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Title: “Geographies of PrEP, TasP and Undetectability”

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Abstract

Recent biomedical innovations in the field of HIV prevention and treatment- namely PrEP, TasP and ‘undetectability’- have completely reshaped the experience of living with virus as well as the meaning of ‘risk’ and ‘safety’ in sexual practices, leading to new forms of pleasure and sociality. While human geographers have been slow to engage with the changing social dimensions brought by these innovations, scholars from the whole spectrum of the social sciences have been far more creative and responsive contributing to a critical understanding of what these processes entail in terms of subject formation, and social and communal relations. The aim of the paper is to propose a distinctly geographical contribution to analysing and interpreting these biomedical technologies, exploring the ways they produce new geographies. Our approach is based on provisional assemblage thinking as it offers the possibility to think the complex connections between biomedical innovations in the field of HIV, sexual practices, subjectivity, pleasure, spaces and technologies, going beyond the subdisciplinary preoccupations and methodological reflexes of geographers focused primarily on either health or sexuality.

Keywords

HIV – assemblage – pleasure – prevention – therapies – geographies of sexualities

Introduction

Since its emergence in the 1980s, HIV and AIDS have completely reconfigured gay and bisexual men’s sexuality, everyday and social life, and forms of activism and political participation. However, the advent of highly active antiretroviral therapies (HAART) first, and more recent developments around ‘undetectable viral load’, ‘Treatment as Prevention’ (TasP), i.e. and Pre-Exposure Prophylaxis (PrEP) have reshaped the significance of living with the virus in terms of life expectancy, (safe) sex,

risk and prevention. This paper thinks about these recent biomedical developments together in order to contribute to new perspectives on the geographies of HIV and to consider how they are reshaping gay and bisexual men's lives in the Global North.

With a few, limited, exceptions (e.g. Carter et al., 2016; Di Feliciano, 2018, 2019; Myers, 2012; Robertson, 2007), human geographers have been slow to engage with the changing dimensions of living with HIV under the new consensus around 'undetectability', and the controversies (and contradictions) surrounding recent forms of prevention, such as TasP and PrEP. Unlike geographers, scholars across social sciences have deeply engaged with them, contributing to a critical understanding of what these processes entail in terms of subject formation, and social and communal relations (e.g. Auerbach and Hoppe, 2015; Brisson, 2019; Girard et al., 2019; Race, 2018; Young et al., 2016). The aim of this paper is to outline and propose a distinctly geographical contribution to analysing and interpreting these changing biomedical technologies, and their "capacity to reorganise social and material worlds" (Race, 2018: 2), producing new, unanticipated, geographies in the process.

While global access to HAART has increased deeply in the last decades (but severe territorial and social inequalities persist), the roll-out of PrEP has been far more partial and uneven, gay and bisexual men in the Global North (and amongst relatively elite groups in the rest of the world) benefiting most from its introduction.

Given our backgrounds as geographers of sexualities, we choose to focus on the impacts and consequences of PrEP, TasP and undetectability on this social group. We are aware that such choice echoes and perpetuates other gaps, inequalities and exclusions in global health strategies (T Brown et al., 2012; Reid-Henry, 2014). We leave it to others to take up the ideas contained in this paper and to think through how they might be applied to other social groups and in other global contexts.

There has been a growing interest in assemblage thinking (DeLanda, 2016) within health geographies over recent years (Andrews, 2019; Andrews and Duff, 2019; Del Casino Jr, 2018; Duff, 2014; 2016). To a lesser extent, this approach is also being explored by geographers of sexualities (Nash and Gorman-Murray, 2017). This work has conceptualised the complex relationships between human and non-human elements in the formation and management of 'health' and 'wellbeing'. In this paper, we use assemblage thinking to explore different aspects of contemporary HIV treatment and prevention, and to chart some of the social, cultural, and political affects, assemblages and events that emerge from the coming together of the HIV virus, pharmaceuticals, bodies, and other objects, in ways which either make the virus undetectable in the body of a person with HIV, or prevent the infection of others (Gagnon and Holmes, 2016). Our use of assemblage thinking is somewhat

provisional; while we believe that it is plausible to appreciate ‘treatment as prevention’ and PrEP as assemblages in which heterogeneous objects become connected to/around HIV, we also use this approach tactically, to try and shift the terms of the debate and draw attention to connections and relations that tend to be obscured by the subdisciplinary preoccupations and methodological reflexes of geographers focused primarily on health or sexuality. As we explore later in the paper, we are not the first scholars to approach HIV and its treatment as assemblages (Rosengarten, 2009). But, by bringing this approach into the geographical study of HIV, we find ourselves more able to think across sub-disciplinary boundaries and to draw attention to the connections between different types of spaces and spatial relationships which are central to the (re)production of this assemblage and within which its affective power is experienced.

