated that taking four doses per week reduced the risk by 96% (Buchbinder, 2018). A systematic review which analysed eleven studies PrEP groups identified that with optimal adherence for daily and episodic dosing the risk of HIV acquisition was reduced by up to 99% (Huang *et al.*, 2018). However, the review highlighted that the highly efficacious levels were reliant on the users taking the medication as fully guided by the clinicians (Huang *et al.*, 2018).

In 2012, the regulator in the USA was the first to approve PrEP use for groups at high risk of sexually transmitted HIV. Following this, in 2015 France implemented PrEP provision through the national healthcare system and in 2016 the European Medicines Agency provided authorisation for PrEP use in European Union (EU) countries. Since this time, several individual EU countries have implemented PrEP provision through their national health care systems.

In the UK, prior to 2017 PrEP was not approved or available through the NHS but was thought to have been often purchased through private prescriptions. In 2017, NHS England started a PrEP clinical trial, enrolling around 10,000 participants (Hanum et al., 2020). In England, between 2010 and 2015 MSM bacterial STI diagnosis in the previous year increased from 4365 to 10,276, which provided an indication for the size of the MSM population that would benefit from PrEP (Mitchell et al, 2019). In 2017, the Scottish Government (early 2017) and Welsh Assembly (mid 2017) made PrEP routinely available through the NHS (Estcourt et al., 2021). A limited PrEP trial was launched in Northern Ireland in 2018, this was expanded in 2020 to be an uncapped programme. Subsequently in England, in 2020 the UK authorities provided approval for PrEP to be routinely available throughout the English NHS (Hanum et al., 2020). In Scotland, in the years pre and post PrEP implementation HIV incidence fell by over 40% in a large cohort of MSM sexual health clinic attendees, although varying influences contributed to this drop PrEP was a key factor (Estcourt et al., 2021).

A systematic review from the USA reported that there had been low uptake of PrEP and multiple factors had limited access, including race, age, stigma & homophobia (Pinto *et al.*, 2018). A systematic review of PrEP medication adherence highlighted that MSM had high adherence levels but within some sub-populations there were interrelated biopsychosocial factors that contributed towards non-adherence (Sidebottom, Ekstrom and Stromdahl, 2018). However, in these reviews there was no examination on PrEP uptake and adherence among MSM substance users.

At the early stages of the initial PrEP trials there were concerns aired from some quarters that PrEP would lead to risk compensation. Risk compensation is an increased participation in risk behaviours which is triggered by a decrease in perceived level of risk (Hogben and Liddon, 2008). The specific concerns were that those starting PrEP may engage in increased rates of CAS and consequently, it would lead to higher rates of other STIs. Although, evidence from the initial PrEP trials reported that medication initiation did not lead to substantive increases in CAS (Marcus *et al.*, 2013; Guest *et al.*, 2008; Baeten *et al.*, 2012). However, limited evidence indicated that some PrEP users displayed elements of risk compensation, specifically increased frequency of CAS (Molina *et al.*, 2017; McCormack *et al.*, 2016). At the time of starting the PhD, there was no evidence examining the impact of PrEP initiation among MSM chemsex participants. The impact of PrEP on sexual activity is an important consideration within the chemsex context, as it may involve higher-risk HIV behaviours.

Evidence from the substance misuse field has demonstrated that biopsychosocial factors among alcohol/drug users have impacted upon medication uptake and adherence, this has been specifically demonstrated for HIV ARVs (Blashill *et al.*,

2015). A study reported that among a cohort of HIV positive individuals, that recent drug users were four times more likely to non-adhere to their ARVs when compared to non-drug users (Hinkin *et al.*, 2007). A recent study of HIV positive MSM demonstrated that the level of ARV non-adherence among recent crystal meth users was 29% in comparison to 11% for those that had not used the drug (Lai *et al.*, 2020). At the time I started the PhD there was no evidence base regarding the inter-relationship between MSM chemsex engagement and PrEP use.

Problem statement

HIV negative MSM who engage in chemsex undertake multiple combined drug use/sexual behaviours which places them at high risk of acquiring HIV. MSM who experience problematic chemsex, may be at a heightened risk of HIV acquisition. If used appropriately PrEP could significantly reduce this risk of acquiring HIV. Evidence from other fields demonstrates that drug use negatively affects ARV medication use. Due to these factors, chemsex may negatively impact on the effective use of PrEP and place the group at continued HIV risk. There was a need to explore the chemsex/PrEP inter-relationship.

PhD output and impact

The PhD aim was to fill this evidence gap and provide an understanding of the inter-relationship between chemsex and PrEP. This was to specifically aid in understanding: (1) Extent to which drug use/sexual behaviours and health factors of the highest risk MSM chemsex participants were associated with PrEP uptake; (2) The motivators for MSM chemsex participants starting PrEP; (3) The barriers and facilitators for MSM accessing PrEP; and (4) General level of PrEP medication adherence and factors which influence adherence when MSM engage in chemsex. It is hoped this evidence will inform policy and practice-based interventions which optimise PrEP use within this high-risk group of MSM.

Research questions, aim and objectives

The key questions I considered within my PhD were:

1. What impact do chemsex behaviours have on PrEP use for MSM?
2. What impact does PrEP use have on chemsex behaviours for MSM?
3. How can PrEP be more effectively used by MSM chemsex participants?

The overall aim of my PhD was to examine the interface of PrEP use among MSM who had engaged in chemsex behaviours. This was in order to inform interventions to optimise PrEP use in this high-risk group. To achieve this, I set the following three objectives:

1. Evidence synthesis of what was currently known about the biopsychosocial factors related to chemsex and PrEP use among MSM within high income countries.

2. Examine biopsychosocial factors associated with PrEP use among MSM in Greater London that had engaged in chemsex behaviours which negatively impacted on their well-being *(problematic chemsex).*

3. Explore the biopsychosocial factors that influenced MSM engagement in chemsex/PrEP use, access to PrEP and medication adherence during periods of engagement in chemsex.

Prior to the PhD upgrade in May 2019, I proposed an additional objective. This was to complete a prevalence estimate for PrEP use study using data from a Greater London charity that provides MSM risk reduction interventions. However, it was recommended from the PhD upgrade that I drop the prevalence study because it would not add anything substantive to the PhD output and wider evidence base. This was specifically in relation to not providing insight into the inter-relationship between chemsex and PrEP.

I focus the thesis on the relevant peer-reviewed published research that examines PrEP use among the MSM population within high-income countries. Where available, I utilise the appropriate evidence on MSM substance use. Firstly, I do this due to global level complexity and scale of the varying factors that affect different populations at risk of contracting HIV. Secondly, as my thesis is concerned with MSM PrEP use and drug use within a high-income country (UK), it provides a more appropriate and accurate reflective account of the structural, socio-economical and socio-cultural factors. There are appropriate mini discussions within each findings chapter, but I provide the substantive recommendations within the main discussion chapter.

Structure of the thesis

In chapter 2, I set out the methodological approach of the thesis, including theoretical base and summary of the research methods. The theoretical base includes my epistemological/ontological stance and view of health which are both key components to the thesis. I outlay the basis of the HIV prevention cascade and adherence framework that I used at specific points in the thesis. Finally, I provide a summary of the PhD objectives, research methods and theoretical underpinnings.

Chapter 3 and 4 (both published) relates to objective 1 which provides a review of the published literature on MSM chemsex behaviours (chapter 3) and MSM PrEP use (chapter 4). This includes the literature search strategy and evidence synthesis methods. I layout the key findings which orientate around the antecedents to chemsex and PrEP use, behaviours involved in chemsex and PrEP use and consequences of chemsex and PrEP use. I provide a discussion on how the findings fit within the wider literature and related evidence gaps.

Chapter 5 relates to objective 2 which outlines the quantitative research methods (chapter 5) and findings on the analysis of PrEP use among MSM who experienced problematic chemsex. I describe the specific objectives, data collection/analysis methods I used, limitations in study design and ethical considerations. Subsequently, I outlay the findings which focused on identifying the key differences in high-risk behaviours and health factors among those that had and had not used PrEP.

Chapter 6, 7, and 8 relates to objective 3 which outlines the qualitative research methods (chapter 6), characteristics of the participants (chapter 7) and findings on the PrEP use experiences of MSM that engaged in chemsex (chapter 8). In chapter 6, I describe the objectives, data collection/analysis methods I used, limitations in study design and ethical considerations. In chapter 7, I outline the participants socio-demographics, motivation for engaging in chemsex, range of chemsex behaviours and impact on their health. In chapter 8, I provide the main qualitative findings in which I explored the participants motivation for starting PrEP, experiences of accessing PrEP and experiences of them attempting to effectively use PrEP.

In chapter 9, I provide the major findings of my thesis and how this makes a unique contribution to the HIV prevention field, specifically MSM PrEP use. I discuss how the major findings fit within the wider evidence base. I outlay the thesis limitations, and provide key recommendations given the applied focus of the thesis to improve public health policy and practice.

Chapter 2: Methodological approach

Introduction

In this chapter I set out the general methodological approach of the thesis. Firstly, I outlay my epistemological and ontological perspective and I detail the theoretical basis of the PhD. This includes a framework which provides a pathway of steps involved in accessing HIV prevention measures and a framework used to explore and explain PrEP adherence. I explore the limitations of the theoretical approaches. Secondly, I reflect on my role as a researcher. Lastly, I summarise the research methods and provide an explanation of how the theoretical approaches were used within each of the PhD objectives.

Epistemological and ontological perspective

There are varying merged epistemological (theory of knowledge: what constitutes knowledge and how we obtain it) and ontological (theory of reality: form, nature and meaning of existence) perspectives which informs the research question, how researchers' approach studies, and the perspective that is adopted. In some studies, a pragmatic perspective is required, particularly when it involves people's real-world experiences and aims to realistically improve their day to day lives (Glasgow, 2013). This approach does not necessarily align itself to one epistemological/ontological perspective. It focuses on using the most appropriate flexible methods that are robustly applied to address a research problem, especially for practical based issues (Glasgow, 2013; Ritchie *et al.*, 2014).

I reflected on my epistemological and ontological stance and adopted a pragmatic perspective to address the PhD aim and key questions. I positioned myself in this way because the overarching priority of the PhD was to provide evidence that informs health practice. This was specifically to provide guidance on how to optimise PrEP use among MSM chemsex participants. A dynamic approach was needed in designing the PhD methods because there was minimal evidence and limited data sources available that explored the interface between chemsex and PrEP. The practical improvement of individual's real-world PrEP use experiences and flexible adoption in the methods used to conduct the PhD, aligned appropriately and efficiently to a pragmatic approach.

Biopsychosocial approach to health

Biomedical approaches to heath are traditionally focused on biological causes of disease and biomedical treatments and preventions e.g., pharmaceutical, surgical and vaccines. The medical model is primarily focused on biomedical sciences' ability to cure illnesses, in which it purely measures health as the absence of disease (Scriven and Cramer, 2017). This approach is limited by focusing solely on measuring health through a physical dimension and does not take account of wider influences (Farre and Rapley, 2017). However, in the mid-20th century there was an increasing realisation that health was more than the absence of disease. In 1948, The World Health Organization (WHO) developed a more holistic and multi-

dimensional definition of health, which at the time was ground-breaking. WHO (1948) defined health as 'a state of complete physical, mental and social wellbeing and not merely the absence of disease or 'infirmity'. It is argued that a multidimensional model is superior as physical health is influenced by wider determinants, including psychological, social, cultural and economic factors (Scriven and Cramer, 2017).

Since the mid 20th century there has been a general move away from healthcare being perceived solely through the bio-medical lens to it being a more complex phenomenon (Scriven and Cramer, 2017). In 1977 George Engel proposed a biopsychosocial approach which views health as a social construct that has multiple dimensions (Farre and Rapley, 2017). It posits that interacting biological, psychological and social factors determine and make up the state of health (Engel, 1977). The three dimensions incorporate these factors: (1) Biological: physical, drugs and disability; (2) Psychological: mental health, beliefs, attitudes and coping skills, and (3) Social: family, peers, occupation and environment (Engel, 1977). A literature review demonstrated that a biopsychosocial approach provides healthcare clinicians with a deeper understanding of the complex factors that affect population health (Kusnanto, Agustian and Hilmanto, 2018).

There have been some criticisms of the biopsychosocial approach to health. The model was developed to reform the field of psychiatry care by replacing the medical model with a more holistic multidimensional approach (Engel, 1977). This has led it to be criticized for lacking a fundamental theoretical basis that explains the origins of health issues and it only provides an understanding of health problems experienced by individuals (Pilgrim, 2015). Its critics argue this limits its applicability to be used in health research. However, the PhD's focus on informing effective interventions aligns with a practical focus to improve the quality of healthcare provision.

As laid out earlier, the PhD was concerned with the effective use of a biomedical intervention within a population that engages in high-risk behaviours that involve psycho-social implications. Due to these multiple factors, I framed health through a biopsychosocial perspective. This holistic approach facilitated a more structured, robust and in-depth consideration of the health dimensions for MSM chemsex participants. It is important to emphasis this is different from the socio-ecological perspective. The socio-ecological model was developed to understand the interaction between individual level factors and multi-layered external environmental influences (inter-personal, community, policy) (Shahmanesh et al., 2020). The biopsychosocial approach has been criticised for not considering the structural influences on health that the socio-ecological model explicitly considers (Shahmanesh et al., 2020). However, the socio-ecological model does not provide a structure to explain the physical, mental and social dimensions of health and effect on an individual's overall health state. This means that the model loses focus of the individual navigating the structural system and cannot clearly understand the interaction/effect on their health and well-being.

Bio-medical prevention is complex, as taking medicine to cure or manage symptoms of an existing disease is different from using it to protect yourself from acquiring a disease. Drug use and sexual behaviours within a chemsex dynamic have intertwining areas of harm but come from two separate harm reduction paradigms.

The use of a bio-medical intervention for prevention purposes within the context of managing the harm from dual chemsex risk behaviours is a unique dynamic. I had a strong interest in pragmatic and practical interventions that informed health policy and practice. So, I sought out theoretical framing that placed the individual at the centre but acknowledged the psychological and social factors that individual MSM who engage in chemsex navigate. The pragmatic perspective and biopsychosocial model of health were well placed to support this work. However, I needed suitable frameworks that facilitated the examination of preventative medication use that was broadly compatible with the pragmatic approach and biopsychosocial perspective.

HIV prevention cascade

There is a paradox in relation to prevention, in that people need to recognise their health is at risk to start and actively seek out access to an intervention. As referred to earlier, this is exemplified with bio-medical products used for preventing disease acquisition. Symptoms commonly motivate people to access healthcare services and use the appropriate medications to treat/cure the disease, although there are no such clear experiential triggers for preventative medications (Horne et al., 2019, French et al., 2010). An example for the type of preventative medication in this paradox is PrEP.

A cascade for HIV treatment has existed for some time but has a clear purpose and function. The HIV treatment cascade provides a framework that explains the five stages of care people with HIV journey through, from HIV testing to the end goal of reaching viral suppression (Kay et al, 2016). The stages are: 1. diagnosed with HIV, 2. linked to care, 3. engaged or retained in care, 4. received ARV treatment and 5. achieved viral suppression (Gardner et al., 2011). It provides a population level framework to analyse the proportion of HIV positive people in each stage of care and treatment (Gardner et al., 2011). This should allow policy makers to identify gaps in service provision and target interventions that would further facilitate people towards viral suppression (Kay et al., 2016). The cascade has been applied in the context of the UNAIDs 90:90:90 targets (now 95:95:95) which spearheaded universal test and treatment care provision. The 90:90:90 targets were: By 2020, 90% of all people living with HIV will know their status, 90% of people with diagnosed HIV will receive sustained ARV therapy and 90% of all people receiving ARV therapy will have viral suppression (Kay et al., 2016). The common denominators in the cascade are the cohesive population and end goal. Building on the success of the HIV treatment cascade, there was a recognition for the need of a multidimensional cascade that incorporated elements for being risk informed and identified the steps involved in using HIV prevention interventions.

Since the HIV global epidemics in the 1980s the application of theories from biology, epidemiology, sociology and health behaviour has led to great advances in understanding disease prevention. These multiple singular theories were applied to attempt to develop interventions and then explain the process and impact of a population's use of health prevention measures. However, all had limitations in explaining the process and have been difficult to practically apply to policy/practice (Hargreaves *et al.*, 2016). This has led to biomedical, behavioural and structural measures being used and evaluated in isolation. This has limited the ability of policy to strategically balance the targeting and use of different HIV risk reduction

interventions (Hargreaves et al., 2016). Cross-discipline collaboration has led to an understanding that there are key progressive pathway steps that a population must navigate to effectively use a risk reduction intervention (Garnett *et al.*, 2016).

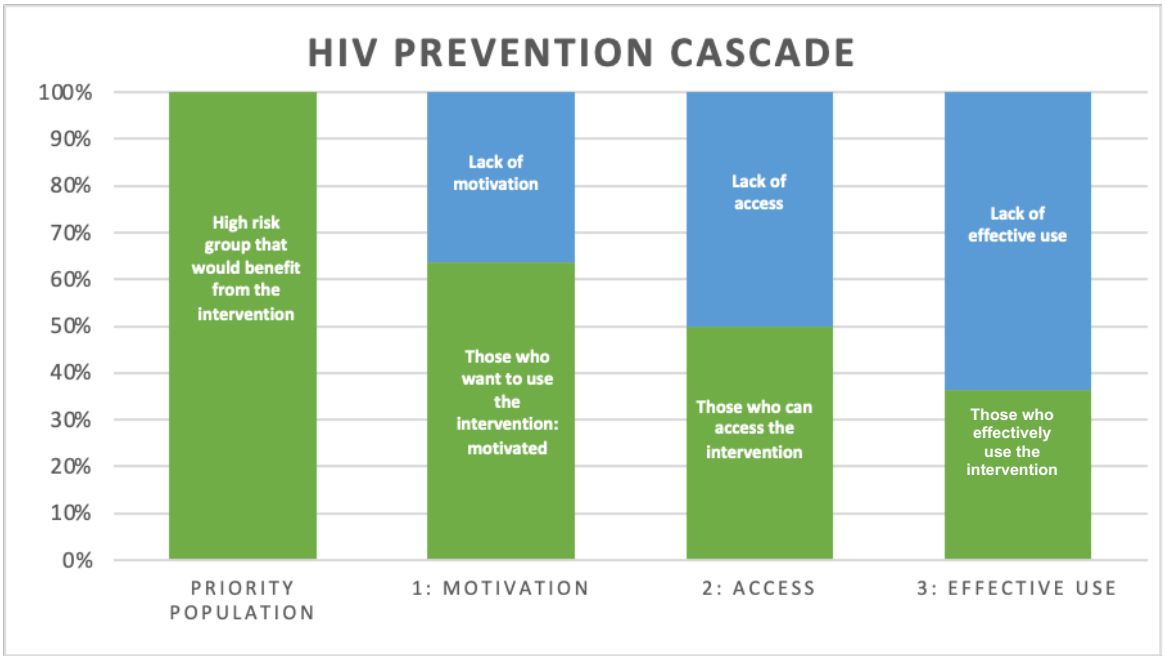
I considered using a few singular theories to structure and explain MSM chemsex participants PrEP uptake and medication use. For example, health belief model and social cognitive theory (Jones et al., 2015; Sulton et al., 2001). However, they all had limitations in being able to be practically applied to fully explain the process involved for a population's use of a disease prevention measure. In the PhD, my aim was to practically optimise the use of a public health intervention which involved looking at the individual through a public health lens. This was to specifically optimise the MSM chemsex participants PrEP use journey, which did not align with the use of a singular theory.

The HIV prevention cascade is a multi-theory approach that provides a practical stepped framework to optimise a population's use of HIV prevention interventions. The cascade's use of multi-level social and behavioural theories takes account of population and individual level factors that influences the provision of risk reduction interventions (Garnett *et al.*, 2016). It posits that multi-level inter-acting structural, societal and behavioural measures are required to maximize the potential of an intervention to reduce HIV transmissibility at a population level (Hargreaves *et al.*, 2016). Thus, with an intervention having optimised efficiency it should reduce the individual contact transmission rates. This has the overall impact of reducing the HIV incidence within the targeted population (Hargreaves *et al.*, 2016). Optimised efficiency in HIV prevention is about being risk-informed and providing the right package to the right person at the right time.

Fig 1 (next page) provides a summary of the cascade's three stepped components. It posits that there are barriers and facilitators at each stage that mediates a high-risk group's utilization of an intervention (Garnett *et al.*, 2016). If barriers are experienced at every stage, a small proportion of the group will only benefit from the effectiveness of the intervention. Firstly, it provides a practical structure to identify the multiple structural and behavioural factors that act as barriers for the group's utilization of the intervention (Hargreaves *et al.*, 2016). Secondly, it provides a framework to target measures that optimises the group's motivation, increase accessibility and enhance the effective use of a risk reduction intervention (Hargreaves *et al.*, 2016).

There are key strengths in a practical multi-level framework, but the HIV prevention cascade has been criticized for having limitations. The prevention cascade principles are founded on the HIV treatment cascade which focuses on a homogenous population. Firstly, in the prevention field there are varying heterogeneous populations that are HIV negative. The cascade has limitations in being dynamic to specify interventions that fulfils their diverse social, cultural and psychological needs (Godfrey-Faussett., 2016). Secondly, the cascade is a linear process which does not take account of a population's fluctuating level of HIV risk over time. This is influenced by changes in perceived level of HIV risk and high-risk behaviours (Godfrey-Faussett., 2016).

Fig 1: HIV prevention cascade



I decided to use the cascade as the main framework to structure the sequential pathway for MSM chemsex participants PrEP journey. The cascade helped me explore the factors that chemsex participants have to navigate in their PrEP use journey. It provided a clear guide for the steps involved in using an HIV prevention intervention and it facilitated the identification of multi-level barriers/facilitators. The central features of the cascade fully aligned with my pragmatic approach and primary aim to practically inform policy/practice. However, I mitigated some of its limitations by adopting the biopsychosocial approach to health and a medication adherence framework.

Perceptions and practicalities approach

An individual's use of a prescribed medication from a healthcare provider has been mapped into key stages. The stages are initiation *(start taking a medication)*, execution (*comparison between actual dosing and prescribed dosing)* and discontinuation *(stop taking the medication)* (Vrijens et al., 2012). Persistence is a core concept associated with an individual's medication journey. This is the time between medication initiation and last dose, which is consequently followed by discontinuation (Aylward, Rausch and Modi, 2015).

On a global scale, there are public health concerns regarding medication adherence. Adherence is the magnitude to which an individual's behaviours match the agreed recommendations with their healthcare provider (Hugtenburg *et al.*, 2013). The World Health Organization (WHO) identified that in developed countries, the average medication adherence rate for the majority of long-term illnesses was only 50% (WHO, 2003). Non-adherence directly links with individual biopsychosocial complications and the unproductive use of resources limits the ability of healthcare services to optimise population level health outcomes (WHO, 2003).

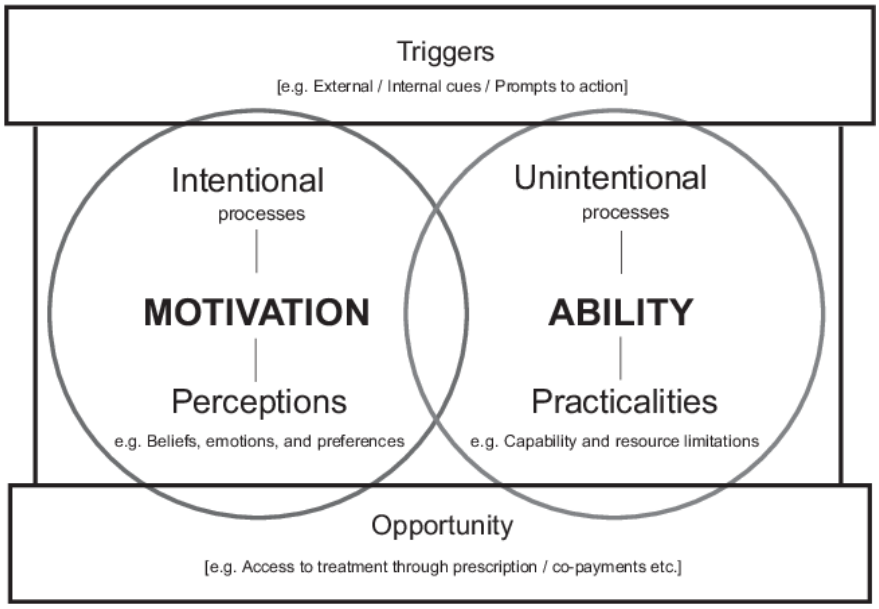
There are multiple frameworks with varying theoretical approaches that provide a basis for understanding the factors that influence medication adherence. The primary aim of a framework is to identify and explain barriers and facilitators for individual and population level medication adherence (Gellad, Grenard and McGlynn., 2009). This conceptualisation informs evidence-based policy that aims to promote adherence which would consequently optimise individual/population level health outcomes and reduces healthcare resource wastage (Gellad, Grenard and McGlynn., 2009). On the whole, these approaches are based on the premise that medication is used as a treatment to minimize the occurrence of symptoms for longer-term diseases (French *et al.*, 2010). There are no frameworks specifically designed to examine preventative medication adherence and its effective use.

As discussed in the introduction, there was a paucity of evidence that explored PrEP adherence within a high-risk chemsex context. However, it was highlighted that substance use contributes towards non-adherence and on a broader scale adherence is a commonplace phenomenon for most health conditions. Due to this, I opted to use a framework that explained the adherence influences within the sphere of MSM chemsex participants PrEP use journey.

I adopted the enhanced perceptions and practicalities approach (PAPA), see summary in Fig 2 (next page). The fundamental premise of PAPAs development was to be a practical framework that informs the provision of effective adherence interventions (French *et al.*, 2010). It does this by recognizing non-adherence as a modifiable behaviour and places a focus on the behaviour as either being intentional or unintentional (Taylor and Harding., 2001). Due to perceptual barriers, an individual may intentionally decide not to follow the treatment recommendations. This is shaped by an individual's cognitive and emotive beliefs which influences their motivation to initiate and continue taking a medication (Horne *et al.*, 2019). An individual may unintentionally not follow the treatment guidance due to their capability being limited by practical barriers. An individual may have limited ability and resources to take medications, for example, poor cognitive function, complexity of regimen, issues in administering pills and affordability (French *et al.*, 2010).

PAPA recognizes that non-adherence is affected by an inter-mix of perceptions and practicality barriers which are influenced by social, economic and cultural factors (French *et al.*, 2010). The framework's ability to identify specific barriers enables this approach to inform the operationalization and targeting of interventions which promotes adherence for specific populations/individuals' needs (Taylor and Harding, 2001). Latterly, an enhanced framework was introduced which added the concepts of triggers and opportunities. It was recognized that PAPA was intrinsically focused on aspects of the person and that there are specific external factors that influence adherence (Horne *et al.*, 2019). Firstly, the lack of opportunities affects adherence, this is primarily on the basis that structural factors influence access to treatment, for example subsidised prescriptions (Horne *et al.*, 2019). Secondly, external triggers will provide a cue and prompt an individual to take a dose or need to acquire a new supply, for example mobile phone alarm to take a pill (Horne *et al.*, 2019).

Fig 2: Enhanced PAPA framework



An integral sub-component of the perceptions element of PAPA is the necessity-concerns framework (NCF). The NCF posits that an individual's decision to start and continue taking a medication (intentionally adhere) is balanced on two categories of treatment beliefs (necessity v concerns) (Horne *et al.*, 2013). Firstly, the necessity consists of how necessary an individual believes they need the benefits of a medication (French *et al.*, 2010). For an individual to perceive treatment as a necessity, they must believe they need the medication because of a health threat (Horne *et al.*, 2019). This is commonly triggered by symptoms of a disease and need to mitigate these negative effects (Horne *et al.*, 2019).

Secondly, an individual may be concerned in various ways about the threats a medication may pose to them (Horne *et al.*, 2013). These concerns consist of dynamic cognitive and emotive components which can vary in individuals and for different medications (Horne *et al.*, 2019). Although generic concerns consist of adverse effects, disruption to daily life, effectiveness and dependence (Horne *et al.*, 2019). Evidence highlights that the weighting of necessity-concerns beliefs across multiple diseases is a determining factor in the level of adherence and understanding motivation for non-adherence (Foot *et al.*, 2016).

As identified earlier, the main premise adherence frameworks are based on is a disease treatment principle, including PAPA. This is reliant on an individual experiencing a trigger (commonly symptoms of a disease) to view initiation and the ongoing use of a medication as a necessity (French *et al.*, 2010). As outlined, this is different to PrEP which is a preventative bio-medical intervention. As the individual will not experience symptoms within a prevention modality, this may limit the ability of adherence frameworks to fully explain the factors which motivate and sustain the

ongoing use of PrEP. Generalised medication may aim for longer term consistent adherence, but PrEP use may evolve dependent on changes in sexual risk which needs to be more adaptive for individual level effective use (Haberer, 2016). PAPA emerged from ARV use among the UK MSM population which strengthens its foundations for being relevant to factors in the HIV field and MSM population. In addition, due to the explicit perception's component of PAPA (NCF) and practical emphasis, it provides a mechanism for understanding the motivators that drives an individual to adhere to preventative medications.

The HIV prevention cascade provided an appropriate structure to stage the PrEP use journey as it was fundamentally configured as a preventative model. The cascade in combination with PAPA provided a dynamic approach to identify the multi-level barriers/facilitators that MSM chemsex participants encountered in their use of PrEP. The general underpinning of the biopsychosocial perspective provided a more-in depth consideration of the multiple health factors that chemsex participants experienced in their PrEP use journey.

Summary of research methods

As briefly summarized in the introduction, I had three objectives which were used to achieve the aim and address the research questions. In the following section I will outline how the research methods were used to address each objective. In addition, how I used each theoretical component for the PhD is explained. The PhD objectives were:

Evidence synthesis of what is currently known about the biopsychosocial factors related to chemsex and PrEP use among MSM within high income countries.

Examine biopsychosocial factors associated with PrEP use among MSM in Greater London that have engaged in chemsex behaviours which negatively impacted on their well-being *(problematic chemsex).*

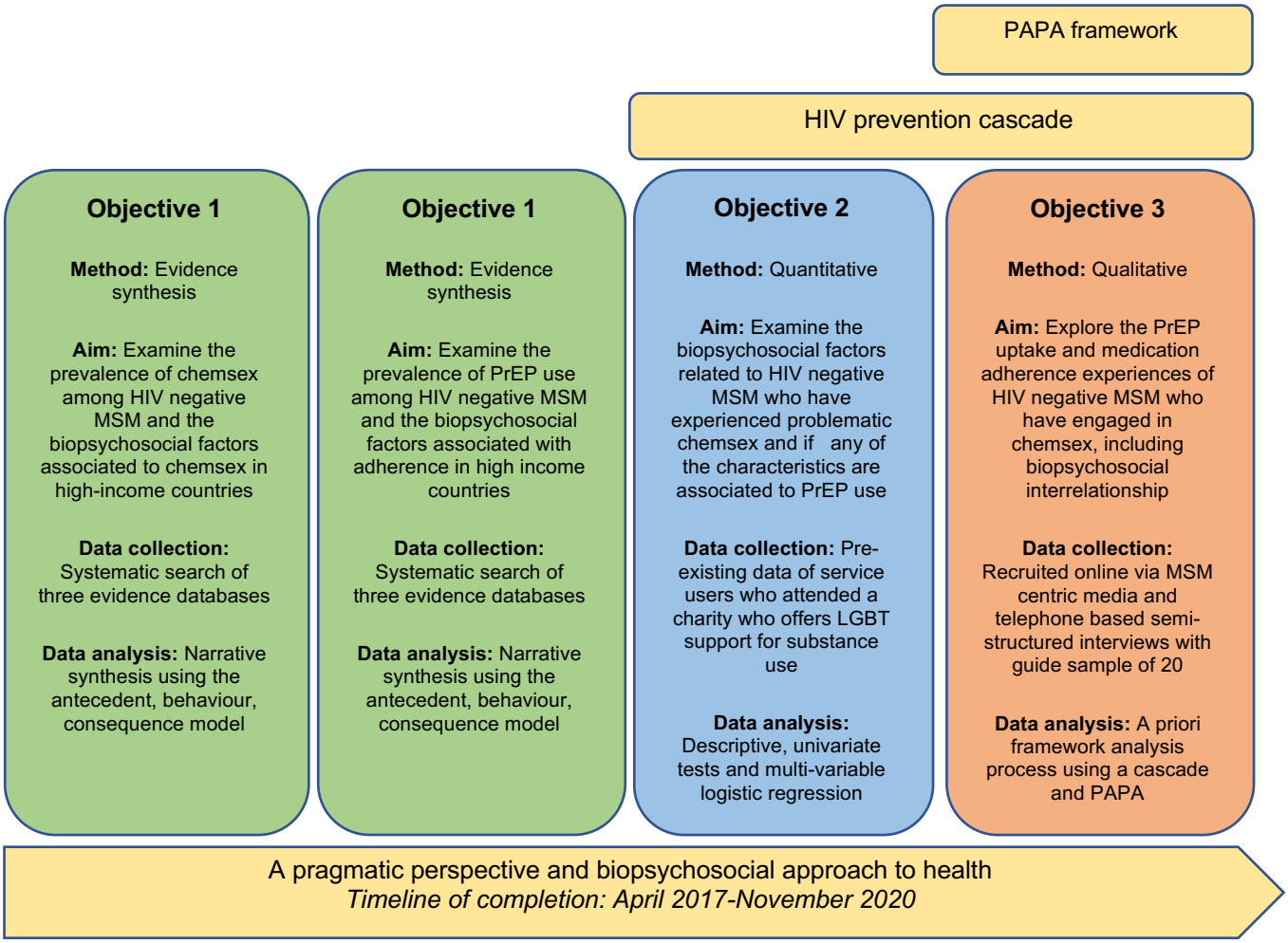
Explore the biopsychosocial factors that influence MSM engagement in chemsex/PrEP use, access to PrEP and medication adherence during periods of engagement in chemsex.

Due to the paucity of combined published literature on chemsex and PrEP, I found that I had to systematically examine the separate evidence bases. This provided a more thorough identification of all relevant published literature and in-depth understanding of both contemporary phenomena. MSM that experience problematic chemsex are potentially a higher risk subgroup that have additional vulnerability to acquiring HIV. An examination of any differences in risks and protective factors provided a more informed understanding of how PrEP access could be more effectively utilized for this higher-risk group. MSM who had recently engaged in chemsex and who were using PrEP, had valuable real-world experiences of both phenomena. An in-depth exploration of their experiences provided an understanding of how PrEP uptake/medication adherence could be optimised.

I have colour coded each of the objectives to indicate how they relate to each part of the sub-studies that form the PhD (see Fig 3). In Fig 3. I provide a summary of the sub-studies research methods that I used to achieve each objective. This includes the aim, data collection/data analysis process. The yellow shapes indicate where I applied each of theoretical approaches.

The systematic reviews I conducted in objective 1, aided in the development and refinement of the quantitative and qualitative study objectives (2-3). Both reviews highlighted the priority areas for analysis in objectives 2 and data collection/analysis for objective 3. Firstly, both reviews informed the type of drug use behaviours, sexual behaviours and biopsychosocial health variables/questions that I included in objectives 2-3. Secondly, the PrEP review highlighted specific issues related to barriers/facilitators for PrEP access, adherence and impact of PrEP initiation that were important for me to incorporate into objective 3.

Fig 3: Summary of research methods



My quantitative findings were important in shaping the interview topic guide and priority areas for analysis for the qualitative study (objective 3). This was particularly in relation to understanding the risk behaviours and health factors related to PrEP access for problematic chemsex. This ensured that I incorporated all key areas into the data collection tool and that they were fully explored during the interviews which

was important as it was a potential that MSM chemsex participants who partook in the study would have experienced problematic chemsex. As a high-risk group it was important to identify particular chemsex experiences that influenced their PrEP use.

I utilized a pragmatic perspective and the biopsychosocial model of health from the start and these approaches have formed the core strands of the thesis. Due to the paucity of evidence available on the topic I found that I needed to be dynamic and responsive in the research methods and frameworks that I employed for this practice focused PhD. Whilst the methods and theory I used evolved, the biopsychosocial lens remained consistent through every objective and related research methods. This provided a consistent, structured and detailed approach to the health datum that was collected and analysed.

I deployed the HIV prevention cascade for objectives 2 and 3. The cascade was primarily used to structure and understand the progressive pathways steps of MSM chemsex participants PrEP use journey. For objective 2, I specifically used it as a guide to target the analysis of PrEP use within the most vulnerable sub-group, MSM that had experienced problematic chemsex and accessed PrEP. This was in terms of understanding and comparing the risk behaviours and biopsychosocial health differences between those that had accessed PrEP and those that had never accessed PrEP. This informed the development of the qualitative study.

I combined the HIV prevention cascade with the enhanced PAPA framework for objective 3. As outlined previously, I used the cascade as it provides a pathway of steps that are involved in using an HIV prevention intervention. I used all three elements of the cascade to ensure the research participants full PrEP use was encompassed into the study. It provided the basis for exploring the barriers and facilitators experienced by MSM chemsex participants. However, as a generalized structure the cascade did not provide an in-depth theoretical base to explore the research participants PrEP adherence. Originally, I intended on using PAPA in the effective element of the cascade as it links to the level of success in executing a medication regimen. However, during the final stages of data analysis I found that it was pertinent I applied PAPA to all the elements of the cascade. The research participants initial perceptions of PrEP and opportunities to access it were integral to the motivation and access elements of the cascade. As PrEP is a preventative, users' perceptions are important in shaping their views of being suitable candidates which alters their motivation and access of the medication.

Reflexive statement

In this section I will provide a brief reflection on my positioning within the research. This includes my wider professional background and current role, interest and motivation for undertaking a PhD within this topic, progress in my professional development and personal reflections on the research process.

I have been practicing as a registered nurse for the past 15 years. In the past 10 years I have specialised in alcohol and drug misuse which provided me with an interest in BBVs. In 2012, I started as a senior charge nurse with responsibility for educational development and quality improvement for substance misuse and BBV treatment provided in primary care. At this time, I did a lot of health improvement

and educational work involving MSM substance use and sexual health/BBVs. I developed a passion to be able to provide beneficial input in reducing the health inequalities which affected this population. I currently work as a lecturer, and I have a drive to develop my career to be a senior researcher. The innovation of PrEP provided me with a unique opportunity to be able to combine my clinical/educational expertise to develop a PhD focused on MSM risk reduction.

In addition to my professional motivation for completing the PhD, there were personal influences that shaped my interest in the topic. As an openly gay man, I have had an interest in understanding why myself and my personal peers face disproportionate health inequalities. The areas of substance use/HIV are particularly pertinent as I have experienced peers being subject to their negative impacts and social stigmatisation from wider society. I am passionate about research being practically informed so it can improve the real day-to-day lives of my community.

Before starting my PhD, I worked in NHS quality improvement and academia, which provided me with a good level of generalized knowledge of theoretical approaches to research. I had substantive experience in NHS project leadership and application of service evaluation skills. This experience prepared me well for using the multi research methods I deployed in my PhD. However, as my primary experience was service evaluation with multiple specialist team members, there were more specific quantitative and qualitative skills I had not developed.

Firstly, I had very limited experience with inferential statistics. PhD courses I attended, and supervision expertise has provided me with confidence in applying specific areas of this skill set. Secondly, I had previously used qualitative methods, but this was always within smaller scale NHS projects with specialist practitioners. The qualitative work I completed has provided me with confidence in leading larger scale projects that use a structured research process. My PhD journey has provided me with insight into the multiple and wide array of specialist disciplines there are within qualitative research. The thematic framework approach is an area I have an affinity with because it is particularly designed for applied healthcare services research.

The key area that I personally reflected upon during my PhD was the qualitative interviews. I was cognizant that participants were disclosing sensitive information about deeply personal experiences. Firstly, it was important I provided an approach that was non-judgmental and non-reactionary as participants were disclosing very explicit scenarios. As a nurse primarily from a substance use and sexual health background, I was used to discussing varied explicit topics including drug use and sexual risk. However, this is usually within a therapeutic consultation process which aims to reduces risk and promote health. I was cognizant that I was not there to provide intervention support, which was a challenge from a carer role where the tendency is to want to help. I felt fully prepared to adopt an approach that engendered trust as I have many years of experience in using advanced communication skills with patients. I was aware not to use questioning styles which are associated to the investigatory process of a patient assessment. Being from a mental health background, I felt comfortably versed in adapting my communication methods.

I was aware that my personal situation as a gay man may influence the participants interviews. As a highly experienced nurse, I am fully adapted at separating my personal and professional perspectives. However, I was aware within a research role that key areas of my personal attributes could appropriately shape the interview experience for the participants. I was aware some participants judged me to be a gay man. I fully engaged with the topic in their language and did not need to query any points. Participants' perceptions that I belonged to their community may have facilitated more trusting relationships. I think they felt more confident as I was able to fully converse with them in the sexual terms they used. This may have helped prompt an ease that they could speak frankly without fear of judgement about their sex lives and inter-related MSM cultural factors.

Chapter 3: Chemsex behaviours among men who have sex with men- a systematic review

Introduction

In this chapter I set out the systematic review of peer reviewed published evidence on chemsex behaviour among MSM. Initially, I lay out the review's objectives, methods and main findings. Subsequently, I discuss the key findings in relation to wider literature, highlight the reviews strengths/limitations and provide a conclusion.

As laid out in chapter 1, PHE (2015) defines chemsex as the planned use of drugs before or during sex to enhance, facilitate and prolong the event. However, there are differing perceptions among researchers and policy makers about how the concept is defined. There are challenges in accurately interpreting research that examines chemsex prevalence and the associated risk behaviours. This is due to the wide variation in methods used to examine chemsex and inter-changeability of terms used to contextualise chemsex (Edmundson *et al.*, 2018).

As identified in chapter 1, within a chemsex dynamic there are multiple behaviours that MSM chemsex participants engage within, including multiple partners, condomless anal sex (CAS), esoteric acts (example: fisting) and IDU (injecting drug use). The disinhibiting effects of drugs will facilitate the user's desired engagement for enhanced sexual behaviours. However, there is a potential risk that drugs severely impair the user's judgement and their decision-making ability. This interface will potentially manifest in multiple high-risk behaviours which places participants are high-risk of acquiring HIV.

At the time I conducted this review, there was no published reviews that examined the use of chemsex drugs before or during sex. Due to the PhD's focus on the MSM chemsex population and understanding their HIV risk within a health prevention modality, there was a need to review the evidence. The review provided the basis for the key areas to incorporate and explore in the PhD's quantitative and qualitative studies. This review particularly focused on drug use risk behaviours, sexual risk behaviours, HIV risk reduction strategies and health factors. The review's aim was to understand the chemsex behaviours and influence on biopsychosocial health among MSM in high-income countries. The objectives of the review were:

1. To define prevalence estimates for chemsex behaviours among MSM.
2. To identify behaviours that manifest within chemsex, including drugs use behaviours, sexual risk behaviours and characteristics of the environment.
3. To identify characteristics associated with chemsex behaviour participation, including HIV status, socio-demographics and expectations of participating.
4. To identify the range of bio-medical risk reduction interventions used by MSM who engage in chemsex behaviours.

5. To identify the biopsychosocial health impact of chemsex behaviours on MSM who engage in the activity.

Methods

I conducted and reported the systematic review in accordance with the Preferred Items for Systematic Reviews and Meta-analysis (Liberati *et al.*, 2009). I used the CINAHL, Medline, Web of Science and CENTRAL databases to conduct the search as they provide a multi-disciplinary range of research, including medicine, nursing, allied health professions and social sciences. I generated the search terms based on the population, exposure and outcome. Table 1 provides the MESH terms and key words that were used for the search. I conducted the search using a predefined protocol which was developed in combination with the two main PhD supervisors (Professor Shahmanesh and Associate Professor Gafos). I conducted the initial search in December 2017 and updated it in September 2018. As per UCL guidelines, ethical approval was not required as it was only a review of published literature.

Table 1: Chemsex behaviour MESH terms and key words

Population	Exposure	Outcome
Men who have sex with men (MSM)	Chemsex	Sexually transmitted infection(s)
Homosexual me(a)n	Party and play	Sexually transmitted disease(s)
Gay me(a)n	Sexualised drug use	HIV
Gay male(s)	Slamming	Hepatitis C
	Substance use disorder(s)	
	Illicit drug use	

As identified, previous research has used varying methods and definitions to examine chemsex drug use. There are recognised challenges in measuring and examining a set of complex human behaviours within a contemporary phenomenon. To mitigate the heterogenous sampling I only included studies of MSM behaviours that explicitly stated in their research methods that drug use was before or during sex. In addition, as previous research stated in the UK there were five main drugs associated to chemsex, I only included studies if one of the following drugs were used: crystal meth, mephedrone, GHB/GBL, cocaine and ketamine.

As the research focus was to understand the interface between chemsex and PrEP including the associated HIV risk behaviours and risk reduction strategies, I only included studies that sampled HIV negative MSM or those whose HIV status was unknown. Studies that exclusively included HIV positive MSM, were excluded from the review. Original research that was fully published in peer review journals were included, specifically cross-sectional, cohort, case-control, qualitative and randomized controlled trial designs. I included studies from high income countries, as defined by the World Bank (*The World Bank*, 2019), and studies published in English between 1st of January 2000 and 1st of September 2018.

I performed the search using a pre-defined protocol that was developed in combination with the two main PhD supervisors. I extracted data retrieved from the search onto Endnote x8 (Thomson Reuters, New York). At the abstract stage, an independent researcher (experienced nursing academic from King' College London) reviewed a random sample of abstracts, 10% for excluded and 20% of included studies. This was to ensure a level of robustness in the selection process. I extracted the following data from the articles onto a structured template: publication details (authors, year and country) details of the study (time it was conducted, location, design, sample eligibility), study aim/objectives, data collection/analysis methods, main findings (variables of interest in table 2) and primary limitations in study design.

Due to the variation in study design of the articles that were included, there was a wide variance in exposures and outcomes. I used Popay's four-stage framework and methods to increase the robustness, transparency and consistency of the narrative synthesis process (Popay *et al.*, 2006). In addition, I used the antecedent, behaviour and consequences (ABC) model to structure and compare the variables of interest. The antecedents involve predictive factors of an event, behaviours describe what occurs at an event and consequences involves factors that may be the outcome of an event (Meaden, Ayvazo and Ostrosky, 2014). Table 2 provides a provisional summary of the ABC analysis of chemsex behaviours which was determined from published literature and discussions with PhD supervisors. The ABC model was subject to alterations and refinements as synthesis progressed.

Table 2: ABC analysis of MSM chemsex behaviour

Antecedent	Behaviour	Consequence
● Socio-demographics ● HIV status ● Expectations of participating	● Prevalence ● Drugs used ● Injecting drug use ● Drug use setting ● Sexual behaviours ● Bio-medical risk reduction interventions	● Physical including STI/BBV infection ● Psychological ● Social

I used two validated quality appraisal tools to perform a risk of bias assessment for each of the articles included in the final synthesis. I used the National Heart, Lung and Blood Institute (NHLBI) tool to assess the clarity and rigour of the outcomes/measures, sample recruitment, data collection and statistical analysis process of quantitative studies that were cohort/cross sectional in design (*National, Heart Lung and Blood Institute*, 2019). I used the Critical Appraisal Skills Programme (CASP) checklist to assess the clarity and rigour of the recruitment strategy, data collection/analysis methodology, ethical considerations and presentation of findings of qualitative studies (*Critical Appraisal Skills Programme*, 2019).

Results

Search results and included studies

The number of articles selected and reasons for exclusion are provided in Fig 4. After de-duplication, the search found 2653 articles. Post title, abstract and full text

screening there were 38 articles included in the review. An independent researcher reviewed a random selection of abstracts against the selection criteria. All discrepancies were discussed and resolved.

Fig 4: MSM chemsex study selection process

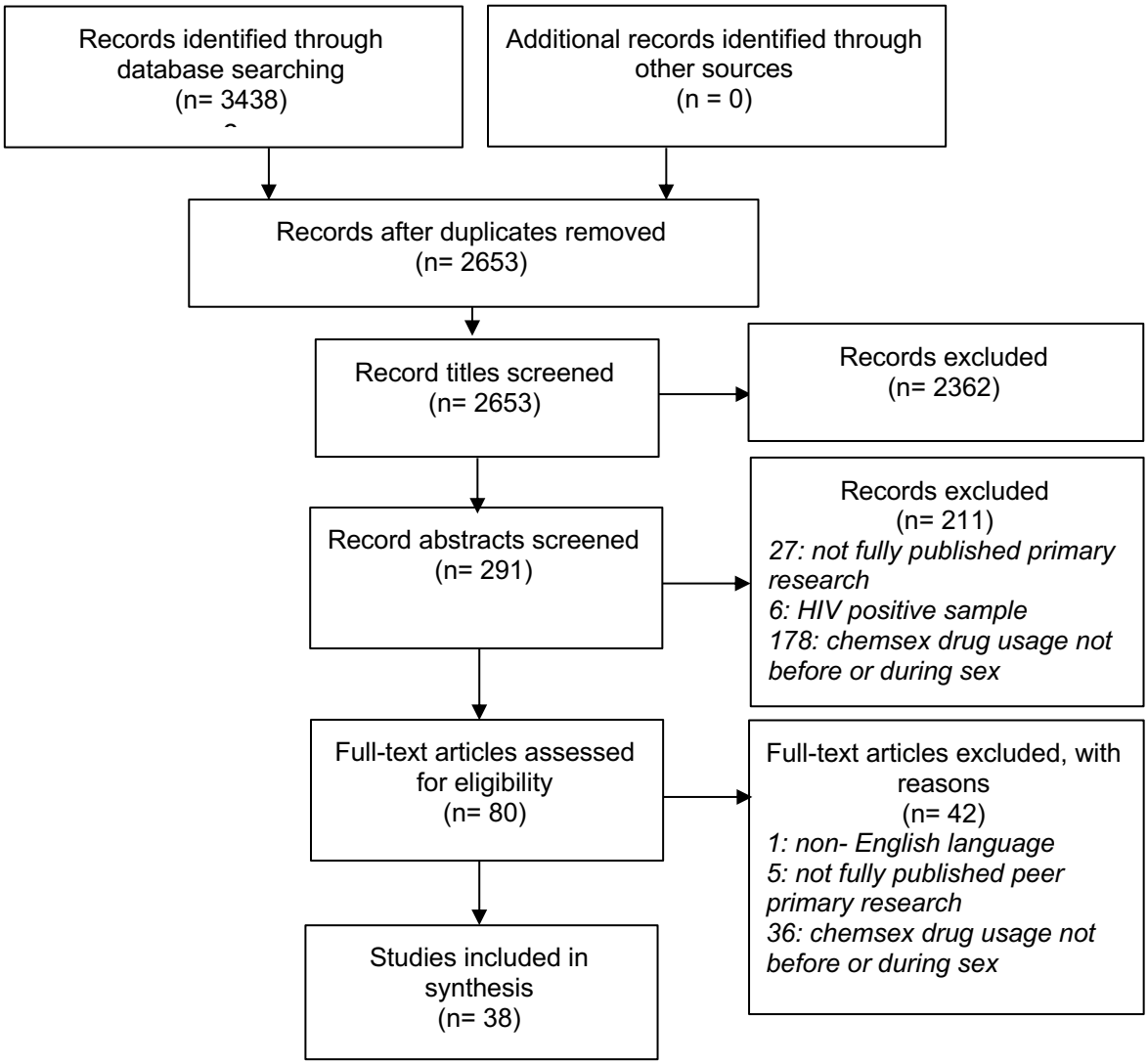
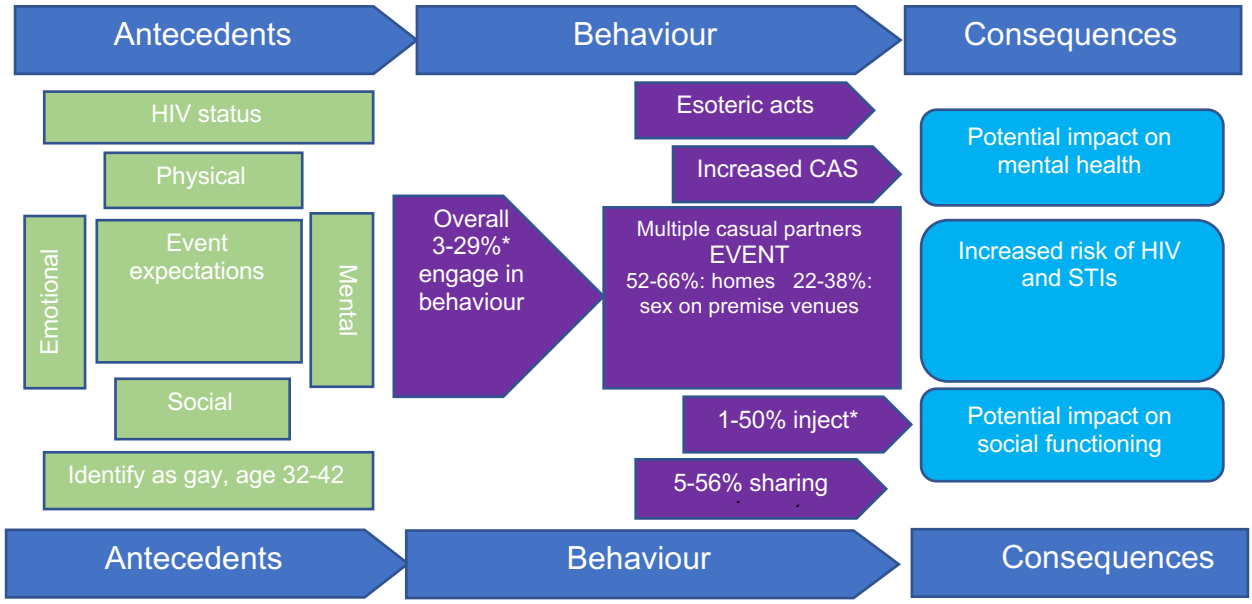


Table 3 (starts on page 37) provides a summary of the 38 articles that were included in the review, including their aim, study design, year of data collection, data analysis methods and main findings structured using the ABC model. Fig. 5 (next page) provides a summary of the review's main findings which is structured using the ABC framework.

The sample size from all the studies ranged from 14 to 6757 with data collected from 2001 to 2017. Many of the studies were from North America (13- USA, 2- Canada) or Europe (10- UK, 3- Netherlands 1- pan European, 1- Germany, 1- Republic of Ireland (ROI), 1- UK/ROI, excluding England). Only six were from other geographical areas, including Australia (5) and Israel (1). Most of the studies were cross-sectional (26) or qualitative (9) in design, with 2 retrospective case note reviews and 1 observational cohort study. Most of the articles (31) reported an HIV prevalence which ranged from 1% to 80% and four studies specifically recruited HIV negative

MSM with three studies not reporting HIV prevalence rates. The heterogeneous sampling frameworks of each of the studies may have been a factor for the wide range of HIV prevalence rates. There was also a wide variation in chemsex prevalence which may be contributed to from the diverse settings in which the samples were recruited.

Fig 5: ABC summary of MSM chemsex behaviour findings



** the overall prevalence %'s for chemsex engagement incorporates higher level estimates of samples from sexual health clinics and injecting prevalence incorporates higher level estimates of samples from drug services*

Acknowledgment: *Maxwell, S., Shahmanesh, M., & Gafos, M. (2019). Chemsex behaviours among men who have sex with men: A systematic review of the literature. The International Journal on Drug Policy, 63, 74–89.*

All the cross-sectional and case note studies were assessed as being fair in their level of quality using the NHLBI tool. Most of these studies only measured the exposures at one point in time, did not provide a sample size rationale and did not state if the researchers were blinded to the status of the included sample. Most of these studies did have specific objectives, defined sample criteria, specific and appropriate data collection and analysis methodology. The main strengths for most of the qualitative studies were the appropriate and justified data collection and analysis process, structured presentation of findings and approved ethics. However, the majority had a limited reflection on the wider ethical factors and role of the researchers within the qualitative process

Antecedents of chemsex behaviours

Socio-demographics

Thirteen studies examined socio-demographics of samples that used chemsex drugs and most were based in the UK and USA. Eight studies provided a mean or median age, ranging from 32 to 42 (Green *et al.*, 2006; Weatherburn *et al.*, 2017; Hegazi *et al.*, 2017; Benotsch *et al.*, 2012; Reback, Fletcher and Swendeman, 2018; Druckler, van Rooijen and de Vries, 2018; Rosinska *et al.*, 2018; Closson *et al.*, 2018) and one

study for injectors identified a median age of 42 (Hopwood, Lea and Aggleton, 2015). A cross-sectional study from the UK identified that MSM between 36-45 were more likely to engage in chemsex (Frankis *et al.*, 2018). In six studies that included sexual identity, most of the sample were gay (Green *et al.*, 2006; Benotsch *et al.*, 2012; Hopwood, Lea and Aggleton, 2015; Weatherburn *et al.*, 2017; McCarty-Caplan, Jantz and Swartz, 2014; Druckler, van Rooijen and de Vries, 2018; Closson *et al.*, 2018).

A USA based study reported that MSM who combined crystal meth with sex were significantly more likely to be white and identify as gay (Rusow, Fletcher and Reback, 2017). In another USA study, crystal meth had higher rates of use in white and hispanic populations. (Ober *et al.*, 2009). In comparison, a USA study reported that white MSM used less cocaine with sex compared to minority ethnicities (Reback, Fletcher and Swendeman, 2018). However, this study was limited by the small number of white MSM in the sample. From this level of evidence, it is not conclusive if ethnicity is a pre-disposed factor for chemsex behaviours. Two studies identified that their MSM samples spend most of their time with other gay men but did not necessarily mean that most of their social network consisted of gay friends (Kelly *et al.*, 2012; Hopwood, Lea and Aggleton, 2015). From this evidence, MSM who engaged in chemsex were more likely to identify as gay and engagement peaked between the mid-thirties to early forties.

Role of HIV status

Eleven studies reported that HIV positive MSM were more likely to use chemsex drugs with sex in comparison to MSM of non-HIV positive status (Ober *et al.*, 2009; Bowden-Jones *et al.*, 2017; McCarty-Caplan, Jantz and Swartz, 2014; Rich *et al.*, 2016b; Gilbart *et al.*, 2015; Hegazi *et al.*, 2017; Rusow, Fletcher and Reback, 2017; Frankis *et al.*, 2018; Rosinska *et al.*, 2018; Hammoud *et al.*, 2018a; Pakianathan *et al.*, 2018). One study reported that HIV positive status was associated with recent injecting and sharing of injecting equipment (Bowden-Jones *et al.*, 2017). In comparison, a study highlighted that recent injectors were highly more likely to be HIV positive when compared to non-HIV positive study participants (Bui *et al.*, 2018). In summary, there is substantial evidence to suggest HIV positive status is associated to chemsex behaviours but limited evidence to demonstrate a specifically strong link with injecting.

Four studies demonstrated that in a chemsex context HIV positive MSM were more likely to sero-sort and engage in CAS with HIV positive sexual partners (Gilbart *et al.*, 2015; Bourne *et al.*, 2015; Melendez-Torres *et al.*, 2016; Rich *et al.*, 2016a). One study reported that there was less incidence of CAS at sexual sessions when the partner's HIV status was sero-discordant or unknown (Melendez-Torres *et al.*, 2017). In overview, this evidence may indicate that HIV positive status is a factor which contributes to the process of MSM using condoms in a chemsex context.

Table 3: Summary findings for chemsex systematic review

Abbreviation notes: ABC: antecedent, behaviour, and consequence *: **ARVs:** antiretrovirals; **CAS:** condomless anal sex; **EDDs:** erectile disorder drugs; **HCP:** health care providers; **HBV:** hepatitis B; **HCV:** hepatitis C; **MSM:** men who have sex with men; **PEP:** postexposure prophylaxis; **PrEP:** preexposure prophylaxis; **RCT:** randomised controlled trial; **SPV:** sex on premise venue; **STI:** sexually transmitted infection; **TGW**: transgender women; **YMSM:** young men who have sex with men.
*** Definitions:** A: predictors that may occur before PrEP use (antecedents); B: processes and factors involved in PrEP use (behaviour); C: factors that may be outcomes of PrEP use (consequences).

Study	Country	Aim	Sample	Data collection	Design	Key Findings
Kurtz, 2005	USA	exploration of the motivations for and consequences of crystal meth use.	15 MSM: crystal meth users via print media recruitment	2003	qualitative	**A:** crystal meth. use motivated by loneliness, apprehensions about self-attractiveness/getting older, and desire to lose sexual inhibitions. **B:** unlikely to use condoms or ask about partner HIV status. **C:** ongoing crystal meth used associated with loss of friends, partners, employment and higher risk of HIV/STIs.
Green & Halkitis, 2006	New York, USA	examination of crystal meth. use and association with social contexts among New York City's gay sexual subculture.	49 MSM: crystal meth users attending gay venues	2001	qualitative	**A:** crystal meth. associated with increased self-esteem, libido and sexual endurance, lowered sexual inhibition and is used to facilitate receptive anal intercourse. **B:** used strategically to negotiate casual encounters at sex parties/bath houses.
Koblin et al, 2007	New York, USA	examination of amphetamine use, in MSM recruited at public venues and associations with sexual behaviours.	503 MSM: attendees at 12-16 public venues	2004-2005	cross section	**A:** Among HIV+ men, more were likely to use the drug than not use the drug (29.8% versus 16.6%). **B:** 13.8% used crystal meth in the past year, of which 71% was for sexualised use and associated with CAS with casual partners, including receptive CAS.
Kubicek et al, 2007	Los Angeles, USA	descriptions of attitudes to and perceptions of drugs among young men in Los Angeles.	24 MSM, age:18-24	2006	qualitative	**A**: crystal meth. associated with the prolongation of sex, but an equal amount said it affected the quality. **C:** negative impact on social relationships, body image and deterioration of health.
Mor et al, 2008	Tel Aviv, Israel	to identify sexual risks and the substance use behaviours associated with them.	2873 MSM: internet based; living in Israel	2005	cross section	**B:** between 1.2% *(ketamine)* and 46% *(alcohol)* used substances during sex. Chemsex related drugs rates are: *EDDs: 4.8%, methamphetamine: 3.9%, cocaine: 2.4%, ketamine: 1.2%.* 23% reported receptive CAS during the last 6 months and substance use was significantly higher among those engaging in receptive CAS.

Ober et al, 2009	Los Angeles, USA	explore if methamphetamine is associated with ethnicity, age, HIV status, venue and number of sex partners; and if crack use is associated with ethnicity, age, housing status and number of sex partners.	779 MSM & MSMW: via seed recruitment at MSM and/or drug user venues	2005-2008	cross section	**A:** HIV +, and white/hispanic associated with methamphetamine use, and black MSM with crack use. **B:** 33% crack and 22% methamphetamine use during sex. CAS, SPV, HIV+ partner, exchanging sex for money/drugs, and a higher number of sexual partners all associated with increased odds of methamphetamine use. CAS associated with increased odds of crack use only when sex partners were thought to be HIV- rather or of unknown status. **C:** methamphetamine users are at greater risk of HIV.
Prestage et al, 2009	Australia	examination of the association between use of drugs and sexual risk behaviour.	746 MSM: engaged in group sex events: attendees of SPVs and gay commercial websites	2007- 2008	cross section	**A:** frequent methamphetamine use associated with younger age, mixing with other gay men and less education. **B:** 63.0% of the sample used illicit drugs, most commonly amyl 38.6%, EDDs 23.2%, methamphetamines 15.9%, ecstasy 15.8%, cannabis 15%, GHB 7.6%, cocaine 3.8%, ketamine 2.9%. Sero-discordant CAS reported by 22% and meth. associated with CAS among non-HIV sero-concordant partners. Frequent meth. users more likely to engage in esoteric sex acts.
Jerome et al, 2009	New York, USA	explore motivations for using club drugs and risky sexual behaviour.	32 MSM: attendees of gay venues	2002-2004	qualitative	**A:** motivations classified into domains; *Physical:* initiation of sex, increased sensations *Emotional/mental*: enhance feelings, share similar thought process and escape into the moment. *Social:* drugs act as a shared mechanism to facilitate sex.
Kelly et al, 2012	New York, USA	assess area of residence and social network influence on sexual risk behaviours.	710 HIV-MSM: attendees at expo events	2005	cross section	**A:** social networks primarily of gay men associated with insertive CAS, 'party and play' and using the internet to find sexual partners. Residence associated with gay-centric networks, but not socialising with other gay men. Association between residence and 'party and play' is mediated by gay- centric networks.
Benotsch et al, 2012	Denver, USA	investigation of the relationship between methamphetamine use, and sexual risk behaviours.	342 MSM: attendees at gay pride event	not specified	cross section	**A:** associated with increased desire for sex (42%) and enhanced sexual pleasure (32%). Non-white men more likely to report recent use. **B:** 27% lifetime methamphetamine use, 7% in the previous 3 months, with a mean of 10 times. Sexualised users more likely to have more partners for receptive CAS, to trade sex for money and report higher levels of risk behaviour.

Heiligenberg et al, 2012	Amsterdam, Netherlands	assess whether drug usage is associated with STIs after adjusting for demographics and high-risk sexual behaviour.	2822: sexual health clinic	2008- 2009	cross section	**A:** HIV+ more drugs with sex than HIV- negative. **B:** reported drugs with sex: most commonly cocaine (15.3%) and GHB (16.1%) and less so ketamine (4.2%) and methamphetamine (3.3%) MSM more sexual partners in the previous 6 months than heterosexuals. Sex related drug use associated with high-risk sexual behaviour in HIV- but not HIV+ MSM. **C:** STIs significantly more common among MSM than heterosexual men and women.
Grov et al, 2013	USA	categorised participants into three groups based on their most recent group sex event and compared groups to understand unique and similar facets of the events.	2063 MSM: online MSM sexual network website	2012	cross section	**A:** HIV+ group sex event varied: 20.0% threesomes, 31.8% spontaneous group sex, 30.1% organised sex parties. **B:** A significantly larger number of MSM whose last group sex event was spontaneous had consumed 5 or more alcoholic drinks, or used cocaine, methamphetamine, MDMA/ecstasy, or GHB/GBL during that encounter.
McCarty-Caplan et al, 2014	Chicago, USA	to establish whether drug use groups exist among MSM; and what characteristics related to HIV risk, in addition to drug use patterns, distinguish these groups.	943 MSM: internet survey	2007-2010	cross section	**A:** larger number of sexualised drug users (SDUs); SDUs 25 or older and HIV+. **B:** 2 drug groups were identified, poly drug users (PDU) and SDU. SDU 10.5% of the sample used poppers, methamphetamine, EDDs, club drugs and cocaine. The SDU group were far more likely to use methamphetamine before sex and more receptive CAS than the PDU group.
Bourne et al, 2015	London, UK	explore HIV/STI risk behaviour during the intentional combining of sex with mephedrone, GHB/GBL and crystal methamphetamine.	30 MSM: chemsex users via gay magazines online apps & venues/ services	2013- 2014	qualitative	**A:** enhanced sexual performance and sensation. **B:** casual partners met via geosocial apps or SPVs. Common for group events in private residences, some men attending multiple events over several days. Some HIV+ men would not use condoms if partner also HIV+. 1 in 3 had multiple episodes of high-risk sexual behaviour and reported drugs affecting their judgment of risk. 1 in 4 always use condoms with casual partners.
Rich et al, 2016a	Vancouver, Canada	compare sexual behaviour, substance use, and prevention strategies of recent group sex event attendees with non-attendees	719 MSM: MSM seed recruitment	2012- 2014	cross section	**B:** 21% went to at least 1 group sex event in the previous 6 months. All drugs linked with group sex events. Crystal meth. use linked with EDDs and attendance at group sex events. Crystal meth users more likely to use EDDs/attend group sex event compared to lower odds of using EDDs/attend group sex when crystal meth not used.

Rich et al, 2016b	Canada	to assess whether (1) EDD are associated with insertive anal sex (2) poppers are associated with receptive anal sex (3) poppers & EDD are associated with versatile & reciprocal anal sex (4) crystal meth is associated with all sex roles.	719 MSM: MSM seed recruitment via paper or electronic vouchers	2012- 2014	cross section	**A:** participants more likely to be HIV+. **B:** levels of any substance use consistent across all sexual acts. Associations between group sex events and crystal meth, GHB in univariate analysis, and with EDDs in multivariate analysis, which is positively associated with insertive sex role. Crystal meth associated with insertive/receptive roles in univariate analysis but not multivariate.
Hopwood et al, 2015	Australia	explore the social aspects of hepatitis C among gay and bisexual men and factors associated with sharing injecting equipment.	474 MSM: Facebook, gay websites & MSM organisations	2013	cross section	**B:** 9% ever injected drugs, 86% in the previous 6 months, most commonly crystal meth 85%, IEDM 25%, speed 21%, cocaine 13% and heroin 3%. 15% injected in the previous 6 months and crystal meth (76%) was the most commonly injected. Men who shared injecting equipment in the previous 6 were more likely to have injected crystal meth. 72% of HIV- men had been tested for HIV and 77% HCV- men had been tested for HCV.
Gilbart et al, 2015	UK	explore the lifestyle and sexual behaviour of MSM diagnosed with S flexneri.	21 MSM diagnosed with S flexneri 3a: via Health Protection Units	2012- 2013	cross section	**A:** HIV+ seek condomless sex, group sex events and chemsex. **B:** 50% attended or organised a sex party through social networks typically of about 8 casual partners that could last for several days. 38% had injected drugs & were injected by others. Needles were soaked for later use in a shared solution. 43% said drugs effected judgement in risk taking.14% used EDDs. HIV+ linked with insertive anal intercourse with casual partners, receptive fisting and web apps. for CAS.
Deimel et al, 2016	Germany	examine reasons for drug use and drug use contexts among MSM.	14 MSM: substance users via LGBT/HIV services	2015	qualitative	**A:** to lower inhibitions, intensify experiences and increase sexual performance. **B:** amphetamine, cocaine or ecstasy used at events that can last hours to days with multiple partners involving behaviours they would not do. 9 had injected drugs, most commonly crystal meth for its sexual intensification. 80% reported CAS in the previous 12 months.
Melendez-Torres et al,	UK	describe the relationship between situational	321 MSM: internet	2011- 2012	cross section	**B:** drug use in 67.7 % of encounters and partner drug use in 43.3 % of encounters including GHB 9.2 %, crystal meth

2016		characteristics and sexual outcomes.	survey via community recruited MSM			8.0 %, and mephedrone 7.3 %. 14.2 % of multi-partner encounters included at least one of these drugs. Locations were SPVs 37.6%, homes 51.6%, cruising locations 10.8%. CAS occurred in 37.7% of the encounters and associated with crystal meth. and EDDs. Encounters involving partners of unknown HIV serostatus were less likely to involve CAS.
Weatherburn et al, 2016	London, UK	examine factors that men value about sexualised drug use and build a picture of motivations for chemsex.	30 MSM: chemsex users via gay magazines online apps & venues/ services	2013- 2014	qualitative	**A:** motivations include arousal, increased libido, confidence and stamina, heightened orgasm and connections with partners, lower inhibitions, to alter perceptions of partner attractiveness, and to have more diverse sexual experiences with more adventurous acts.
Hegazi et al, 2017	London, UK	explore associations between chemsex, STI, Hepatitis C and HIV incidence and sexual risk behaviours.	818 MSM: case note review of 2 sexual health clinics	2014- 2015	case note review	**A:** chemsex associated with HIV+ but not with ethnicity or place of birth. **B:** 113/655 had engaged in chemsex commonly using mephedrone 69.3%, GBL/GHB 56.4%, crystal meth. 46%, cocaine 15.8% and ketamine 5.9%. Frequency of participation in the previous 3 months varied: 34.18% > once a month, 17.72% 1–3 times and 48.1% less often. Chemsex associated with more than 6 partners in the previous 3 months, transactional sex, group sex, fisting, sharing sex toys, injecting drug use, higher alcohol consumption and use of 'bareback' social networking apps. Participants more likely to report sex with a discordant HIV or HCV- infected partner. **C:** any STI and PEP use. 52% reported consequences: time off work (14.1%), accidental overdose (4.8%), hospitalisation (7.7%), impact on mental health (15.1%).
Ahmed et al, 2017	London, UK	describe the nature and operation of social norms relating to chemsex and identify public health implications.	30 MSM interviews: 12 MSM groups: via gay magazines online apps	2013- 2014	exploratory	**B:** chemsex viewed as mainstream, only a few men thought it was a minority behaviour. 1 in 3 interviewees had injected, one quarter were wary of or disliked injecting drug use. One-sixth thought slamming had become more commonplace. Some sexual acts were more acceptable during chemsex because the drug effects justified actions, particularly high risk/esoteric acts. Chemsex in private

			& venues/ services			settings linked to mobile apps. Private settings (homes/hotels) reported as secure places to participate in chemsex.
Melendez-Torres et al, 2017	England, UK	to test associations between drug use and unprotected anal intercourse.	2142 MSM: online via dating websites	2011-2012	cross section	**B:** CAS associated with use of EDDs, crystal meth, GHB and occurred in 30.9% of encounters. Sexual encounters without drugs decreased odds of CAS as did encounters with casual and steady partners and with people who were HIV- sero-discordant or of unknown HIV status.
Rusow et al, 2017	USA	participant racial/ethnic, sexual identities, socio-demographics, would be associated with differential choice of venue, and choice of venue would be associated with different risk behaviours during that sexual encounter.	1298 MSM: used any substance in the 12 months via outreach in substance using MSM venues	2005- 2012	cross section	**A:** Gay, White and HIV+ associated with methamphetamine use during last sexual encounter. **B:** 39.7% report methamphetamine use during sex which is most likely to occur during SPV (49.0%). SPV significantly more likely to involve multiple sex partners (19.1%) and/or sex with anonymous partners (82.3%) than PSE or private locations. SPV more likely to be with HIV- sero-discordant partners (85%) than PSE (60.5%) or private locations (52%).
Bowden-Jones et al, 2017	London, UK	describe patterns of HIV risk-related drug use and sexual activity in an MSM population presenting for drug treatment.	407 MSM: attendees of a specialist drug service	2011- 2014	cross section	**A:** HIV+ MSM associated with chemsex/injecting drug use. **B:** 73% used drugs to facilitate sex including methamphetamine, cocaine and ketamine. Methamphetamine use associated with a four-fold increase in the risk of being HIV+. 50% had ever injected drugs (data for n ¼ 399 men), a third had injected in the last 28 days and 11.8% had shared injecting equipment for chemsex. These injecting behaviours more likely in primary problem methamphetamine users.
Ottaway et al, 2017	Brighton, UK	hypothesise that MSM sexualised drug usage is contributing to current STI and HIV transmission.	260 MSM: (130 cases and 130 controls): sexual health clinic	2015	observational cohort	**B:** Chemsex significantly greater in cases than controls. Mephedrone used most frequently, followed by GHB/GBL. More sexual partners and significantly more CAS among cases than controls. **C:** associations between STIs and HIV, number of sexual partners, increased CAS and chemsex.
Bui et al, 2018	Australia	investigate the prevalence & correlates of recent injecting using baseline data from a large	1995 MSM: MSM specific websites	2014-2015	cross section	**A:** HIV+ & HCV+ MSM more likely to inject, Reasons for injecting crystal meth: facilitate anal intercourse, sustain sex for longer % reduce inhibitions. **B:** 4.7% recently injected and 91% was for sexual

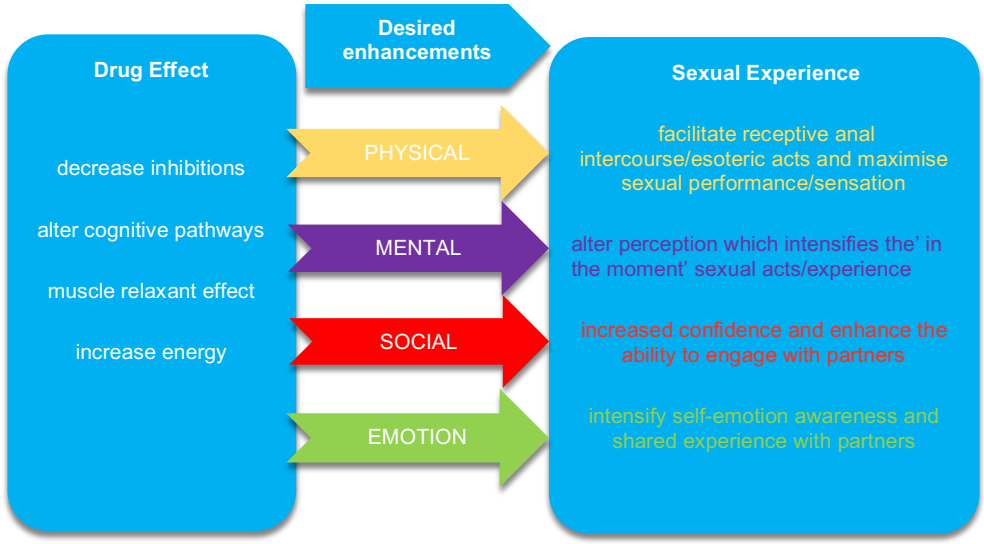
		prospective observational study.	and apps			purposes. The most commonly injected drug is crystal meth & 1 in 10 had shared injecting equipment. Associated with recent injecting is multiple partners & group sex.
Frankis et al, 2018	Scotland, Wales, Ireland	examine the prevalence of MSM chemsex drug usage, including sexual context and determine the associated behaviours.	3217 MSM: MSM specific websites and apps	2016	cross section	**A:** HIV+ MSM and HIV test in previous 3 months **B:** 6.1% engaged in chemsex and 1.3% injected for sexual purposes. Chemsex drug use rates in the last year: crystal methamphetamine 2.5%; mephedrone 4.5%; GHB/ GBL 4.9%; ketamine 3.8%. Chemsex in the last year associated with CAS, fisting sand transactional sex.
Rosinska et al, 2018	Thirteen European Cities	examine the prevalence and predictors of drug use during a sexual encounter amongst MSM.	4266 MSM: community field workers	2013-2014	cross section	**A:** HIV+ MSM, younger age and university education **B:** 3.4% engaged in chemsex, range 0%-14% across the different cities. Chemsex associated with injecting & more than one partner. 23% used EDDs and is associated with more than 1 partner. **C:** STI diagnosis
Hammoud et al, 2018b	Australia	describe the prevalence of concurrent use of methamphetamine, PrEP & EDDs, and methamphetamine and EDDs, without PrEP.	1831 HIV-MSM: social media, including MSM specific	2014-2017	cross section	**B:** 2017: 14.5% used methamphetamine and 28.3% EDDs. Concurrent use of meth, PrEP and EDDs in 2014: 1.9% & 2017: 6%. 13.4% engaged in chemsex. Overall, PrEP use in 2014:1% & 2017: 28%. PrEP use (n=205) in previous 6 months for chemsex participation: 81.5% never used, 2.4% used once.
Druckler et al 2018	Netherlands	examine the proportion of STI clinic clients engaging in chemsex and identify if chemsex is a risk factor for STI diagnosis.	6757 MSM: sexual health clinic & online survey via MSM app	2016	cross section	**B:** STI clinic (n=4925): 18% engaged in chemsex, Online survey (n=1832): 29% engaged in chemsex. Most used: GHB/GBL 93%, methamphetamine 22%, mephedrone 16%. 6% injected for sexual purposes in previous 6 months. Chemsex participants had more partners, CAS & more often on PrEP than non-participants. **C:** STI diagnosis
Pakianathan et al, 2018	UK	hypothesis that a new HIV diagnosis is positively associated with chemsex participation.	1840 MSM: case note review of 2 sexual health clinics	2014-2015	case note review	**A:** HIV+ MSM **B:** 17% engaging in chemsex, drugs most common: mephedrone 78.6%, GHB/GBL 62%, methamphetamine 50%, cocaine 28%, ketamine 13%. Chemsex participants more likely to engage in group sex, inject drugs & engage in esoteric acts, have sex with a sero-discordant HIV and HCV+ partner; **C:** HIV & STI diagnosis, accessing PEP
Hammoud et al, 2018a	Australia	examine factors associated with the use of	3190 MSM: social	2014-2017	cross section	**A:** HIV+ MSM & sexual enhancement a primary reason for GHB use

		GHB, its relationship to sexual risk behaviour,	media, including MSM specific			**B:** 80% never used GHB, 19.5% had ever used it & 5% used it in the previous 6 months. Primary reason for GHB use was sexual. GHB associated with a greater number of partners, casual partners, CAS and group sex. **C:** risk of overdose, accidental injury & loss of friends
Hoornenborg et al, 2018	Netherlands	examine for changes in sexual behaviour after the initiations of PrEP among MSM and transgender women.	330 HIV-MSM/TGW: sexual health clinic	2015	cross section	**B:** 99% are MSM**.** 75% chose daily PrEP and 25% episodic PrEP. 41% engaged in chemsex. Older age, PEP use, engaging in chemsex with casual partners and daily PrEP regimen are factors associated with increased CAS with casual partners at 6 months compared with baseline. Overall, no evidence of increase in partners. Median number of CAS with casual partners increased from 2 at baseline, to 4 at 6 months.
Glynn et al, 2018	Republic of Ireland	examine the prevalence of chemsex use & the relationship between chemsex and other sexual risk behaviours.	486 MSM: sexual health clinic	2016	cross section	**B:** 27% engaged in chemsex and 9% had injected drugs for sexual purposes. Drugs most commonly used: GHB/GBL 57%, cocaine 46%, ketamine 30%, methamphetamine 21%, mephedrone 16%. Chemsex participants are more likely to have more partners and CAS than non-participants.
Reback et al, 2018	USA	examine the associations between users' socio-demographics, substance use before or during sex & sexual behaviours.	286 MSM: methamphetamine user via MSM venues, online media	2014-2016	cross section	**B:** Participants had more than 1 episode of sex in the previous 30 days with cocaine & methamphetamine. Higher level of cocaine use is associated with engaging in more CAS, not significant in partner type. Higher level of methamphetamine use is associated with engaging in more CAS, significant across partner types.
Closson et al, 2018	USA	explore strategies for PrEP adherence and dosing preferences in the context of sexualised drug use.	40 MSM: chemsex users via MSM venues & primary care clinics	2012-2013	qualitative	**B:** participants believe it may be an issue to remember and take PrEP while under the influence of methamphetamine, crack, powder cocaine, & GHB. All believe it is viable to take PrEP while not under the influence of drugs. Daily PrEP was the preferred regimen for those who more regularly use drugs and episodic PrEP use was preferred by those who only frequently use drugs.