The key theoretical contribution of this paper is twofold. First, it conceptualizes new geographical responses to the latest developments in HIV treatment and prevention; and, second, by utilizing an assemblage approach, we think across multiple sites and spatial scales to highlight the ways in which changing biomedical approaches are reshaping gay lives. We make this intervention because, with a few exceptions (Davies et al., 2018; Lewis, 2015; Lewis et al., 2015; Tucker, 2016), there has been a curious silence around HIV in many recent debates about geographies of sexuality, and this overlooks the virus’s continuing role in shaping gay and bisexual men’s lives. Our use of assemblage thinking to frame these interventions is partly driven by a desire to trace what things come together to shape the contemporary experiences of ‘undetectability’. But, it is also motivated by an acceptance that framing our analysis in a way that is attentive to immanence and emergence helps step outside of some of the problematic ‘paranoid thinking’ (Sedgwick, 2003) that has come to shape queer anti-normative critiques.

The paper is structured through six main sections. It begins with a concise review of existing geographical work on HIV to review key themes and debates, as well as to identify some of the ways in which this body of work is limited in its capacity to think through the implications of PrEP and undetectability. The paper then thinks with and through different aspects of the undetectability assemblage, beginning with an examination of the materiality of the HIV virus and the medications used to treat and prevent its spread. Next the paper considers the forms of biomedical surveillance that are required to maintain HIV at undetectable levels in the body and engages with the biopolitical concerns raised by this surveillance. The following sections turn from the treatment and prevention of HIV itself to examine the negotiation of new forms of pleasure which emerge out of the assemblage. The first of these sections examines the renegotiation of bodily fluids and the declining significance of condom use as a primary HIV prevention measure. The second section explores the ways in which these embodied renegotiations of sex, risk and pleasure are contributing

to a wider reconfiguration of gay men's socio-sexual spaces and practices. The next section examines the uneven roll-out of PrEP across different national contexts, thinking through the geopolitical aspects of this, as well as some of the strategies that gay and bisexual men have developed, individually and collectively, to circumvent restricted access to PrEP. In line with the attention to pleasure in other sections of the paper, here we argue that these economic practices and extra-territorial mobilities are difficult to detach from other aspects of gay men's social and sexual lives. Finally in the conclusions we highlight the potential contribution of our approach across different sub-disciplines of human geography.

Reviewing geographical theorizations of HIV treatment and prevention

Medical geographers were amongst the first in the discipline to engage with the spatialities of HIV and AIDS, focusing on the spatial distribution and diffusion of the pandemic at different scales (Casetti and Fun, 1991; Dutt et al., 1987; Gardner et al., 1989; Gould, 1993; Pyle, 1992; Shannon and Pyle, 1989; Shannon et al., 1991; WB Wood, 1988). One of their main endeavours consisted of modelling the epidemic in order to anticipate the future geographies of AIDS, thus supporting public health responses and new prevention targets and models (e. g. Golub, Gorr and Gould, 1993; Gould, 1991; Loyotonnen, 1991; Wallace and Fullilove, 1991). In his review of the study of AIDS in medical geography, Kearns (1996) stressed the need to consider five dimensions to understand the relation between space and the new epidemic: its distribution; diffusion; determinants; delivery; and difference. While the first four concerned the main traditional fields of enquiry for medical geographers influenced by spatial science, the last one questioned the experience of health and illness across different social groups (see also Kearns, 1995).

Kearns' thesis followed the milestone paper by M Brown (1995) on the geographies of AIDS, in which he argued that medical geographers were mostly focused on the geographies of the virus, rather than people living with it, and ended up erasing (the experiences of) the social group most affected by the epidemic in North America, i.e. gay men (Schulman, 2018). In M Brown's (1995: 161) own words,

“Gay men and their spaces are foregrounded unidimensionally, asocially, and only occasionally as nodal points in an epidemiological epic. These people are textually, socially distanced as bodily carriers. The viral focus reduces the already marginalized gay body to a mere vector for illness. Further, geographers have taken an Archimedean, abstracted—hence distanced—account of space in its portrayal of the AIDS crisis. Only certain places are

discussed from a global perspective, while others—specifically gay communities in North America—are all but ignored”.