Expectations of participating

Twelve articles reported that MSM who engage in chemsex behaviours may have perceptions and expectations that the desired biological effects of a drug will enhance a sexual encounter (Kurtz, 2005; Green *et al.*, 2006; Kubicek *et al.*, 2007; Jerome, Halkitis and Siconolfi, 2009; Benotsch *et al.*, 2012; Bourne *et al.*, 2015; Deimel *et al.*, 2016; Weatherburn *et al.*, 2017; Ahmed *et al.*, 2016; Prestage *et al.*, 2009; Bui *et al.*, 2018; Hammoud *et al.*, 2018a). Most of the studies were from the USA or UK and qualitative in design. The drugs had multiple interacting affects which can be categorised physical, mental, emotional and social domains. Fig. 6 provides a summary of drug effects and the expected outcomes that alter the sexual encounter.

Fig 6: Expected drug effects on a sexual event



Acknowledgment: *Maxwell, S., Shahmanesh, M., & Gafos, M. (2019). Chemsex behaviours among men who have sex with men: A systematic review of the literature. The International Journal on Drug Policy, 63, 74–89.*

Most of the studies found that a key effect was the ability to increase stamina and arousal levels, which facilitated more sustained periods of sex and facilitated easier anal sex acts (Kurtz, 2005; Green *et al.*, 2006; Kubicek *et al.*, 2007; Jerome, Halkitis and Siconolfi, 2009; Bourne *et al.*, 2015; Deimel *et al.*, 2016; Ahmed *et al.*, 2016; Weatherburn *et al.*, 2017; Prestage *et al.*, 2009; Bui *et al.*, 2018; Hammoud *et al.*, 2018a). Some of the studies reported that the lowering of cognitive inhibitions mediated the men to overcome their low confidence levels and facilitated a quicker connection with their partners (Green *et al.*, 2006; Jerome, Halkitis and Siconolfi, 2009; Weatherburn *et al.*, 2017). The disinhibition affect appears important for the establishment of a sexual interaction with partners, which provides the basis for a more meaningful sexual encounter. Three studies reported that the perceived increase in self-awareness and intensity of inner feelings was important to enhance the emotional connection with sexual partners (Green *et al.*, 2006; Jerome, Halkitis and Siconolfi, 2009; Weatherburn *et al.*, 2017). The evidence highlights multiple inter-twinning factors for desired drug affects, but the overarching outcome is to heighten and intensify the sexual event.

Behaviours involved in chemsex

Prevalence and type of non-injecting drugs

Ten articles examined the prevalence of chemsex drugs within general MSM samples and most of the articles were from the USA and Western Europe (Koblin *et al.*, 2007; Mor *et al.*, 2008; Prestage *et al.*, 2009; Heiligenberg *et al.*, 2012; McCarty-Caplan, Jantz and Swartz, 2014; Benotsch *et al.*, 2012; Frankis *et al.*, 2018; Rosinska *et al.*, 2018; Hammoud *et al.*, 2018a; Hammoud *et al.*, 2018b). Most of the studies examined numerous sex related drugs but two from the USA specifically focused on crystal meth and cocaine *(Koblin et al., 2007; Benotsch et al., 2012).*

Eight studies provided an overall prevalence for chemsex related behaviour which incorporated various drugs, this ranged from 3%-29% (McCarty-Caplan, Jantz and Swartz, 2014; Hegazi *et al.*, 2017; Rosinska *et al.*, 2018; Druckler, van Rooijen and de Vries, 2018; Glynn *et al.*, 2018; Frankis *et al.*, 2018; Pakianathan *et al.*, 2018; Hammoud *et al.*, 2018b). Prevalence estimates which ranged from 17%-27% were all of samples attending sexual health services and the 29% estimate is from an online survey which used one MSM geo-social app to recruit the sample (Glynn *et al.*, 2018; Hegazi *et al.*, 2017; Druckler, van Rooijen and de Vries, 2018; Pakianathan *et al.*, 2018; Hammoud *et al.*, 2018b). Four other studies that provided lower estimates of between 3%-13% all used a variety of multiple online platforms to recruit their samples (McCarty-Caplan, Jantz and Swartz, 2014; Frankis *et al.*, 2018; Rosinska *et al.*, 2018; Hammoud *et al.*, 2018b). A multi-site study of thirteen European cities reported a prevalence range of between 0%-14% (Rosinska *et al.*, 2018). Prevalence varied widely across the different locations.

Six studies provided use rates for the three drugs primarily connected to chemsex *(crystal meth, mephedrone, GHB/GBL*) (Frankis *et al.*, 2018; Druckler, van Rooijen and de Vries, 2018; Pakianathan *et al.*, 2018; Glynn *et al.*, 2018; Hegazi *et al.*, 2017; Melendez-Torres *et al.*, 2016). Most of the studies were from Western Europe and many of the samples were recruited from sexual health services. Mephedrone was the most used in two UK studies and the least used in three other studies from the UK, ROI and the Netherlands (Pakianathan *et al.*, 2018; Frankis *et al.*, 2018; Druckler, van Rooijen and de Vries, 2018; Hegazi *et al.*, 2017; Melendez-Torres *et al.*, 2016; Glynn *et al.*, 2018).

Seven studies examined rates of GHB/GBL use, in which five reported it as the most used chemsex drug and in the other studies it was the second mostly commonly used (Hegazi *et al.*, 2017; Melendez-Torres *et al.*, 2016; Heiligenberg *et al.*, 2012; Frankis *et al.*, 2018; Druckler, van Rooijen and de Vries, 2018; Pakianathan *et al.*, 2018; Glynn *et al.*, 2018). A study from Australia which only examined the use of GHB/GBL reported that 5% of the MSM sample had used the drug in the previous 6 months (Hammoud et al, 2018a). With the exception of this study, all the other studies that examined GHB/GBL were from Western Europe. The five studies which reported GHB/GBL as the most used drug originated from the Netherlands, UK and Ireland. Most of the samples were recruited from sexual health services.

Eight studies examined the use of methamphetamines, in which five provided prevalence estimates ranging from 3%-22%. From these studies the three USA

(2007-12) stimulant focused articles reported a prevalence range of 9%-22% (Koblin *et al.*, 2007; Mor *et al.*, 2008; Ober *et al.*, 2009; Benotsch *et al.*, 2012; Heiligenberg *et al.*, 2012). The highest rate of 22% is from a study in which the sample was from a low income and had high rates of previous homelessness (Ober *et al.*, 2009). With the exemption of this study, the crystal meth prevalence range was from 3%-10%. McCarty-Caplan (2014) in a USA study reported an overall chemsex behaviour prevalence of 10% which was comparable to the prevalence results of the two USA crystal meth studies of 9%-10%. (Koblin *et al.*, 2007; Benotsch *et al.*, 2012). Six of the eight studies that examined various substances all identified that crystal meth was among the highest three most used chemsex drugs (Mor *et al.*, 2008; Hegazi *et al.*, 2017; Melendez-Torres *et al.*, 2016; Heiligenberg *et al.*, 2012; Frankis *et al.*, 2018; Druckler, van Rooijen and de Vries, 2018; Pakianathan *et al.*, 2018).

Cocaine was examined in seven studies and ketamine within six studies. Three of the studies reported cocaine prevalence estimates ranging from 2%-33% (Mor *et al.*, 2008; Ober *et al.*, 2009; Heiligenberg *et al.*, 2012). The highest rate of 33% was from the Ober et al. study, except for this study the cocaine estimate range was lower at 2%-15%. Four of the studies which examined varying chemsex drugs reported that cocaine was one of the least used drugs (Mor *et al.*, 2008; Hegazi *et al.*, 2017; Melendez-Torres *et al.*, 2016; Pakianathan *et al.*, 2018). Two of the studies related to ketamine reported a prevalence range of 1%-4% and four studies ranked ketamine as one of the least used chemsex drugs (Mor *et al.*, 2008; Heiligenberg *et al.*, 2012; Hegazi *et al.*, 2017; Frankis *et al.*, 2018; Pakianathan *et al.*, 2018). Only two studies from the ROI and Netherlands found ketamine was used more frequently than crystal meth (Heiligenberg *et al.*, 2012; Glynn *et al.*, 2018).

Prevalence and type of injecting drugs

Nine of the studies examined MSM injecting drug use for sexual purposes which provided a prevalence range of 1%-50% (Gilbart *et al.*, 2015; Hopwood, Lea and Aggleton, 2015; Bowden-Jones *et al.*, 2017; Hegazi *et al.*, 2017; Ahmed *et al.*, 2016; Bui *et al.*, 2018; Frankis *et al.*, 2018; Druckler, van Rooijen and de Vries, 2018; Glynn *et al.*, 2018). Five studies had large MSM samples that reported a prevalence range of 1%-9% and within three of the studies crystal meth was the most injected drug (Hopwood, Lea and Aggleton, 2015; Frankis *et al.*, 2018; Glynn *et al.*, 2018; Druckler, van Rooijen and de Vries, 2018; Bui *et al.*, 2018). Four studies that recruited specific MSM sub-populations or had small samples reported a higher prevalence range of 25%-50%. The higher rates may be indicative of one study having a small sample diagnosed with shigella and another study with a small sample from sexual health services. One of these studies specified drug type, which indicated crystal meth was the most injected drug. (Bowden-Jones *et al.*, 2017).

Four studies highlighted the sharing of injecting equipment ranged from 5%-56%, but the three most recent studies reported a lower range of 5%-12% (Hegazi *et al.*, 2017; Hopwood, Lea and Aggleton, 2015; Bowden-Jones *et al.*, 2017; Bui *et al.*, 2018). Gilbart et al (2015) highlighted that their sample had a low level of knowledge related to their risk for acquiring BBVs. Only one study from Australia identified that injecting of drugs was associated with group sex and multiple partners (Bui *et al.*, 2018). Overall, crystal meth appears to be the most injected chemsex drug but due

to heterogenous sampling there was limited evidence to interpret a more accurate picture of the risk behaviours involved in sexualized injecting practices.

Drug Use Setting

Thirteen of the studies examined elements of the environments and related drug use patterns that chemsex behaviours occurred within (Ober *et al.*, 2009; Prestage *et al.*, 2009; Grov *et al.*, 2013; Bourne *et al.*, 2015; Rich *et al.*, 2016b; Rich *et al.*, 2016a; Gilbart *et al.*, 2015; Deimel *et al.*, 2016; Melendez-Torres *et al.*, 2016; Ahmed *et al.*, 2016) (Melendez-Torres *et al.*, 2017; Rusow, Fletcher and Reback, 2017; Bowden-Jones *et al.*, 2017). Most of the studies had specific MSM samples; five focused on varying factors of drug using MSM and three on MSM who engaged multi-partner sexual sessions. All the studies indicate a complex interface between MSM using specific drug types and group sex, within which the venue played a key role.

Five studies reported that chemsex activities primarily took place within sex on premise venues (SPV) or private residence (Ober *et al.*, 2009; Bourne *et al.*, 2015; Rusow, Fletcher and Reback, 2017; Ahmed *et al.*, 2016; Melendez-Torres *et al.*, 2016). Two studies demonstrated that between 22%-38% of the events occurred within SPVs and 52%-66% within private residence (Melendez-Torres and Bourne, 2016; Ober *et al.*, 2009). Two UK studies suggest that with the growth of use in geo-social networking apps, there is a change of chemsex activities moving towards being more likely to take place in private residence (Ahmed *et al.*, 2016; Bourne *et al.*, 2015). Three studies from Europe reported that chemsex sessions primarily involved multiple casual partners and vary between lasting a few hours to several days (Deimel *et al.*, 2016; Gilbart *et al.*, 2015; Bourne *et al.*, 2015).

Prestage et al (2009) reported that 63% of an MSM group sex attendee sample had consumed illicit drugs at a group sex event in the previous six months. In comparison, a UK study from a club drug clinic highlighted that 75% of the sample had used the primary chemsex drugs (mephedrone, methamphetamine, GHB/GBL) to facilitate sex (Bowden-Jones *et al.*, 2017). Three studies indicated that consumption of multiple substances took place at group sex events, which included crystal meth, mephedrone, GHB/GBL, cocaine, ecstasy and ketamine (Grov *et al.*, 2013; Rich *et al.*, 2016a; Prestage *et al.*, 2009). Three studies reported that 14%-26% of MSM attending sex parties consumed erectile disorder drugs (EDDs) and within two studies EDDs were associated with crystal meth use (Gilbart *et al.*, 2015; Melendez-Torres *et al.*, 2016; Prestage *et al.*, 2009). Gilbart et al (2015) highlighted that MSM chemsex participants may use EDDs to counteract the physiological effect of crystal meth.

Sexual behaviour

Seventeen studies reported that there was an increased risk of CAS when chemsex drugs were used with sex (Koblin *et al.*, 2007; Ober *et al.*, 2009; Prestage *et al.*, 2009; Benotsch *et al.*, 2012; McCarty-Caplan, Jantz and Swartz, 2014; Melendez-Torres *et al.*, 2016; Ottaway *et al.*, 2017; Melendez-Torres *et al.*, 2017; Gilbart *et al.*, 2015; Bourne *et al.*, 2015; Ahmed *et al.*, 2016; Reback, Fletcher and Swendeman, 2018; Glynn *et al.*, 2018; Druckler, van Rooijen and de Vries, 2018; Hoornenborg *et al.*, 2018; Frankis *et al.*, 2018). Only three studies provided CAS rates which ranged

from 30%-38% (Ober *et al.*, 2009; Bourne *et al.*, 2015; Melendez-Torres *et al.*, 2016). However, these studies had specific or small samples. Five UK studies highlighted that when a sexual event involved chemsex dugs there was an increased likelihood of MSM performing esoteric sex acts *(for example: fisting*) (Hegazi et al., 2017; Ahmed et al., 2016; Gilbart et al., 2015; Frankis et al., 2018; Pakianathan et al., 2018). Two studies had high rates of HIV positive MSM in the sample and one study had a small sample.

Six of the studies examined the associations between specific drug types and the likelihood of engaging in high-risk sexual activity. All the studies reported that crystal meth use when combined with sex was associated with CAS but only one study found this was distinctly with HIV negative sex partners (Koblin *et al.*, 2007; Ober *et al.*, 2009; Prestage *et al.*, 2009; Benotsch *et al.*, 2012; Melendez-Torres *et al.*, 2016; Reback, Fletcher and Swendeman, 2018). One of the studies found there was an inter-relationship between crystal meth and EDDs, which increased levels of CAS (Melendez-Torres *et al.*, 2016). The general evidence base was centred around crystal meth and there was minimal evidence for types of drugs.

Bio-medical risk reduction interventions

Ten studies examined components of risk reduction interventions, including STI/BBV testing, PrEP, post-exposure prophylaxis (PEP) and injecting equipment provision (IEP) (Prestage *et al.*, 2009; Gilbart *et al.*, 2015; Hopwood, Lea and Aggleton, 2015; Hegazi *et al.*, 2017; Pakianathan *et al.*, 2018; Frankis *et al.*, 2018; Druckler, van Rooijen and de Vries, 2018; Hammoud *et al.*, 2018a; Hammoud *et al.*, 2018b; Closson *et al.*, 2018). An Australian study reported that 89% of the sample had ever had an HIV test and a UK study that 94% of the sample had ever attended sexual health services (Prestage *et al.*, 2009; Gilbart *et al.*, 2015). However, 63% of the sample in the UK study were HIV positive. On study identified that in the previous 12 months 72% of the HIV negative MSM sample had tested for HIV and 77% of the HCV negative MSM sample had tested for HCV (Hopwood, Lea and Aggleton, 2015). A more recent study from the UK identified if the sample had tested for HIV in the previous 3 months, there was a greater likelihood of them participating in chemsex (Frankis *et al.*, 2018).

Two studies highlighted that MSM chemsex participants were more likely to access PEP than MSM non-chemsex participants (Hegazi *et al.*, 2017; Pakianathan *et al.*, 2018). An Australian study reported that 80% of the PrEP users in the sample had not engaged in chemsex in the previous 6 months, although it had a small sample that had used PrEP (Hammoud *et al.*, 2018b). In contrast, a European study highlighted that the MSM sample who engaged in chemsex were more likely to use PrEP compared to those who did not participate in chemsex (Druckler, van Rooijen and de Vries, 2018). A qualitative study highlighted that MSM who engaged more regularly in chemsex would opt for daily dosing and less frequent engagers would adopt episodic dosing (Closson *et al.*, 2018). One study of an MSM small sample diagnosed with shigella reported that they were generally unaware of IEP and methods of safer injecting. In overview, with a limited evidence base it is not substantively clear how MSM chemsex participants utilize the range of bio-medical interventions.

Consequences of chemsex behaviours

Biological Impact

As demonstrated in the earlier evidence, there is an association between HIV positive status and engagement in chemsex. It is necessary to consider that HIV negative MSM who engage in chemsex will be at risk of HIV acquisition. Seven studies that had a majority of drug users in their samples, reported an assumed HIV negative prevalence range of 20% to 59% (Kurtz, 2005; Green *et al.*, 2006; Bourne *et al.*, 2015; Hopwood, Lea and Aggleton, 2015; Bowden-Jones *et al.*, 2017; Deimel *et al.*, 2016; Reback, Fletcher and Swendeman, 2018). It was highlighted that in a chemsex context there is an increased risk of participants engaging in CAS. A key determinant to consider in CAS rates is the disinhibited effects of drugs. A few studies highlighted that an important factor was the effect drugs have on an individual level of cognizance, which influences their decision-making ability and judgement for engaging in high-risk sexual behaviours (Bourne *et al.*, 2015; Gilbart *et al.*, 2015; Ahmed *et al.*, 2016; Deimel *et al.*, 2016). These multiple inter-twinned dimensions highlight that HIV negative MSM who engage in chemsex are at high risk of acquiring HIV.

Four studies reported a prevalence rate for HCV for MSM samples that engaged in chemsex behaviour which ranged from 6%-30% and two highlighted an HIV/HCV co-infection prevalence range of 9%-21% (Hopwood, Lea and Aggleton, 2015; Bowden-Jones *et al.*, 2017; Deimel *et al.*, 2016; Bui *et al.*, 2018). The highest rate of 30% was from a study with a small sample of which approximately 80% were HIV positive. Three of the studies with the highest prevalence rates had samples which primarily consisted of MSM who injected drugs. Bui et al (2018) identified that recent injectors were more likely to be HCV positive compared to non-recent injectors. There was no substantive evidence to demonstrate clear HCV positive rates for MSM who inject chemsex drugs.

Seven studies that examined elements of STIs highlighted that MSM who engage in chemsex behaviours had issues with previous infections (Ottaway *et al.*, 2017; Hegazi *et al.*, 2017; Gilbart *et al.*, 2015; Kurtz, 2005; Druckler, van Rooijen and de Vries, 2018; Rosinska *et al.*, 2018; Glynn *et al.*, 2018). One of the studies reported that MSM diagnosed with STIs were more likely to engage in chemsex (Ottaway *et al.*, 2017). In contrast, four studies identified that chemsex engagement was associated with STI diagnosis and/or treatment (Hegazi *et al.*, 2017; Rosinska *et al.*, 2018; Druckler, van Rooijen and de Vries, 2018; Glynn *et al.*, 2018). In overview, this evidence-base may indicate MSM chemsex participants are at high risk of acquiring an STI.

Psychosocial impact

Six studies examined aspects of the perceived and actual psychosocial impact of chemsex behaviours. A UK study identified that 1 in 4 of the MSM sample reported that chemsex had a negative effect on their wider lives (Glynn *et al.*, 2018). Two USA studies highlighted that the MSM sample perceived that crystal meth use could lead to the loss of partners and friends (Kurtz, 2005; Kubicek *et al.*, 2007). A USA study identified that crystal meth users reported that sustained use of the drug

reduced their capability to fulfil essential day to day functioning roles (Closson *et al.*, 2018). In comparison, an Australian study reported that the higher the frequency of GHB use by the MSM sample, the greater the detriment it had on their social networks (Hammoud *et al.*, 2018a). Two studies identified that chemsex drug use had consequences on the samples' employment, in one study some had lost their jobs and in the other 14% had taken time off work (Kurtz, 2005; Hegazi *et al.*, 2017).

One UK study identified that 15% of the sample reported chemsex engagement had negatively impacted their mental health and a USA study identified that some crystal meth users experienced generalized paranoia (Hegazi *et al.*, 2017; Kurtz, 2005). In comparison, one study reported that poly drug users were more likely to experience psychological distress when compared to sexualised drug users, but this did not achieve statistical significance (McCarty-Caplan, Jantz and Swartz, 2014). An Australian study did not find that GHB use was associated with anxiety or depression (Hammoud *et al.*, 2018a). In general, there was a small level of evidence that examined the psychosocial impact of chemsex, although important to emphasis some men reported it had a detrimental impact on varying aspects of their wider life.

Discussion

There was wide variation in the prevalence of chemsex behaviours, which was dependent on the data collection settings, geographics and sample sizes. However, estimates from larger generalised MSM samples indicated a prevalence of 3% to 13%. Higher prevalence estimates tended to be from sexual health clinics. Two literature reviews which included some studies on prevalence estimates for chemsex, indicated a range from 4% to 94% (Edmundson *et al.*, 2018; Tomkins, George and Kliner, 2019). In contrast, a recent study from England with a sample of 3933 MSM reported that 10% had engaged in chemsex in the previous year (Blomquist *et al.*, 2020). A study of two large sexual health clinics reported that MSM attendees chemsex behaviour fell over time from 32% to 11% (Sewell et al., 2019). Wider evidence would correlate with the lower prevalence estimates in my review, which demonstrates a minority of the wider MSM population engage in chemsex. However, prevalence can vary across countries and regions or cities within one nation.

As outlined in the introduction, there have been challenges in defining and understanding the term chemsex. This provides challenges in accurately estimating prevalence estimates. The review published by Tomkins et al (2018) identified a prevalence range from 4%-94%, but it incorporated research that does not fit within the PHE definition of chemsex. It included studies within which the drug use was not before or during sex. In contrast, a large European survey of MSM identified that 1 in 4 PrEP users had recently engaged in multi-partner chemsex (MacGregor et al., 2021). However, Edmundson et al (2018) highlighted that generally chemsex drugs were also used outside of sexual events and the inter-changeable use of terms can cause ambiguity in estimating prevalence levels. It is important to consider the achievability of having one clearly defined term for a complex social-cultural phenomenon which is seen to be unique to part of the MSM population.

This review found that there were greatly varying prevalence estimates for the types of substances used within a chemsex context, which varied vastly by geographical

location. This was consistent with a systematic review on LGBT sexualised drug use which reported that MSM chemsex substance use pattens varied across regions and countries (Hibbert et al., 2021b). In my review, the prevalence estimates for crystal meth were published over a longer-time frame which may be partly explained by the MSM population having a longer history of using this drug. Research examining mephedrone and GHB/GBL was primarily from Western Europe. It was not possible to evidence specific drug trends for chemsex behaviours due to the variation across the high-income regions. As chemsex is a socially constructed phenomenon the use of specific drugs will vary across different cultures and MSM sub-populations. This limitation is reflective of the previous challenges of interpreting the term chemsex and related prevalence estimates. The social constructed nature of chemsex may account for the variation of drug types used across the different geographical locations.

Despite the variation in prevalence and drug types there was some commonality within the motivations to combine drugs with sex, setting and risk behaviours. Motivators to engage in chemsex behaviours were multi-faceted and orientated around removing inhibitions to heighten and intensify the sexual encounter. This was in terms of the physical pleasure/prolongation, increased confidence to engage in sexual exploration and a more immediate/deeper connection with partners. A systematic review identified multiple complex reasons for engaging in chemsex, which included sexual performance, intimacy, lessening inhibitions, belonging to a community and removal of psychological distress (Lafortune *et al.*, 2020). These findings correlate with my review, in which physical, psychological and social reasons can form part of the individual's motivators to engage in chemsex.

The findings in the review identified that MSM who engage in chemsex behaviours will be at high risk of acquiring HIV, which is mediated by CAS and esoteric acts. This evidence demonstrated that HIV positive status is one mediating factor for MSM engaging in chemsex. The drug effect on level of cognizance mediates an increased level of engagement in higher risk sexual behaviours. A literature review demonstrated that drug used combined with a sexual context leads to an increased risk of engagement in CAS (Edmundson *et al.*, 2018). Two recent studies identified that MSM chemsex drug use in a sexual setting is associated to CAS with casual partners, one specifically highlighted this was only for HIV negative or untested chemsex participants (Blomquist *et al.*, 2020; Hampel *et al.*, 2020). This correlates with my review's findings, which demonstrated that high-risk HIV behaviours within a chemsex setting can be commonplace. This places HIV negative MSM who engage in chemsex behaviours at potentially high risk of HIV acquisition.

In addition to the HIV risk there was some evidence in this review to indicate MSM that engage in chemsex behaviours are at a high risk of acquiring other STIs. There was minimal evidence for HCV. A recent meta-analysis of 19 studies reported that MSM who use drugs in a sexualised context had higher odds of bacterial STI, HIV and HCV diagnosis (Guerra *et al.*, 2020). This analysis was of generalised illicit drug use with sex and did not focus on planned chemsex drug use to facilitate sex. In contrast, a European study reported that multi-partner chemsex in comparison to no chemsex was associated with greater odd of recent syphilis, gonorrhoea and chlamydia infection (MacGregor et al., 2021). This overall evidence base

demonstrates there are varied factors which place MSM chemsex participants at high risk of multiple biological risks.

In this review there was very limited evidence that explored the psychosocial impact of chemsex behaviours, although the evidence indicated between 14%-25% of participants experienced mixed negative consequences on their wider life. This review's finding correlates with another literature review that reported chemsex type behaviours can have a detrimental impact on some participants mental health and social networks (Tomkins, George and Kliner, 2019). The evidence was generally focused on the biological risks and limited for psychosocial factors. However, it is important to recognise that there is potential of psychological and social dysfunction because of chemsex.

A UK study identified that crystal meth use was associated with depression (Miltz et al., 2019), although the substance use was not within a sexual context. In comparison, a study reported that drug use during sex was not associated with depression, although is associated with mild/moderate mental ill health when the use becomes problematic or dependent (Prestage *et al.*, 2018). A recent study of an MSM sample reported that the need for professional support due to chemsex was higher for those who engaged in the behaviour more often and had experienced detrimental effects on their wider life (Evers *et al.*, 2020). The wider substance use evidence-base demonstrates that the higher the frequency of drug use, the more significant the psychosocial consequences, particularly in poly-drug use (Ives and Ghelm, 2009; European Centre for Monitoring Drugs and Drug Addiction, 2009). This evidence is important to consider on the level of chemsex engagement and potential psycho-social impact.

The studies in this review that examined the array of biomedical risk reduction interventions did not provide conclusive evidence on how commonly MSM who engage in chemsex utilize these supports. This limited evidence indicated that the majority of MSM who participate in chemsex have attended a sexual health clinic. Frankis et al (2018) in their study highlighted that MSM chemsex engagement was associated with an HIV test in the previous three months. A recent study indicated that 61% of an MSM sample that was recruited via a geo-social networking app had attended a sexual health clinic, in which 81% had an HIV test (Blomquist *et al.*, 2020).

This review's findings also suggest that MSM who participant in chemsex behaviours may be more likely to access PEP and PrEP. However, it is possible that greater access to these interventions is influenced by service providers. A study from England sexual health services reported that in a sample of MSM chemsex drug users the level of PEP use was 14% and PrEP use was 4.5% (Sewell *et al.*, 2017). In contrast, a clinical trial of PrEP reported that in the previous three months approximately 44% of the MSM sample had used crystal meth, GHB/GBL or mephedrone (Dolling *et al.*, 2016). Two studies from Europe highlighted that the intention to start PrEP was associated with chemsex drug use (Hanum *et al.*, 2020; Hulstein *et al.*, 2020). In addition, a study reported that MSM who engaged in chemsex had higher rates of linkage to PrEP care when compared to those that had not participated in chemsex (Xia et al., 2020) This evidence indicates there may be a linkage between chemsex and PrEP, but evidence base is limited to draw

substantive conclusions. Due to the recent development of PrEP an important research area that needs further examination is how this innovation in HIV prevention interfaces with the high-risk activity chemsex.

Strengths and limitations

Due to the use of the ABC model the review was able to process a complex array of research into an understandable three stage behavioural event. However, the simplicity of the model may limit the more nuanced in-depth results of the included studies. The review adopted a clear systematic methodology to address very specific objectives. A strength was the explicit inclusion and exclusion criteria which meant only studies were included if their methods identified if the use of chemsex drugs was before or during sex. However, a limitation was not being able to determine if the chemsex behaviours were planned and/or intentional to enhance the sex.

The review was limited by the absence of sampling frames in the studies and resulting heterogeneity of predominantly purposive samples. The review may also be limited by its exclusion of research from low to medium income countries and by including only English language articles. However, the context of the PhD being conducted in a high-income country may strengthen the relevance of the findings as included studies may have more similarities in their social and structural factors.

Conclusion

A minority of the MSM population engaged in chemsex behaviours which consisted of varied drug use behaviours. MSM who engaged in chemsex behaviours partook in high-risk sexual behaviours and were exposed to biological risk factors, including STIs and HIV. Some participants also experienced wider detrimental impact on their psychosocial functioning. Frequency of engagement in chemsex may have been inter-related to MSMs experiences of problematic chemsex. On the other hand, the review suggests that MSM chemsex participants actively engaged with (and are offered) bio-medical interventions. The recent development of PrEP in combination with other strategies creates a window of opportunity to reduce HIV transmissibility in this high-risk population.

Chapter 4: PrEP use and medication adherence among men who have sex with men: a systematic review

Redacted due to copyright.
Maxwell, S. Gafos, M. Shahmanesh. (2019) Pre-exposure prophylaxis use and medication adherence among men who have sex with men: A systematic review of the literature. Journal of Nurses in AIDS Care, 30(4), 38-61.
To access the published version please go to:
https://journals.lww.com/janac/Abstract/2019/08000/Pre_exposure_Prophylaxis_Use_and_Medication.14.aspx

Chapter 5: Examining factors associated with PrEP use among MSM who experienced problematic chemsex

Introduction

In this chapter I set out the quantitative analysis that examined PrEP use among MSM who had experienced problematic chemsex. I lay out the methods used to perform the analysis and main results. Subsequently, I summarize the key findings in relation to the wider literature and highlight the strengths/limitations of the study.

As I discussed in the chemsex review, MSM chemsex participants are at high risk of acquiring HIV and some may experience a detrimental impact on their psychosocial well-being. In the substance use field, individuals who experience negative effects on their wider health due to drug use are defined as experiencing problematic use (Bevan, 2009). The wider literature indicates that higher level frequency of drug use is an influencing factor for the development of problematic use and can have a detrimental impact on the user's well-being (European Centre for Monitoring Drugs and Drug Addiction, 2009.

MSM who experience problematic chemsex are potentially at higher risk of acquiring HIV due to higher level of engagement in risk behaviours. This engagement may interact with psychosocial factors and lead to a higher level of negative impact on the men's wider health and well-being. PrEP accessibility for this higher risk chemsex sub-group should therefore be a priority. However, to date there has been minimal evidence available around PrEP use in MSM who experience problematic chemsex.

The aim of the study was to better understand the biopsychosocial factors related to HIV negative MSM who engaged in problematic chemsex and if any of the biopsychosocial characteristics were associated with PrEP use. The objectives of the study were:

1. Describe the socio-demographics, drug use, sexual risk behaviours, mental ill health and alcohol use characteristics of MSM who have engaged in problematic chemsex.
2. Establish the prevalence of PrEP use for MSM who have engaged in problematic chemsex and describe the participants socio-demographics, sexual risk behaviours, mental ill health and alcohol use.
3. Identify any associations between PrEP use and socio-demographics, sexual risk behaviours, mental ill health and alcohol use factors for MSM who experienced problematic chemsex.

Methods

Study design

I conducted a secondary data analysis from information that originated from a service user assessment form which was collected by a charity London Friend. They provide substance use harm reduction services to the LGBT community in London.

Study setting

The charity provides a service called Antidote that delivers harm reduction information and face to face support for members of the LGBT community in London that are experiencing problematic substance use. The service offers walk in assessments across six sites in Greater London. LGBT community members self-refer for an assessment and the services are promoted via sexual health clinics, other LGBT services and social media. London Friend frequently have people who self-refer to the service for assessment who are using drugs to facilitate or enhance sex, which can involve high risk sexual and drug use behaviours.

Population and data collection

The charity completes a full assessment on service users by filling in a structured template of health and social needs (Appendix 1). The information is then transposed onto an online database. The analysis used anonymised data that was collected from service users who engaged with the charity between the 1 August 2016 and 30 July 2018. Data were used from August 2016 as this was when information on PrEP was first incorporated into the assessment form. The sample eligibility was:

1. Identified as male and same gender at birth
2. Had sex with other men
3. 18 years old and over
4. Self-reported being HIV negative
5. Engaged in chemsex that had a detrimental impact on health

Variables

The Antidote assessment form has two separate questions in which men were asked if they were either currently using PrEP and if they had previously used PrEP. To examine the overall level of PrEP use, I combined these two variables to generate a new dichotomous variable to determine those who had ever used PrEP: *Ever (currently or previously)* versus those who had never used PrEP: *Never (not currently and not previously).*

The Antidote assessment form had questions which asked what type of settings the service users used drugs and for the number of chemsex partners. Service users were identified as having engaged in chemsex if the assessment form had the following questions completed: 1: *a sexual context of drug use (question categories: clubbing, sexual, with friends, on my own and other)*; or 2: *number of partners per chemsex event*. The Antidote assessment recorded up to three substances for which

service users identified as problematic use. To examine the overall use prevalence of the five chemsex drugs I created a new variable for each drug, which was a total combination of problem substances 1 to 3.

The explanatory data measures I used for the analysis included key socio-demographics, substance use behaviours, sexual health behaviours, PEP use and mental health factors. The 34 variables of interest and levels of missing data are reported in table 7 (starts on page 80).

Analysis

I completed a descriptive analysis and used non-parametric tests to establish which key independent variables were associated with ever using PrEP. To test for associations between different variables, I used a Mann-Whitney U test for continuous variables and a Fisher' exact test for categorical variables. Non-parametric tests were appropriate for the analysis due to the small size of the sample and potential non-normal distribution of continuous variables (Kirkwood and Sterne, 2003). In order to identify the factors most strongly associated with PrEP use, I performed a multivariable logistic regression analysis. The dichotomous outcome of interest was ever having used PrEP versus never used PrEP. Individuals with any missing data for the variables of interest were excluded from the analysis. Data analysis was performed using STATA 15.

Ethics

A full UCL ethics submission was not required as this was a fully anonymised secondary data analysis completed as a service evaluation. Informed consent from service users at London Friend was provided for service evaluation. However, project approval and exemption from full ethics submission was required and provided at Institute level from UCL. The study did not use any identifiable information, London Friend removed all personal details and demographic information that was not required for the study. London Friend sent the anonymised data to me via an encrypted digital drop box, and I stored the data on a closed access file within a higher education institute secured network system. The analysed information will only be retained until the PhD is complete.

Table 7: Variables of interest for quantitative analysis

	Variable name	Definition of variable	Miss.
1	Age	Numerical variable of person's age: *Range: 21-63*	4
2	Age category	Numerical age variable classified into categories: *20-29* *30-39* *40-49* *50-59* *60-69*	2
3	Employment	Current employment status: *regular unemployed* *student* *long term disabled* *homemaker* *not on benefits* *voluntary work* *retired* *other*	9
4	Ethnicity	Primary ethnic identify categories: *White* *Black* *Asian* *Mixed* *Chinese* *Other*	1
5	Sexuality	Sexual identity: *lesbian* *gay* *bisexual* *queer* *hetero-sexual* *other*	0
6	PrEP ever	Previously or currently using PrEP: *Yes: currently/previously used* *No: not currently/previously used*	20
7	PrEP current	Currently using PrEP: *Yes: currently using* *No: not currently using*	21
8	PrEP previously	Previously used PrEP: *(not currently)* *Yes: not previously used* *No: previously used*	47
9	Substance 1	Number 1 substance of problematic use: *crystal meth* *GBL/GHB* *mephedrone* *cocaine* *ketamine* *other*	1
10	Substance 2	Number 2 substance of problematic use *As above*	25
11	Substance 3	Number 3 substance of problematic use *As above*	57
12	Crystal meth use	Substances 1 to 3 categorised to identify any use of crystal meth as a problematic drug: *Yes* *No*	1

13	GHB/GBL use	Substances 1 to 3 categorised to identify any use of GHB/GBL as a problematic drug: *Yes* *No*	1
14	Mephedrone use	Substances 1 to 3 categorised to identify any use of mephedrone as a problematic drug: *Yes* *No*	1
15	Cocaine use	Substances 1 to 3 categorised to identify any use of cocaine as a problematic drug: *Yes* *No*	1
16	Ketamine use	Substances 1 to 3 categorised to identify any use of ketamine as a problematic drug: *Yes* *No*	1
17	Injecting status	Engaged in injecting of drugs: *currently injecting* *previously injected* *never* *other people inject for you*	21
18	Total partners	Sex partners in previous 3 months: *Numerical value on total sex partners*	19
19	Chemsex partners	Sex partners per chemsex session: *Numerical value on chemsex partners per event*	29
20	Condom use	% of sex life using condoms: *Numerical value 0% to 100%*	18
21	Sex working	Been involved in paid sexual working/escorting *Currently engaging in sex working* *Previously engaged in sex working* *No: never engaged in sex working*	14
22	PEP ever	Previously used PEP: *Yes: have used it before* *No: never used it before*	17
23	PEP last year	Used PEP in the last year: *Yes: used in the last 12 months* *No: have not used it in the last 12 months*	60
24	PEP post chemsex	Ever used PEP after a chemsex session: *Yes: have used it post session* *No: never used it post session*	62
25	HCV status	Current hepatitis C infection status: *Positive* *Negative* *Not tested*	25
26	HBV status	Current hepatitis B immunisation status: *Acquired immunity* *Immunised already* *Not offered* *Offered and accepted* *Offered and refused*	14
27	Mental health condition	Current mental health diagnosis *Yes: have a diagnosis* *No: do not have a diagnosis*	23
28	Mental health services	Involved with mental health services: *Yes: have input* *No: do not have input*	21
29	Mental health medication	Currently prescribed psychotropic medications: *Anti-depressants* *Anti-psychotics*	26

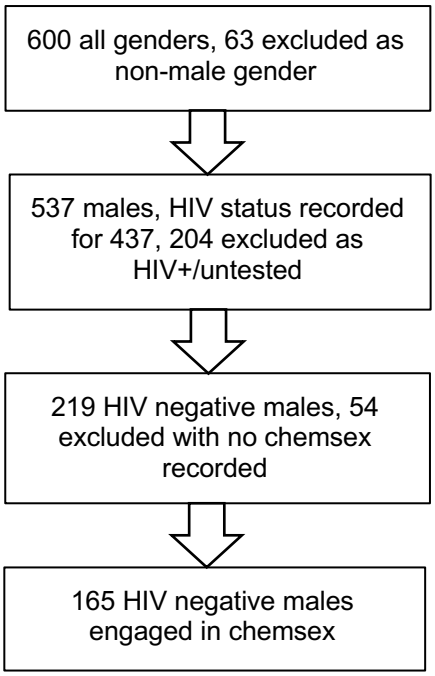
		Anxiolytics *Not on medication* *Other*	
30	Suicide	Previously attempted suicide: *Yes: previously attempted* *No: not previously attempted*	11
31	Suicidality	Any suicidal ideas: *Yes: current ideas of suicide* *No: no current ideas of suicide*	11
32	Self-harm: current	Currently engaging in self-harm: *Yes: are currently* *No: not currently*	6
33	Self-harm: previously	Previously self-harmed: *Yes: have before* *No: have never*	17
34	Total Audit C score	Measure/identification of high-risk alcohol use: *0-7: lower risk* *8-15: increasing risk* *16-19: higher risk* *20+: possible dependence*	24

Results: Descriptive summary and univariate analysis

Overall Data Summary

Fig. 9 provides a summary of the key data inclusion stages for the final sample included in the analysis. Between August 2016 and July 2018, 600 service users attended for an Antidote assessment, after exclusion of all other genders and HIV positive/untested the number of HIV negative MSM was 219. However, this included 25% (n= 54) who did not identify or report drug use within a sexualised context. Of the 219, 165 men (75%) explicitly identified that they had engaged in chemsex behaviours. As highlighted earlier, men were identified as having engaged in chemsex behaviours if the Antidote assessment form had the following sections/questions completed: 1: reported a sexual context of drug use category; or 2: chemsex partners per event had been recorded. I therefore included 165 HIV negative MSM who had engaged in drug use within a sexual context in the final analysis (Fig 9).

Fig 9: Process of data inclusion



PrEP use

PrEP status was not recorded for all the 165 men who had engaged in chemsex. Of the sample with any PrEP data, 34% (n= 50/145) of the men had ever used PrEP, of which 13% had previously used PrEP (n= 14/109) *(not recorded as current users)* and 25% (n= 36/144) were currently using PrEP *(not recorded as previously using)*. Ten men that reported no current PrEP use had a missing response for previously using PrEP; and were assumed not to have previous use. In addition, one man reported previous use of PrEP without specifying whether this was also current.

Socio-demographics

Table 8 provides a summary of the sample's age categories, ethnic groups, sexuality and employment status. Of the 165 sample, 163 men reported an age range of 21 to 63, with a median age of 36 (IQR: 30-42, n=163). Approximately 70% of the sample were aged 30-50 years old, of which 42% were between the ages 30 and 39.

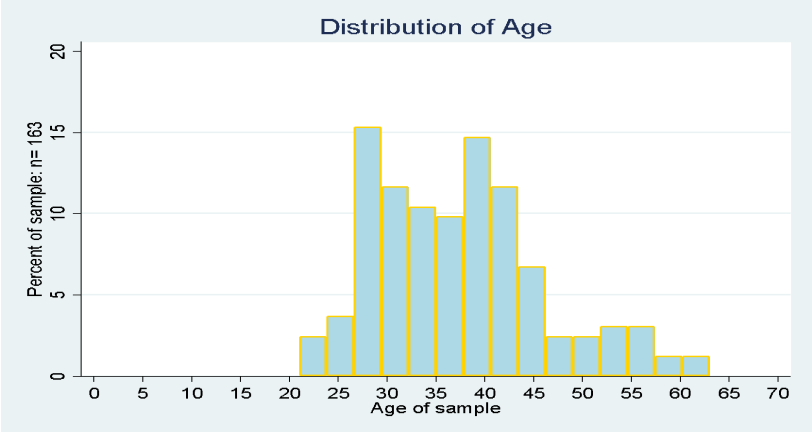
Fig. 10 (next page) provides a histogram of age distribution for the sample (n= 163/165), in which the positive skew indicates that the sample had a non-normal distribution. Most of the sample identified their ethnicity as white (79%, 130/164), their sexuality as gay (92%, 152/165) and were in regular employment (65%, n= 102/165). 19% (n=29/165) were not employed but were looking for work. There was no statistically significant difference in age between men who had ever used PrEP and those that had never used PrEP (p= 0.296). Additionally, there was no significant difference between the proportions of those had ever used PrEP and ethnicity (p=0.521), sexuality (p=0.704) and employment status (p=0.279).

Table 8: Summary of socio-demographics

Demographic Type*	***n* (%) ***	**PrEP ever**	**Never PrEP**	**p-value**
Age categories (n=163)				
20-29	35 (22%)	9 (27%)	24 (73%)	0.296
30-39	69 (42%)	20 (33%)	41 (67%)	
40-49	44 (27%)	14 (38%)	23 (62%)	
50-59	13 (8%)	6 (55%)	5 (45%)	
60-69	2 (1%)	1 (100%)	0 (0%)	
Ethnic Groups (n=164)				
Black	11 (7%)	4 (44%)	5 (56%)	0.521
White	130 (79%)	36 (31%)	79 (69%)	
Asian	7 (4%)	4 (67%)	2 (33%)	
Mixed	8 (5%)	2 (33%)	4 (67%)	
Chinese	2 (1%)	1 (50%)	1 (50%)	
Other	6 (4%)	2 (33%)	4 (67%)	
Sexual Identity (n=165)				
Bisexual	6 (9%)	1 (17%)	5 (83%)	0.704
Gay	152 (92%)	48 (35%)	89 (65%)	
Heterosexual	2 (1%)	0 (0%)	0 (0%)	
Queer	2 (1%)	1 (50%)	1 (50%)	
Employment Status (n=156)				
Long term sick/disabled	4 (4%)	0 (0%)	4 (100%)	0.279
Not receiving benefits	2 (1%)	0 (0%)	1 (100%)	
Student	8 (5%)	3 (43%)	4 (57%)	
Regular employment	102 (65%)	36 (38%)	58 (62%)	
Retired	2 (1%)	1 (50%)	1 (50%)	
Unemployed	29 (19%)	5 (20%)	20 (80%)	
Unpaid voluntary work	1 (1%)	0 (0%)	1 (100%)	
Other	8 (5%)	3 (6%)	2 (2%)	

** % and sample number for the row variables is for the overall sample. Due to non-reported data, the ever/never PrEP figures will not add up to this total.*

Fig 10: Age distribution



Problematic substance use

As outlined earlier, the Antidote assessment form collected information on up to three substances (alcohol and drugs) for which the service user reported was problematic use. Fig. 11 (next page) provides a summary of the usage rates (substance 1: n=164, substance 2: n= 140, substance 3: n=108) for the ten substances that the sample reported as being problematic. The most frequently used primary problematic substances were crystal meth (54%, n= 89/164), GHB/GBL (14%, n= 23/164) and alcohol (13%, n= 21/164). In total, 85% (n=140/164) had a problematic second substance and 66% (n=108/164) a problematic third substance. There were various patterns of drug use among men who used a chemsex drug versus a non-chemsex drug as their primary problematic substance. For the men who used crystal meth as their primary substance, 66% used GHB and 16% used mephedrone as secondary substances. In comparison, men who used alcohol as their primary substance, 43% used crystal meth and 30% used cocaine as secondary substances.

Table 9 (page 87) provides a summary on the distribution of the sample that used the 10 substance types by those that had used PrEP and had never used PrEP. Some men did not record use of a second or third substance, and it is assumed that this reflects the use of less than three substances. There was no statistically significant difference observed for the first (p= 0.110), second (p= 0.343) or third (p= 0.498) substances.

Fig 11: Substance 1-3 use rates

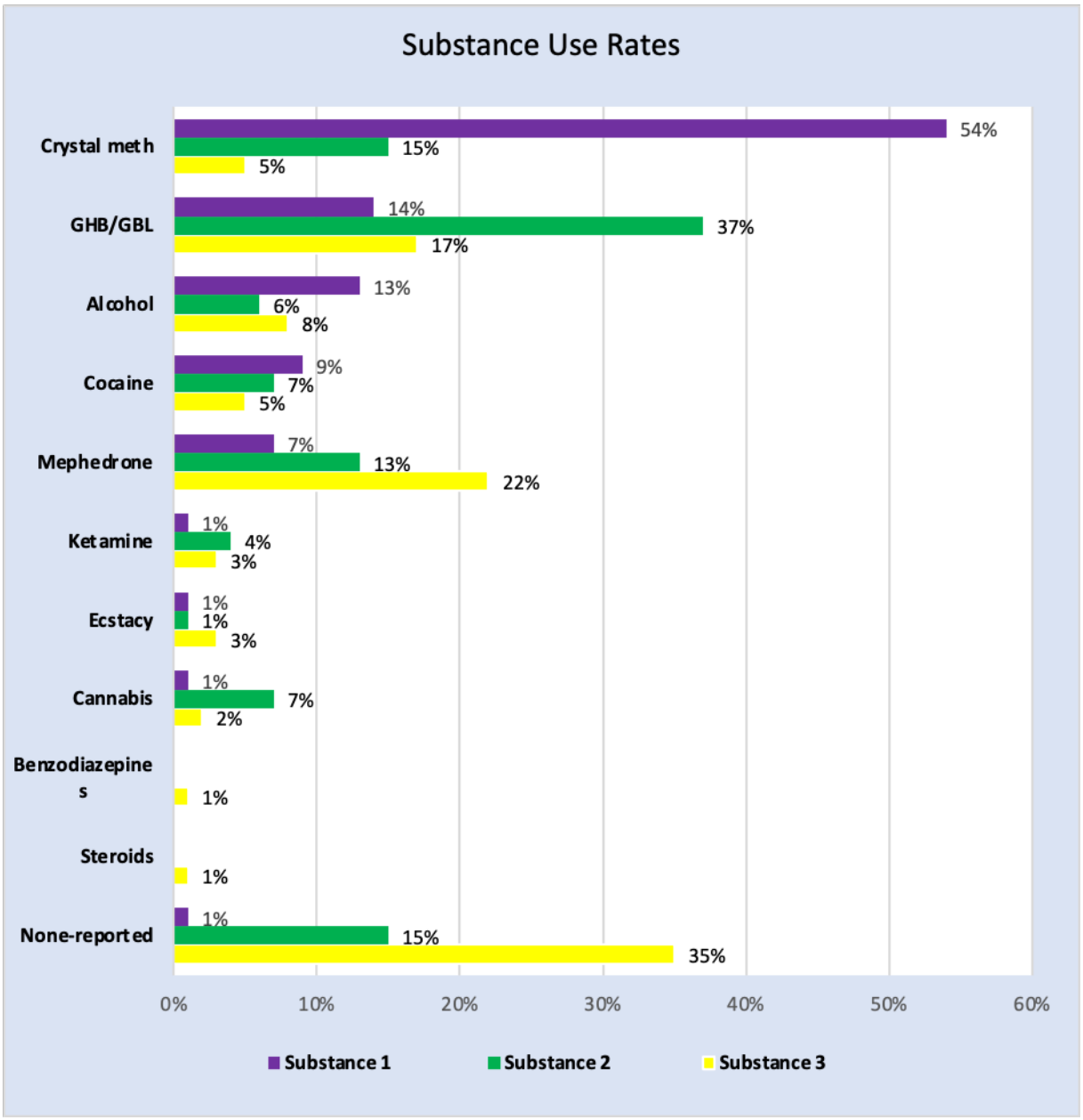
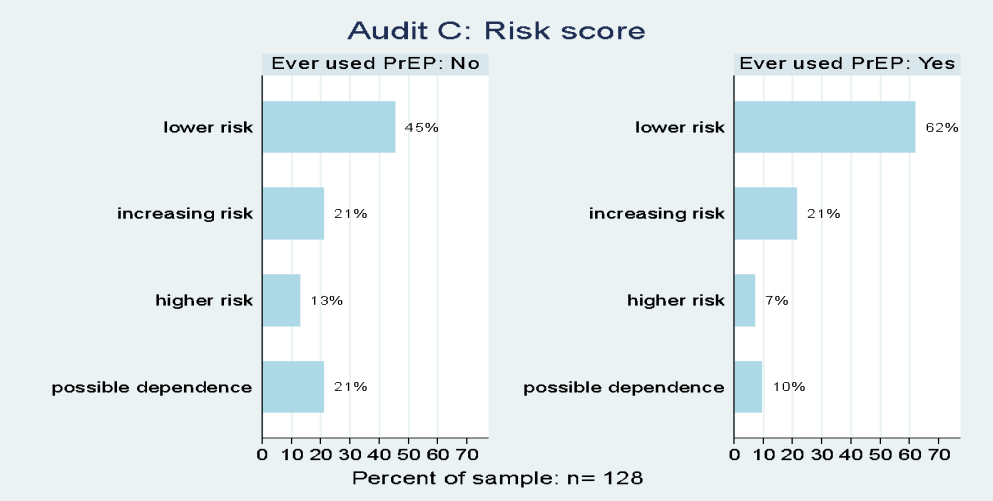


Table 9: PrEP use by substance type

Substance Type	PrEP ever	Substance 1	Substance 2	Substance 3
Alcohol	Yes	2	1	5
	No	17	8	7
Crystal meth	Yes	33	7	2
	No	43	16	5
Mephedrone	Yes	3	4	13
	No	7	14	19
Benzodiazepines	Yes	0	0	1
	No	0	0	0
Cannabis	Yes	1	1	0
	No	1	4	3
Cocaine	Yes	3	3	1
	No	10	7	6
Ecstasy	Yes	0	1	1
	No	0	1	4
GHB/GBL	Yes	7	24	8
	No	15	31	16
Ketamine	Yes	1	3	0
	No	1	2	3
Steroids	Yes	0	0	1
	No	0	0	0
p-value		0.110	0.343	0.498

The Audit-C screening tool is offered as part of every assessment for people who attend the Antidote service. The Audit-C is a tool which measures the level of alcohol use and provides four categories of measurement for the risk level of the person's alcohol use. Fig. 12 provides a summary of the samples (n= 128/165) level of alcohol risk by ever having used PrEP. There was no significant (p= 0.226) difference between the proportions of alcohol risk categories and ever having used PrEP. However, possible dependence is 11% lower and lower risk drinking is 17% higher for those that had ever used PrEP in comparison to those who had never used PrEP.

Fig 12: Summary of Audit C score category



Chemsex Drug Use

As outlined, earlier, to examine the overall use rates of the chemsex drugs I created a new variable for the five substances, which was a total combination of problem substance 1 to 3. Fig. 13 provides a summary of percentages of the sample (n=164/165) who used the drugs linked with chemsex. The highest-ranking drug used by three-quarters of the sample was crystal meth. The three drugs most associated (crystal meth, GHB/GBL, mephedrone) with chemsex had the highest use rates in the sample. As indicated on the table, the two chemsex-linked drugs least used by the men in the sample were cocaine and ketamine.

Fig 13: Chemsex drug use prevalence

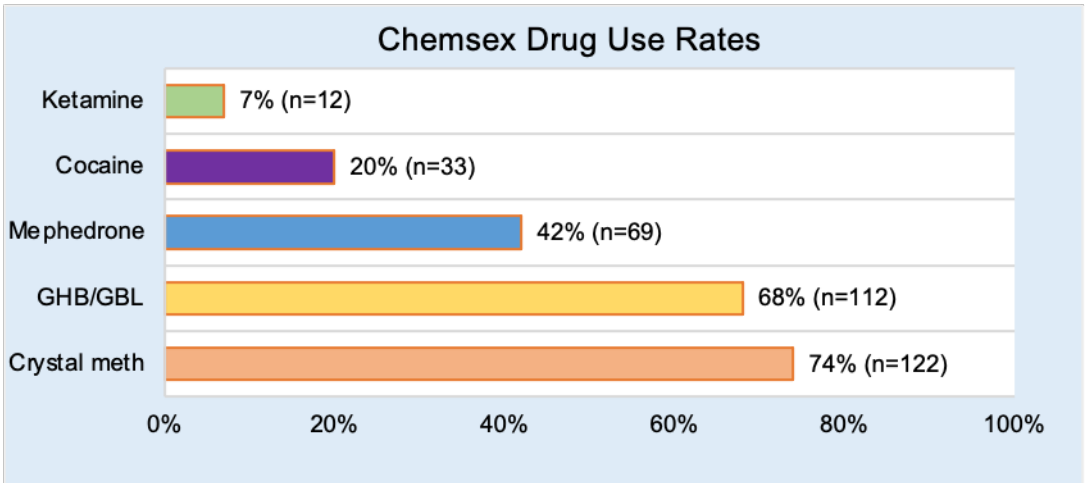


Table 10 (next page) provides a summary of the relationship for each chemsex drug and injecting status by ever having used PrEP. The use of crystal meth was associated with a higher proportion of 'ever using PrEP' (40% vs 21%, p=0.047). The significance with crystal meth use was not maintained for men currently using PrEP, although a similar relationship was present (30% vs 13%, p=0.052). There were no significant differences between the proportions of those that had ever used PrEP and the other four chemsex drugs. In addition, there was no significant difference between ages of men who had and had not used each of the five chemsex drugs (crystal meth: p= 0.630, GHB/GBL: p= 0.737, mephedrone: p= 0.096, cocaine: p= 0.519, ketamine: p= 0.441).

One in three (35%, n=50/144) of the sample were currently injecting and one in five had previously injected (20%, n= 29/144). There was a highly significant association between the proportions of injecting status and crystal meth use (P<0.001). In particular, the proportions of men who were currently or who had previously injected were substantially higher for those who had used crystal meth versus those who had not used the drug. In addition, there was a significant difference between the proportions of injecting status and those men that had used GHB/GBL (p=0.019). There was no significant difference among the proportions of injecting status categories and the other three chemsex drugs (mephedrone, cocaine, ketamine). There was no significant (p= 0.863) difference with injecting status and ever using PrEP.

Table 10: PrEP use by chemsex drug

Chemsex drug use*		**Never used PrEP**	**Have used PrEP**	**p-value**
Crystal meth: 74% (n=122/164)	Yes	64 (60%)	42 (40%)	0.047
	No	30 (79%)	8 (21%)	
GHB/GBL: 68% (n=112/164)	Yes	62 (61%)	39 (39%)	0.180
	No	32 (74%)	11 (26%)	
Mephedrone: 42% (n=69/164)	Yes	40 (67%)	20 (33%)	0.860
	No	54 (64%)	30 (35%)	
Cocaine: 20% (n=33/164)	Yes	23 (77%)	7 (23%)	0.196
	No	71 (62%)	43 (38%)	
Ketamine; 7% (n=12/164)	Yes	6 (60%)	4 (40%)	0.739
	No	88 (66%)	46 (34%)	
Injecting status*		**Never used PrEP**	**Have used PrEP**	**p-value**
Currently: 35% (n=50/144)		30 (68%)	14 (32%)	0.863
Previously:20% (n=29/144)		18 (67%)	9 (33%)	
Other people inject me: 1% (n=1/144)		1 (100%)	0 (0%)	
Never: 44% (n=64/144)		35 (61%)	22 (39%)	

** % and sample number for the row variables is for the overall sample. Due to non-reported data, the ever/never PrEP figures will not add up to this total.*

Sexual Behaviour

The sexual behaviours were examined using histograms and statistical testing, this included chemsex partners per event, sexual partners in the previous 3 months, sex working and level of condom use. From 136 men in the sample, for whom there was relevant sexual behaviour data, the reported range of chemsex partners per event ranged from 0 to 30 with a median of 3 (IQR: 1-5). Fig. 14 (next page) provides a distribution of chemsex partners per event which has been divided in to ever having used PrEP. Most men reported under five chemsex partners per event, this applied equally to men who had used PrEP and never used PrEP. There was no significant difference in chemsex partner numbers between these groups (p= 0.355).

The number of sexual partners in the previous 3 months (n=146/165) ranged from 0 -200, with a median of 10 (IQR: 4-20). Fig. 15 (next page) provides a distribution of sex partners in the previous 3 months by ever having used PrEP. There was a significant (p= 0.004) difference in sexual partner numbers between those who had used PrEP and never used PrEP. The median number of sex partners for men who had used PrEP was 20 (IQR: 9-25) and 10 (IQR: 4-20) for those who never used PrEP (p=0.004 difference between the groups). In addition, this significant difference (p= 0.0046) was maintained for men who were currently (20 partners, IQR: 10-30) using PrEP in comparison to those not currently (10 partners, IQR: 4-20) using PrEP (p=0.005).

Fig 14: Distribution of chemsex partners per event

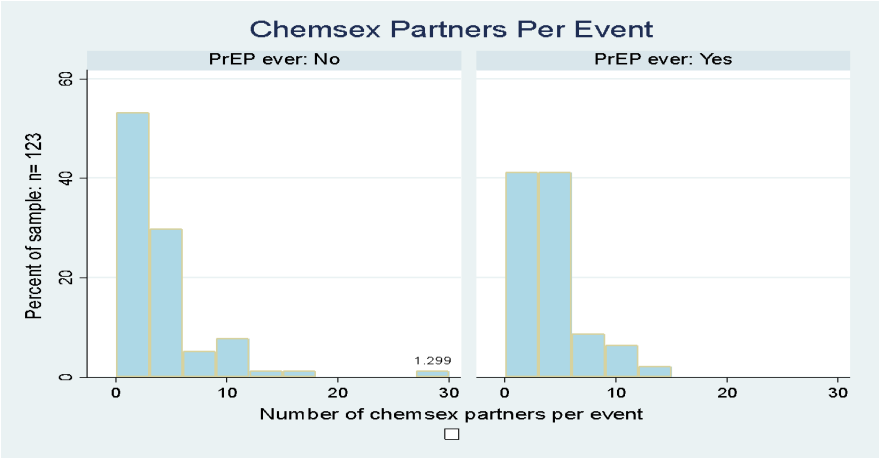
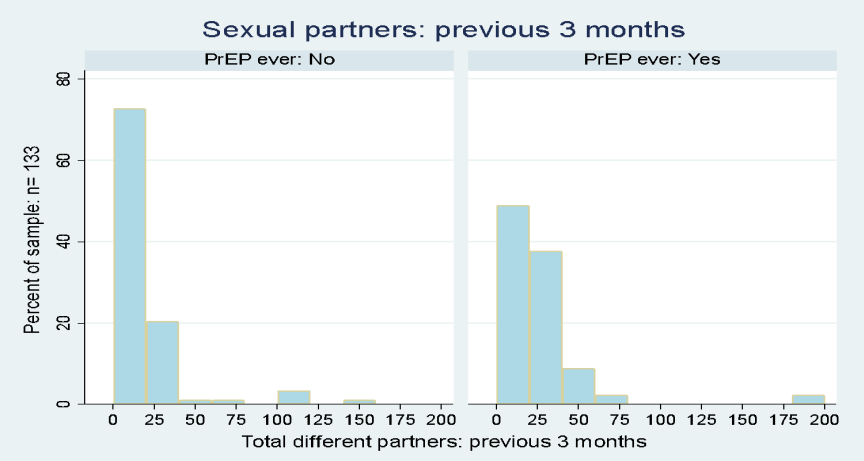


Fig 15: Sexual partners in previous 3 months



For 151 men in the sample, 83% (n= 126/151) had never been involved in sex working, 5% (n= 7/151) were currently involved and 12% (n= 18/151) reported that they had been previously. There was no significant (p= 0.243) difference between those who had ever used PrEP and involvement in sex working.

Condom usage was recorded as what level of percentage the men's sex life involved condoms. The percentage of condom use in the samples (n= 147/165) sex life ranged from 0% to 100%, with a median of 20% (IQR: 0-80%). There was a significant (p= 0.010) difference in level of condom use between men who had and hadn't used PrEP. The median percentage of condom use for those that had used PrEP was 5% (IQR: 0-80%) and 50% (IQR: 0-90%) for men that hadn't used PrEP. This significance was maintained for men who were currently using PrEP versus those not currently using PrEP (p=0.021). The median percent of condom use for current users was 5% (IQR: 0-30%) in comparison to 50% (IQR: 0-80%) for men not currently using PrEP.

There was no significant difference in the number of sex partners in the previous 3 months for men who had and hadn't used crystal meth (p= 0.656), mephedrone (p=

0.883), cocaine (p= 0.947) and ketamine (p= 0.549). However, there was a significant difference in sex partner numbers for men who had used GHB/GBL (p= 0.035). The median number of partners in the previous 3 months for GHB/GBL users was 12, in comparison to 6 for non-GHB/GBL users.

Table 11 provides an overview on the statistical test results for each chemsex drug and chemsex partner numbers per event. There was a significant difference in chemsex partner numbers per event for GHB/GBL (p= 0.004), crystal meth (p= 0.044) and mephedrone use (p= 0.013). Men who used these three drugs had a slightly higher number of partners compared to those who hadn't used the drugs. However, there was no significant difference for cocaine (p= 0.744) and ketamine use (p= 0.205).

Table 11: Chemsex partners per event by chemsex drug use

Chemsex Drug Use	Sample: Yes/No	Median partner no.	p-value
Crystal meth use	Yes: 107	3	0.044
	No: 28	1	
GHB/GBL use	Yes: 98	3	0.004
	No: 37	1	
Mephedrone use	Yes: 55	4	0.013
	No: 80	2	
Cocaine use	Yes: 26	2	0.744
	No: 109	3	
Ketamine use	Yes: 10	2	0.205
	No: 125	3	

Table 12 provides a summary of the variables for ever using PEP, using PEP in the last year and PEP use after chemsex, which is divided into ever having used PrEP. From 148 men in the sample, 64% reported that they had a previous course of PEP and 63% (n= 105/165) had received a course in the previous year. From 103 men in the sample, 68% said they had taken a course of PEP after a chemsex event. There was no significant difference between the proportions of men that had ever used PrEP and the three PEP use variables.

Table 12: Summary of PEP use

PEP use		Never used PrEP	Have used PrEP	p-value
Ever used PEP	Yes	57 (63%)	33 (37%)	0.185
	No	37 (75%)	12 (24%)	
Used PEP in the last year	Yes	41 (64%)	23 (36%)	0.357
	No	24 (75%)	8 25%)	
Used PEP after a chemsex event	Yes	46 (69%)	21 (31%)	0.349
	No	26 (79%)	7 (21%)	

Table 13 (next page) provides a summary of the hepatitis C and B status for the sample. Most of the sample were negative for hepatitis C (88%, n= 123/140) and

indicated to have a protective immunisation status for hepatitis B (94%, n= 142/160. There was no significant difference in hepatitis C and B status between men who had ever used PrEP and never used PrEP.

Table 13: Hepatitis C and B status

Hepatitis Status*	**% Of sample***	**Ever using PrEP**		**p-value**
Hepatitis C status (n=140)		**Yes**	**No**	0.380
Negative	88% (n= 123)	40 (35%)	73 (65%)	
Positive	12% (n= 17)	3 (21%)	11 (78%)	
Hepatitis B status (n= 151)		**Yes**	**No**	0.921
Acquired immunity	43% (n= 65)	23 (38%)	37 (62%)	
Immunised already	51% (n= 77)	24 (35%)	45 (65%)	
Offered and accepted	1% (n= 2)	0 (0%)	2 (100%)	
Offered and refused	4% (n= 6)	2 (33%)	4 (67%)	
Not offered	1% (n=10)	0 (0%)	1 (100%)	

** % and sample number for the row variables is for the overall sample. Due to non-reported data, the ever/never PrEP figures will not add up to this total.*

Mental health

Testing was performed to examine associations of mental health diagnosis, psychotropic medication use, suicide and self-harm against men who have ever used PrEP. Table 14 provides an overall summary of the sample's mental health status and association of each variable with ever having used PrEP.

Table 14: Summary of mental health

Mental health*		**Never used PrEP**	**Have used PrEP**	**p-value**
Mental health diagnosis: 37% (n=52/142)	Yes	36 (73%)	13 (27%)	0.130
	No	48 (59%)	33 (41%)	
Mental health services: 22% n=31/144	Yes	19 (73%)	7 (27%)	0.490
	No	67 (64%)	38 (36%)	
Previous suicide attempts; 27% (n=42/154)	Yes	26 (67%)	13 (33%)	1.000
	No	64 (65%)	34 (35%)	
Previous suicidal ideas; 49% (n=75/154)	Yes	44 (64%	25 (36%)	0.720
	No	46 (68%)	22 (32%)	
Current self-harm: 4% (n=6/159)	Yes	2 (40%)	3 (60%)	0.339
	No	90 (67%)	45 (33%)	
Previous self-harm; 22% (n=32/148)	Yes	26 (90%)	3 (10%)	0.002
	No	61 (59%)	42 (41%)	

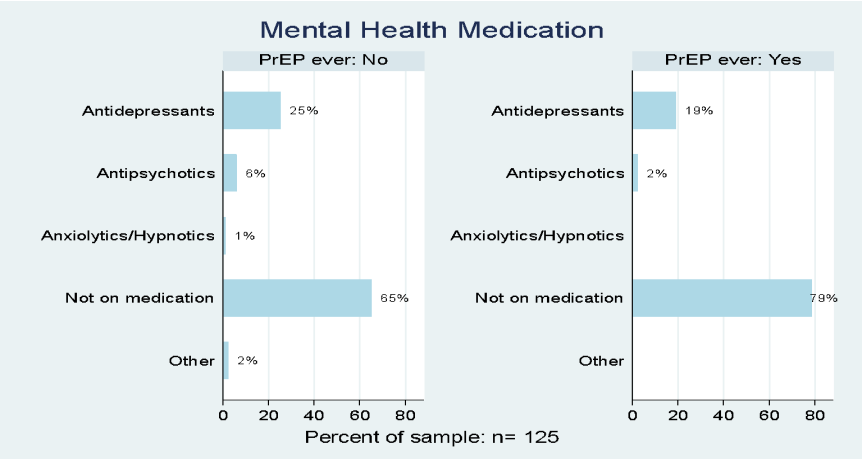
** % and sample number for the row variables is for the overall sample. Due to non-reported data, the ever/never PrEP figures will not add up to this total.*

From 142 men in the sample, 1 in 3 (n=52/142) had a current mental health diagnosis and 1 in 5 (n= 31/144) were involved with mental health services. From 154 men in the sample, 49% (n= 42) had previous suicidal ideas and 27% (n= 75) had attempted suicide. One in five (n=148) had previously self-harmed and there was a significant difference (p= 0.002) in the levels of previous self-harm for men who had ever used PrEP. specifically, there was a higher number of men who had

previously self-harmed who had never used PrEP in comparison to those who had used PrEP. There was no significant difference in the proportions for the other five mental health variables.

Fig. 16 provides a summary for the percentage of the sample that were taking specific types of psychotropic medications by ever having used PrEP. Anti-depressants were the most used medication, but the majority did not take psychotropic medications (69%, n= 96/139). There was no significant (p= 0.620) difference in the proportions of men ever using PrEP and the current use of psychotropic medication.

Fig 16: Mental health medication



Results: Multivariable logistic regression

I conducted multivariable logistic regression analysis to understand what sociodemographic, mental health, sexual behaviour and substance use factors were associated with PrEP use and how they were inter-related. Exposures that were identified through the systematic reviews to be key factors related to chemsex and PrEP use were included. In addition, any exposures that were significantly associated with PrEP use in univariate analysis at a p value of 0.05 were also included. The dependent variable was ever using PrEP and the independent variables were grouped and tested in specific characteristic classifications. Table 15 (next page) provide a summary of the classifications of grouped variables and rationale for inclusion.

I constructed eight models that included a priori of socio-demographics as core variables. I then built the models, first by including mental health, sexual behaviour and substance use variables separately and then in a variety of combinations. I finally build model 8 which included socio-demographics, mental health, sexual behaviour and substance use variables. To maintain sample consistency in the analysis, all observations that had missing data were excluded. Table 16 (next page) provides a summary of results for the eight multivariable logistic regression models. None of the models showed overall statistical significance for the set of predictive variables included in comparison to the null model with no predictors. However, this was anticipated due to the relatively small sample size.

Table 15: Classification of independent variables and rationale

Socio-demographics	**Rationale**
Age	PrEP review: most PrEP users aged late 20s-early 40s, 2 studies showed use was more common in older men.
Ethnic group	PrEP review: in 13 studies most, PrEP users were white and 2 indicated that white men more likely to use PrEP.
Sexual identity	PrEP review: evidence indicated early adopters of PrEP were mostly men who identify as gay.
Sexual behaviour	**Rationale**
Sex partners in previous 3 months	Attained significance in univariate analysis: p= 0.004. PrEP review: 4 studies found PrEP users had more sex partners than non-PrEP users.
Level of condom use	Attained significance in univariate analysis: p= 0.010. PrEP review: 2 studies found uptake was associated with CAS and 4 studies reported a PrEP motivator was men having sex with unknown HIV status partners.
Substance behaviour	**Rationale**
Crystal meth use	Attained significance in univariate analysis: p= 0.047. The most common used d substance was crystal meth (54%) and 1 paper in the chemsex review highlighted an increase in concurrent use of crystal meth and PrEP.
Mental health	**Rationale**
Previous self-harm	Attained significance in univariate analysis: p= 0.002
Mental health diagnosis	Due to significance of previous self-harm, this could be an indicator of mental health illness.

Table 16: Summary of results for multivariable regression models

Variable	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
Age *(continuous no.)*	1.0 (1.0-1.1, 0.09)	1.0 (1.0-1.1, 0.36)	1.1 (1.0-1.1, 0.04)	1.0 (0.97-1.0, 0.47)	1.0 (0.99-1.1, 0.10)	1.0 (0.97-1.1, 0.41)	1.0 (0.1.0-1.1, 0.04)	1.0 (0.97-1.1, 0.49)
Ethnicity (*white v non-white)*	2.0 (1.0-4.5, 0.14)	1.8 (0.60-5.0, 0.29)	2.3 (0.85-6.2, 0.10)	2.0 (0.67-6.3, 0.20)	1.7 (0.72-4.2, 0.21)	1.7 (0.58-5.0, 0.33)	2.2 (0.80-6.0, 0.13)	2.0 (0.66-6.3, 0.22)
Sexuality *(gay v non-gay)*	0.35 (0.03-2.5, 0.25)	0.30 (0.32-2.8, 0.30)	0.38 (0.40-3.5, 0.40)	0.35 (0.03-3.4, 0.36)	0.33 (0.03-3.8, 0.31)	0.37 (0.04-3.5, 0.39)	0.39 (0.04-3.6, 0.40)	0.37 (0.37-3.6, 0.39)
% condom use (*continuous no.)*			0.98 (0.97-1, 0.01)	0.99 (0.98-1.0, 0.03)			0.99 (0.98-1.0, 0.02)	0.99 (0.98-1.0, 0.06)
Partners in 3 months (*continuous no.)*			1.0 (0.98-1.0, 0.10)	1.0 (0.99-1.0, 0.25)			1.0 (0.99-1.0, 0.11)	1.0 (0.99-1.0, 0.25)
Crystal meth use *(yes v no)*					2.3 (0.92-5.5, 0.07)	2.3 (0.92-5.5, 0.16)	1.4 (0.50-4.0, 0.52)	1.3 (0.41-4.0, 0.67)
Previous self-harm *(yes v no)*		0.30 (0.08-1.3, 0.07		0.10 (0.08-1.3, 0.10		0.27 (0.07-1.0, 0.06)		0.31 (0.08-1.3, 0.10)
Mental illness *(yes v no)*		0.58 (0.23-1.4, 0.23		0.54 (0.21-1.4, 0.20		0.63 (0.25-1.6, 0.32)		0.60 (0.21-1.4, 0.23)
Model results given as: odds ratio (95% confidence interval, p-value)								

In model 1 and 2, socio-demographics were not significantly associated with PrEP use. With the addition of mental health factors in model 2 I found that previous self-harm achieved near significance (p= 0.07). In model 3, age (p= 0.04) and % condom use (p= 0.01) were significantly associated with PrEP use, but with the inclusion of mental health factors in model 4, age did not maintain its significance. Crystal meth use (p= 0.07) with socio-demographics in model 5 achieved near significance, but with the incorporation of mental health and sexual behaviour factors (models 6-8) this was not maintained (p= 0.16-0.67). However, previous self-harm (p= 0.06) did achieve near statistical significance in this model. Age (p= 0.04) and condom use (p= 0.02) attained significance in model 7 with the substance use variable, but this was not maintained with the addition of mental health factors (model 8). However, a near significant relationship was indicated for condom use (p= 0.06) in model 8.

It is notable that only two independent variables were significantly associated with PrEP use (p= <0.05) within specific models, including age and % condom use. However, the only variable that remained associated with PrEP in all the models, was % condom use. As the overall level of participant condom use decreased from 100% to 0%, there was increasing odds that participants would have ever used PrEP. Notably, the odds ratio for previous self-harm and mental health diagnosis are consistent in their direction across the different models, even if it was not statistically significant. Due to the small sample size, it is not possible to draw any substantive and wider conclusion from the multivariable analysis.

Discussion

I found that a substantial minority of the men who experienced problematic chemsex and who engaged in harm reduction services had accessed PrEP, 1 in 3 had ever used PrEP and 1 in 4 were currently using PrEP. In comparison, a European wide study identified that 28% of MSM PrEP users had recently engaged in multi-partner chemsex (MacGregor et al., 2021). These high rates of PrEP use and chemsex may not be reflective of the wider MSM population as they focus on higher risk MSM sub-groups. In addition, the MacGregor et al (2021) study was not explicitly on a cohort of MSM who experienced problematic chemsex. A study from the UK of MSM sexualised drug use reported that PrEP use was associated with chemsex (Hibbert *et al.*, 2019). There was no wider published up to date evidence that examined PrEP prevalence among chemsex participants. This limited evidence suggests that there were higher, but not ubiquitous, levels of PrEP use among MSM who have experienced problematic chemsex, even amongst those already engaged with harm reduction services.

The men in the sample who had ever accessed PrEP had significantly higher levels of sexual risk behaviours compared to those that had never used PrEP. This included double the number of sexual partners in the previous 3 months and significantly lower level of condoms use (PrEP use: 5% v 50%: no PrEP use). These findings were consistent with my systematic review of MSM PrEP use which identified that PrEP users had a higher level of sexual partners compared to non-PrEP users (Maxwell, Gafos and Shahmanesh, 2019). In addition, two studies in this review reported that a history of condomless anal sex (CAS) or inconsistent condom use was associated with MSM starting PrEP (Kuhns *et al.*, 2017; Collins,

McMahan and Stekler, 2017). The higher levels of sexual risk behaviour among my sample's PrEP users may be expected due to the clinical indicators in the PrEP guidelines. However, it is notable that despite being engaged in services that among the men in my study who had never accessed PrEP, half engaged in CAS.

In the study's sample the most used problematic substance was crystal meth, and its use was associated with current and previous injecting. These findings are comparable to a UK study of an MSM sample attending a specialist drug clinic that reported crystal meth was the most frequently used drug and its use was associated with ever injecting (Bowden-Jones *et al.*, 2017). In addition, my systematic review on MSM chemsex behaviours identified that crystal meth was specifically associated with an increased risk of CAS (Maxwell, Shahmanesh and Gafos, 2019). It is important to highlight that in my review crystal meth commonly featured as a drug used by MSM populations across varying high-income regions and nations.

The study highlighted that crystal meth use was associated with a higher proportion of ever accessing PrEP. It could be speculated that due to the high-risk behaviours associated with crystal meth, that users in my sample had an increased awareness of their HIV acquisition risk. In comparison, a study from Australia reported that the concurrent use of crystal meth, PrEP and EDDs increased by 4% over a three-year period (Hammoud *et al.*, 2018b). However, this study did not explicitly link the crystal meth use episodes with PrEP use. Overall, there was limited evidence to explain the crystal meth use link with PrEP. However, this is an important factor to consider given the interface the chemsex drug has with high-risk activities.

One in three of the sample had a current mental health diagnosis, although no information was available for specific conditions. However, as anti-depressants were the main medication it is reasonable to speculate this was primarily depression and/or anxiety. A systematic review reported that 60% of MSM chemsex participants had a history of mental ill health (Tomkins, George and Kliner, 2019). Tomkins et al (2018) highlighted that short-term post chemsex engagement impact can include lowered mood and anxiety. The evidence highlighted earlier indicated that MSM who use crystal meth had amplified biological risks. A study of a PrEP clinical trial reported that crystal meth use was associated with depression, in which the depression related to issues of accepting their sexuality (Miltz et al., 2019). In comparison, a German study reported that MSM who used crystal meth with sex were more likely to experience depression than non-crystal meth users (Schecke et al., 2019). These studies are not within a problematic context, they highlight the psychosocial issues that MSM chemsex participants may experience.

To understand the potential level of mental health issues among chemsex participants, it is important to compare this to wider populations. A study from England identified that the prevalence rate for long term mental health issues among the wider MSM population was 1 in 10 which compared to 1 in 20 for the heterosexual population (Elliott *et al.*, 2015). A meta-analysis highlighted that the LGBT population were 1.5-2 times more likely to suffer from anxiety and depression in comparison to the heterosexual population (King *et al.*, 2008). This overall indicates MSM who experience problematic chemsex may have higher rates of mental illness than other populations.

The study found that a higher number of men who had previously self-harmed had never used PrEP in comparison to those who had used PrEP. There was no clear rationale for this relationship and no wider evidence that explored self-harm in the context of PrEP. Within the study's overall sample, 1 in 5 had previously self-harmed and 1 in 4 had previously attempted suicide. A mental health survey from England highlighted that LGBT prevalence for previous self-harm and suicide attempts was 9%, which was approximately double the heterosexual prevalence (Chakraborty *et al.*, 2011). This indicates that my study's sample's previous mental health risk behaviour rates are double that of the wider LGBT population. There was no substantive evidence to comparatively gauge these rates against MSM that did not experience problematic chemsex. This overall mental health evidence highlights the potential psychosocial vulnerabilities of MSM who experience problematic chemsex.

Strengths and limitations

A key strength of the study was the multiple and wide breadth of variables that have facilitated one of the first examinations of PrEP use among MSM who encountered problematic chemsex. This is particularly unique with varied substance use behaviours and psychosocial related factors. However, as the study was cross sectional in design it was not possible to establish the direction of association between variables. It only provides a 'snapshot' of a relatively small sized sample's behaviours.