Against these approaches, M. Brown (1997) later advocated for a more sustained engagement with ethnographic methods, demonstrating how the AIDS crisis opened new political spaces beyond those defined by state administration, reshaping the meanings and sites of citizenship, thus enabling the emergence of new political identities amongst gay men. The focus on community responses and everyday activism was key to the understanding of the evolution of urban (gay) politics and the development of successful prevention, education and support initiatives (Altman, 1994; M Brown, 1999; France, 2016; Kayal, 1993). In this period, another important ethnographic study was offered by Wilton (1996) who examined the everyday lives of gay men living with HIV/AIDS in Los Angeles. Despite HIV/AIDS representing a terminal condition, at the time, thus ‘diminishing’ the everyday life of those infected because of physical deterioration, social stigma and emotional trauma, Wilson highlighted how the infection did not mark a univocal path to death. He identified different factors shaping the experience of daily life with HIV/AIDS, including: individual physical and psychological strength, the men’s social networks, community support, and access to support services. Wilson and Brown’s studies refocused the geographies of HIV/AIDS from maps of distribution and diffusion towards social geographies of the condition, in which place and difference were understood to have a central role in the experience of the illness. While this was an important development in the context of the mid-1990s, we argue that there is now a need to articulate the more-than-human social and political geographies of HIV. Advances in the treatment and prevention of HIV place geographers in a position where by attending to the materiality of the virus and the medications that suppress it we can better understand its place in, and impact on, the socio-sexual cultures of contemporary gay men.

The mid-1990s represented a turning point for HIV treatment with the introduction of HAART reshaping the bodies and life aspirations of people living with HIV. From that point on, living with HIV progressively improved as medical condition, although the side effects of the new medications could still be very taxing and visibly carried on the HIV-positive body (Persson, 2005). However, this improved situation was far from enjoyed equally (either socially or geographically) and specific groups and communities struggled to access the new therapies, while entire countries could not get them because of the extremely high costs involved. In Western countries, several studies published in the early 2000s showed how access to HAART was higher among people with upper socio-economic status (SES) even in countries where access to HAART, and healthcare in general, was free (Borrell et al., 2006; McFarland et al., 2003; Schwarcz et al., 2000; E Wood et al., 2002). Internationally the unequal access to HAART mostly concerned African countries where AIDS-related

deaths continued to rise, while in Western countries HIV/AIDS was gradually becoming a chronic but manageable condition. The geographical study of HIV, thus, came to represent a privileged viewpoint from which to look at different transnational issues (healthcare systems in times of financial constraints; international aid and cooperation; migration) through a political economy perspective (e.g. Hunter, 2007; Ingram, 2010, 2013; King, Burka and Winchester, 2018; Marx, Halcli and Barnett, 2012).

Beyond this robust political economic orientation, as result of the diffusion and availability of HAART most (geographical) studies centred in Western countries in recent decades have tended to focus on prevention strategies rather than the geographies of people living with the virus (for exceptions see Carter et al, 2016; Di Felicianantonio, 2018, 2019; Doyal, 2009; Evans, 2011; Evans and Thomas, 2009; Robertson, 2007). However, in both cases, increasing attention has been directed to the intersection of different social processes and identities, such as race, class, age, and gender, to understand the existing barriers to prevention programs and testing as well as the different experience of living with the virus according to these relational and contextual factors. As we demonstrate throughout the rest of the paper, though, the contemporary geographical implications of undetectability and PrEP are *not just* about those living with HIV, or at risk of contracting it, but reshape a wider set of spaces in which the virus's (real and imagined) presence circulates.

The materiality of the virus and medication

Current medical guidelines (WHO, 2015) recommend that people diagnosed with HIV should commence anti-retroviral treatments at the earliest opportunity, to minimize the long-term damage to their immune systems, and to ensure that they cannot infect others. Following the 'Swiss Statement' in 2008 (Vernazza, 2008), medical research has established that those on therapies with an undetectable viral load for more than six months cannot transmit the virus to others. This new knowledge accelerated the impetus for the development and spread of TasP, a strategy based on getting people to test regularly in order to know their serostatus and start HAART early. People on anti-retroviral therapy need to take medication every day. When early forms of HAART were introduced in the 1990s, the combined drug regimens usually required taking multiple pills each day, at highly regimented time-intervals. As these medications have improved, most people now only need to take a single pill each day.

HIV attacks the CD4 cells of the immune system, which help the body fight infection. Untreated, HIV not only attacks CD4 cells, but uses them to replicate and transport itself around the body. Anti-retroviral drugs work by preventing the HIV virus from multiplying (making copies of itself) and thus

reduce the amount of HIV in the body (the 'viral load'). Reducing viral load allows the body's immune system an opportunity to recover and better fight off infection and those opportunistic infections and cancers to which people with HIV can be susceptible.

A variety of different HIV medications are currently approved for use. These HIV medicines are grouped into seven drug classes (which each share similar chemical structures and correspond to different mechanisms for blocking the replication of the HIV virus at each of the seven stages of its lifecycle). When individuals start on anti-retroviral therapies, they are usually prescribed a combination of three different HIV medications from at least two drug classes. The exact combination prescribed depends on possible side effects, potential interactions with other medications, and whether blood tests reveal the individual to have a mutation of HIV which is resistant to any specific drugs.

Truvada is the brand name of the main drug approved for use as Pre-Exposure Prophylaxis (although other drugs are currently undergoing clinical trials, and 'Truvada' is also available in generic forms). It is a combination of two different HIV medications, Emtricitabine and Tenofovir Disoproxil. PrEP is either taken daily, on an on-going basis, or on an 'events-based' basis (where people take two doses of the drug 2 - 24 hours in advance of an anticipated condomless sexual encounter, and then one pill a day for the two days afterwards – this method is only proven to work for anal, not vaginal/frontal, sex). By taking the medication regularly, the levels of anti-retroviral drugs build up in the individual's bloodstream, genital tract, and rectum before they are exposed to the virus. With this concentration of the drugs in key parts of the body, should exposure to the virus occur, HIV is unable to enter cells and replicate. Infection does not occur.

To account for the productive role of medications in the construction of social relations and sexual life, a more generative approach to conceptualizing living with HIV is needed. Approaches based around assemblage thinking provide an important step forward here, as shown by their increasing use in studies on HIV-prevention and treatment to frame the complex and generative character of drugs. Rosengarten (2009) was one of the first scholars to challenge the opposition between 'the living' (humans) and 'the material' (viruses, drugs, medical knowledge) in HIV-related knowledge, arguing that antiretroviral drugs are agents, not simply passive 'things'. For Gagnon and Holmes (2016: 255), the most basic assemblage to consider is the "antiretroviral drugs-body" which is variable from one person to another and is part of a wide network of connections with other people living with HIV, organizations, practices, medical programs, healthcare systems, and so forth, resulting "in a constant *state of becoming*" (italics in original). Similarly, in addressing the ethical issues raised by PrEP trials among 'at risk' populations in low income countries, Rosengarten and Michael (2009: 194) suggested conceptualizing PrEP as a 'prophylactic assemblage' whose ontology

“is a constant negotiation between the singularity of PrEP designated at an international level ... and the complex fluidities of PrEP as it emerges out of local context-related phenomena”. Building on these ideas, Race (2012) framed HIV-prevention as an *event* resulting from the collective activities of both human and non-human actors, thus including drugs, norms, discourses, medical practices and settings. Here we expand our attention beyond the ‘prophylactic assemblage’ to consider how it combines with the ‘treatment assemblage’ to function as part of a broader assemblage of undetectability. Over the sections that follow, we think out from the virus, thinking about how different objects, processes and relations come together to form the undetectability assemblage.

Biomedical surveillance and biopolitics

To achieve (and maintain) undetectability requires strict adherence to medication regimes and regular bloodwork to monitor viral load, to check for possibly drug resistance, as well as monitoring the effects of medication on the liver and other organs. This is often accompanied by a full sexual health screening. PrEP users are also advised to comply with similar surveillance regimes – they need to have an HIV test before starting the medication to confirm they are HIV negative, otherwise there is a risk for the body to develop drug resistance. Once on PrEP, they need regular testing to confirm non-infection and to monitor potential side effects. Consequently, we want to think through some of the paradoxes of ‘undetectability’ and to consider what the implications of these biomedical advances might be for contemporary sexual citizenship. The most obvious of these paradoxes is that ‘undetectability’ relies on continuous biomedical surveillance (Guta, Murray and Gagnon, 2016).

We therefore suggest that it is useful to think of TasP and PrEP not simply as forms of medication, but as socio-technical assemblages (Race, 2009), that involve far more than the consumption of a single pill each day. These surveillance and monitoring technologies are a key part of that assemblage, but they also help make visible some of the ways in which these new approaches to HIV treatment and prevention have wider social, cultural, and political consequences, even for those who do not directly engage with these medications (Girard et al., 2019; Grace et al., 2015; Persson, 2013).

The monitoring of viral load does not just occur at an individual level, as an indicator of adherence to drug regimes and a measure of successful treatment. It has also been aggregated and mapped to provide an epidemiological measure of ‘community viral load’ (Castel et al., 2012; Das et al., 2010) – both as a marker of where treatment as prevention should be having an impact, and to identify ‘viral concentrations’ where it appears to be less successful. There is certainly considerable evidence now that the more individuals living with HIV within a geographically-based population know their

serostatus and adhere to treatment, the more likely it is that a reduction of new infections will subsequently be recorded amongst that population. The significant reductions in HIV infection rates amongst gay men in San Francisco, New York, and London in recent years attest to this (e.g. Nwokolo et al., 2017). When twinned with widespread PrEP use amongst HIV negative people, viral suppression can play a significant role in the management of HIV.