As the sample were seeking help for their substance use, it may not be fully generalizable to the wider MSM population who have experienced problematic chemsex. In addition, due to the limited evidence base on problematic chemsex, it was difficult to evaluate how representative this sample was of the wider MSM chemsex population. However, this study provides insights into key characteristics and risk factors that are associated with PrEP access among this very high-risk group. Although was limited by not having data that could examine the effectiveness of PrEP use, particularly the adherence to dosing regimens.

Conclusion

A significant minority of MSM who have experienced problematic chemsex had ever accessed PrEP. Evidence suggests that there was higher levels of PrEP use in this study's group of men in comparison to the wider MSM population. However, men who had never used PrEP also engaged in risk behaviours and were at high risk of acquiring HIV. Men who had used PrEP engaged in higher risk sexual behaviours than men who didn't use PrEP. A significant minority had mental health issues and previous suicidal and/or self-harm tendencies. Crystal meth was the most used problematic substance. Men who used crystal meth had high levels of PrEP use, whilst those who had previously self-harmed were less likely to use PrEP. It is encouraging there was a high level of PrEP use among this population. However, there is a need to further examine factors that facilitate the expansion of PrEP access for this group that is at high risk of HIV acquisition.

Chapter 6: Exploring PrEP use among men who have sex with men who have engaged in chemsex

Introduction

In this chapter, I present the methods for the qualitative study that explored PrEP use among MSM chemsex participants. I describe the aim, objectives and rationale, followed by the data collection methods, data analysis process and ethical considerations. Lastly, I explore the strengths and limitations of the methods and the study methods are briefly concluded.

The aim of the study was to explore the PrEP uptake and medication adherence experiences of HIV negative MSM who had engaged in chemsex behaviours. This specifically included understanding the biopsychosocial dyadic interrelationship between chemsex and PrEP: *the impact of chemsex behaviours on PrEP use and impact of PrEP use on chemsex behaviours*.

The objectives of the study were:

1. To explore the biopsychosocial factors which act as barriers and facilitators for PrEP uptake among MSM who participate in chemsex.

Rationale: Evidence in my PrEP review showed that there were relatively low levels of PrEP uptake among MSM. A key motivator for the wider MSM population to see themselves as PrEP candidates was perception of their risk level and fear of contracting HIV. In the PrEP review I found that multi-faceted structural and social factors act as barriers for MSM accessing PrEP. However, both my reviews found a lack of evidence that explores motivators/demotivators for PrEP use and PrEP access among chemsex participants who are at high risk of HIV acquisition. The quantitative analysis found only a minority of the highest risk men who had experienced problematic chemsex were currently using PrEP and suggested that those who self-harm, were less likely to use PrEP.

2. To explore the biopsychosocial factors which act as barriers and facilitators to PrEP adherence and non-adherence when MSM engage in chemsex behaviours.

Rationale: Evidence in my chemsex review found that MSM chemsex participants engage in high-risk drug and sexual behaviours. In addition, my PrEP review indicated that some MSM may risk compensate following PrEP uptake. The quantitative analysis of MSM who had experienced problematic chemsex found that men who had used PrEP, engaged in higher-risk behaviours compared to those who had never used PrEP. However, this was cross sectional and may have reflected greater uptake of PrEP amongst chemsex users. Neither of my reviews identified any studies that explored if PrEP impacts on changes in the level of risk men take when they engage in chemsex.

3. To explore any changes in the drug use and sexual behaviour of MSM chemsex participants which may have occurred post PrEP uptake.

Rationale: My PrEP review found limited evidence that substance use contributed directly towards non-adherence. However, neither my reviews found studies that explored PrEP adherence among MSM who engaged in chemsex. The quantitative analysis found high-levels of varied poly-substance use and mental health issues in men who had experienced problematic chemsex, although was not able to explore the factors which influence adherence.

Data collection

I collected the data using one to one semi-structured interviews, in which I used open and closed questions. Semi-structured interviews are a practical format which facilitates the exploration of the participant's experiences (Braun and Clarke, 2013). I conducted the interviews by telephone and they lasted 45 to 60 minutes. Telephone interviews are a useful and effective mechanism to explore sensitive topics with minority populations (Drabble *et al.*, 2016). Video interviews were considered but there was cost and technology implications. Telephone was more economical and technologically practical. I recorded all the interviews, and they were transcribed verbatim.

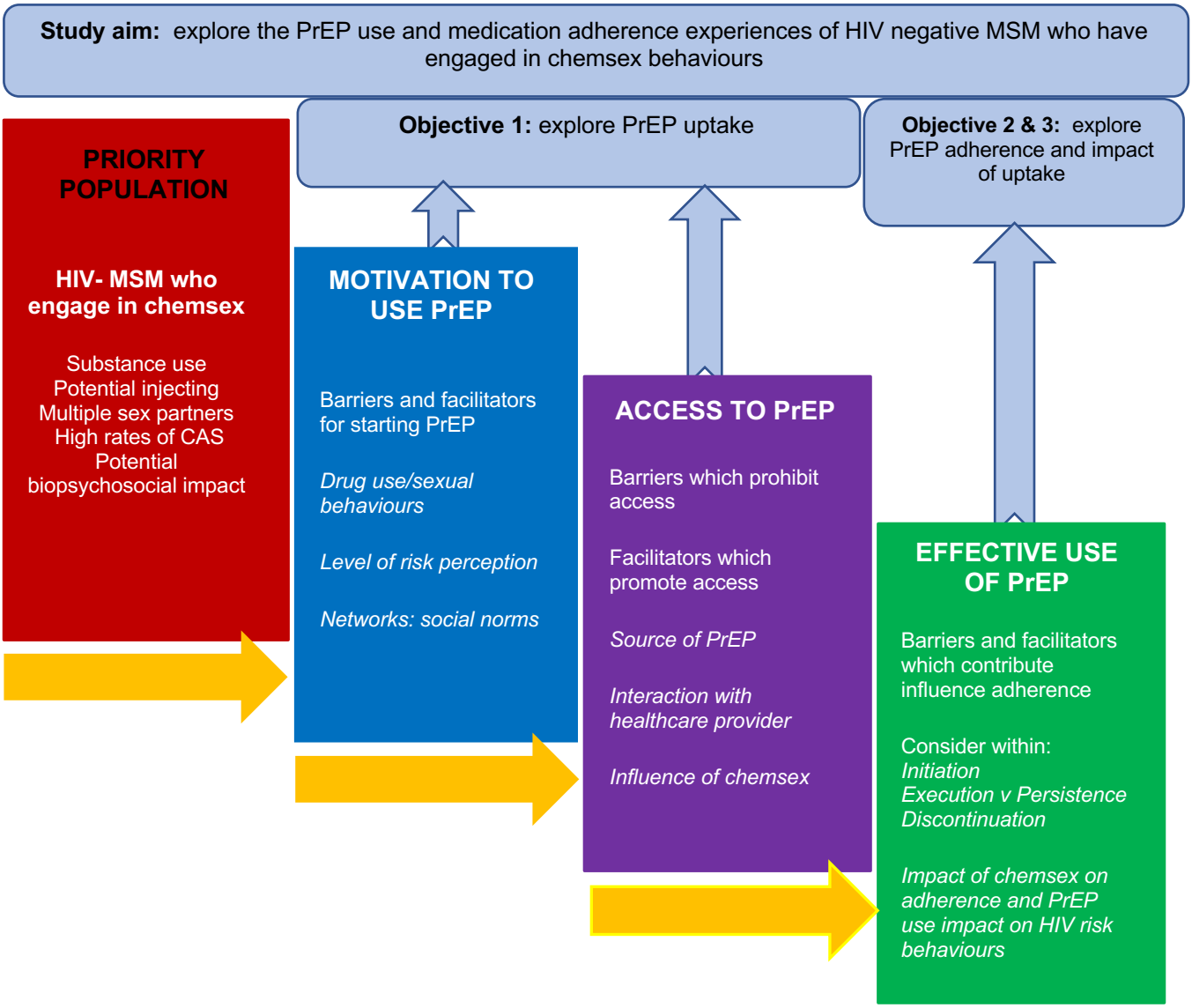
I used Hargreave's HIV prevention cascade as a theoretical base to structure and understand what areas should be explored. As outlined in chapter 2, the cascade is a three-stage framework that facilitates an identification of the barriers and facilitators high-risk populations experience when attempting to use HIV prevention interventions (Schaefer *et al.*, 2019). Fig. 17 (next page) provides a summary of how the objectives and key enquiry areas for the study were structured within the cascade. Key findings in my systematic reviews and quantitative analysis informed the development of the interview guide (Appendix 2) which was structured using the three stages of the cascade.

To explore the motivation, access and effective use stages of the HIV prevention cascade, I considered the three behavioural processes of medication adherence. As outlined in chapter 2, the stages comprise of initiation *(starts taking the medication)*, execution (*comparison between the person's actual dosing and prescribed dosing)* and discontinuation *(stops taking the medication*) (Vrijens et al., 2012).

To effectively explore execution, I considered the term persistence. Persistence is the time between medication initiation and last dose, which is then consequently followed by discontinuation (Aylward, Rausch and Modi, 2015). A study that examined PrEP use over 2 years indicated that there were high levels of low persistence, which potentially placed users at risk of HIV acquisition (Coy *et al.*, 2019). Evidence suggests that if higher risk groups have insight into their level of risk, this can potentially lead to increased level of persistence in using medication (Horne *et al.*, 2013). As chemsex participants are at high risk of HIV acquisition, it was important to consider factors that influenced initiation, execution, persistence and discontinuation.

I used key concepts within the PAPA framework to inform the development of the interview topic guide. As highlighted in the methods chapter, I had intended to focus the application of PAPA within the effective use element of the cascade. This was due to the idea that the successful execution of a medication regimen correlated with its effective use. This included understanding the key perceptions and practicalities for continuing to intentionally/unintentionally non-adhere to PrEP which links with barriers and facilitators of effective use. However, during the process of data analysis I adapted the framework to include PAPA concepts within the motivation and access elements. This is explained further under the data analysis section within this chapter.

Fig. 17: HIV prevention cascade summary for qualitative study



Population

My initial target size for the sample was 20. Twenty is deemed to be a satisfactory sample size to explore specific research questions before data saturation is achieved (Green and Thorogood, 2018). I completed a total of 19 interviews at which point data saturation was achieved. Data saturation refers to the stage where no new information is discovered within the data analysis process, which indicates that data collection may cease (Braun & Clarke, 2013). Interviews took place between October and December 2019. The eligibility criteria were:

- A man who has had sex with other men
- 18 years old and over
- HIV negative or assumed HIV negative
- Have participated in chemsex within the last 3 months
- Are currently using PrEP or stopped using PrEP in the last year

It was important that I included a range of views and experiences in the sample, ranging from men who had stopped using PrEP to men who were actively using PrEP. However, it was important the majority were current users so that a variety of men's current real-life experiences could be explored: from the point of PrEP uptake to medication adherence. My aim was to include 3-5 men who had stopped using PrEP. This was to allow for a deeper exploration of the role persistence played within effective medication adherence. As my PrEP systematic review highlighted that young MSM can have lower levels of adherence, I aimed to recruit between 3 to 5 men aged between 18 and 25. There were no other sample age quotas.

Recruitment and enrolment

I recruited the sample by promoting the study on a combination of multiple MSM and PrEP centric social media platforms and networking applications. The advertisements on media platforms included a digital poster (Appendix 3). The poster included brief information on the purpose of the study, brief summary of sample eligibility, what was involved and a means of contact to enquire about the study. Depending on the level of recruitment, I planned three separate promotional rounds that would be carried out 6-8 weeks apart. The first promotional round was carried out in October 2019. Study recruitment posts that were free of charge were placed on the social media of PrEP'ster, I want PrEP now, SX Scotland, LGBT Health and Well-being in Manchester, Terrence Higgins Trust MSM service in Brighton, MESMAC MSM service in Leeds and London Friend. I placed one paid advert on the MSM networking site Recon. I only required one promotional round to recruit the final sample of nineteen men. Ten participants were recruited via the ad on Recon, six from the free posts on stakeholders' social media and three via hearing about the study from MSM peers.

The digital poster advised potential participants to contact me via my university email address. Once potential participants had initiated contact, I sent a standardised reply which included an introduction and the participant information sheet (PIS) (Appendix 4), this included the purpose of the study, full sample eligibility and what was involved. Following this information, potential participants were asked to reply if they met study eligibility, had any questions and wanted to proceed to interview. Subsequent to this, I arranged interviews with eligible men. I sent out a total of 24 PIS sheets, including the 19 who completed interviews. Three did not meet the full criteria (2 for no recent chemsex activity and 1 for no recent/current PrEP use) and two who confirmed they met eligibility did not follow up on arranging an interview.

After I completed the interview, each participant was emailed a £20 e-voucher for Amazon. A small gesture as a thank you can provide an acceptable means of recognition for the time and quality information that participants provide to research (Braun and Clarke, 2013).

To maximise sample anonymity, I only collected the essential amount of identifiable information that was required to facilitate the study. This included a first name, age, sexual identity, ethnic group, country of birth, region of residence in the UK, email and telephone number the participants used as their preferred means of communication. The demographics outlined above were required to describe and

compare any differences among the participants. Subsequent to data collection and in all analysis/write up of the data, I assigned each participant a pseudonym.

I store all the electronic information on a closed access file within a secured network system within a higher education institute (HEI). I store all the hard copy information and electronic devices used for the interviews within a lockable filing cabinet in an HEI. All the participants directly identifiable information (real name and contact details, plus specific age and area of residence) is only stored on one central password protected spreadsheet which I only have access to on the HEI system. The audio interview files were transcribed by a professional company which was on UCLs approval list (confidentially agreements with the institute etc). Any reference to confirming real name and all personal demographics at the start of the audio files were removed by me before I transferred them to the transcribing company. I transferred all the electronic files by using the institute's approved file transfer processes. All other electronic and hard copy files only contain a pseudonym name and no directly identifiable information (real name and contact details). To further enhance anonymity, in all these files the participants are categorised into age ranges and nation of residence. I will not reveal the real first name or contact details of participants to any other individuals. I will retain all these files and destroy them once the PhD is complete (maximum date: 31 March 2022). All these data process mechanisms were subject to UCL's ethics application approval and are General Data Protection Regulation compliant.

Data analysis

I adopted a framework analysis approach. This is a deductive process that is effective in supporting the development of policy and practice orientated research findings (Ritchie *et al.*, 2014). This involves systematically summarizing the content and classifying the data into a thematic framework (Green and Thorogood, 2018). The main stages are (1) Familiarization: researcher becoming familiar with transcripts and early themes, (2) Identifying a thematic framework: creating an initial overarching coding structure, (3) Indexing: numerically annotating transcripts to identify consistencies in data and adaption of the coding framework, (4) Charting: re-arrangement of data/framework into a logical order, and (5) Mapping/interpretation: iterative process of exploring and explaining the findings within the framework (Ritchie *et al.*, 2014). I chose this approach because the primary output of the PhD was to help inform the development of evidence-based policy and practice for PrEP delivery.

I structured the over-arching priori coding framework using the three steps of the HIV prevention cascade, with sub-codes for barriers and facilitators in each step. Initially, I used key concepts from the PAPA framework as sub-codes within the effective use stage of the cascade. However, as highlighted earlier, during the final stages of the analysis process I added PAPA sub-codes to the motivation and access stages of the cascade. The initial coding development was informed by key findings in the systematic reviews and quantitative analysis. I used NVivo 12 to assist with the data management.

I adapted the interview methods and coding based on the first six to seven interviews. This initially involved sending a sample of two random transcripts to

Professor Shahmanesh who reviewed the interview structure, questioning style and areas of response. This allowed me to make minor adaptions which made some of the questions clearer. Throughout the whole process I remained reflexive to new and emerging themes. This was particularly important after the first several interviews from which I needed to revise some of the sub codes. This was following the review of an initial framework at a PhD supervision session with Professor Shahmanesh and Associate Professor Gafos. The overarching framework structure which used the three HIV prevention cascade elements remained unchanged. However, some of the elements sub-codes were merged and new sub-codes emerged which was specifically important for factors related to social discourse. At the final stages of analysis, I added the necessities and concerns framework from PAPA to the motivation element of the cascade and the opportunity component from PAPA to the cascade's access element. Necessity and concerns beliefs were fundamental factors that influenced perception on seeing PrEP as being suitable and inter-related with motivation to start PrEP. Opportunities was important in terms of the availability of PrEP and how easy or hard it was to access. To increase robustness of the final framework, I presented a formulated summary table of the thematic findings to Professor Shahmanesh and Associate Professor Gafos at a PhD supervision session. This led to me making minor refinements to the final thematic framework.

Ethical considerations

As I was collecting and analysing personal and sensitive data, a UCL high-risk ethics approval was required. As I was doing the data collection at a distance via telephone, a hard copy of written informed consent was not viable. At the start of the telephone interview, I provided all the components required for informed verbal consent (Appendix 5). This included the nature and purpose of the study, statement that participating was voluntary and that they may withdraw at any time (without giving a reason), that the interview included sensitive topics and any risks or benefits. UCL ethics approval is provided in appendix 6.

After the interview, I emailed all study participants a £20 e-voucher for Amazon. If they decided to later withdraw from the research, I made it clear they retained the gesture. It was a direct benefit for participating. However, the small gesture provided a formal recognition to the participants for contributing their valuable time and information on their experiences.

As I was exploring personal and sensitive topics in the study; this was made clear to participants via the PIS. Due to the sensitive nature of the topics that participants were to discuss, it was made explicit on the PIS and at the verbal consent stage, that they could stop or pause the interview at any time. As the interviews were telephone based, there was no socio-environmental risks factors for the me as a researcher.

Strengths and limitations

The use of virtual based interviews facilitated my engagement with a minority population to discuss personal and sensitive topics. However, the lack of in person interaction and non-verbal interaction ques can limit the level of trust that is established between the participant and researcher (Braun and Clarke, 2013).

Subsequently, this can impact on participants behaviours not being recorded that may be important in explaining the verbal information.

A framework analysis strengthened the process of systematically extracting data into a structured, comprehensible and detailed format (Ritchie *et al.*, 2014). This approach was conducive with my PhD aim which is to practically inform health policy and practice. However, the multiple stages can be resource intensive, and a level of expertise is required to successfully execute the analysis (Gale *et al.*, 2013). I had some experience in qualitative methods but had close supervisory and learning support from Associate Professor Gafos who is a highly experienced social scientist.

Conclusion

The aim of the study was to explore the PrEP uptake and medication adherence experiences of MSM who engaged in chemsex. The HIV prevention cascade informed the development of the data collection process. In late 2019, I completed 19 telephone interviews with HIV negative MSM who had recently engaged in chemsex and who were currently or had previously used PrEP. I recruited the men via MSM and PrEP centric social media. I used framework analysis, which was underpinned by the HIV prevention cascade and PAPA. There were multiple ethical considerations in terms of this being a sensitive and personal topic. I received UCL high-risk ethical approval for the study.

Chapter 7: Chemsex context of MSM who have used PrEP

Introduction

In this chapter, I summarise and discuss the chemsex experiences of the nineteen participants who took part in the interviews. This focuses on the participants socio-demographics, reasons for engaging in chemsex, drug use behaviours, sexual behaviours and related health and well-being factors. Latterly, I compare the key findings to the wider research-based literature and highlight the strengths and limitations.

Socio-Demographics

The primary demographics that I collated for all the study participants were age, ethnicity, sexual identity and nation of residence within the UK. Table 17 provides a summary of the participant's socio-demographics with an assigned pseudonym name for each participant. As per the eligibly criteria of the study, they all confirmed they identified as male and were HIV negative. The age range for the study participants varied from 26-71, with an IQR of 31-51 and median age of 41. Most of the participants identified their ethnicity as white and sexual identity as gay. Fifteen of the participants resided in England and four within the Celtic Nations, including Scotland, Wales and Northern Ireland.

Table 17: Participant's socio-demographics

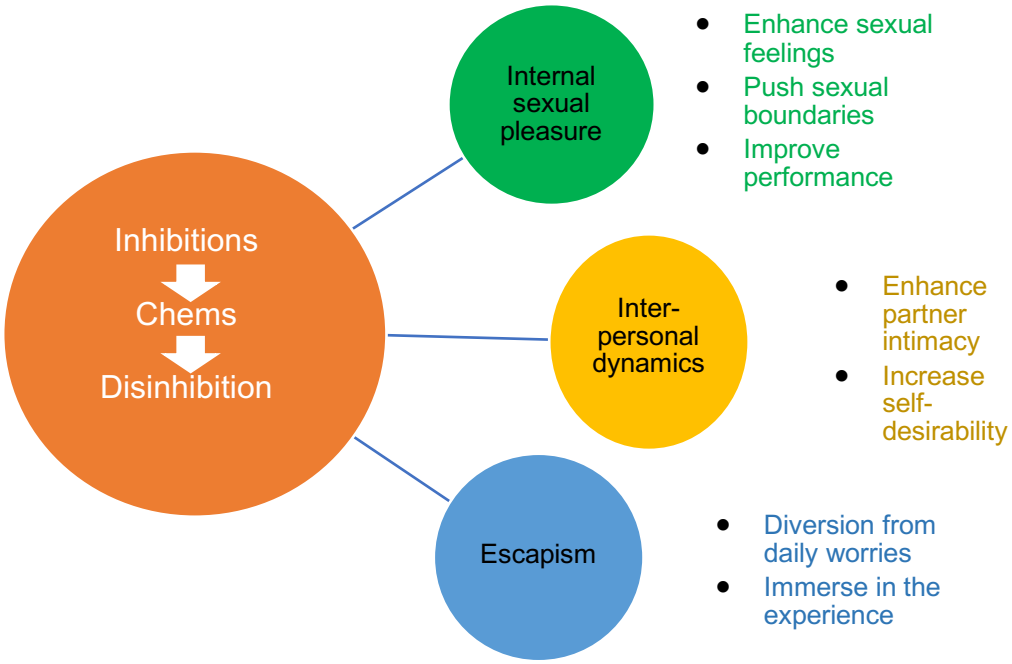
Pseudonym	Age Range	Sexuality	Ethnicity
Adrian	50-60	Gay	White
Ben	<30	Gay	White
Chris	>60	Gay	White
David	30-40	Gay	White
Eric	40-50	Gay	White
Fynn	<30	Bisexual	Mixed race
Glen	40-50	Gay	White
Henry	>60	Gay	White
Jack	30-40	Gay	White
Kevin	50-60	Gay	White
Liam	30-40	Gay	White
Max	<30	Gay	White
Neil	50-60	Gay	White
Owen	30-40	Gay	White
Patrick	>60	Gay	White
Ross	30-40	Gay	White
Steve	40-50	Gay	White
Troy	30-40	Gay	White
Wes	40-50	Gay	White

Motivation for engaging in chemsex

I discussed the reasons for combining drugs with sex with all the participants, in which they described three primary but inter-twinning classifications for engaging in

chemsex. The classifications consisted of internal sexual pleasure, inter-personal dynamics and escapism. Fig 18. provides a summary of the participants reasons for engaging in chemsex. A key component of all the classifications was the participants purposeful use of chems to reduce internal inhibitions which facilitated their immersion into an overall enhanced sexual experience.

Fig 18: Summary of reasons for engaging in chemsex



Internal sexual pleasure

There were three categories of internal sexual pleasure, which included sexual feelings, sexual boundaries and physical performance. Many of the participants described that the use of drugs lowered or fully removed their inhibitions which enabled them to experience enhanced sexual feelings.

"It makes you just more relaxed and creates a connection, makes things more intense. It just gets rid of all your inhibitions, so you just let yourself go" (Glen, 40-50)

The key aspects of pleasure seeking that participants described chemsex provided was a sexual intensity and heightening, which involved excitement, enjoyment and feeling alive. A few of the participants less commonly described that pleasure was inter-related with their desire to experiment with new sexual activities. This included seeking sexual feelings of "wanting to be sleazy and promiscuous".

"Just liking the feeling, I think, it does heighten sexual pleasure I guess, and you lose inhibitions. I just think you're just more like reckless and you don't feel pain as much, so you'd be willing to push your limits" (Max, <30)

A second aspect of internal sexual pleasure was the ability to be able to push sexual boundaries. Some participants described that the use of chems with sex made their body capable of doing sexual activities it would not normally be able to achieve. These activities included anal focused sexual practices, with a central component being penetrative anal sex acts. A less recurrent element of pushing sexual boundaries was participants feeling able to explore and experience new and different types of sexual activities, which focused on esoteric sex activities (example: fisting).

"Found that it was just something that gave me that extra buzz. It gave me the intensity. It took away my inhibitions. It allowed me to be the man that I wanted to be sexually" (Adrian, 50-60)

Lastly, many of the participants reported that the use of chems increased their physical performance. Chems allowed them to stay awake for longer and enabled their libido to have prolonged performance. A central aspect of this element was their ability to engage in longer pleasurable sex sessions which they could not manage without chems.

"Two things mostly, the stamina and being able to stay awake as well because everyone is getting stuck in and it's all happening, I am usually going off to bed otherwise because I don't really find myself awake at that time of the day" (Eric, 40-50)

Inter-personal dynamics

A second classification of motivation for engaging in chemsex was inter-personal dynamics which consisted of two categories, this included self-desirability and partner intimacy. In terms of seeing themselves as desirable, a few of the participants described a lack of confidence in being able to engage with partners. The use of chems increased their overall self-confidence, which provided them with the ability to more quickly establish sexual connections with partners. A less re-current element was participants specifically using chems to boost body confidence levels which made them feel more sexually attractive and desirable to partners. A distinctly rare element described was the social aspect of chemsex which provided an instant partner network for them to feel popular and accepted by a group of peers.

An important aspect of the inter-personal relationships was partner intimacy. Several participants highlighted an important element for them using chems with sex was the enhanced sexual and emotional connection they had with partners. They believed they could not achieve the same level of intimacy outside of the chemsex environment.

"Well, it just intensifies the experience really. I think I feel sometimes more connected to somebody" (Troy, 30-40)

An important but less commonplace component of this enhanced connection was the perception that chems made them more considerate towards their partners sexual needs. A few of the participants described that within a chemsex environment they had a sense of freedom to engage in sex they desired without the fear of being judged by partners. Within this chemsex intimacy dynamic they did not fear a sense of shame where partners were seeking similar shared sexual experiences.

Escapism

Another distinct but less frequent reason for participating in chemsex was their desire to experience a sense of escapism. A few of the participants described that engaging in chemsex allowed them to escape from normal life, in which they would let go of any worries and stress related to everyday issues.

"You've just got no hassles, no worries. You just become the person in the room, the only person that matters is you and your pleasure and you get people to pleasure you" (Henry, >60)

The disinhibiting effect of chems allowed them to live in the moment and fully immerse themselves into the pleasure of the shared experience with their partners.

Patterns of chemsex behaviours

The primary chemsex related behaviours that I discussed during interviews and that are outlined in the following section included multiple substance use and sexual behaviours. These behaviours include current frequency of chemsex sessions, maximum chemsex session length, types of drugs used within chemsex sessions, number and type of partners at chemsex sessions, type of sex at sessions and sexualised injecting practices. Table 18 provides a summary of some of the key chemsex behaviours reported by the nineteen participants.

Table 18: Key chemsex behaviours

Pseudonym	Current frequency of engagement	Maximum session Length	Average number of session partners	Ever Injected status
Adrian	Twice per month	< 20 hours	< 5 partners	No
Ben	Once every 2/3 months	< 10 hours	< 5 partners	No
Chris	Twice per month	< 10 hours	< 5 partners	No
David	Twice per month	< 48 hours	< 15 partners	No
Eric	Once every 2/3 months	< 10 hours	< 15 partners	No
Fynn	Twice per month	< 10 hours	< 5 partners	No
Glen	Twice per month	< 20 hours	< 5 partners	No
Henry	At least once per week	Not discussed*	< 5 partners	Yes
Jack	Once every 2/3 months	< 48 hours	Not discussed*	Yes
Kevin	Twice per month	< 20 hours	< 5 partners	Yes
Liam	Twice per month	< 10 hours	Not discussed*	No
Max	Currently abstaining	< 48 hours	< 15 partners	No
Neil	Twice per month	< 48 hours	< 20 partners	No
Owen	Twice per month	< 20 hours	< 15 partners	No
Patrick	At least once per week	Not discussed*	< 5 partners	Yes
Ross	At least once per week	< 10 hours	< 5 partners	Yes
Steve	At least once per week	< 10 hours	< 5 partners	Yes
Troy	Once every 2/3 months	< 10 hours	Not discussed*	No
Wes	At least once per week	Not discussed*	< 5 partners	No
*Not discussed: did not ask and/or did not come up during the interview				

The participants described varying levels of current frequency of engagement in chemsex, which broadly formed into three levels of category. The most dominant current frequency of chemsex sessions described by the participants was a couple of

times per month. The second category of current engagement in chemsex was weekly and the third was once every two to three months. In the participants' views, the level of frequency would vary and changed depending on wider daily life and health factors. Max had been abstaining from chemsex for two months as he had encountered health issues which had been influenced by an increased frequency of sessions. The inter-relationship of chemsex frequency and the participant's health will be discussed later in this chapter.

The participants described varying experiences for the maximum length of chemsex sessions they had previously attended. It was commonplace that a session lasted less than one night which was generally away from the participant's home. These typically took place at weekends, starting late afternoon/mid evening until the early hours of the next morning. The maximum session length for one night broadly fell in to two categories, for several participants this was less than 10 hours and for others was 14-20 hours. In contrast, a few participants had experienced chemsex sessions which lasted up to 48 hours, which typically took place over a full weekend. Longer sessions may have been less common as several participants consciously decided not to do full weekend sessions. This was to ensure that chemsex did not impact on their ability to function at work on a Monday morning.

"Sessions are probably around 2 or 3 hours. Sometimes a little bit longer. Obviously, if it's a weekend generally I'll be aware that I've got still time to the Monday before the Saturday night. I don't want to completely write off my next week" (Ben, <30)

The average number of partners at one chemsex session varied widely from them being one to one to having up to 20 partners. It was mainstream in the participants experiences for a chemsex session to either be one to one or only have a few partners (less than five). In contrast, some of the participants had experiences which involved far higher levels of partners at one chemsex session, ranging between 10 to 20 partners. It was more commonplace for the higher level of partners to be at sessions that last over a couple of days. Some participants preferred sessions with less partners as it could be more of an intimate sexual experience.

"I prefer to be one on one, because I think the connection is much better. People when in a group, tend to be sitting on the apps too long. I'm the kind of person that tries to please everyone, of course it is impossible. So, I was not happy entirely, I could not relax as well" (Wes, 40-50)

The participants described experiences where chemsex sessions involved long term regular partners and casual partners. All the participants had experiences where the partners were primarily casual in nature, either anonymous or known. Several of the participants engaged in chemsex with non-anonymous partners on a regular basis. A few of the participants had long term partner's which were open relationships, with whom they had engaged in chemsex with casual partners.

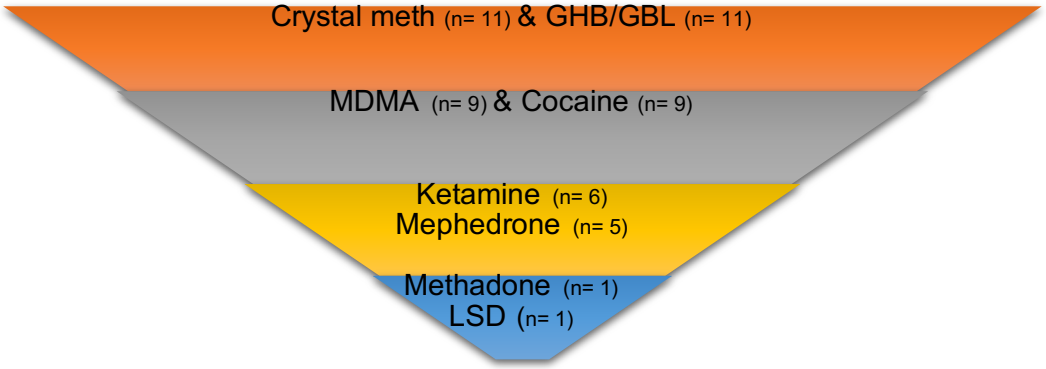
There were two main areas of sex type that participants engaged in at chemsex sessions, these were anal focused and non-anal focused. Anal focused sex for all the participants involved condomless anal sex (CAS) and for many participants

included esoteric sexual acts, such as fisting and sex toys. In addition to anal sex, many of the participants partook in non-anal focused activities, which focused on oral sex and for a few involved sensual touching of partners. Non-anal activities that focused around being sensual (touching, caressing) was more commonplace in chemsex sessions which had less partners.

> *"I'm a much more tactile, sensual, sort of gentle type of person. So, for me, that's how it generally starts, and that forms a large part of it, but I do know other people, they jump up and down, they want to play as hard as they can, and so, on" (Patrick, >60)*

Participants had experiences of using different types of drugs at chemsex sessions, which could involve multiple substances. There was a commonality in the type of drugs the participants used within a chemsex context. Fig 19. provides a summary on the levels of popularity of the drugs the participants used at chemsex sessions. The top of the pyramid indicates the drugs the participants had more widely used, which decreases down the pyramid to the drugs they had less commonly used. Due to the size of participants in the study, it was not possible to establish substantive patterns amongst the chemsex substances. However, it was commonplace for each participant to have previously used two to three different types of drugs. This may have been singular or mixed use of drugs at the same chemsex session.

Fig 19: Types of chemsex drugs



Several of the participants had experiences of previously injecting drugs for sexual purposes at a chemsex session. The only drug used within this context was crystal meth. Participants described that injecting took their chemsex experience to another level which was different from non-injection. The experience created a bigger rush which removed all inhibitions and provided a highly intensive positive feeling of pleasure and enjoyment.

> *"Just to describe it as being on another scale would be an understatement. It's in a league of its own. The intensity and the degree of inhibition, all these things differ wildly depending on whether slamming's part of the session or not" (Ross, 30-40)*

It was typical in the participants experiences that they would only ever use sterile injecting equipment and needles would only be used once. In some of the participants first experience, they wanted to feel safe so injected with a partner they

felt assured understood safer injecting practices. For the purposes of ensuring ongoing safer injecting, some of the participants emphasised the importance of only doing the activity with trusted known partners.

Health and Well-being

At interview I discussed the health and well-being of participants, which was focused on mental health, social networks and the inter-relationship chemsex had on these aspects of life. Firstly, I explored the participants mental health status and influence/impact of chemsex. Subsequently, I explored their types of social networks and influence/impact with chemsex.

There were three main and distinct categories related to the mental health and well-being of the participants. These categories included 1. General mental health status; 2. Short term impact of chemsex on mental health, and 3. Chemsex as a coping mechanism. The participants general mental health status was divided into two main elements. Current mental health of the participants varied from describing it as fine with no major issues, to experiencing longer term mild/moderate mental health issues which were not related to chemsex. The mental health issues primarily consisted of intermittent days of low mood and anxiety. These participants stated the issues pre-dated involvement with chemsex and were linked to wider daily life issues.

Some participants had previous experiences of chemsex affecting their mental health for a few days after a session. This impact was dominantly referred to by the participants as a post session 'come down'. This effect varied in terms of severity and type of impact, but commonly involved fatigue, limited concentration and a lowered mood. A few participants perceived that the 'come down' had impacted their daily mental functioning, this affected their ability to effectively focus on fulfilment of day-to-day activities.

"One night without sleep is Ok, but I'm not going to do a weekend or 3 nights type of thing because that would completely affect my life and might affect my work performance" (Neil, 50-60)

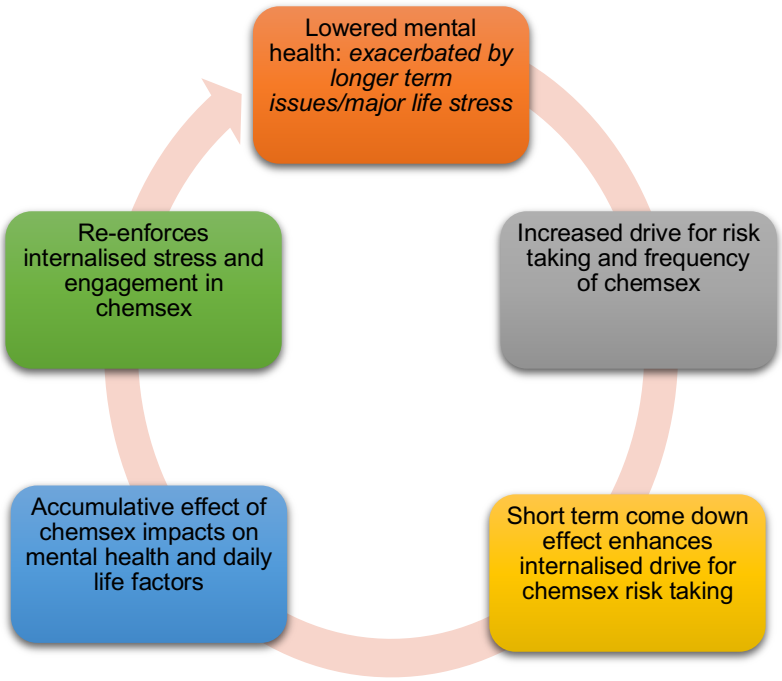
A few participants described major life changes and high levels of stress which resulted in increased frequency and intensity of engagement in chemsex. These major life changes were multiple and varied but included personal relationship and employment issues. Furthermore, when a few participants longer term mental health issues were exacerbated, they described an increase in the level of chemsex frequency and risk-taking behaviour within sessions.

"It makes me want to do it more, but actually doing it has the negative impact on my mental health. So, you can have the chicken and egg concept. If I'm on a downer, I actually do want to engage in group sexual activities or I want to undertake some other form of risk taking" (Adrian, 50-60)

The drive to engage in more chemsex risk was enhanced by the post session come down effect. The accumulative negative effect of chemsex impacted on wider life factors, which re-enforced the inner need to engage in chemsex, which further

impacted on mental health and the re-start of the cycle. Fig 20. provides a summary of a cyclical process for chemsex being utilised as a coping mechanism.

Fig 20: Cyclical process for chemsex as a coping mechanism



There were five categories identified in relation to the social networks of the participants, this included types of social networks and influence of chemsex upon these supports. This included 1: family/friends' network; 2: chemsex network; 3. chemsex stigma; 4: chemsex impact on family/friends, and 5: chemsex impact on employment.

It was common for the participants to have a wide and supportive family and friends' network that was not related in any way to chemsex. Many of the participants identified that chemsex did not impact negatively on their wider social networks. It was uncommon for participants to have experiences in which chemsex networks provided a wider and more substantial social support, or in which anonymous partners at sessions became friends. However, for the few participants that made new friends at chemsex sessions, they had experienced personal changes within their lives which motivated them to find new social networks and avoid loneliness. The life changes described in the interviews included moving to a new area and/or change in role which had removed other support networks.

Many of the participants could not discuss chemsex with wider family and friends. They felt they could not discuss it with non-chemsex networks as there was stigma related to the activity and issues with sexual health being a private topic. Only a few of the participants felt that they could discuss chemsex with very close friends for emotional support, this only ever occurred in circumstances where the activity had negatively affected their health.

Chemsex did have a detrimental impact on some of the participants family/friends' networks and employment. When some of the participants frequency of chemsex sessions increased, non-chemsex networks became less of a priority. This had the impact of them spending less social time with family/friends and they became more isolated from these networks. A few of the participants employment had been impacted by chemsex in a multitude of ways.

"I mean you couldn't see any traces of me being a user of substances but there were some changes in behaviour. I started, because of course it makes you so on edge, but you can go on and on to the point I was living a second life at night, and something had to give" (Steve, 40-50)

Firstly, this involved work performance being reduced due to the come down effect. Secondly, involved longer term sick leave from work due to declining mental health function which was combined with an increased frequency of engagement in chemsex. Lastly, loss of employment which was due to the level of engagement in chemsex and influence on their ability to perform work related activities.

A key feature in the participants experiences for chemsex having a negative impact on wider life was higher levels of frequency in the activity. As discussed earlier, this impacted on the participants health, family/friends' networks and employment.

"I completely changed, and all my closest friends had noticed that I was becoming more insular not replying, really irritable, secretive. And that goes hand in hand with the frequency of the chemsex" (Max, 20-30)

Some participants recognised the problematic influence chemsex was having or was starting to have upon their lives and implemented measures to minimise the impact. This included reducing the frequency of chemsex, containing the activity to weekends, limiting the length of sessions and avoiding certain drugs, controlling drug dosage and injecting. Another measure that was implemented was abstinence, but this was primarily used when there was severe exacerbation of longer-term mental health issues and major impact on social networks.

Discussion

In summary, nineteen men with chemsex experiences within the UK participated in the interviews. Motivations for engaging in chemsex included sexual pleasure, inter-personal dynamics and escapism. Chemsex sessions more commonly lasted less than ten hours and had less than five partners. There were several types of drugs used with sex which primarily included crystal meth, GHB/BLB, MDMA and cocaine. Chemsex sessions involved anal focused and non-anal focused sex activities. Chemsex can have a problematic impact on health, but this is influenced by wider psychological stresses/issues and an increased need to engage within the activity.