Stepping back from the intricacies of viral load monitoring, it is beneficial to think about 'undetectability' in relation to long-standing debates about sexual citizenship and homonormativity (Bell and Binnie, 2000; Richardson, 2017). For nearly 50 years, gay (and, later, LGBT) activism in many places around the world has principally been founded on the strategic importance of public visibility for sexual minority groups (whilst also simultaneously demanding the right to privacy). 'Coming out', Pride parades, and the development of 'gay villages' were all, to some extent, founded on the belief that greater public visibility for sexual minorities would help overcome shame and stigma, and eventually lead to shifts in social attitudes towards homosexuality. These assumptions about public visibility (especially in urban space) underpinned much of the early geographical work on gay lives. Of course, as Podmore (2006) demonstrated the resulting methodological assumptions tended to make gay male spaces more visible to the geographers' eye and perpetuate the invisibility of lesbian spaces. Equally, as Tucker (2009) showed in his study of queer visibilities in post-apartheid South Africa, what in/visibility looks like and where it is enacted varies geographically and is overdetermined by the intersections of social class and racial politics (amongst other factors).

In her theorization of the 'new homonormativity', Duggan (2002: 179) worried about the ways in which this contemporary gay politics in the USA was turning its back on the public visibility (founded in public sexual cultures) of the 1970s and 1980s, in favour of a "demobilized gay constituency and a privatized, depoliticized gay culture anchored in domesticity and consumption". Duggan (2002) primarily articulated her analysis of these changes in terms of political economy – seeing homonormativity as an aspect of the sexual politics of neoliberalism (cf Brown 2009, 2012; Di Feliciano, 2015). Revisiting Duggan's theorization of homonormativity it is noticeable how little the changing politics of HIV/AIDS factors into her analysis. This is not to suggest that neoliberal economics and political imperatives were not significant in the emergence of a 'depoliticized', 'privatized' and 'domesticated' gay constituency; but to recognise that Duggan was writing in the aftermath of 'the Protease Moment', when HIV mortality rates were dropping across Western countries and the life expectancy of many people with HIV was beginning to improve as a result of those new HAART. It is, perhaps, understandable that after a decade and a half of urban gay populations being decimated by AIDS-related deaths {and those populations being mobilized to care for the sick, remember the dead, and demand access to appropriate treatments), that gay men and

their allies might respond to advances in medical treatment by seeking a slower pace of life, for a while. We are not suggesting that the advances in anti-retroviral treatments led, causally, to homonormative sexual politics, but we do think they form (an overlooked) part of the socio-technical assemblage out of which these new normative political imperatives arose.

Whether a person has an undetectable viral load cannot be read through casual (or even intimate) observation of their body. Even so, 'undetectable' is not 'invisible'. Not only does undetectability rely on significant, regular biomedical surveillance, it is becoming increasingly visible in other ways too. In early 2016, the U=U (Undetectable = Untransmittable) initiative was launched by the US-based Prevention Access Campaign. Within a year, more than 400 organisations in 60 countries had endorsed their consensus statement (Eisinger, Dieffenbach and Fauci, 2019). Making the medical and epidemiological consequences of undetectability known and understood is now a global endeavour (Amico and Bekker, 2019). It is intended not only to encourage people exposed to HIV to test, to seek, and adhere to treatment in order to achieve an undetectable viral load, it is also hoped the U=U message will tackle and reduce stigma about HIV infection. Much has been written about HIV anxiety and stigma (Calabrese and Underhill, 2015; Schwartz and Grimm, 2019), and rightly so, but we believe focusing only on the experience of stigma (and how to diminish it) can obscure other affects that attach themselves, productively, to the undetectability assemblage. It is for this reason that we will discuss the reconfiguration of pleasures later in this paper.

How to conceptualize and understand the political significance of these new forms of biomedical surveillance has provoked considerable debate. Building on popular Foucauldian theories of (bio)power and medicalization, some prominent scholars have assumed a critical stance in relation to the biopolitics of PrEP. Despite asserting that he is not against PrEP, the critical sexualities scholar Tim Dean (2015: 239) has framed its introduction as the manifestation of 'pharmacopower' allowing gay men to engage in 'raw' sexual practices supported by "the magical idea of invisible condoms". From this perspective, sex has become "hypermediated by technologies - pornographic as well as pharmaceutical - that give biopower full access to our bodies and their desires in the service of economic profit" (Dean, 2015: 239). Dean's critique built upon Preciado's (2013) theorization of 'pharmacopower'. Taking the example of the birth control pill, Preciado argued that it marked a shift from a regime of control represented by the Foucauldian panopticon to a "pharmacopower" regime: power no longer relies on an external architecture but infiltrates and occupies the body through the pharmaceutical substances we ingest. On this basis, Preciado (2015) has also criticized PrEP for extending the logics of biopolitical control to the HIV-negative, mostly gay, body and modifying sexual ecologies. There is certainly an argument to be made that PrEP is a perfectly 'neoliberal' intervention, given that (at least from one perspective) it encourages individualized responsibility for

HIV prevention in ways that are consistent with broader neoliberal trends in healthcare (Fries, 2008; Mooney, 2012). From a less paranoid perspective, Florencio (2018) and Schubert (2019) have attempted to articulate the more 'democratic biopolitics' of PrEP. Without denying that there is a biopolitics at work, Schubert (2019) focuses on the ways in which access to PrEP has been widely driven by the grassroots advocacy and campaigning of gay men themselves. He argues that PrEP is contributing to the 'destigmatization' of gay sexuality and transforming gay subjectivities – topics which we return to later in this paper. While the debates around biopolitics and "pharmacopower" shed light on significant political concerns surrounding PrEP, we believe these approaches limit researchers' capacity to (re)think the complex negotiations between sexual practices, medical technologies, desire, pleasure, and subject formation that result from the new geographies of PrEP and undetectability.