Most participants were white gay men with a median age of 41. This is consistent with my systematic review of MSM chemsex that reported many men who engage in the activity identified as gay and were aged between their mid-thirties and early forties (Maxwell, Shahmanesh and Gafos, 2019). There was inconclusive evidence within the review to identify if age and ethnicity was associated to chemsex. A

recent study of a large MSM sample highlighted that chemsex drug use was a predictor of PrEP initiation and that older men (over 40) were more likely to start PrEP when compared to younger men (under 25) (Hanum *et al.*, 2020). In my qualitative study the participants were generally older and there were none under the age of 27. Importantly, the study was not able to identify if younger or ethnic minority MSM experienced unique chemsex risk factors.

The participants' reasons for engaging in chemsex focused on intensifying self-pleasure, enhancing inter-personal dynamics with partners and being an escapism from wider life. One of the first UK based chemsex study's highlighted that the combining of drugs with sex made the experience more intense, diverse, longer in duration and facilitated heightened connections with partners (Bourne *et al.*, 2015). In comparison, a more recent study reported that motivation for chemsex engagement was driven by a need for escapism, lack of intimacy, to enhance emotional connection with partners and to push personal boundaries (Van Hout *et al.*, 2019). All these studies demonstrate consistent findings that suggest motivational reasons to engage in chemsex is multi-faceted which involves psychological and social dynamics.

All the five drugs that have been associated with chemsex were used by the participants during sex. Research within the UK identified that crystal meth, GHB/GBL, mephedrone, ketamine and cocaine were the key drugs used by MSM to intentionally enhance sex (PHE, 2015; Bourne *et al.*, 2015). However, in my qualitative study the participants used drugs for sexual purposes which were generally not associated to the UK chemsex scene, primarily MDMA. My systematic review of chemsex behaviours also found that MSM had used MDMA during sex (Maxwell, Shahmanesh and Gafos, 2019). Importantly, a systematic review of MSM chemsex type behaviours identified that the type of drug used within the activity can vary across geographical regions and nations' (Hibbert et al., 2021b). The variation in drugs used may also be influenced by the socially constructed nature of chemsex and varied interpretations of the phenomenon.

The drug the participants injected during chemsex sessions was similar to wider research. My systematic review reported that MSM primarily injected crystal meth and most recently the sharing of equipment varied between 9% and 12% (Maxwell, Shahmanesh and Gafos, 2019). In the qualitative study, the participants placed an importance on safe and sterile injecting practices. Some wider evidence highlighted variations in MSM injecting practice knowledge, ranging from having no knowledge of safety/BBV risks to only ever using single use sterile injecting techniques (Gilbart *et al.*, 2015; Bourne *et al.*, 2015). The robust practices of the participants in my interviews may have been mediated by their high level of HIV risk perception.

The participants' chemsex sessions pre-dominantly took place over one night with a few casual partners. This is consistent with other European studies that reported chemsex involved multiple casual partners and lasted from several hours to a few days (Deimel *et al.*, 2016; Bourne *et al.*, 2015; Nimbi *et al.*, 2020). However, it is important to highlight my interview participants also engaged in one-to-one sessions. A recent study from Italy highlighted that chemsex commonly took place among couples (Nimbi *et al.*, 2020). In my qualitative study the participants chemsex regularly involved anal sex acts, but in sessions with less partners there was an

importance placed on sensualism. Two systematic reviews (including my chemsex review) reported that MSM who used drugs with sex commonly engaged in CAS (Edmundson *et al.*, 2018; Maxwell, Shahmanesh and Gafos, 2019). As most of my interview participants were on PrEP, it would be expected they engaged in CAS. Due to the systematically high level of CAS at chemsex sessions it is beneficial for sexual health clinics to universally offer PrEP to anyone who engages in chemsex.

The participants experienced two levels of impact from chemsex, the come down effect and wider negative effect on well-being. The come down effect consisted of lethargy and decreased mental function the day after a session. In comparison, a study from Italy reported that immediately after chemsex sessions the participants commonly experienced dysphoric mental states (Nimbi *et al.*, 2020; Van Hout *et al.*, 2019). The immediacy of this effect would suggest this it is attributable to physiological effect of the substance and inter-related sleep deprivation.

The wider negative impact affected participants mental state, social function and occupational roles. These findings were consistent with two UK systematic reviews (including my chemsex review) which reported that up to 1 in 4 had experienced negative effects because of chemsex, which involved mental ill health, social isolation and loss of employment (Tomkins, George and Kliner, 2019; Maxwell, Shahmanesh and Gafos, 2019). However, it is important to emphasise that my interview participants' development of problematic chemsex was interrelated with wider life stressors and frequency/intensity of engagement. A study highlighted that MSM engaged in chemsex to escape from life stressors and that the desire to engage developed into drug dependence after attending several days sessions (Van Hout *et al.*, 2019). The evidence therefore suggests that the development of problematic chemsex is contextual. Similarly, the consequences on wider psycho-social well-being are interwoven with the individuals daily stress levels, underlying mental illness and the intensity of the chemsex behaviour.

Participants used tailored measures to contain the chemsex impact on their well-being, including avoiding certain harder drugs, not injecting, checking doses, length and days of sessions. A study of problematic chemsex reported that the sample perceived that specific drugs had riskier profiles and they adopted a high degree of personal behavioural controls to minimise the health impact (Van Hout *et al.*, 2019). These controls included using specific drugs, limited dosing and sourcing/securing their own substances. The limited evidence intimates that chemsex participants who perceived themselves at higher levels of drug risk harm will deploy harm reduction and harm containment strategies.

Strengths and limitations

The study may have been limited by not having a definition for chemsex within the participant eligibility criteria. However, this was intentional as chemsex is a social construct that is challenging to universally define. The reliance on participants to perceive if they had engaged in chemsex provided the study with the ability to freely construct their experiences without any pre-defined bias. Importantly, there were key similarities between the participants chemsex experiences and wider research base.

The study was not designed to understand variations and patterns in chemsex drug use. Wider research has demonstrated that the type of drugs used within a chemsex context varies across regional and national areas. The study explored generalised chemsex experiences and did not focus specifically on activity that caused harm to health and wellbeing. This could have limited the study's ability too fully understand the more complex behaviours, risks and influence on health which is involved within problematic chemsex. The small number of non-white and young participants is another limitation of the study.

Conclusion

The participants had a variety of chemsex experiences, but there were similarities in key areas of the phenomena. The motivators for engaging in chemsex included sexual pleasure, enhanced inter-personal dynamics and escapism. The primary drugs used to enhance sex were psychoactive substances, ranging from MDMA to GHB/GBL. Chemsex sessions primarily consisted of a few partners that lasted less than one night. However, some sessions were with a large number of men that lasted up to 72 hours. There were multiple types of sex performed, although there was a focus on anal acts. A few participants had injected crystal meth for sexual purposes. Some participants experienced problematic chemsex, this was particularly during increased periods of psychological distress and/or increased intensity of sessions. This impacted on mental health, social networks and occupation. Participants used multiple harm reduction strategies to minimise the negative impact of chemsex.

Chapter 8: Motivation, access and effective use of PrEP among MSM that have engaged in chemsex

Introduction

In this chapter, I explore the PrEP use experiences of the nineteen participants that partook in the interviews. The findings are structured around the three elements of the HIV prevention cascade. I explore the participants motivations for starting PrEP, experiences of accessing PrEP and their effective use of PrEP. The HIV prevention cascade stages are explained in the context of the theoretical PAPA framework. PAPA is commonly applied to treatment adherence which relates to the effectiveness pillar of the cascade. However, I identified that in the context of PrEP that PAPA was also applicable to the motivation and access pillars. Participants initial perception for being suitable candidates affected their motivation to start and access PrEP. In addition, the availability of opportunities shaped their access to PrEP. Lastly, I discuss the findings in relation to the wider research-based literature.

Summary of PrEP use status

Table 19 provides a summary of the PrEP status for all the participants. At interview, eighteen of the participants were using PrEP and one had stopped in the previous 6 weeks. The length of period the participants used PrEP varied from 1 to 6 years, with an IQR of 2-3 years and median of 2. At the time of interview, the dominant dosing method used was a daily regimen (n= 15). Four participants took it via other schedules, two by episodic dosing and two taking at least four doses per week.

Table 19: Participant's PrEP use status

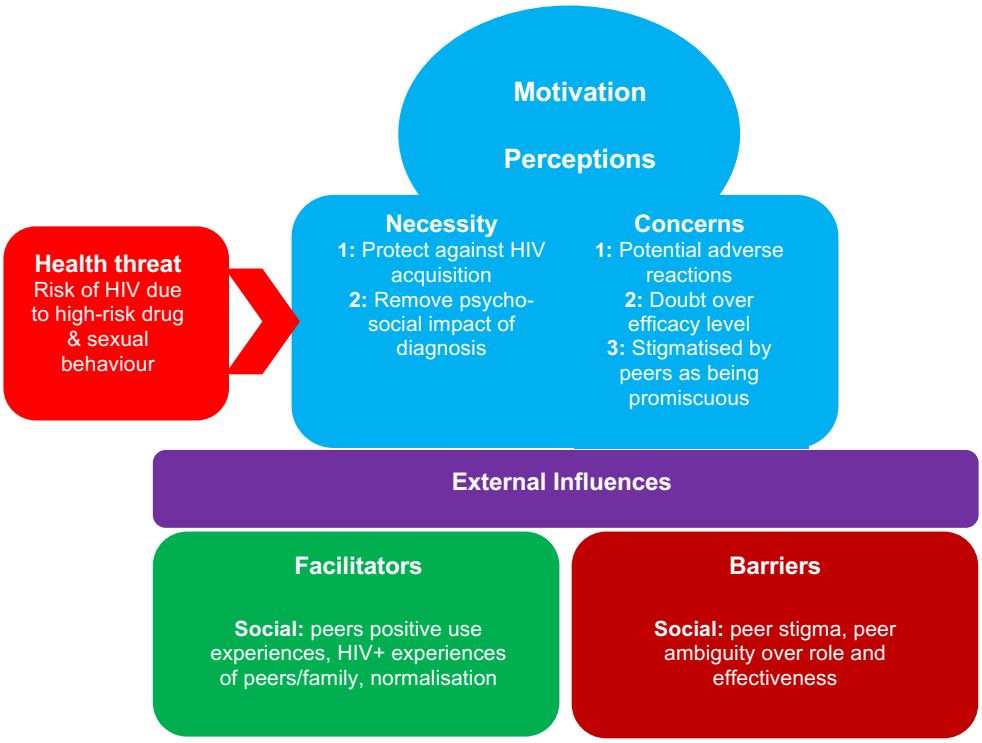
Pseudonym	Age	Status of use	Duration	Dosing method	Source
Adrian	50-60	Current	2 years	Daily	NHS
Ben	<30	Current	1.5 years	Daily	Private
Chris	>60	Current	2 years	Daily	NHS
David	30-40	Current	3 years	Tues/Thur/Sat/Sun	Private
Eric	40-50	Current	1.5 years	Daily	NHS
Fynn	<30	Current	2 years	Daily	NHS
Glen	40-50	Current	2 years	Episodic	NHS
Henry	>60	Current	6 years	Daily	Private
Jack	30-40	Current	3 years	Daily	NHS
Kevin	50-60	Current	3 years	Episodic	Private
Liam	30-40	Current	1.5 years	Daily	NHS
Max	<30	Current	3 years	Daily	NHS
Neil	50-60	Current	2.5 years	Daily	NHS
Owen	30-40	Current	1 year	Daily	NHS
Patrick	>60	Current	2 years	Daily	NHS
Ross	30-40	Current	4 years	Daily	NHS
Steve	40-50	Current	2 years	Daily	NHS
Troy	30-40	Current	3 years	Daily	Private
Wes	40-50	Stopped: 1 month	2 years	Every other day	Private

Of these, one participant who started on daily and one participant who started on episodic both later switched to using 4 doses per week and daily. Eight of the participants had initially sourced their PrEP from a private supply, but two later switched to an NHS supply. This was at a point when PrEP became more widely available on the NHS. Wes had stopped using PrEP and his previous source of PrEP had been private. All the private supplies were sourced from online providers.

Motivation to start PrEP

In this section I explore the participants' reasons for starting PrEP within the motivation stage of the HIV prevention cascade. I discuss this in relation to the intrinsic factors *(from within and about the person)* and extrinsic factors *(out with that are separate from the person)* that influenced motivation. Fig 21. provide a PAPA based NCF framework summary of the participants views on their need to start PrEP, their concerns about PrEP and external factors that influenced motivation. Necessity and concern beliefs were key factors that effected participants perception for seeing themselves as suitable candidates and consequential motivation to start PrEP.

Fig 21: Influences on motivation to start PrEP



Intrinsic motivation to start PrEP

There were three classifications of intrinsic motivational reason that facilitated participants starting PrEP. These were perceived high-risk susceptibility to HIV, perceived necessity for PrEP and health experiences. However, perceived concerns acted as barriers on participants motivation to start PrEP.

Before starting PrEP, most participants perceived that their health was at threat due to being at high risk of acquiring HIV. This was primarily due to an awareness of their engagement in high-risk sex including high-risk chemsex behaviours. Participants identified that even in a wider non-chemsex context they engaged in high-risk sex which included condomless anal sex (CAS) and sex with casual partners.

"Well, the state of my sexuality really. I mean I was putting myself at risk of course by sometimes not using protection. You know, it was basically the idea to have this parachute really" (Steve, 40-50)

A less frequent reason some participants provided for being at heightened risk of HIV acquisition was previously being diagnosed with other STIs, previous PEP use and unwanted sexual experiences. Unwanted experiences were varied but included condom breakage and sexual violence. These factors amplified their worries about acquiring HIV.

Several participants had a nuanced understanding of the distinct elements of chemsex, that placed them at higher risk of acquiring HIV. Participants understood that their intentional use of drugs resulted in high-risk sexual activities and recognised this also placed them at higher risk of HIV acquisition. They acknowledged they were not as lucid during sex to make informed decisions. These sexual behaviours involved multiple partners and CAS. A key motivation for participants to engage in chemsex was the removal of inhibitions and to enhance the sexual encounter. This demonstrates that participants continue to engage in what they perceive as the benefits of an enhanced experience despite the recognition of their high-risk susceptibility to HIV.

"If I am going to more of situations where I take drugs, my guard might be down around my condom use. It was just a risk factor that was just so much more than I ever thought it was" (David, 30-40)

A second motivational classification was the perceived necessity of PrEP. The perceived need to start PrEP for the benefits it provided was triggered by the health threat of being highly susceptible to acquiring HIV. There were three inter-related categories of benefits, these included biological, psychosocial and sexual pleasure.

In the biological category, most of the participants believed that PrEP would provide a layer of protection against HIV acquisition. They viewed the diagnosis of HIV differently from bacterial STIs. Participants were aware that bacterial STIs were curable, and they viewed HIV as a life-long condition that was life changing. PrEP provided participants with the opportunity to biologically protect against the health threat of HIV.

Several of the participants identified psycho-social benefits. PrEP removed the worry and stress they had experienced about contracting HIV.

"It really removes a lot of that psychological doubt, because there's obviously that jetlag between getting your HIV result, it's taken about 2 or 3 months. So, I think it really reduces a lot of that kind of psychological stress as it were" (Owen, 30-40)

Participants feared the social consequences of an HIV positive status which involved living life with a disease which was stereotyped and stigmatising. They believed the stereotype of being a gay man living with HIV led to issues of social ostracization and isolation. PrEP provided a viable tool that protected them from the life-long psycho-social impact of an HIV sero-conversion.

"Like there was a period where the fear of God or the fear of STIs was seen to be the message coming from all the health authorities and so, I actually had something of an anxiety around sero-converting" (Ross, 30-40)

Enhancement of sexual pleasure was a less dominant category that some participants attributed as a benefit. With PrEP they could experience the bare feeling of anal penetrative sex as there was a reduced need for condoms. PrEP facilitated the exploration of longer-term fantasies and enhancement of sexual activities within the chemsex context. As PrEP removed the worry of HIV acquisition participants felt able to relax and enjoy their sexual experiences.

"I came out late and was a late developer, but I had these things that I wanted to try but I was always aware that I didn't want to catch HIV. PrEP just seemed to be the key in allowing me to experience my – well my fantasies really" (Kevin, 50-60)

Participants concerns about starting PrEP included perceived HIV risk and perceived adverse effects. A few participants were concerned about the effectiveness of PrEP. These participants had high levels of worry about their level of HIV acquisition risk and the psycho-social implications of an HIV diagnosis. They used all the available HIV risk reduction strategies and initially believed PrEP would not provide any additional benefits.

"Whether or not it would be effective, would it actually prevent the HIV virus when I have sex without condoms. Also, would there be any side effects that I'd be having a reaction to, but it's like that with any pill. Whether or not it will be effective, is it just a placebo thing?" (Fynn, <30)

Some participants had concerns about the potential adverse effects of PrEP which made them initially unsure if it was suitable for them. They believed that PrEP had undesirable side effects which would affect their wider health, for example digestive function. This view was further amplified if participants had pre-existing medical conditions, which raised concerns about renal and hepatic functioning. In contrast, previous PEP use that resulted in no side effects, removed concerns about PrEP reactions as they understood the medications were similar. Older men initially believed they were not suitable as they thought their physical health would not be able to tolerate PrEP.

On first hearing about PrEP, a few participants believed that it was only used by other gay men as a means to justify high-risk sexual behaviours, primarily CAS. This belief initially put them off starting PrEP as they did not perceive themselves as the kind of man who would use the medication as an excuse to engage in 'risky' sex.

Perceived high-risk susceptibility to HIV was a central factor that motivated participants to start PrEP. Although there were mediating influences that shaped their view on their level of risk. Participants intentionally used drugs for their disinhibiting properties to engage in sex, despite knowing this placed them at high risk of HIV. The participants weighted the benefits and risks for starting PrEP, which was an individual process influenced by external factors. The removal of the worry of acquiring a lifelong condition and the biopsychosocial health impact motivated the initiation of PrEP. However, there were primary concerns regarding the level of PrEP's effectiveness and the potential adverse effects. In this group of early adopters, there was some initial hesitancy about whether they were high risk enough to benefit from PrEP.

Extrinsic influencers on motivation to start PrEP

There were external factors that influenced participants motivation to start PrEP. These influences formed around multi-faceted social dynamics.

Participants described varying degrees of MSM peer support and social norms around PrEP that had an impact on their behaviour. Several of the participants had early discussions with other MSM peers who expressed opinions that PrEP was only used by promiscuous gay men who engaged in lots of CAS. These interactions re-enforced the participants beliefs that PrEP was not suitable for them as they did not perceive their behaviour within the negatively viewed prism of 'promiscuous' sex.

"When I told some friends, they were like, 'What do you need PrEP for? its only for people, who are like bare backing, going to gang bangs and orgies', Like you know, PrEP's for sluts" (David, 30-40)

In addition, these participants had experienced misinformation being exchanged in peer PrEP use discussions. This created ambiguity in their understanding the role of the medication. This was primarily linked to inaccurate information that PrEP also protected against other STIs.

Most of the participants experienced social interactions that encouraged them to start PrEP. These interactions were with MSM peers, long term main partners and casual partners (chemsex and non chemsex) who to varying degrees normalised PrEP. It re-enforced the participants' perception that PrEP was a necessity to protect them against an HIV diagnosis.

Participants had become increasingly aware about the growth in use of a new HIV prevention measure amongst MSM peers. This manifested in face to face and online discussions with MSM peers who shared their PrEP experiences. These interactions centred around PrEP being highly effective at protecting against HIV acquisition, sexual risk factors, how they used it and if they had encountered any problems. This reduced their concerns about PrEP and magnified their perception that it was a necessity to protect against HIV.

"I think a friend asked me how often I used a condom for sex, and it was like, I always do. He said he only used condoms 50% of the time. He was like what about

you?", On a percentage, I think it was probably 40%, or 30% or so. And he was like, 'Well why don't you take PrEP like I do'" (Troy, 30-40)

Over time, as PrEP was being increasingly used by MSM peers, participants were less concerned about the associated promiscuous stigma. They believed as it was becoming normalised that it was acceptable to use.

Paradoxically, normalisation of PrEP led some participants to feel social coercion to use the medication. As PrEP was becoming increasingly normative, they were concerned that the wider gay community expected condomless anal sex. They feared that if they wanted to use condoms and not start PrEP, they may not get any sex from within the gay community.

"The stigma started to change and then I started getting like, you know, when I hook up with guys, I would start to feel ostracised because I wasn't on PrEP. I was really worried that I wasn't going to be able to have sex because it feels like everyone in my generation is on it and that it's not an option" (Liam, 30-40)

Some of the participants motivation for PrEP use was driven by their long-term main partner who wanted to reduce the risk of HIV acquisition within their relationship. This was primarily driven by concern to protect their partner's health in the context of open and non-exclusive relationship. In this situation they were engaging in chemsex with casual partners.

An inter-related component of main partner dynamic was the influence of casual partners. A few of the participants were concerned about casual partners potentially acquiring HIV as they were engaging in high-risk sex with multiple men. The participants were aware by engaging in CAS and not using any form of protecting, they were highly susceptible to acquiring HIV which also placed their partners at risk from their behaviours. If there was a main partner involved in the sex with casual partners, there was an amplified need to protect all the partners against HIV.

Some of the participants had experienced varying social interactions which focused on HIV positive lived experiences. Participants who had an HIV positive long-term partner had listened to their partner's stressful journey of being diagnosed and they both agreed that prevention was better than cure.

"It was seeing and hearing of how my partner first got infected with the virus and what he went through and changes he had gone through, for drugs and seeing that impact on him" (Jack 30-40)

The participants believed that the partners motivation for sharing their experiences was driven by concern. The partners stories of living with HIV made the participants fear that they may suffer the same experiences. This amplified the need to protect against the HIV risk which came from outside of the relationship.

"I wouldn't be reliving two years of pure hell when my partner became unwell with HIV. So, after speaking to other people with HIV, I thought it was easier to be treated with PrEP" (Neil, 50-60)

Participants heard stories of HIV positive peers' experiences of living with the condition and daily medication use. This encouraged them to consider the benefits of a similar medication. Participants who had observed partners become unwell and/or die from HIV were highly emotional about the need to protect against the disease. They felt a responsibility to use PrEP as it could help avoid the fate of a previous generation that suffered from the disease.

Most of the participants described their views on talking to non-MSM networks about PrEP, which included categories of non-discussion, selective discussion and educational advocacy. This network primarily involved family, pre-dominantly non-MSM friends and colleagues. The participants did not broadly believe that these networks had influenced their motivation to start PrEP. They generally did not discuss their PrEP intentions and sexual health with family or non-MSM-friends as they saw it as a private issue.

"It's a bit like what they say about Vegas, what happens in Vegas stays in Vegas. And I never discuss my sexual life with my friends. So, yeah, you know once it was over, it was over" (Glen, 40-50)

In some circumstances, participants selectively discussed their intention to start PrEP with specific family members. This was only when the family member had concerns about the participants risk of contracting HIV. The purpose was to reassure the family member and not to consult. It did not affect the participants decision making.

In some circumstance's participants disclosed their intention to start PrEP with predominantly heterosexual networks. They discussed what PrEP was and how it was highly effective at protecting against HIV. The purpose was to advocate the benefits and empowerment PrEP has provided the gay community.

Access to PrEP

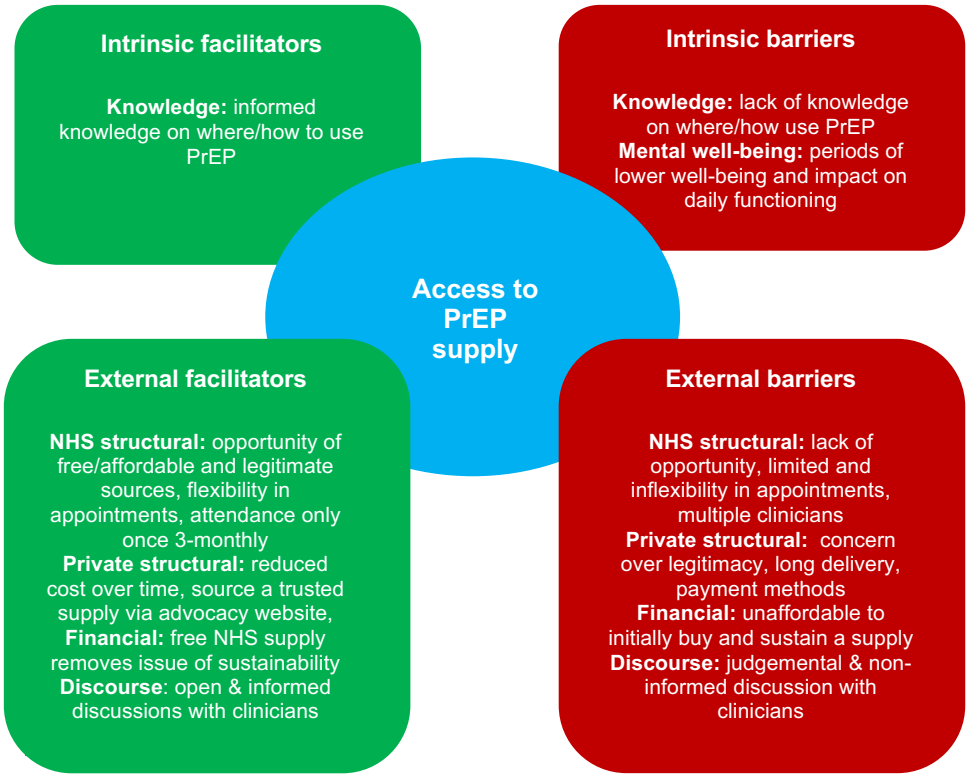
In this section, I explore the factors that influenced the participants access to PrEP within the access stage of the HIV prevention cascade. Fig 22. (next page) provides a PAPA summary of the intrinsic factors that influenced access to PrEP and the external barriers/facilitators for accessing a source of PrEP. I found that the elements of PAPA that were specifically applicable in this stage were the external opportunity factors.

Intrinsic factors for PrEP access

Some of the participants level of PrEP knowledge and mental health influenced their access to PrEP. Not having knowledge on where they could access a genuine supply inhibited access. This was at a time when PrEP was not widely available on the NHS. The pivotal knowledge that facilitated participants access to PrEP was understanding where to access a safe supply and how they took doses. They gained this knowledge from different sources. Sources included MSM PrEP using peers at the final motivation point when participants had decided to start/access PrEP and sexual health services when participants attempted to access PrEP. Participants explained that due to a low mood they had missed appointments to

discuss PrEP. In some circumstances, they missed multiple appointments which delayed them starting PrEP.

Fig 22: Barriers and facilitators for PrEP accessibility



Extrinsic factors for PrEP access: structural

There were varying extrinsic structural factors that influenced the participants access to PrEP. These formed into three categories, which consisted of NHS structural factors, private structural factors and financial factors.

Most of the participants described multiple factors related to the NHS that had influenced their access. Early adopters lacked the opportunity to access PrEP via the NHS as they were informed by sexual health services that it was not available. Due to this, they sourced a private supply. The was at a time when spaces on clinical trials were limited and/or it was not approved for routine provision on the NHS.

"What put me off initially was the cost and how to get it, because the NHS wasn't covering it. And at that time, it was about £400 a month. Which is quite a lot of money" (Glen, 40-50)

Over time, the provision of a free PrEP source provided the opportunity for participants to access to the medication. This removed their worries about being able to afford to start and sustain a private supply. PrEP provided by a mainstream healthcare provider, provided assurance that it was legitimate and trustworthy to use. The flexibility in appointments and need to only attend once every 3 months promoted easy access.

"Not having to worry about sourcing it anymore with getting it from the NHS, that's one thing. Obviously, the cost, there's a benefit in that sense. And the fact that it does force you to go and get your regular screens, because otherwise you don't get it" (Patrick, >60)

There were various factors in the design and set up of NHS sexual health services which delayed or deterred participants from attending PrEP appointments. The centralisation of local sexual health services and lack of availability of appointments restricted participants' access. The need for multiple clinicians to authorise PrEP's use and lack of consistency at appointments made the process feel unpleasant.

"The local clinic where I live has a very poor reputation. I think it is better now, but it's had a long history and it's also very busy. They would say right we see what we can today, the rest of you just go home and come back tomorrow sort of thing" (Chris, >60)

Some of the participants experienced varying factors that influenced their access to private online PrEP sources. Participants explained that as the PrEP came from other countries, they had doubts over it being effective at protecting them against HIV. They did not directly discuss any of these PrEP sourcing issues in relation or comparison to similar issues with chemsex drugs. The purchase process was complex, suppliers required payment solutions which they did not use, and they had to consider import taxation. As the PrEP came from varying countries, they had uncertainties about the duration of delivery. Concerns of product legitimacy and delivery periods was more pronounced the first-time participants accessed a supply.

"Initially because it was private and imported, there is always a bit of uncertainty about how long it will take to turn up and pay for import licenses or not. I think it actually took a good month to turn up" (Jack, 30-40)

Participants described that they overcame the product legitimacy problem with the aid of a UK based advocacy organisation that recommended online suppliers. The primary online advocacy site mentioned by participants was I want PrEP now. Participants believed that the PrEP advice/testing support (for example, check renal/liver function before starting and when using it) they had received from sexual health services provided them with re-assurance that it was safe for them to use.

"I just went to the clinic, and I needed PrEP and they told me which websites to go to and they said shop around. I shopped around, got a good deal, ordered it, went back to the clinic and said to them, is this the right stuff? They went, yes, this is the right stuff, and I started taking it. And then over the years, it's gone from expensive to cheap as chips" (Henry, >60)

A few of the participants who continued to use a private supply had intermittent ongoing worries about their financial capability. They were concerned that with the addition of any unexpected outgoings it would not be viable for them to sustain a steady supply. However, overtime as private sources became more affordable it provided the opportunity for them to sustain a steady supply.

Extrinsic factors for PrEP access: healthcare discourse

As most participants were accessing their PrEP via the NHS, they had in-depth discussions with sexual health services. The participants identified positive and negative attributes which influenced their access to PrEP. The attributes which encouraged participants to access PrEP related to clinicians being professional, including being open minded, non-judgemental, generally helpful and supportive. The attributes that discouraged participants from accessing PrEP related to clinicians being judgemental about male same sex, including chemsex culture. Chemsex/PrEP discussions could feel intrusive and like a tick box exercise if they were rushed. However, participants understood services were busy and they required very personalised information.

"They were very confidential, very, very open-minded, no issues whatsoever. I could discuss anything with them regarding my sexual health and they were non-judgmental. So, it was very good support system there. You didn't feel you were being judged by asking any silly questions" (Fynn, <30)

A few participants had experienced positive and negative PrEP discussions with primary healthcare providers, including GPs and community pharmacists. Negative experiences involved the clinicians not being aware of PrEP as an HIV prevention and assuming it was for HIV positive people only. If participants felt clinicians were overly busy, it created feelings of them feeling rushed and non-supported. This led to participants leaving without their health needs being addressed.

"I have a GP and talk to them about my PrEP use. I don't necessarily feel supported by the GP, but I think they are all busy. I'm surprised that most pharmacists don't know what it is when you go with a prescription, and you say you're on something else and they don't know what it is. Which I find really annoying and because only gays and queer people know what it is" (Liam, 30-40)

In contrast, the positive experiences included clinicians being aware of PrEP, having the ability to provide accurate information and generally supportive. These attributes provided participants with confidence that their health care was of a high standard.

Effective use of PrEP

In this section, I explore the participants implementation of their PrEP regimen within the effective use stage of the HIV prevention cascade. I explored general level of perceived adherence, circumstances that promoted adherence, circumstances of non-adherence, chemsex influence on adherence and factors that promoted adherence. Fig 23. (next page) provides a PAPA summary of the factors which influenced the intentional and unintentional processes of adherence for participants PrEP use.

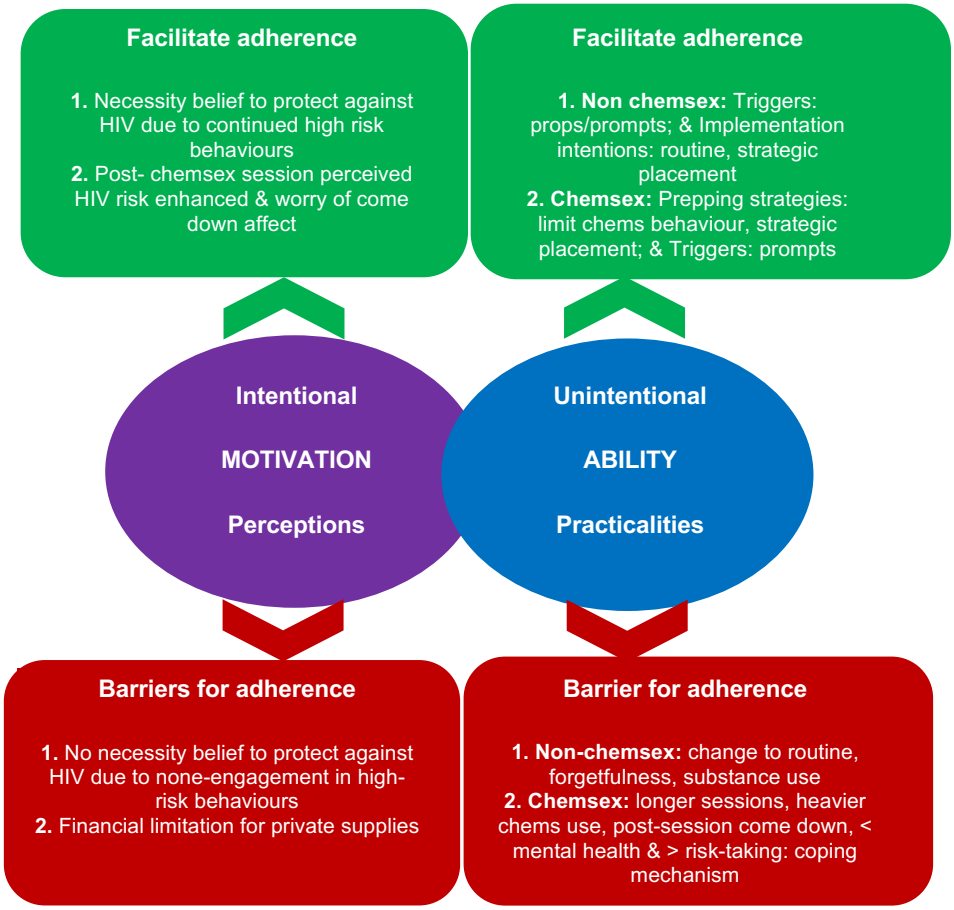
Dosing regimen

The dominant dosing schedule used by participants was daily and the two least used were episodic and four doses per week. Participants preferred daily as they could never predict when they would have sex and it provided re-assurance, they were

always protected against HIV. In addition, daily pill taking had easily configured into their life and they did not worry about when and if they had taken their pills.

The participants that used episodic dosing (as referred to in the thesis introduction) usually contained their sex life to a specific part of the week. They felt confident that this method provided a suitable level of HIV protection which saved them taking a pill every day. Participants that used four pills per week had established this into a weekly routine which lengthened the duration of cover they got from their private supply. It is important to highlight that they understood four doses per week provided high levels of protection against HIV.

Fig 23: Summary of adherence/non-adherence to PrEP



Perceived level of adherence

The participants as a whole generally had very high adherence levels. However, the level of non-adherence broadly formed into three types, including 1. Optimal adherence; 2. Occasionally non-adherent; and 3. Multiple non-adherence episodes.

The optimal adherence type included four participants who were fully confident that they had never missed any doses since starting PrEP. The occasional non-adherent type included eleven participants that described they had only missed one to three doses per year. This primarily consisted of missing only the occasional singular dose. The last type of multiple non-adherence episodes included four participants who were confident they had frequent episodes of missing doses. These non-

adherence experiences primarily consisted of only missing a singular dose on a monthly basis.

Circumstances of general non-adherence

The participants' non-adherence formulated into two PAPA based classifications, unintentional and intentional. The unintentional classification consisted of three non-adherence factors, which all inter-linked with the practicalities of taking medication. These factors included routine/forgetfulness, substance use, mental health and financial capability. The intentional classification primarily consisted of perceived low risk to HIV.

Several of the participants had unintentionally forgotten to take singular doses because their regular daily routine had been interrupted. Changes involved multiple scenarios but included planned time away from home on holiday or with work. Participants explained that when they were unexpectedly running late for work, they forget to take a dose before leaving home or to take a dose with them. When they were busy and distracted with daily commitments, they forgot to take a dose.

"I was travelling and counting my days because I was overseas. Another time I was in the house and just forgetting. Like it wouldn't be anything special, just being busy and distracted" (Liam, 30-40)

A few of the participants ability to take a singular dose had been affected due to non-chemsex substance use. If participants were out at pubs/clubs for long periods consuming alcohol, they forgot to take that day's dose. In similar circumstances, lengthy sessions of recreational drug use, lead to them forgetting to take that day's PrEP dose. Participants believed that 'hangovers' from heavy alcohol consumption resulted in them missing one dose. How the participants dealt with this substance effect is discussed later in this chapter.

"So, it's been more when I have been drunk out partying that I have missed a dose but have only ever missed one in a row. If I have been out drinking all day, sort of thing and because of the time I take my tablets, usually Monday to Friday it is in the last hour at work" (Jack, 30-40)

In addition, a few of the participants occasionally missed one or several PrEP doses because of mild/moderate mental ill health. This generally consisted of short periods of low mood which they did not link to chemsex but longer-standing issues with depression and/or psychological stress.

A few of the participants unintentionally missed one or a few days continuous doses of their private PrEP supply because of financial limitations. At points they had limited money available to purchase a consistent supply. The participants financial capability was further affected by unplanned expenses which meant they had to re-prioritise their financial resources. These participants did not discuss any short-term strategies to deal with these specific periods of non-adherence.

A few participants intentionally stopped taking PrEP for pre-defined periods which lasted several days to a couple of months. During this time, they stopped PrEP

because they were abstaining from sex to focus on their wider well-being or important social/career activities.

"I very purposely didn't have any kind of sex, really reduced going out and socialising because I was concentrating on my education. I was just completely tunnel-visioned about it. I wasn't really in the mood for sex, which was fine with my partner, and I didn't go looking elsewhere" (Owen, 30-40)

Their motivation to use PrEP had lowered as they believed it was not necessary to protect against HIV when they were not participating in high-risk behaviours. However, they re-started PrEP when they re-engaged in sexual activity.

Chemsex influence on non-adherence/adherence

Chemsex influenced the participants non-adherence and adherence, which consisted of intrinsic and extrinsic factors. These factors all inter-linked with the participants' perceptions of the medication and practicalities in taking doses.

A few of the participants described intrinsic factors related to chemsex that had influenced their potential and actual ability to take doses. Participants worried about missing the first PrEP dose due after a chemsex session because they were aware drugs affected their level of awareness and daily functioning. This worry, inter-linked with not knowing casual partners HIV/PrEP status.

Several of the participants had experienced extrinsic factors related to chemsex that had influenced their ability to take planned doses of PrEP. They were more likely to miss the first PrEP dose due after a chemsex session if it was longer in duration and/or if there was heavier use of chems.

"If I passed out from exhaustion or from slightly too much GHB, I may sleep through and miss a dose or have a late dose. What happens much more often is a delayed dose, less than 12 hours late. I think there's a direct correlation between missing 1 or more night's sleep and being exhausted from extensive play sessions, then pass out in exhaustion, there's clearly a nexus there" (Ross, 30-40)

In these situations, the participants described that the first dose due after a session had been delayed by several hours or missed because of the come down effect. The come down effect involved feelings of exhaustion that led to participants sleeping most of the day. If they engaged in sessions that lasted 48-72 hours, they could miss 2-3 doses which were due mid and post session. When participants had a lowered state of mental health functioning, they generally missed more doses and would be more motivated to engage in risk taking behaviours. In this situation, after a chemsex session they had high levels of anxiety when they missed previous doses.

"When I've either missed my PrEP for a day, or two, I go to a chemsex party and then I'm panicked and go get PEP. I've done that a few times, because I've been really anxious, but I also think that's a reflection of my mental state. The anxiety skyrockets and then I rush to the clinic" (Max, <30)

As described in chapter 7, at times of exacerbated mental ill health, participants were more motivated to engage in chemsex as a means of a coping mechanism. There was no evidence that participants intentionally missed PrEP doses in the build-up to chemsex sessions. The increased motivation to engage in chemsex was for escapism and the non-adherence was unintentional. This was due to their limited ability to manage doses with a pre-existing lowered mental health state. However, the participants increased engagement in chemsex and the accumulative detrimental effects of chemsex on cognitive function further exacerbated unintentional non-adherence.