Latex and fluids

Biomedical advances around TasP and PrEP throw into question the continued use of condoms as an HIV prevention strategy (Hughes et al., 2018). Indeed, medical evidence suggests that (when adhered to properly) PrEP is statistically more reliable in preventing HIV infection than condoms (although condoms are still effective protection against many other STIs) (McCormack et al., 2016). Although research and anecdotal evidence suggest that many gay men were already dispensing with condoms before the widespread availability of PrEP (e.g. Dean, 2009), the (potential) displacement of condoms as the primary prophylaxis against HIV draws new attention to the materiality of anal sex and the sexual exchange of bodily fluids between gay men. Indeed, in exploring gay men's initially ambivalent responses to the availability of PrEP, Race (2016) argued that an aversion to sex (and its messy materialities) had long been a feature of both individual and ideological responses to HIV. He suggested that for more than three decades condoms have functioned not just as a barrier to infection, but a membrane against confronting some of the (psychoanalytically) disruptive qualities of gay sex in a heteronormative society. In other words, we might ask, as condoms begin to fall out of the HIV prevention assemblage, does semen become materially more significant in the socio-sexual assemblages of undetectability?

The body has been at the core of the field of geographies of sexualities since its inception. Attending to the body has allowed geographers of sexuality to consider its sexualized and gendered character; its role in disrupting sexual normativities and power relations; as well as its cultural and social construction (Cream, 1995; Gorman-Murray, 2007; Hutta, 2016; Johnston and Longhurst, 2016; Misgav and Johnston, 2014). However, sex itself is still, curiously, under-explored by geographers interested in sexuality (G. Brown, Browne and Lim, 2011). As noted by Gorman-Murray (2007: 114),

“it is through the body that we encounter and make sense of the world. The body is the threshold between individual selves, the lens through which we perceive the intentions and actions of others, and the medium through which we engage in interpersonal interactions and relationships”.

Following Dorn and Laws (1994), medical and health geographies started engaging with bodily geographies, focusing on several issues such as fitness and the cultural construction of *othered* bodies, impairment, pregnancy, illness, medication, diagnosis, assigning a central analytical role to the working of medical knowledge and practice in shaping these bodies (see Parr, 2002, for a review of the debate). Despite this increasing attention to the body, geographers have tended to ignore “the fluid, volatile flesh of bodies” and, more generally, “a body that breaks its boundaries - urinates, bleeds, vomits, farts, engulfs tampons, objects of sexual desire, ejaculates” (Longhurst, 2001: 23). We argue that, in thinking about the component parts of the assemblage of undetectability, new attention needs to be paid to the changing significance, meanings and practices that become attached to sexual contact with bodily fluids between gay men (Florencio, 2018).

Despite its potential to prevent HIV infection, a number of researchers (working in different national contexts) have noted the initial ambivalence and reticence of large numbers of gay men towards PrEP in the early stages of its implementation (Brisson and Nguyen, 2017; Race, 2016; Thomann, 2018). Indeed, several high profile gay and AIDS activists publically questioned the social, political and ethical implications of the new medication. Precisely because PrEP might alleviate anxieties around sex, and reduce the risks associated with ‘raw’ sex (without condoms), there were many instances of ‘slut shaming’ against PrEP users (Calabrese and Underhill, 2015; Schwartz and Grimm, 2019; Spieldenner, 2016). This brings us back to Kane Race’s (2016: 14) argument about the social role of condoms over the last four decades,

“the ongoing controversy over PrEP and gay sex speaks to how condoms have served to manage communal fears about sexual excess in the era of AIDS, providing not only a latex barrier but also symbolic reassurance that gay sex might in some way be made “safe.” Symbolic because, given its clinical efficacy, the characterization of PrEP use as “irresponsible” could make sense only in a world in which the problem that HIV prevention is supposed to address is not simply viral transmission but the moral danger attributed to gay sexual pleasure in general”.

For this reason, Race (2016: 7) – writing at a far earlier stage in the implementation of PrEP - defined it as a *reluctant object* manifesting the aversion to sex on the part of both the gay community and HIV clinical/behavioural research shaped “by attempts to manage or otherwise avoid the

presumptive negativity of sex". Since Race made that intervention, the uptake of PrEP in those major urban centres of the Global North with large gay populations has grown considerably. It appears that some of this earlier 'reluctance' has passed. And yet, that does not mean that all gay men are entirely comfortable with dispensing with condoms and renegotiating their relationship with seminal fluid. For Brisson (2019), PrEP as a medical technology and gay subjectivities are co-produced, although the meanings assigned by the subject need to be historically situated within specific systems of knowledge and medical practice. Although the participants in his study were regularly practicing 'unprotected sex' without condoms, they were not interested in utilizing the new biotechnology because they associated it with the morally despicable practice of bareback sex. This suggests that even as condoms fall out of gay men's socio-sexual assemblage, the meanings attached to them linger and limit new lines of flight. More broadly, though, we argue that new geographical work on HIV, undetectability and PrEP (particularly attending to the experiences of gay and bisexual men) should take changing embodied experiences seriously *and* consider how changes in the treatment and prevention of HIV are reconfiguring the role of fluids in sex and understandings of 'safer sex'. These are topics we will return to, from a different vantage point, in the next section of the paper.

Socio-sexual spaces and pleasures reconfigured

Undetectability, TasP and PrEP cannot be reduced to health-related events, they combine with a myriad of social and technical objects to reshape the ways in which (homo)sexualities are lived. In this section we explore the new possibilities opened by these biomedical technologies in terms of pleasure, social life and sexual citizenship through the use of assemblage thinking, showing how these new forms of pleasure and sociality are always part of wider socio-spatial-technological assemblages.

Undetectability (metaphorically and materially) disrupts the binaries of public visibility and privatised invisibility that have shaped debates about the geographies of sexual citizenship since the 1990s, as well as more recent theorizations of homonormativity (Bell and Binnie 2000; Duggan 2002). In fact the 'gayborhood'- as the main spatial configuration of the new homonormative regime- seems to reproduce *othering* (Casey, 2007) and *invisibility* of the HIV-positive body in ambiguous ways, thus requiring qualitative and complex analyses (M Brown, 1999). However, with the increasing 'demise of the gayborhood' (M Brown, 2014; Reynolds, 2009) across the Global North and the emergence of so called 'queer-friendly neighborhoods' (Gorman-Murray and Waitt, 2009), shall we assume the full *invisibilization* of the HIV-positive body? This seems to contrast with the

recent emergence of several sex parties aimed particularly at men on PrEP and TasP through a no condom policy and imagery.

Undetectability and PrEP are becoming visible in other ways too. For example, Grindr and other gay-focused hook-up apps have incorporated questions about HIV status (including the option 'negative on PrEP'), most recent test date, and preferred sexual health strategies into their profile templates. Quite apart from the consequences of these developments for interpersonal interactions and social attitudes, they are of legal significance in those juridical contexts where non-disclosure of HIV-positivity before sex is criminalized (Lazzarini et al., 2013).

In approaching TasP and PrEP as socio-technical assemblages, we believe it is productive to connect this analysis with other recent applications of assemblage thinking by geographers of sexualities. Nash and Gorman-Murray (2017) have explored how mobile flows of people, ideas, knowledge and capital, become assembled in temporary and unstable arrangements which recursively reshape both sexualities and the (urban) spaces where they are lived out. While the assemblage they describe brings together changing urban property markets; new divisions of labour and modes of working; changing legal arrangements; digital technologies, and more; there is no mention of HIV or the socio-technical assemblages that gather around its treatment and prevention. One could object that HIV is undetectable here (it is certainly invisible). However, as charted by Tim Dean (2009, the emergence of effective anti-retroviral treatments twenty years ago consolidated the emergence of new sexual and cultural practices amongst some gay men – namely 'barebacking' (sex without condoms). In response to new biomedical knowledge and new treatment options, gay men explored new sources of pleasure. While geographers examined the role of new digital media in the changing spatialities of gay lives, they have paid less attention to changing experiences of HIV (including prevention strategies) in reconfiguring gay pleasure and the spaces where it is experienced. This reconfiguration includes the increasing use of hook-up apps, the increasing practice of raw/bareback sex, an imagined increase in the use of recreational drugs to have sex (usually defined as 'chemsex' or 'Party 'n' Play-PnP) and the displacement of traditional 'gay villages'. Although geographers have been slow to explore the assembling of these technologies and practices, other cognate disciplines have been addressing these issues (albeit, sometimes, from problematic perspectives). For example, many epidemiologists and behavioural scientists have approached these practices as pathologies (e.g. Dew and Chaney, 2005; Grov and Parsons, 2006; Kirby and Thornbur-Dunwell, 2013). Hurley and Prestage (2009: 597-598) examined the increasing diffusion in Australian cities of what they defined "intensive sex partying" (ISP), made of

“frequent partying, frequent sex, higher rates of anal sex than amongst gay men generally, sequential or simultaneous multiple sex partners, specific drug combinations, a broad sexual

repertoire with sexual experimentation and unprotected anal intercourse with casual partners”.