Most of the participants had experienced intrinsic factors related to chemsex that had affected aspects of their adherence. This influenced their perception of the need to take PrEP and the practicalities of taking doses. Participants understood that as long as they continued to engage in high-risk sexual behaviours, they were at risk of HIV, which required them to continually use PrEP. This demonstrates that their high levels of motivation to persistently adhere to PrEP was driven by the perceived high-risk of susceptibility to HIV and necessity to protect against a diagnosis.

Participants' motivation to adhere to PrEP was enhanced in the short period immediately after a chemsex session. Firstly, participants were more aware of the need to take the first dose due after a session. They were worried that they may forget due to the drugs come down effect.

"It might have reminded me for like when I get home, that it's probably best to take it when I get in in case I kind of crash out and wake up like 3 or 4. I think it's just kind of that protection. If I'm going to be on a little bit of a come down on Monday, I'm more likely to be in a rush. So, probably more likely to miss it then. So, it's just to make sure that I don't ever miss like two days in a row" (Ben, <30)

Secondly, participants were self-conscious of the need to take their PrEP after a session because they had just engaged in high-risk behaviours. The recent chemsex activity appeared to reinforce the participants perceived high-risk susceptibility to HIV and that it was an ongoing necessity to protect against HIV.

Several of the participants used containment strategies to ensure chemsex did not negatively impact on their wider life, including impede their ability to take PrEP. They limited the duration of chemsex sessions to one night at weekends, controlled aspects of their chems use (For example: drug type, consumption method, dosage and source) and avoided sessions that lasted two or three days.

"I've a good conscience, I don't take things from people who I don't know. I don't go and buy things from people that I don't know or take it because it's for free. I wouldn't be going to these parties that last two, three days. I will probably go back at home, after just one night out" (Wes, 40-50)

In contrast, participants sometimes took a small quantity of PrEP pills with them to extended chemsex sessions. This was to ensure that they had sufficient protection against HIV for the period they were away from home. If they forget to take PrEP with them to a chemsex session, they sometimes asked a partner for a pill. However, this was only when they had excessive worry about contracting HIV and if

they had missed recent dose(s). There was no evidence in the participants experiences that chemsex partners reminded each other to take PrEP.

A few of the participants described that if their main partner was on PrEP, they reminded each other to take doses which were due pre and post chemsex session.

"I think sometimes I've had to be reminded by my partner, "oh have you taken…" "No, no I've not," and I've taken it in the car home. I have had to be reminded if sometimes you're still a bit away with the fairies and you've totally forgotten" (Kevin, 50-60)

This was only in circumstances where they had engaged in drug and sexual behaviours together with other casual sex partners. Participants explained that the main partner's reminder (external trigger) was driven by concern for their well-being.

Other adherence influencers

The wider adherence was influenced by two factors, which included perpetual necessity to take PrEP and practical strategies that increased ability to take doses.

A few of the participants intentional adherence was influenced by concerns about their wider health and well-being. Participants explained that it was essential they took other medication because of a severe long-term medical condition. They stopped any activity to take this medication, including chemsex sessions. The use of other daily medications allowed them to easily add PrEP to their daily routine. The participants with severe long-term medical conditions formed part of the group that were fully confident they had optimally adhered to PrEP. They had a high degree of perceived necessity to take all their medications of which PrEP was only part.

"It's in my genes to take my tablets in the morning because it's not only my PrEP, but also my other medication as well. So, come hell or high water, 9 o'clock in the morning, I take my drugs. It's just self-preservation. I know I need to take it. Nothing stops me. When that alarm goes off, it goes off and it doesn't matter what you do or where I am in the sexual situation" (Henry, >60)

Most of the participants used implementation intentions *(self-regulation strategies: individuals intend to perform a set plan to achieve a clear goal)* to increase their ability to adhere to their daily dosing. Planning a routine to take medication is a key example of an implementation intention. Firstly, participants set a regular time every day to take their pills which formed part of their wider life routine. For example, taking pills first thing in the morning with breakfast. Secondly, in addition to a daily routine, most of the participants used strategic placement as part of their implementation intentions. Pills were positioned beside other essential items they had to access on a daily basis. If they normally took their doses when they were away from home or were planning to be away, they placed pills in other areas. For example, car mug holders and wallet/bags used for days/nights they were away.

"I wouldn't be as adherent as I am, because I need to use a car every day. If I'm in for the weekend, then it will still probably be taken in the morning, I may keep it in my bedside cabinet, or I will leave it by my toothbrush" (Troy, 30-40)

Most of the participants used a variety of combination of props and prompts that acted as external triggers to promote their adherence. Participants used two primary modes of intervention. They set mobile alarms to remind them when doses were due and used 7-day pill boxes to plan the weeks doses.

"As far as I am aware, I've been fully compliant with dosage. There was one day only when I didn't realise it was early afternoon and I hadn't taken it in the morning with my breakfast, as a result I got a 7-day pill box. I wasn't absolutely sure I hadn't taken it; I've got an absolute routine" (Chris, >60)

On a more general basis, participants described that if their main partner was on daily medication, they reminded them within a normal daily routine to take their PrEP.

Influence of PrEP on sexual behaviour and wellbeing

PrEP directly impacted on changes in participants sexual behaviour and well-being. There were two classifications of change, extrinsic and intrinsic factors. For most of the participants, PrEP initiation instigated three types of impact upon risk behaviour. This included increased risk, neutral affect and decreased risk. The most dominant type of change was PrEP initiation having a neutral effect on behaviour. There were no changes in chems use and any type of sexual behaviour. Participants recognised that before starting PrEP they were already engaging in high-risk sex. PrEP was only a viable additional HIV prevention tool.

The second dominant type of change was PrEP initiation leading to increased high-risk behaviour. There was decreased condom use, increased level of sexual partners and more anal sex acts. Participants described that these changes were due to them being confident they were protected against HIV. This allowed them to sexually explore and enjoy the feelings of bare anal sex. The least dominant impact that PrEP initiation had was decreased risk behaviour, leading to increased condom use with anal sex. Participants explained that this was due to them having more knowledge about what sexual acts put them at high risk of acquiring other STIs.

Since they had started PrEP, some of the participants experienced changes in their confidence levels and HIV risk perception. It boosted confidence in their ability to sexually perform and liberated them to explore new sexual behaviours. They did not worry about HIV as they were confident about PrEP's protective benefits.

Some participants described that as PrEP removed the worry of HIV, they felt a wider 'peace of mind' that their overall health was protected. A few of the participants explained that the removal of the psychosocial implications of an HIV diagnosis liberated them to feel at ease with and explore their sexuality. For these participants, sexual identity and sexual behaviour were closely intertwined. They felt that PrEP removed an 'inner guilt' that had repressed their sex life and this freedom provided a boost to their wider psychological well-being.

Discussion

The participants' motivation to start PrEP was driven by the need to protect against the acquisition of a life-long condition and its psycho-social consequences. Participants were initially hesitant to start PrEP because of concerns over effectiveness, side effects and stigmatisation. However, PrEP discussions among MSM networks and social normalisation facilitated participants view that they were suitable candidates. Initially, participants were discouraged from accessing PrEP because of high cost, lack of availability and negative experiences with healthcare services. However, over time the drop in cost and increased availability from dynamic services facilitated participants access to PrEP. Generally, participants had high adherence levels and chemsex did not cause widespread non-adherence. Factors such as forgetfulness/change in routine, substance use and mental health contributed towards occasional unintentional non-adherence. The hang over effect from a chemsex session occasionally led to participants forgetting a dose. Pre-existing mental health issues with increased intensity in chemsex could lead to more severe periods of non-adherence. Participants used combinations of implementation intentions and external triggers to promote generalised adherence and to minimise chemsex non-adherence.

The participants' motivation to start PrEP was driven by their perceived high-risk susceptibility for contracting HIV. This motivator was consistent with two other studies, which indicated that MSM PrEP initiation was influenced by perceived risk of HIV acquisition, high for starting and low for declining the medication (Bil *et al.*, 2016) (Fina *et al.*, 2019). In my qualitative study, the participants had a complex view of risk. They intentionally used drugs to facilitate multiple risk behaviours and were initially unsure if their risk profile made them suitable candidates. These participants undertook individualised risk benefit assessments which was primarily facilitated by their MSM networks and changing norms. Healthcare professionals appeared to have minimal influence on the participants initial process of risk/benefit analysis and candidacy suitability. For these early PrEP adopters there was a move away from biomedical intervention uptake being driven by healthcare services to a more community based empowered model.

The participants sustained high levels of persistence in the execution of their PrEP regimen. This was also primarily driven by their perceived high risk for acquiring HIV. They only intentionally non-adhered during short periods of risk behaviour abstinence, but re-started PrEP once they had re-engaged in sex. Two studies that explored MSM PrEP users' discontinuation reported that one of the primary reasons they had stopped the medication was because of perceived low sexual risk (Kota et al., 2021; Zimmermann *et al.*, 2019). This intimates that risk perception is an important factor which influences persistence. However, in the wider evidence base there is dubiety and complexity in gauging if perceived risk accurately reflects actual behaviour. A study of a representative sample of the UK population found that most who perceived themselves at higher risk of HIV did not have a test in the previous year and most MSM/ethnic minority groups who engaged in sexual risk behaviours did not have high perceived HIV risk (Clifton et al., 2016). In comparison, a study with a large MSM sample highlighted that risk perception was a strong indicator for regular HIV testing, but this was interlaid with other key factors such as gay/HIV stigma and partners status (Marcus et al., 2016). Overall, in my qualitative study the

participants' dynamic use of PrEP suggests that users go through a cyclical process of risk change that influences motivation to access and effectively use the medication.

The participants identified that the primary benefits of PrEP included preventing the biological acquisition of a life-long incurable disease and living with the psycho-social implications. A secondary but important benefit was the freedom to explore their sexuality. A Netherlands study of MSM substance users reported that their PrEP initiation was facilitated by the psychological benefits, which included removal of anxiety about acquiring HIV, sexual empowerment and reduced risk of HIV positive stigma (Storholm *et al.*, 2017). Similarly, a UK study of MSM PrEP users reported that the benefits of PrEP included removal of stress, sexual liberation and enhanced intimacy (Harrington, Grundy-Bowers and McKeown, 2020). All the findings highlight that the psychological and sexual liberation effects are important considerations for PrEP uptake initiatives.

Participants concerns about PrEP's level of effectiveness and potential adverse reactions influenced their motivation to start PrEP and choice of dosing schedule. They chose daily as they believed it provided more consistent protection against HIV as they had unplanned sex lives. In contrast, the episodic users could predict their sex lives and plan when to take doses. In comparison, two studies reported that MSM preferred daily as it had higher perceived efficacy with a sporadic/frequent sex life and easier dosing, in contrast men who preferred episodic had concerns about side effects, forgetting daily doses and affordability (Bil *et al.*, 2016; Zimmermann *et al.*, 2019). A recent study reported that one of the primary reasons MSM PrEP users switched from episodic to daily pill taking was associated with chemsex (Coyer et al, 2020). Overall, it is important to highlight that pharmaceutical concerns and dosing choice appear to be inter-woven factors that need to be addressed when users initiate/execute a PrEP regimen.

Complex interpersonal dynamics and social norms were important factors that influenced participants motivation to start PrEP. Initially, participants were deterred from using PrEP as MSM peers held mixed perceptions of its acceptability. Similarly, a study from Canada found that there were conflicting norms, some men believing PrEP was only an additional HIV risk reduction tool and others an unacceptable facilitator for promiscuity (Knight *et al.*, 2016). However, it is important to note in my qualitative study that as PrEP became more widespread within participants MSM networks, it became more acceptable to use. Informed risk and benefits discourse with MSM peers and long-term partners facilitated normalisation and enhanced motivation for them to start PrEP.

A systematic review from the USA reported that family, friends and partners stigmatised views of PrEP limited MSM users' motivation to use the medication (Mayer, Agwu and Malebranche, 2020). These findings were not fully consistent with my study which found that family and non-MSM friends did not generally affect participants motivation to start PrEP. However, as highlighted earlier, MSM peers stigmatised perceptions of PrEP inhibited the participants motivation to start PrEP. Evidence (including my PrEP review) indicates that young and/or ethnic minority MSM experienced PrEP uptake barriers which were intermixed reasons around HIV risk perception, financial, social/behavioural stigma and lack of social identity as

being PrEP candidates (Edeza *et al.*, 2020; Pinto *et al.*, 2018; Maxwell, Gafos and Shahmanesh, 2019). To optimise PrEP uptake interventions, it is important to consider stigma and socio-cultural factors but particularly the individuated needs of MSM sub-groups. An analysis of PrEP implementation in Scotland highlighted that the significant reduction in HIV incidence had mostly benefited white gay men and access may be limited to other higher risk groups, including ethnic minorities (Estcourt et al., 2021; Grimshaw et al., 2021). Overall, it is recommended that diversification of care modalities is required to improve the access to multiple types of population.

There were varying healthcare factors that acted as barriers and facilitators for participants access to PrEP. Economic factors were initially an important issue but over time became less problematic. The lack of dynamism in service design and non-professional clinicians deterred participants from attending services. In contrast to my qualitative study, two USA systematic reviews highlighted multiple healthcare barriers for accessing PrEP, which included distrust of healthcare providers, affordability, stigma from clinicians and lack of clinician knowledge (Mayer, Agwu and Malebranche, 2020; Pinto *et al.*, 2018). The contrast in prominence of healthcare factors in my UK based study may be due to differences in healthcare modality. However, there appears to be a consensus that HIV/PrEP stigma and professional provision of services need to be considered to facilitate high-risk groups access to PrEP and wider inter-related HIV prevention measures.

The participants appeared to have similar adherence levels and reasons for non-adherence in comparison to generalised MSM. Two literature reviews on PrEP use reported that MSM had high adherence levels, (Riddell et al., 2018; Sidebottom et al., 2018), but daily logistics, forgetfulness, and mental illness contributed towards non-adherence (Sidebottom et al, 2018). These findings were consistent with another review on MSM generalised medication use (non-PrEP) that found MSM had adherence levels of over 80% and common reasons for missing doses were changes in routine and forgetting (Liu et al., 2014). In contrast, wider evidence indicates that up to 50% of the generalised population in high-income countries do not adhere to long-term medications (Cheen et al., 2019; Lam & Fresco, 2015). It is evident non-adherence is not unique to MSM and there are common reasons for all medications, but there are some unique PrEP/MSM aspects. A systematic review reported that barriers for MSM PrEP medication adherence included high cost, gay/HIV socialised stigma and high-perceived HIV risk (Ching et al., 2020). In addition, some evidence in my PrEP review intimates that sub-populations are at higher risk of HIV acquisition because of more frequent episodes of non-adherence, including young MSM and substance users (Maxwell, Gafos and Shahmanesh, 2019). These are important factors to consider within a chemsex dynamic. However, my study did not recruit any young MSM.

On a general basis, chemsex engagement did not have a widespread and severely detrimental impact on the participants adherence. This is consistent with a PrEP study which reported that chemsex did not impact on MSM users self-reported adherence (O'Halloran *et al.*, 2019b). Similarly, a USA study of MSM PrEP users reported that there was no difference in adherence levels between substance users and non-users (Hoenigl et al., 2018). However, these studies were not designed to explore the nuance of PrEP use within a chemsex environment. A recent study of

MSM PrEP users reported club drug use increased the odds of missing the dose the same day by 55% and missing one day's dose increased the odds by eight-fold of missing the next day's dose (come down effect) (Grov *et al.*, 2019). These findings are comparative with my interview participants description of their own occasional unintentional non-adherence. They occasionally missed one dose because of the drugs come down effect.

Participants who used chemsex as a coping mechanism had psychosocial stressors and were at heightened risk of non-adherence. The accumulative negative effect of regular chemsex engagement and problematic health impact increased the risk of them having substantial non-adherence episodes. A German study of problematic chemsex reported that the sample had experienced multiple health impacts, including increased STI diagnosis and psychological issues (Graf *et al.*, 2018). Two studies of MSM PrEP users identified that 40-50% engaged in unhealthy drinking and 16% experienced problematic drug use (Hojilla et al., 2018; Kota et al., 2021). Hojilla et al (2018) found that stimulant use and unhealthy alcohol use did not negatively affect retention in care (Hojilla et al., 2018). However, these studies did not specifically do an in-depth exploration of adherence. Overall, substance use among MSM PrEP users is not uncommon and those who experience problematic chemsex are a more vulnerable group at enhanced risk of HIV acquisition.

The participants deployed generalised and chemsex specific interventions to promote their adherence to PrEP. The most used interventions were implementation intentions (self-regulation strategy: planning a set routine to take their medication) and external triggers. A systematic review reported that epilepsy and stroke patients that had used self-regulatory strategy planning achieved better medication adherence outcomes when compared to those that had not used this type of strategy (Kersten *et al.*, 2015). There was no substantive wider evidence that explored implementation intentions effectiveness for preventative sexual health medication. My interview participants reliance on implementation intentions and these wider findings highlights the importance of this form of strategy for PrEP regimens. However, it is important to emphasis, they were combined with other adherence interventions.

As highlighted, participants specifically used secondary strategies to minimise the harm chemsex had on PrEP medication adherence. This included containment strategies, strategic placement and external triggers. Containment strategies were implemented by participants to minimise the impact chemsex had on their wider health, of which medication adherence was a factor. There was an element of overall strategic planning which included limiting the length of sessions, days they partook in chemsex, level/type of drugs used and placement of pills in bags used daily/within car cupholders. Overall, there was limited wider evidence for tailored adherence interventions within a chemsex context. However, the participants intentional use of a pre-planned chemsex strategy is similar in concept to generalised implementation intentions which are used to promote daily medication use. It would be beneficial for policy makers to recommend multi-layered intervention plans which are tailored to individual chemsex participants circumstances.

Strengths and limitations

A key strength of the study was the robust application of a structured theoretical base which facilitated identification of the key barriers and facilitators for PrEP uptake and medication adherence. However, the linear process of the HIV prevention cascade limited the flexibility of the study to understand PrEP use as a cyclical process. As the participants had navigated all three stages of the cascade, it limited the exploration of the barriers experienced by eligible individuals that had not managed to start PrEP.

As most of the participants were using PrEP and had recently engaged in chemsex there was a vast level of data which provided an in-depth picture of the phenomena. However, there was a self-selection bias which limited the exploration of wider chemsex/PrEP experiences. Only one participant had discontinued PrEP which limited the ability of the study to understand why chemsex participants stopped using the medication. The study did not recruit MSM under the age of 25 and the participants were predominantly white. This means the study was not able to identify specific barriers experienced by young and ethnic minority MSM.

The participants adherence was self-reported, and the study did not use a structured adherence questionnaire. This limited the ability of the study to measure and report levels of adherence. I carried out all the data collection and analysis. I reflect on my position within the research process within the reflexivity statement (within the methods chapter), which was particularly pertinent to this qualitative element. To enhance the robustness and rigour of the qualitative process/findings, PhD supervisory support was used at multiple key stages (Initial check of early transcripts, discussion of the initial analytical framework and final framework).

Conclusion

High-risk susceptibility to HIV was a central motivator for participants initiation and continued use of PrEP. Generalised sexual and chemsex behaviours heightened the participants perceived HIV risk. The benefits of PrEP included protection against the diagnosis of a lifelong condition, removal of the psycho-social implications and sexual liberation. Key concerns about PrEP involved adverse reactions, level of effectiveness and peer stigma. MSM networks and social norms were important factors that influenced participants motivation to start PrEP. There was an absence of healthcare provider influence on participants initial motivation to start PrEP. Lack of dynamism and stigma from healthcare providers limited access. Free PrEP from professional and flexible healthcare providers facilitated access. Participants had high adherence levels and chemsex did not cause widespread non-adherence. However, the drugs come down effect and prolonged chemsex sessions contributed towards occasional unintentional non-adherence. MSM that experienced problematic chemsex were at heightened risk of more frequent non-adherence. Participants used multi-level implementation intention and external trigger planning to promote adherence.

Chapter 9: Discussion

Introduction

In this chapter, I synthesise the main findings in relation to the PhD's questions and evaluate them against the relevant wider research-based literature. Subsequently, I set out key recommendations and a plan for disseminating findings. Lastly, I lay out the key strengths and limitations of the PhD, and provide overall conclusions

Discussion

My aim in this PhD was to examine the interface between MSM PrEP use and chemsex engagement, from which I defined three research questions. I set three objectives to achieve the aim and questions. I mapped the objectives directly to the literature reviews, quantitative analysis and qualitative study. Within these chapters, I compare the specific study's main findings to the wider evidence base and lay out strengths and limitations. I directly address the PhD aim and all the objectives to answer the two interface questions (Q1 and Q2). Question 3 relates to setting out recommendations to optimise PrEP use, which I address under the recommendation section. The three questions were:

1. What impact do chemsex behaviours have on PrEP use for MSM?

2. What impact does PrEP use have on chemsex behaviours for MSM?

3. How can PrEP be more effectively used by MSM chemsex participants?

I use the questions as sub-sections to structure the discussion. As the specific study's findings were compared to the key wider literature within each of the previous chapters; this section's evidence comparison will focus on the main findings and the emerging evidence that examines aspects of MSM substance use and/or PrEP use.

The impact of chemsex behaviours on PrEP

The first question was intended to understand if any aspect of chemsex effected PrEP uptake and medication adherence. I primarily focused on chemsex influence on MSM's motivation to use PrEP and their medication adherence/non-adherence. These findings were substantively drawn from the qualitative study with some aspects under-pinned from the literature reviews and quantitative analysis. My key findings to the question were:

Summary of key research findings:

1. The high perceived HIV risk associated with chemsex was a key motivator for PrEP use, both to start and to persist in its ongoing use.

2. Chemsex participants decision to start PrEP was motivated for their pleasure of chemsex, which balanced with the multiple risks it involved and the need to reduce the potential harm.

3. MSM network discourse including chemsex elements were an important mediating factor for PrEP-naïve MSM to start PrEP.

4. Chemsex influenced unintentional PrEP non-adherence in specific areas, including missing a dose due to drugs come down and multiple doses due to long/heavy sessions.

5. A complex inter-mix of psychosocial issues with chemsex behaviours can become problematic and lead to higher levels of non-adherence.

Chemsex influenced adherence by amplifying the need to take the first dose due post session and by the adoption of multi-level adherence strategies. Chemsex influenced MSM's initial and ongoing motivation to view PrEP as a necessary HIV protection tool. There were layered levels of perceived HIV risk that drove their motivation to use PrEP. Firstly, the PrEP review and qualitative study both highlighted that a key influencer for starting PrEP was high perceived HIV risk which was associated with generalised MSM sexual behaviour. Secondly, the qualitative study identified that a higher perceived HIV risk associated with chemsex amplified their motivation to use PrEP. The enhanced perception of HIV risk aligns with the behaviours highlighted in the chemsex review including high rates of condomless anal sex (CAS) and multiple partners. This is consistent with a systematic review which reported that MSM who had a high perceived HIV risk, in which their behaviour involved frequent sexual acts and high levels of partners were more likely to accept PrEP (Peng *et al.*, 2018). Similarly, a systematic review on PrEP use highlighted that MSMs persistence to continually use the medication was facilitated by high perceived HIV risk (Ching *et al.*, 2020). However, neither of these two reviews examined PrEP use within the chemsex dynamic. Currently, my PhD is the only evidence that directly examines the HIV risk linked to chemsex and PrEP uptake. I found that perceived risk due to chemsex was a central factor that mediated PrEP use; but it was influenced by other factors.

MSM chemsex participants decision-making to use PrEP was a multi-faceted dynamic process that was shaped by pleasure, risk and reduction of harm. In the qualitative study, chemsex participants with a high perceived HIV risk held generalised cognitive and emotive belief concerns which provided some initial hesitancy about their PrEP candidacy. Generalised concerns relating to effectiveness and adverse reactions are commonplace for most pharmaceutical products (French *et al.*, 2010). Even within this insightful high-risk group there were emotive concerns about peer stigma and being perceived as highly promiscuous. Weighing the pleasure of chemsex and high level of risk with the need for protection against HIV (a life-long condition) helped them over-come their concerns. To limit the harm to their health, men contained chemsex to specific times and controlled aspects of their drugs use.

This balance between engaging in a high-risk activity and reducing health harms was reminiscent of the harm reduction approach from the drug misuse field. A harm

reduction perspective places an emphasis on using a multi-intervention approach to minimize health harms of risk behaviours, without the imposed necessity to abstain from the activity (Lenton and Single, 1998). This paradigm correlates with key aspects of chemsex and PrEP. MSM chemsex participants continually engaged in the activity for its desired benefits which they knew involved multiple substance use and sexual risk behaviours. PrEP may thus form part of a wider risk reduction plan which is combined with other drug/sexual interventions. An English study reported that sexual health providers within the sample did adopt a harm reduction approach Hibbert *et al.*, 2021a). However, the same study identified that services had accessibility issues and that some clinicians pre-judged men's motivation for engaging in chemsex (Hibbert *et al.*, 2021a). The study did not examine if clinicians understood the issues related to chemsex and/or if the services provided specific drug use interventions. Moreover, evidence on UK sexual health services chemsex harm reduction approach highlighted geographical disparities in its adoption, that there was an over focus on sexual health outcomes, that clinicians pre-judged men and that there was a lack of intervention integration (Frankis and Clutterbuck, 2017; Van Hout *et al.*, 2019; Tomkins *et al.*, 2018). This resonates with my findings that clinicians' pre-judgement or lack of awareness of male same sex culture discouraged men from attending services. A study of HIV clinics patients views on what formed a harm reduction approach included the principles autonomy, pragmatism, individualism and accountability (Hawk *et al.*, 2017). My findings provide further evidence for the need to integrate harm reduction ethos and drug use interventions alongside PrEP within sexual health services.

Specific drug use factors related to problematic chemsex appeared to influence access to PrEP. My quantitative study and a German study both found that men who used crystal meth were more likely to have accessed PrEP than those who did not use the drug (Schecke *et al.*, 2019). In contrast, a recent study of MSM PrEP users reported that 16% had experienced in problematic drug use but substance use was not associated with ever using PrEP (Kota et al., 2021). In comparing drugs, a study of problematic chemsex drug use found that crystal meth users were more likely to be injectors and be HCV positive when compared to mephedrone users (Stevens, Moncrieff and Gafos, 2020). The Schecke et al (2019) study identified that crystal meth users commonly adopted multiple harm reduction strategies. My qualitative study found that injectors had high levels of knowledge about safe injecting. It is not clear why crystal meth users in my quantitative study had higher levels of PrEP access. However, the qualitative study found that some men controlled their use of what they perceived to be 'harder drugs', which included crystal meth. It suggests that crystal meth users had a high perceived HIV risk which drove their access to harm reduction tools. It is possible this is inter-mixed with them being more aware of the wider drug use risks and have closer engagement with services.

Social discourse among MSM networks is a central factor for influencing chemsex participants motivation to start PrEP. In the qualitative study healthcare providers had minimal influence on the participants initial decision-making process to initiate PrEP. The qualitative study highlighted that MSM commonly exchanged their personal PrEP use views and experiences which ranged in level of knowledge, from naive to expert. These exchanges were important for facilitating a change in potential users' perception that PrEP was valuable to their own circumstances. This was particularly important for addressing varying concerns: general pharmaceutical

to HIV risk suitability and social stigma. Naïve MSM candidates used these exchanges to build their confidence to start PrEP.

There were two distinct elements of MSM PrEP peer exchanges: (1) Motivation: when considering suitability of PrEP (perceived risk profile, de-stigmatisation and normalisation, protective benefits, issues encountered). (2) Access: once decided it is suitable and will start PrEP (where and how to access, methods of use). These network exchanges could provide the basis for a framed discourse intervention which aims to facilitate PrEP initiation. A qualitative study that explored MSM PrEP users' views on network influences found that a peer intervention that framed PrEP through an empowerment and sex positive perspective was the most effective approach to engage the wider community (Gómez *et al.*, 2020). A systematic review showed that peer led interventions significantly increased MSM HIV testing rates within high-income countries (Shangani et al., 2017). A peer led approach may be particularly important for higher risk and/or minority MSM. A study of an ethnic minority MSM PrEP peer intervention found that its approach of addressing concerns, promoting benefits and health positive perspective substantially increased uptake (Kelly *et al.*, 2020). My chemsex review found only a minority of MSM engage in chemsex and qualitative study highlighted that these men feel sexually liberated with like-minded peers in a chemsex sexual context. A peer-based approach using expert PrEP chemsex participants may be a social-culturally inclusive and dynamic intervention for engaging PrEP hesitant and/or more vulnerable men who engage in chemsex.

In nuanced ways, chemsex influenced PrEP users' adherence and non-adherence. The PrEP review and the qualitative study identified that the overall MSM population and MSM who engaged in chemsex both typically had high PrEP adherence levels. These findings are broadly in line with a UK PrEP trial sub-study that found chemsex did not impact upon self-reported daily adherence (O'Halloran *et al.*, 2019b). However, this was a secondary sub-study that was not specifically designed to examine the nuanced interface between chemsex and PrEP. A USA PrEP study reported that at 48 weeks of PrEP use there was no difference in adherence levels between MSM substance users and non-MSM substance users (Hoenigl et al, 2018). In comparison, another USA study identified that stimulant use among MSM PrEP users did not negatively impact on their level of retention in care (Hojilla et al, 2018). However, both these studies did not specifically examine the impact of chemsex upon PrEP adherence. In my qualitative study, chemsex contributed towards unintentional non-adherence in two ways: i) missed dose following a session because of the come down, ii) missed 2-3 doses mid-and post session which was linked to lengthy sessions/heavier chems use. Missing the occasional one dose is not significantly concerning as four doses per week provides a 96% level of HIV protection (Buchbinder, 2018).

There was an inter-mix of complex risk factors which influenced men to miss multiple PrEP doses. The qualitative study reported that men missed multiple doses when they had a higher level of frequency and/or when sessions were longer in duration. Some men intentionally avoided longer sessions as they had previously caused health issues or perceived their health could be impacted upon. Two studies on MSM club drug use suggested that longer binges can lead to men missing multiple PrEP doses (Storholm *et al.*, 2017; Grov *et al.*, 2019). In my qualitative study,

generalised psychosocial stress led to some men forgetting PrEP doses and to an increased desire to escape within chemsex. This increased frequency worsened their mental state and lead to a compulsion to engage in chemsex, this vicious cycle led to multiple doses being missed. A study of MSM stimulant use highlighted those intervals of drug use and PrEP non-adherence were associated with increased rates of CAS (Wray *et al.*, 2019). Two studies of MSM substance use reported that medium/high risk (increased frequency with desire and problematic impact) cocaine use was associated to PrEP non-adherence (Shuper *et al.*, 2020; Hojilla *et al.*, 2019). Although this wider research provides useful comparative evidence, it was not within a sexualised context. The evidence suggests that a complex inter-mix of psychosocial issues with chemsex behaviours can become problematic and lead to higher levels of non-adherence.

There were aspects of chemsex that enhanced the users need to adhere to PrEP regimens. The PrEP review and qualitative study highlighted that the wider MSM PrEP using population and MSM PrEP users who engaged in chemsex both adopted varying combinations of implementation intentions and external triggers to support their medication adherence. As described earlier, 'implementation intentions' are self-regulatory strategies in which individual's intend to perform a set plan to achieve a goal (French et al., 2010). An intention in medication adherence terms was planning when, where and how to take doses, for example a daily routine of taking PrEP at home in the morning with breakfast. In the qualitative study, chemsex had two levels of impact upon adherence. Firstly, participants had an increased drive to take their next dose after a session because they were aware of the high-risk sex, they had just engaged in. Secondly, participants adopted chemsex specific strategies to protect their adherence. An Irish study on MSM chemsex reported that men adopted an array of harm reduction strategies to limit the impact chemsex had on their wellbeing (Van Hout *et al.*, 2019). Similarly, in my qualitative study the men adopted strategies that minimised the negative effects chemsex had on their overall health, of which PrEP was a key consideration. These overall strategies included multiple intentions (containing chemsex timings, control type/form/dose of chems, take PrEP pills to session), strategically placing pills and external triggers for doses. The adoption of generalised and chemsex specific measures as part of a harm reduction strategy would be beneficial to promote PrEP adherence.

As previously outlined, I focused the PhD on MSM PrEP use, but it is important to recognise that there are other key high-risk groups and important developments within the field that can inform MSM PrEP use. Maintaining optimal PrEP adherence is important in women as protective levels are not attained until 21 days in vaginal tissue compared to 7 days in colorectal tissue (Riddell et al., 2018). This places an importance on sustained adherence to oral PrEP. Women face multiple health inequities that act as barriers for them accessing PrEP and impact on them having lower levels of persistence for staying on PrEP (Hodges-Mameletzis et al., 2019). It has been suggested that dynamic models of care that embed reproductive health and STI prevention with the provision of varied formulations of PrEP (intra-vaginal rings/long acting injectables) could support more effective uptake and medication adherence among women (Hodges-Mameletzis et al., 2019). More recent clinical trials have demonstrated that PrEP which is injected once every eight weeks is more effective at reducing HIV acquisition among women, trans women and MSM than oral PrEP (Mahase, 2020). The future provision of injectable PrEP offers the

prospect of long-acting options that offers effective protection against HIV for the subgroup of chemsex using MSM that struggle with adherence.

As discussed in earlier chapters, PrEP is provided throughout the UK healthcare system to people who meet the eligibility criteria. In 2017, PrEP was implemented in Scotland; the first UK nation to universally provide PrEP. In a Scottish based study, HIV incidence dropped by 43% among an MSM sexual health clinic patient cohort in the years pre and post PrEP implementation (Estcourt et al., 2021). In 2020, routine provision of PrEP was implemented in England, although prior to this it was available via a clinical trial (IMPACT) (Hanum et al., 2020). During a period of the IMPACT trial, a study of English sexual health records reported that there was over 1000 patients not on the trial who were awaiting PrEP, in which it suggests there was 15 avoidable new HIV diagnosis if PrEP had been universally available on the NHS (Jewsbury et al., 2021). An English study of MSM PrEP users and sexual health providers identified that some men self-sourced because of the trial waiting list, perception of NHS bureaucracy and worry of stigmatisation from services (Hillis et al., 2021). Hillis et al (2021) reported that the participants held a general view that more affluent MSM were accessing PrEP and there was a need to increase routes of access for minority ethnicities and lower socio-economic groups. Similar barriers to PrEP access in Black African and Black Caribbean women were described by Nakasone et al (2020). Since these studies were conducted PrEP was approved for universal NHS provision in England, which is anticipated to overcome some of these barriers for PrEP uptake.

Even with universal provision in Scotland, evidence suggests that it is health literate white cis gay men that have pre-dominantly accessed PrEP, this highlights that there is still a need to diversify delivery to other high-risk groups, including ethnic minorities (Estcourt et al., 2021; Grimshaw et al., 2021). To date studies have not specifically explored these issues for MSM who engage in chemsex. However, structural issues faced by marginalised groups may resonate with MSM chemsex participants who can be stigmatised, particularly ethnic/culturally diverse men. This highlights an ongoing need to evaluate reach and coverage of PrEP (Grimshaw et al., 2021) and provide dynamic/responsive models of care that reach out to all groups at high-risk of acquiring HIV.

The impact of PrEP on chemsex behaviours

The second question was intended to highlight if PrEP use influenced any aspect of chemsex. I primarily focused the influence of chemsex on sexual behaviour and psycho-sexual well-being. These findings were substantively drawn from the qualitative study with key areas under-pinned from the PrEP literature review and quantitative analysis. My key research findings were:

Summary of key research findings:

1. After PrEP initiation, most users did not change sexual/chemsex activities although some engaged in higher levels of risk behaviours.

2. PrEP removed internalised stress about HIV, which can liberate users to be able to explore their sexuality.

3. The liberation PrEP provided, interconnects with increased empowerment in sexuality and promotion of psychological wellbeing.

The PrEP review and qualitative study identified that for most of the MSM population and MSM who engage in chemsex, initiation did not lead to major changes in sexual behaviour. This is consistent with a systematic review on PrEP which reported that there was no substantive evidence that medication initiation led to fundamental changes in sexual behaviour (Freeborn and Portillo, 2018). In contrast, another PrEP systematic review reported that for some MSM PrEP initiation led to a decrease in condom use (Traeger *et al.*, 2018). My qualitative study contextualises some of these conflicting findings, with some participants describing that PrEP removed the HIV anxiety and allowed them to use condoms less (within a chemsex environment). This is comparative with a study that reported MSM who used PrEP had significantly lower levels of worry about HIV in comparison to non-PrEP users (Keen *et al.*, 2020). This wider evidence on PrEP and risk compensation is within a wider MSM context. However, one study that examined PrEP among MSM substance users reported that the removal of HIV worry was a key effect of starting the medication (Storholm *et al.*, 2017). Two recent studies reported that starting PrEP can lead to changes in sexual risk but there are wider more complex influences (Lorenc *et al.*, 2021; Reyniers *et al.*, 2021). In my quantitative study, men who had accessed PrEP had higher risk sexual behaviours compared to men who had never accessed PrEP. However, the men who had never accessed PrEP, also engaged in high levels of HIV risk behaviours. Suggesting that the high-risk behaviours associated with chemsex predate PrEP and aren't necessarily caused by PrEP risk compensation. As PrEP removes internalised anxiety about HIV, this may influence the development of risk compensation. However, there are multiple intertwined factors that move beyond the risk paradigm.

Risk compensation is based on the premise that when humans are given a protective device, they will act in a way which thereby neutralises the protective benefits (Thompson, Thompson and Rivara, 2001). Evidence from wider disciplines highlights that not everyone will increase risk behaviour and there are multiple levels of adjustment which is affected by wider factors (Hedlund, 2000). There have been methodological issues in the application of risk compensation within HIV literature whereby all behaviour changes are simply explained within this concept (Rojas Castro, Delabre and Molina, 2019). The theoretical base and evidence for risk compensation comes from the traffic regulations field and it is not easily translatable to sexual health. Whilst risk compensation may be useful in measuring HIV risk behaviour changes, following PrEP initiation, they are better explained as part of a more complex and nuanced psychosocial dimension of change.

Starting PrEP facilitated wider sexual health changes among some MSM chemsex participants. In the qualitative study, some participants felt that PrEP provided them with a sense of liberation to sexually explore as the stress of an HIV diagnosis and its implications had been removed. Two recent studies of MSM PrEP users identified that the medication was life changing, it empowered them to sexually explore and have control of their sexual health (Reyniers *et al.*, 2021; Lorenc *et al.*, 2021). Similarly, a study of MSM substance users felt that PrEP had provided them a sense of empowerment over their sexual lives (Storholm *et al.*, 2017). Within all

this evidence, it is suggestive that there is repression of sexuality and psychological stress related to the stigma of being an HIV positive gay man. A USA study of MSM who lived in urban areas reported that PrEP changed community norms in relation to condoms/risk tolerance, increased HIV knowledge and increased overall confidence in being in control of HIV risk (Pantalone *et al.*, 2020). Overall, PrEP appears to have a wide level of impact which enables MSM PrEP users to control their own sexual lives and promote psycho-sexual wellbeing.

It is important to consider the influence PrEP has on MSM who experience problematic chemsex as they are at heightened vulnerability to HIV. In the quantitative study, the men who experienced problematic chemsex commonly engaged in poly-substance use and had high levels of HIV risk behaviours (CAS, recent partners and injecting). In comparison, a study reported that MSM problematic chemsex drug use was associated with previous/current injecting, high levels of recent partners and recent PEP use (Stevens, Moncrieff and Gafos, 2020). In addition to the HIV risks, my quantitative study found that a significant minority had mental ill health; although as it was cross-sectional there was no way to determine causation. However, a study on MSM chemsex reported that the problematic impacts were biopsychosocial, including STIs and mental illness (Graf *et al.*, 2018). A study of MSM PrEP users reported that those with poly-drug use and depression were more likely to engage in CAS than those without these combined factors (Nöstlinger *et al.*, 2020). Another study of MSM PrEP users highlighted that crystal meth use was associated with depression and that this was inter-connected to vulnerabilities of being a victim of intimate partner violence (Miltz et al., 2019). Overall, the evidence of problematic chemsex is suggestive of a complex interface between psychosocial factors and risk behaviour. My qualitative findings also suggested that the general impact PrEP initiation had on the participants sexual behaviours appeared to apply equally to those men who experienced negative effects from chemsex. This further supports PrEP as part of a harm reduction package to improve health and well-being of MSM who have complex and interlinked sexual and drug use risk behaviours.

Recommendations

In this section I address the PhD's third question in relation to optimising PrEP use for MSM who engage in chemsex. As is appropriate within an applied research thesis and the focus being to practically improve the PrEP use journey, I provide recommendations for policy, practice and research. I anticipate through my advisory group and professional roles within wider networks that these recommendations will influence MSM health policy and care/treatment provision. These recommendations are based on the thesis key findings, which is supported by the wider evidence on MSM substance use and PrEP.

Recommendations for policy and practice

Recommendation 1: Policy makers develop health promotion strategy that utilises an individual risk/benefit assessment facilitated by community stakeholders.

The PhD's findings will provide confidence to policy makers that PrEP appears to be a viable and effective tool for MSM chemsex participants. Overtime access was

made easier by funded PrEP programmes and chemsex did not cause widespread negative impact on adherence. There has been normalisation of PrEP within MSM communities although concerns remained over HIV/PrEP stigma. Chemsex participants had some initial hesitancy about adopting PrEP but the key process that facilitated their candidacy was them undertaking in an individual risk and benefit analysis of the medication. There are aspects around risk and stigmatised behaviours that only effect MSM who engage in chemsex. In addition, there were potential issues with non-adherence within the higher risk MSM chemsex participant cohort. Policy makers should adopt the risk/benefit process as a base for a strategy that is tailored to the needs of this marginalised group. Collaboration with community groups/advocates would provide easier reach to this minority MSM group.

Recommendation 2: Sexual health service providers should be enabled to offer the holistic array of chemsex harm reduction strategies: substance and sexual.

MSM chemsex participants use PrEP as part of a wider harm reduction approach, in which substance use strategies play a key role. However, there appears to be disparity of equity in sexual health provision and sexual health services do not systematically offer a holistic harm reduction approach. It would be beneficial for policy makers, public health leads and commissioners to provide mechanisms for sexual health services to offer 'wrap around services' which better supports the men's needs. This may include embedding principles of a person-centred harm reduction approach, offering drug use equipment provision and clinicians being enabled to engage in evidence-based harm reduction interventions. This would better enable services empower men to reduce the harm to their health.

Recommendation 3: Community awareness interventions continue to challenge PrEP stigma but promote PrEP as a choice within a pleasurable safer sex paradigm.

Increasing MSM community PrEP dialogue and higher levels of men using PrEP has led to a decrease in stigma and social normalisation. However, there was ongoing views that PrEP was only used by promiscuous MSM. In addition, with increasing PrEP norms, there is a risk that some chemsex participants feel passively coerced into starting the medication and not to use condoms. Policy makers, public health leads and HIV organisation should continue to tackle PrEP stigma but within a paradigm that respects choice of interventions that promote pleasurable safer sex. This might engage naïve chemsex participants who do not view themselves as high risk and who have pre-conceptions about the type of man that uses PrEP. This may facilitate an alteration in their perception that they are suitable PrEP candidates. Community awareness may further facilitate universal risk informed approach to MSM PrEP candidacy, whilst maintaining respect and dignity in everyone's choice.

Recommendation 4: Practitioners who support MSM sexual health have access to resources which enables them to facilitate chemsex participants PrEP candidacy.

Some chemsex participants had hesitancy about their PrEP candidacy and healthcare interactions mediated their motivation to start. This hesitancy was based around perceptions of risk. If chemsex participants are not engaged in constructive HIV discourse, there are missed opportunities that reduce their risk of HIV acquisition. As high-perceived HIV risk is key to chemsex participants PrEP access,

it would be beneficial if practitioners had access to learning resources that enabled them to facilitate their candidacy. This may take the form of good practice guidance and/or brief education session. This should enable practitioners to raise chemsex participants awareness of their HIV risk, address the necessities/concerns of PrEP candidacy, challenge practitioner stigma and provide a framework for key engagement questions. It would be beneficial if this was available to practitioners in the appropriate non-statutory MSM organisations and NHS sexual health services.

Recommendation 5: Practitioners within PrEP services have access to resources which enables them to promote adherence for high risk chemsex participants.

There are circumstances in which some chemsex participants will not-adhere to PrEP. This is particularly important for MSM who experience problematic chemsex because they are at heightened risk of acquiring HIV. It would be beneficial if practitioners who are involved in the prescribing and monitoring of PrEP had access to learning resources that enabled them to more effectively support their adherence. This may take the form of good practice guidance and/or brief education session. This should enable practitioners to identify problematic chemsex behaviours/impact, understand patterns and reasons for non-adherence, promote PrEP adherence strategies and wider harm reduction, provide a framework for key adherence questions and facilitate wider psychosocial support. In addition, it would be beneficial to undertake further research as outlined in recommendation 6 and 7.

Recommendations for research

Recommendation 6: Study to examine the viability of a peer-based intervention that promotes PrEP uptake/medication adherence among MSM who engage in chemsex.

Discussion of PrEP within MSM networks facilitated its acceptability and normalisation. These interactions facilitated the removal of potential PrEP candidates' concerns that it was suitable for them. Ongoing MSM social discourse that maintains the PrEP stigma narrative may discourage high risk men from considering PrEP. This is particularly concerning for MSM who experience problematic chemsex. Chemsex participants generally had high adherence levels. However, more intense levels of chemsex and/or problematic chemsex may contribute towards non-adherence. This potentially places these PrEP users at high risk of acquiring HIV, which is concerning for this group who engage in higher level risk behaviours. Due to these factors, it would be beneficial to assess the feasibility of a two-part peer-based intervention: part 1 for uptake and part 2 for adherence. The uptake element could use expert PrEP user discourse to address concerns, promote the benefits and address the practicalities in how it is used. This type of intervention may continue the de-stigmatisation of PrEP and promote uptake. The second element could be targeted by expert PrEP peers to support those with concerns and/or experiencing non-adherence. This would use PAPA as a theoretical base: promotion of chemsex strategies (implementation intentions: containment of chemsex, control of drugs use, and external triggers) that reduce unintentional non-adherence. This may reduce periods of non-adherence and promote protection levels.

Recommendation 7: Study to explore the dyadic interface between problematic chemsex and PrEP uptake/medication adherence.

There was a complex interaction between psychosocial factors and stress that increased some chemsex participants desire to engage in chemsex. This may lead to a compulsion and exacerbate the health outcomes of this group. Only a minority of MSM who had experienced problematic chemsex had accessed PrEP and they were at increased risk of non-adherence. Although the PhD highlighted these factors, it was limited in the depth of understanding it could provide on the impact the behaviours had on adherence. With high levels of mental health issues and risk behaviours, they are a particularly vulnerable group. It would be beneficial to undertake a qualitative study to explore inter-relationship between problematic chemsex and PrEP, particularly the barriers and facilitators for uptake/medication adherence. This would enable the development of any further needed recommendations that reduces the risk of HIV acquisition and related health impact on this high-risk MSM group.

Recommendation 8: Study to explore young and minority ethnic chemsex participants experiences of PrEP uptake and medication adherence.

The wider evidence suggests that they have lower PrEP uptake levels and/or are more likely to be affected by non-adherence. However, the qualitative study did not-recruit anyone under 25 and only one MSM from an ethnic minority. Due to the potential increased HIV acquisition risk among these MSM sub-groups, it would be beneficial to complete a qualitative study that explores these groups motivation to start PrEP, accessibility of PrEP and effective use of PrEP. This evidence could inform the implementation of appropriate interventions that promotes PrEP uptake and medication adherence.

Dissemination: creating impact

Dissemination is a key tool for creating and evidencing impact for research findings and their associated recommendations. There are varies dissemination mechanisms to create meaningful impact. I have started the dissemination process and will engage in further activities for key findings/recommendations.

Publications in peer review journals is one method for widely disseminating research findings. To date, three of the PhD sub-studies have been published in respected peer review journals. This includes two systematic reviews (MSM chemsex behaviours and MSM PrEP use and medication adherence) and a quantitative analysis of PrEP use among MSM who experienced problematic chemsex. These journals relate to the sexual health and drug use field which are accessed by a broad range of professionals. The chemsex review already has over 70 citations and the PrEP review has over 10 citations. This demonstrates that other professionals have used the findings within research. The substantive findings from the qualitative study have not been published but will be submitted to a journal.

Stakeholder engagement is crucial for establishing if recommendations and supporting findings are valid, applicable and beneficial for the intended population's health issue and promotion of their outcomes. To examine the validity, robustness,

functionality of the recommendations I will present them to the PhD advisory group. As the group has varying professionals it will enable an exploration of the priorities and further means to best disseminate findings. Within my professional role in Scotland, I sit on MSM health prevention groups at a national and local level. These groups consist of clinicians, academics, public health leads and community organisations. As with the advisory group, which is England based, I will undertake in the same consultation process with these groups. This will provide an opportunity to explore which recommendations may be a priority for Scotland's MSM policy/practice.

Service user engagement is key to exploring which recommendations/findings are meaningful to the community, that are a priority and the best methods for creating impact. I have established links with two MSM community organisations (London and Edinburgh), with whom I will disseminate a digital presentation with key questions to appropriate service users. This will be linked with a follow up digital knowledge exchange event which community practitioners and service users. In addition to this consultation process, I will create a digital poster which has key messages. These messages will be agreed with the community organisations. This poster will then be disseminated on multiple non-statutory MSM/PrEP centric social media platforms. This will raise wider community awareness of the key findings and pertinent issues.

As chemsex has higher prevalence rates within large, urban areas, it would be beneficial to engage in targeted work with specific services and communities. I will engage in specific consultation with an MSM service in London, two of Scotland's largest sexual health clinics and a key Scottish MSM community organisation. They form part of my established links within my professional and doctoral roles. This will include a research briefing of the key findings via established digital news mechanisms. I will set up a digital knowledge exchange event which will allow dissemination of the findings and critical discussion on the best ways practitioners can use findings to support their service users. Recommendations 4 and 5 (practitioner-based resources that facilitate PrEP uptake/medication adherence) will be the focus of this event. However, I have started to explore options for delivering a brief learning session with two of Scotland's sexual health clinics. I am co-leading the review of Scotland's national MSM education resource which is a tiered modular approach for all health and social care professionals. There is curriculum on chemsex and PrEP, in which I will embed relevant PhD findings on chemsex behaviours, impact of chemsex on health, impact of chemsex on PrEP and strategies to promote uptake/medication adherence.

Within my professional role, I have time in which I am expected to create research output and measurable impact. As part of my post-doctoral development and role expectations, I will initially and proactively pursue recommendations 6 and 7 (studies to develop a peer-based intervention and explore problematic chemsex/PrEP). As MSM who experience problematic chemsex have complex health factors and are at high risk of acquiring HIV, recommendation 7 is a key priority. I had initial conversations with an MSM community organisation about their interest in a peer-based intervention, in which recommendation 6 would provide a basis for further development. To pursue these recommendations, I will engage with the relevant stakeholders and identify appropriate research funders.

Strengths and Limitations

The PhD's primary strengths and limitations are summarised in this section. The sub-studies strengths and limitations are discussed in the relevant findings' chapters.

This is one of the first studies that specifically examined the interface between chemsex and PrEP. The inter-mixed structured use of the HIV prevention cascade and PAPA framework provided the PhD with a dynamic and robust theoretical underpinning. This has allowed me to explore the phenomena interface in an in depth but focused and systematic manner. This approach has produced original findings that answer the research questions and produced specific recommendations.

Despite the generally complimentary application of the HIV prevention cascade and PAPA framework, there were some limitations. The cascade's linear structure did not reflect the dynamic process of user's intentionally stopping and re-starting PrEP which was dependent on perceived level of HIV risk. This limited the ability of the cascade to account for the fluctuations in motivation and potential multiple times that an individual may interact with each of the cascade's elements. Originally, I had planned for PAPA to be focused on the cascade's effective use element. Through the data analysis it became apparent key PAPA concepts were relevant to the other elements, particularly the motivation stage.

A key challenge for me throughout the PhD was examining chemsex as it is a social construct which involves complex multiple behaviours. It has been established in the wider literature that there are inter-changeable terms and varying methods used to report evidence on chemsex. In addition, chemsex drug trends and patterns varied across different geographical areas. The quantitative study included men if the drug use was within a sexualised context and qualitative study included men if they had recently been involved in what they perceived to be 'chemsex'. In the qualitative study it was important for me to use an inclusive approach that allowed the participants to self-define if they had been involved in what they perceived as chemsex. Imposing a pre-defined set of criteria would have excluded men and biased the results. My chemsex findings in terms of the motivations for engagement and risk behaviours were comparative to the wider evidence.

As my PhD was part time and self-funded this produced some limitations within the research process and outcomes. As I was funding the PhD myself there was limited resources to be able to collect and analysis data on the interface between chemsex and PrEP, specifically being able to collect primary quantitative data or longitudinal qualitative studies. This meant I had to be flexible and innovative in the use of available data sources and targeting of participant recruitment. However, original detailed findings have been produced, the research questions have been achieved and qualitative data was novel which has added a valuable contribution to the evidence- base.

The development and implementation of the data collection and analysis methods was centred on myself as a singular part time researcher which is normal as a PhD learning process. To ensure quality in the research process and output there were governance mechanisms in place for each of the PhD sub-studies: 1. An

independent researcher reviewed a sample of abstracts from articles included in the literature reviews; and 2. PhD supervisors reviewed all data collection plans and extracts of data analysis. I had a complimentary team of three PhD supervisors with specialist expertise in all the PhD's research methods and the HIV field. Standard limitations may be expected in the development of a PhD as it is a professional and personal development process.

Conclusion

A minority of the overall MSM population engaged in chemsex, but those that do were at high risk of acquiring HIV. Chemsex involved multiple inter-connected substance use and sexual behaviours, including poly substance use, injecting drug use, CAS, multiple sex partners and esoteric sex acts. Some participants experienced problematic chemsex, which had a negative effect on biopsychosocial health. The development of problematic chemsex was intertwined with complex psychosocial factors and higher intensity risk behaviours. High perceived HIV risk associated with chemsex was a key influencer for participants motivation to use PrEP. MSM peer networks and social norms mediated chemsex participants suitability for being PrEP candidates.

Chemsex participants access to PrEP was facilitated by structural opportunities, specifically free or cheap PrEP sources from trusted and established providers. MSM who engaged in chemsex generally had high PrEP adherence levels. However, this was mediated by frequency/duration of risk behaviours and containment of chemsex engagement. Chemsex participants use multiple strategies in their day to day lives and within a chemsex context to promote PrEP adherence. PrEP initiation did not cause widespread changes in risk behaviours among chemsex participants. However, it did contribute to some changes in risk behaviours, but was intertwined with sexual liberation and benefits for psycho-sexual wellbeing.

There have been concerns that PrEP would not be used effectively by MSM chemsex participants. However, my PhD has highlighted that PrEP is a viable tool for chemsex participants and should be part of a wider chemsex harm reduction strategy. Furthermore, I have identified key healthcare provider and peer-based interventions that could promote PrEP uptake/medication adherence for those who are hesitant and/or at higher risk of HIV. Finally, I identified a need for further research to explore the chemsex/PrEP dynamic among higher risk minority MSM groups.

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Appendix 1: Antidote service user assessment form

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LGBT drug and alcohol support

ONLINE KEYWORKING REFERRAL FORM

Assessor: _____ **Date:** _____

CLIENT DETAILS

FIRST NAME:	**LAST NAME:**	**DATE OF BIRTH:**
ADDRESS: _____ _____ **POSTCODE:** _____ **BOROUGH:** _____		**EMAIL:** _____ **PHONE:** _____

SEX:	☐ Male ☐ Female ☐ Intersex ☐ Non-Binary ☐ Other If other:	**SEXUALITY:**	☐ Lesbian ☐ Gay ☐ Bisexual ☐ Queer ☐ Heterosexual ☐ Other	**RELIGION:**	☐ Buddhist ☐ Spiritual ☐ Christian ☐ Other ☐ Hindu ☐ None ☐ Jew ☐ Muslim ☐ Sikh
GENDER IDENTITY:	Different to sex assigned at birth? ☐ Yes ☐ No	**NATIONALITY:**			
DISABILITY / ACCESS REQUIREMENTS:	☐ Yes ☐ No	**IF YES, DETAILS:**			
ETHNICITY:	☐ White British ☐ White Irish ☐ White Other ☐ Mixed White/Black Caribb. ☐ Mixed White/Black African	☐ Mixed White/Asian ☐ Black Caribbean ☐ Black African ☐ Black Other	☐ Asian Indian ☐ Asian Bangladeshi ☐ Asian Pakistani ☐ Mixed Other	☐ Asian Other ☐ Chinese ☐ Arabic ☐ Other	

EMPLOYMENT STATUS:	**CURRENT ACCOMMODATION:**	
☐ Regular Employment ☐ Unemployed ☐ Pupil / Student ☐ Long Term Disabled / Sick ☐ Homemaker ☐ Not Receiving Benefits ☐ Unpaid Voluntary Work ☐ Retired From Work ☐ Other Do you receive sickness / invalidity benefits? ☐ Yes ☐ No	☐ Private Rented ☐ Staying with Friends / Family ☐ Live on Streets ☐ Own Property ☐ Use Night Hostels ☐ Sleep on Different Friends Floor ☐ Night Winter Shelter ☐ Direct Access Short Stay Hostel	☐ Short Term B&B or Hostel ☐ Squatting ☐ LA or RSL Rented ☐ Approved Premises ☐ Supported Housing / Hostel ☐ Traveller ☐ Settled with Friends / Family ☐ Young Person's Services
	PARENTAL STATUS:	
	☐ Not a Parent ☐ Some of my Children Live with me **Number of Children under 18 Living in Household:**	☐ All my Children Live with me ☐ None of my Children Live with me

REFUGEE OR ASYLUM SEEKER? **(Please note that this information like any other will be treated confidentially and will only be used anonymously for monitoring services)**	☐ Yes ☐ No

REFERRAL DETAILS:

How did you hear about the service?	**Have you accessed Antidote previously?** ☐ Yes ☐ No If yes, when:
Have you been treated for substance misuse at another organisation? ☐ Yes ☐ No If yes, please give details: If yes, do we have permission to liaise with that organisation? ☐ Yes ☐ No	**What is your availability for appointments?** ☐ Monday Mornings ☐ Thursday Evenings ☐ Other

SUBSTANCE USE

SUBSTANCE	NUMBER IN ORDER OF PRIORITY	DAYS USED LAST MONTH AND AMOUNT	ROUTE OF ADMINISTRATION	AGE OF FIRST USE
Crystal Meth				
GHB/GBL/G				
Mephedrone				
Ketamine				
Cocaine				
Cannabis				
Other				
Alcohol				

INJECTING DETAILS:
Currently injecting/slamming? ☐ Yes ☐ No
Previously injected/slammed? ☐ Yes ☐ No
Sharing needles? ☐ Yes ☐ No
Other people inject for you? ☐ Yes ☐ No

MAIN CONTEXT OF USE:
☐ Sexual ☐ With Friends / Social
☐ Clubbing ☐ On my own ☐ Other

DAILY UNITS OF ALCOHOL:

HEALTH

HIV STATUS:

Are you HIV+? ☐ Yes ☐ No ☐ Not Tested Test Date: _____

If HIV+:
Are you on medication? ☐ Yes ☐ No
Does drug use interfere with adherence to meds? ☐ Yes ☐ No
Do you attribute your HIV status to substance use? ☐ Yes ☐ No
Did your substance use follow your diagnosis? ☐ Yes ☐ No
Did your substance use escalate after your diagnosis? ☐ Yes ☐ No

If HIV-:
Have you had a course of PEP? ☐ Yes ☐ No How many courses this year? _____
Did PEP follow a chem sex session? ☐ Yes ☐ No
Are you on PrEP? ☐ Yes ☐ No
Have you been on PrEP previously? ☐ Yes ☐ No
Do you consider going on PrEP? ☐ Yes ☐ No
Would you like a sexual health appointment? ☐ Yes ☐ No

SEXUAL LIFE:

Last penetrative sex without a condom (bareback):
Percentage of penetrative sex involving condoms: _____
Number of different sex partners in past 3 months: _____
Chems used for sex this year: ☐ Crystal Meth/Tina ☐ GBL/GHB/G ☐ Mephedrone
☐ Cocaine ☐ Other:
Average number of partners per chem sex session: _____
Last time sober sex without drugs or alcohol: _____
Use websites or apps to hook up for sex? ☐ Yes ☐ No
Which sites do you prefer? ☐ Grindr ☐ BBRT ☐ Scruff ☐ Hornet ☐ Recon
☐ Gaydar ☐ Manhunt ☐ Other:

SEX WORK:

Are you engaged in sex working or escorting? ☐ Yes ☐ No ☐ Previously
If yes: ☐ Street ☐ Private Premises ☐ Business Premises ☐ Porn Industry

HEP C STATUS:

Are you HEP C+? ☐ Yes ☐ No ☐ Not Tested Test Date:
Previously cleared HEP C? ☐ Yes ☐ No Would you like to arrange a HEP C test? ☐ Yes ☐ No

HEP B STATUS:

Have you been immunised? ☐ Yes ☐ No Total vaccinations you had: ☐ 1 ☐ 2 ☐ 3 ☐ 4
Acquired immunity? ☐ Yes ☐ No Would you like a HEP B intervention? ☐ Yes ☐ No

HPV VACC:

HPV vaccinated? ☐ Yes ☐ No Do you consider getting an HPV vaccination? ☐ Yes ☐ No

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Client Name: _____

ASSESSMENT

Client Presentation Notes & Initial Care Plan Notes

GOALS: ☐ **Stop** ☐ **Reduce, then stop** ☐ **Reduce** ☐ **Maintain abstinence**
☐ **Gain control** ☐ **Harm-reduction** ☐ **Unsure** ☐ **Sober sex**

Risk Assessment

Risk of self-harm or suicide		**Risk Event History** (detail each event ticked with a Yes)
1. Previous suicide attempts?	☐ Yes ☐ No	
2. Previous suicidal ideation?	☐ Yes ☐ No	
3. Current suicide ideation?	☐ Yes ☐ No	
4. Plan made?	☐ Yes ☐ No	
5. Previous self-harm?	☐ Yes ☐ No	
6. Current self-harm?	☐ Yes ☐ No	
Risk of violence or sexual assault		
1. Is client at risk of violence?	☐ Yes ☐ No	
2. Is client a risk to others?	☐ Yes ☐ No	
3. Exhibiting aggressive behaviour?	☐ Yes ☐ No	
4. Expressing paranoid delusions?	☐ Yes ☐ No	
Risk of self-neglect and vulnerability		
1. Current self-neglect?	☐ Yes ☐ No	
2. Evidence of eating disorder?	☐ Yes ☐ No	
Risks related to substance use		
1. Risk of overdose?	☐ Yes ☐ No	
2. Risk of dangerous withdrawals?	☐ Yes ☐ No	
3. Risky sexual practices?	☐ Yes ☐ No	
4. Dangerous injecting practices?	☐ Yes ☐ No	
Risk to Children		
1. Contact with children	☐ Yes ☐ No	
2. Is client a main carer?	☐ Yes ☐ No	
3. Use in home with children present?	☐ Yes ☐ No	
4. Is the client pregnant?	☐ Yes ☐ No	

Is the client high risk? ☐ Yes ☐ No

Social services involved? ☐ Yes ☐ No **If yes, details:**

Mental health services involved? ☐ Yes ☐ No **If yes, details:**

Mental health diagnosis? ☐ Yes ☐ No **If yes, details:**

Current Psychotropic Medication?

☐ No ☐ Anti-Depressants ☐ Anti-Psychotics ☐ Anxiolytics/Hypnotics ☐ Other: _____

Public Health England

TREATMENT OUTCOMES PROFILE

CLIENT ID | **KEYWORKER**

SEX: MALE ☐ FEMALE ☐

TREATMENT STAGE: START ☐ REVIEW ☐ EXIT ☐ POST-TREATMENT ☐

DOB: DD / MM / YYYY

INTERVIEW DATE: DD / MM / YYYY

Use 'NA' only if the client does not disclose information or does not answer

1 SUBSTANCE USE

Record the number of using days in each of the past four weeks, and the average amount used on a using day

	WEEK 4	WEEK 3	WEEK 2	WEEK 1	AVERAGE PER DAY	Total for NDTMS return
A. ALCOHOL	0-7	0-7	0-7	0-7	UNITS	0-28
B. OPIATES/OPIOIDS (ILLICIT) Includes street heroin and any non-prescribed opioid, such as methadone and buprenorphine	0-7	0-7	0-7	0-7	G	0-28
C. CRACK	0-7	0-7	0-7	0-7	G	0-28
D. COCAINE	0-7	0-7	0-7	0-7	G	0-28
E. AMPHETAMINES	0-7	0-7	0-7	0-7	G	0-28
F. CANNABIS	0-7	0-7	0-7	0-7	SPLIFFS	0-28
G. OTHER SUBSTANCE. SPECIFY:	0-7	0-7	0-7	0-7	G	0-28
H. TOBACCO Includes ready-made and hand-rolled cigarettes, cannabis joints with tobacco, cigars, pipe tobacco, shisha/waterpipes, etc	0-7	0-7	0-7	0-7		0-28

2 INJECTING RISK BEHAVIOUR

Record the number of days the client injected non-prescribed drugs during the past four weeks

	WEEK 4	WEEK 3	WEEK 2	WEEK 1	
A. INJECTED	0-7	0-7	0-7	0-7	0-28
B. INJECTED WITH A NEEDLE OR SYRINGE USED BY SOMEBODY ELSE	YES ☐	NO ☐			Y or N (Y if either is yes)
C. INJECTED USING A SPOON, WATER OR FILTER USED BY SOMEBODY ELSE	YES ☐	NO ☐			

3 CRIME

Record the number of days of shoplifting, drug selling and other categories committed during the past four weeks

	WEEK 4	WEEK 3	WEEK 2	WEEK 1	
A. SHOPLIFTING	0-7	0-7	0-7	0-7	0-28
B. SELLING DRUGS	0-7	0-7	0-7	0-7	0-28
C. THEFT FROM OR OF A VEHICLE	YES ☐	NO ☐			Y or N (Y IF EITHER IS YES)
D. OTHER PROPERTY THEFT OR BURGLARY	YES ☐	NO ☐			
E. FRAUD, FORGERY OR HANDLING STOLEN GOODS	YES ☐	NO ☐			
F. COMMITTING ASSAULT OR VIOLENCE	YES ☐	NO ☐			Y or N

4 HEALTH & SOCIAL FUNCTIONING

A. CLIENT'S RATING: PSYCHOLOGICAL HEALTH (Anxiety, depression, problem emotions and feelings)

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

POOR — GOOD

0-20

Record days worked, or at college or school in the past four weeks

	WEEK 4	WEEK 3	WEEK 2	WEEK 1	
B. DAYS IN PAID WORK	0-7	0-7	0-7	0-7	0-28
C. DAYS ATTENDED COLLEGE OR SCHOOL	0-7	0-7	0-7	0-7	0-28

D. CLIENT'S RATING: PHYSICAL HEALTH (Extent of physical symptoms and bothered by illness)

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

POOR — GOOD

0-20

Record accommodation status for the past four weeks

E. ACUTE HOUSING PROBLEM: YES ☐ NO ☐ — Y or N

F. AT RISK OF EVICTION: YES ☐ NO ☐ — Y or N

G. CLIENT'S RATING: OVERALL QUALITY OF LIFE (Able to enjoy life, gets on with family and partner, etc)

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

POOR — GOOD

0-20

PHE TOP v1.1 February 2016

CURRENT SITUATION

Your Sense of Control over your Drug/Alcohol Use

Poor	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Good

Your Sense of Control around Managing Sexual Risk

Poor	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Good

CLIENT CONSENT FORM

We are committed to protecting your privacy and keeping the information you provide to us confidential. Sometimes we may need to share some information about you with other services involved in your care to better allow us to co-ordinate the treatment and care you receive. If this is the case, we will make every effort to discuss it with you fully first.

Your information will not be used for any other purpose and is managed according to the General Data Protection Regulation (GDPR) and the Data Protection Act 2018. Please note that you have the right to apply for access to any records kept about you; to rectify any incorrect information; and you may withdraw consent for us to process your personal data at any time.

London Friend's Privacy Policy can be viewed at www.londonfriend.org.uk/privacy A worker can provide a hard copy version of this on request.

- I consent to London Friend storing and processing my personal data as long as necessary for the purpose of contacting me and managing my care, treatment or support in accordance with London Friend's Privacy Policy.
- I agree for my personal information to be shared with the services / individuals listed on this form.
- I agree that my anonymised treatment data can be submitted to Public Health England through the National Drug Treatment Monitoring System (NDTMS)
- I agree for information to be used by London Friend to improve and monitor services, including where working in partnerships.
- I understand that I may change or withdraw this consent at any time by emailing London Friend.

CONTACT LIST (please only provide information you consent to us holding)

AGENCY	NAME & CONTACT DETAILS	CONSENT TO CONTACT?
Emergency Contact		☐ Yes ☐ No
GP		☐ Yes ☐ No
Social Worker		☐ Yes ☐ No
Psychiatrist		☐ Yes ☐ No
Other Drugs or Alcohol Agency		☐ Yes ☐ No
Community Mental Health Team		☐ Yes ☐ No
Family Members		☐ Yes ☐ No

NDTMS	To ensure that treatment services meet the needs of service users, basic information is collected about individuals and the type of treatment you receive. All information is kept strictly confidential and does not include anything which can identify you like your name or address.	☐ Yes ☐ No

I give consent for correspondence to be sent to my home address: ☐ Yes ☐ No **I give consent to be put on the mailing list:** ☐ Yes ☐ No	**Declining will in no way affect your treatment.**

FEEDBACK

Do you feel that the work done here today has helped to increase your awareness of issues relating to substance use?	☐ Yes ☐ No
Do you feel that the work done here today will help you to improve your overall health & wellbeing?	☐ Yes ☐ No
Do you feel your visit here today will improve confidence around sexual health/well-being?	☐ Yes ☐ No

DATE	SIGNATURE

AUDIT – C

Questions	Scoring system					Your score
	0	1	2	3	4	
How often do you have a drink containing alcohol?	Never	Monthly or less	2 - 4 times p/month	2 - 3 times p/week	4+ times p/week	
How many units of alcohol do you drink on a typical day when you are drinking?	1 -2	3 - 4	5 - 6	7 - 9	10+	
How often have you had 6 or more units if female, or 8 or more if male, on a single occasion in the last year?	Never	Less than monthly	Monthly	Weekly	Daily/almost daily	

Scoring: A total of 5+ indicates increasing or higher risk drinking.
An overall total score of 5 or above is AUDIT-C positive.

SCORE ☐

Remaining AUDIT questions

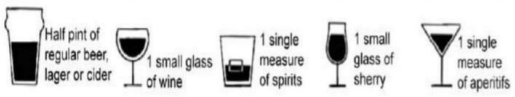
Questions	Scoring system					Your score
	0	1	2	3	4	
How often during the last year have you found that you were not able to stop drinking once you had started?	Never	Less than monthly	Monthly	Weekly	Daily/ almost daily	
How often during the last year have you failed to do what was normally expected from you because of your drinking?	Never	Less than monthly	Monthly	Weekly	Daily/ almost daily	
How often during the last year have you needed an alcoholic drink in the morning to get going after a heavy drinking session?	Never	Less than monthly	Monthly	Weekly	Daily/ almost daily	
How often during the last year have you had a feeling of guilt/remorse after drinking?	Never	Less than monthly	Monthly	Weekly	Daily/ almost daily	
How often during last year have you been unable to remember what happened the night before because you'd been drinking?	Never	Less than monthly	Monthly	Weekly	Daily/ almost daily	
Have you or somebody else been injured as a result of your drinking?	No		Yes, but not in last year		Yes, during last year	
Has a relative or friend, doctor or other health worker been concerned about your drinking or suggested that you cut down?	No		Yes, but not in last year		Yes, during last year	

Scoring: 0 – 7 Lower risk, 8 – 15 Increasing risk, 16 – 19 Higher risk, 20+ Possible dependence

TOTAL ☐

SCORE ☐

This is one unit of alcohol...



...and each of these is more than one unit

Appendix 2: Interview topic guide for qualitative study

(Opening with interview script for verbal consent)

How old are you?
How would you describe your sexual identity?
How would you describe your ethnicity?
What country were you born in?
What region of the United Kingdom do you live?

HIV prevention cascade: motivation questions

1. I would be interested to find about your PrEP journey, can you tell me about your PrEP use experience?
Knowledge of PrEP
Social network influence
Media influence

2. Can you describe what first got you thinking about using PrEP?
Worries and concerns
Peer support
Chemsex: perception on level of risk

3. Is it Ok if we discuss your chemsex experiences? Could you tell me about your journey of using chems with sex?
Frequency, type and patterns of drug use
Frequency, number, type of sexual partners/sexual acts
Motivators for engaging in chemsex

4. How would you describe your emotional and mental health well-being since participating in chemsex?
Current Mental health status and previous issues
Involvement with other social networks: family/friends
Risk: altered due influence of chemsex

5. Thinking back to when you first thought of using PrEP, were there any factors that encouraged you or put you off from seeing PrEP as being suitable?
Other HIV risk reduction interventions
Family and friends: perception of use
Use by sexual partners

HIV prevention cascade: access questions

1. Can you tell me about when you first got started on PrEP?

Time and place
Dosing method
Barriers and facilitators to get started
Reasons for stopping: doses taken, intentional non-adherence*
**if participant has discontinued, explore their PrEP use as per other participants and use specific Q5 in effective use cascade to explore their stopping experience.*

2. Can you tell me about your experience of discussions about starting on PrEP with other people?
Disclosure and peer influence
Health care professionals
Chemsex in relation to PrEP: barrier or facilitator
Support offered to get started

HIV prevention cascade: effective use questions

1. How has PrEP or chemsex effected your sex life?
Disclosure to chemsex and sex partners
Use of other risk reduction interventions: HIV/STI testing due to PrEP provision
Impact on chemsex behaviours: substance use/sexual activity

2. Can you tell me about a time that you may have missed a dose of PrEP?
Frequency of missing doses
Circumstances of missing doses
Factors that contribute to non-adherence

3. In your experience, can you tell me about any factors from participating in chemsex that impacted on you missing doses or reminded you to take them?
Influence of substances
Partners
Level of risk in behaviours

4. Can you tell me about anything that has helped you to take your PrEP doses?
Influence of family/partners
Routine
Prompts and aids

5. Can you tell me about your experience of stopping using PrEP? *(specific for participants who discontinued PrEP)*
Length of period using PrEP
Consider dosing type/adherence
Influencing factors: level of risk (substance/sex), social network, adverse effects

Thank you for the information you have provided. Is there anything else you would like to add, or do you have any questions? If you have any further questions, please contact me via my email. Would you like me to email you a copy of the report once the findings are written up? Thank you for taking part.

Appendix 3: Recruitment poster for qualitative study

Re-moved due to personal material within the content.

Appendix 4: Qualitative study participant information sheet

Title of Study: Use of pre-exposure prophylaxis among men who have sex with men who engage in chemsex

Department: Institute for Global Health

Researcher: Steven Maxwell

Principal researcher: Dr Maryam Shamanesh

Before you decide to take part, it is important for you to understand why the research is being done and what participation will involve. Please take time to read the following information and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading this.

Why are we doing this study?

This is part of a PhD research project that is exploring PrEP use and medication adherence among men who have sex with men who participate in chemsex. This is specifically trying to better understand if chemsex impacts on PrEP use and medication adherence and if using PrEP impacts on factors involved in chemsex. The findings will be used to help inform the development of HIV prevention policy and practice. This PhD is due to be completed by the 31 March 2022. The study has been provided ethics approval from University College London.

Why have I been chosen?

The study is being advertised via social media and taking part in the study is only if potential participants contact the researcher for further details. The study is aiming to recruit around 20 men.

Am I eligible to be take part?

You can take part in the study if you meet the following criteria:

- A man who has had sex with other men
- 18 years old and over
- HIV negative or assumed HIV negative
- Have participated in chemsex in the last 3 months
- Are currently using PrEP or have stopped using PrEP in the last year

What does participation involve?

This will involve one telephone interview with the researcher, which will last approximately 45 minutes. This will involve questions about your drug use, sexual life, PrEP use, mental health and social supports.

Do I have to take part?

If you do decide to take part, you can keep a copy of this information sheet and a verbal consent statement will be read out by the researcher at the start of the interview. This is to ensure there is a record for obtaining informed consent and you are fully satisfied with taking part in the study.

You can withdraw at any time without giving a reason and without it affecting any benefits that you are entitled to. If you decide to withdraw you will be asked what you wish to happen to the data, you have provided up to that point. Upon your request, all your data can be destroyed.

Will I be recorded and how will the recorded media be used?

The interview will be audio-recorded. The recordings will be kept in secure, password protected files. The recordings will be typed-up, but we will not type up any details that might identify you. The audio-files will be destroyed once the study is complete. Any direct quotations from participants will be used anonymously.

What are the possible disadvantages and risks of taking part?

The interview will involve discussion about experiences that you may find personal and sensitive. This will include your experiences about your sex life, drug use and health and well-being. At any time during the interview, you can ask for it paused or stopped without having to give a reason.

What are the possible benefits of taking part?

After the interview, you will be emailed a £20 e-voucher for Amazon, this is to provide a thank you for participating in the study. If you decide to withdraw from the study after the interview is complete, you will keep the £20 e-voucher.

What if something goes wrong?

If you are not happy with any aspect of your involvement in the study and wish to make a complaint, in the first instance please contact the principal researcher (Dr Maryam Shahmanesh). Should you feel the complaint has not been handled to your satisfaction, please contact the Chair of the UCL Research Ethics Committee:

Is my participation confidential?

Yes. Your personal information will only be used for the purposes of this research and used in accordance with all relevant Data Protection Legislation. Your identity will be kept strictly confidential, and all information will be held securely. The researcher will not reveal your name, or any other information that might identify you

to any other person. Your information will be kept securely on file, but this will be fully destroyed once the study is complete.

Limits to confidentiality

Please note that assurances on confidentiality will be strictly adhered to unless evidence of wrongdoing or potential harm is uncovered. In such cases the University may be obliged to contact relevant statutory bodies/agencies.

What will happen to the results of the research project?

A report will be typed up and will be available for anyone to read but there will be nothing in it that can identify you and there will be no mention that you took part in the study. Findings from the report might be reported at conferences, in academic papers and in the media (you will not be identified). All participants can be emailed a copy of the report.

Data Protection Privacy Notice

The data controller for this project will be University College London (UCL). The UCL Data Protection Office provides oversight of UCL activities involving the processing of personal data, and can be contacted at: . UCL's Data Protection Officer is and he can also be contacted at:

Your personal data will be processed for the purposes outlined in this notice. The legal basis that would be used to process your personal data will be public task and for special category data it will be for research purposes. Informed consent will be obtained by the researcher reading out a statement at the start of the telephone interview. You can provide your consent by verbally agreeing to the statement after it has been fully read out by the researcher.

Your personal data will be held for a maximum period: up to the 31 March 2022. If we are able to anonymise or pseudonymise the personal data, you provide we will undertake this and will endeavour to minimise the processing of personal data wherever possible.

If you are concerned about how your personal data is being processed, please contact UCL in the first instance at: . If you remain unsatisfied, you may wish to contact the Information Commissioner's Office (ICO). Contact details, and details of data subject rights, are available on the ICO website at: https://ico.org.uk/for-organisations/data-protection-reform/overview-of-the-gdpr/individuals-rights/

Contact for further information
If you any queries or wish to participate, please contact the researcher, Steven Maxwell:

Thank you for reading this information sheet and for considering taking part in this research study.

Appendix 5: Qualitative study interview script for informed verbal consent

Hello, my name is Steven. I am a PhD student from University College London, Institute for Global Health. We arranged a telephone interview today for you to participate in the research study about your PrEP use experiences when you have engaged in chemsex. The full conversation will be recorded today if that is Ok? If you are Ok to go ahead, I will read out a statement that is required for verbal consent?
All information will be handled in accordance with all applicable data protection legislation. The legal basis that will be used to process your personal data will be public task and for special category data it will be for research purposes.

Your identity will be kept strictly confidential, and all information will be held securely. The information you supply will be written in a report and available for people to read but this will be fully anonymized, and you will not be identifiable. Findings from the report might also be reported at conferences, in academic papers and in the media. However, you will not be identifiable and all direct quotations you provide will be used anonymously. All the information you supply, will be destroyed once the study is complete, this will be the 31 March 2022.

Please note that confidentiality will be maintained as far as it is possible, unless during our conversation I hear anything which makes me worried that someone might be in danger of harm, I might have to inform relevant agencies of this.

Your participation in this research is entirely voluntary, and you may withdraw at any time without giving a reason. If you wish to later withdraw, please contact me by email and all the information you supplied can be destroyed.

The interview today forms part of my PhD, which is aims to understand the PrEP use and medication adherence experiences of men who have sex with men who engage in chemsex. This specifically, is about trying to understand if chemsex impacts on PrEP use and if PrEP use impacts on chemsex. I will be interviewing around 20 men, and today this will involve an interview with myself lasting 45 minutes. This will include questions about your drug use, sexual life, PrEP use, mental health and social supports.

I understand some of these topics are sensitive, if at any time it is difficult to talk about them, please let me know and we can pause or close the interview. You can stop the interview at any time without giving a reason. After the interview today, if it is helpful, I can email you support information about PrEP and chemsex.

After completing the interview today, I will email you a £20 e-voucher. There are no further direct benefits for taking part, but it is hoped the information you supply today will inform the development of evidence-based policy and practice for PrEP use. Once the findings are written into a report, I can email you a copy.

Do you agree to be in the study? Can I go ahead and ask you some questions to help me understand your experiences?

Appendix 6: Ethics approval for qualitative study

Re-moved due to personal material within the content.