According to the authors, the main rationale behind ISP is the desire to maximise sexual pleasure, and they claim that a disproportionate number of the men practicing ISP are HIV-positive (although we would suggest that increasing numbers of men who use PrEP are participating in these subcultural practices too). Although mostly centred around pleasure, risk and (self-)care, their analysis includes a brief reflection on the spatialities of these practices, represented by domestic spaces, sex parties and sex-on-premises venues. Race (e.g. 2015; 2018) advanced the understanding of these practices by conceptualizing them as *culture* rather than pathological behaviours. His work devotes a meaningful importance to WiFi, 3G and hook-up apps, defined as “infrastructure of the sexual encounter” (2015:254) in order to highlight their agency. To this list, we would add PrEP and other HIV medications. These technologies are *mediators* of sexual practices and cultures, i.e. they “modify the practices and encounters they enable in quite specific, potentially impactful, ways” (Race 2015: 256), and become part of the wider assemblage of socio-sexual encounters in the age of undetectability.

The role of geographers might also be fundamental in understanding the spatialities of these sexual practices. According to Race (2015: 254), this emerging sexual culture mostly takes place in urban centres and relies “on participants’ ability to access private accommodations in these locations—something that depends in the contemporary metropolis on economic affluence and/or cultural capital to an unprecedented degree”. In the British context, Hakim (2019) offers interesting insights to think the social and political economy dimensions of the emergence of ‘chemsex’, suggesting that it relies more on private accommodation, as a consequence of the closure of an increasing number of commercial gay venues that facilitated sexual encounters on their premises. While Race and Hakim are probably correct that these practices occur most in large urban centres (or smaller cities with disproportionately large gay populations), we contest the assumption that they do not also occur in a wider range of (sub)urban and, even, rural locations. In current times of rampant gentrification and housing unaffordability, suburban and peripheral locations have become increasingly attractive also for gay and bisexual men; actually, the possibility to have access to larger houses in these locations make them particularly suitable for group sex parties.

Geographers have increasingly researched the digital geographies of gay sex and their relationship to physical spaces (e.g. Bonner-Thompson, 2017; Miles, 2017; Roth, 2016), but have rarely considered the role of biomedical technologies such as TasP and PrEP in shaping the hook-up experience. However, Miles’ (2017) analysis on the hybridization of space— the private house becoming a quasi-public space where strangers are invited, digital connectivity being the main criterion of access— can

be particularly generative when developing a new geographical perspective on the reconfiguration of gay sex through digital technologies, recreational drugs, and new HIV-related drugs. If combined with Shield's (2018) work on the importance of Grindr for socialization, Miles' approach opens interesting possibilities to frame the spatialities of gay sexual life (with or without recreational drugs, in group or one-to-one) in times of PrEP and undetectability. By engaging more extensively with these emerging socio-sexual-technological assemblages, geographers might contribute to a deeper understanding of the role of home in both *shaping* sexual and social life and *being shaped* by them, as well as the reconfiguration of the public/private space divide through digital technologies. However, the geographies of PrEP and undetectability are not limited to the microscale of everyday life, home and the city but concern also regional and transnational flows, this being the object of the next section.

Geopolitics and geoeconomics of access to PrEP

The roll-out of PrEP globally has been very uneven (Amico and Bekker, 2019). *PrEPWatch*, an initiative of the US-based international AIDS advocacy NGO, AVAC, monitors the availability of PrEP internationally. Figures for July 2019 demonstrate that PrEP is available in some form in most regions of the world, but there are many countries (particularly in Eastern Europe, North Africa, Latin America, and Asia) where no official provision of PrEP is available. In some countries, both Truvada and its generic forms are approved for use, but very few countries make PrEP easily available to all. In many countries, PrEP is currently only available through various kinds of demonstration and implementation trials, usually targeting specific population groups (reflecting a mix of epidemiological need and political expediency). These trials are occasionally funded through national health services, but just as often by UNAIDS, or other international aid agencies and philanthropic foundations.

At present, the most extensive roll-out of PrEP has been in the USA where at least 135,000 people are officially taking it (PrEPWatch, July 2019). Kenya and South Africa have the next highest use of PrEP, with about 44,000 and 24,000 PrEP users respectively. There are approximately 19,000 PrEP users in Australia, 15,600 users in the UK, and 14,000 in France. However, at least in the major economies of the Global North, these figures are likely to be under-estimates of total PrEP use, as in addition to those accessing the pills through national health services and health insurance schemes, many other people (particularly gay and bisexual men) are known to be privately sourcing generic versions of PrEP through specialist online pharmacies (see Brisson, 2018 on informal PrEP use).

The private purchase of PrEP reveals some interesting geographical patterns – not least of all, in that it often relies on sidestepping barriers to PrEP within one national context by sourcing the medication extra-territorially (cf Brickell and Cuomo 2019; Calkin and Freeman 2019, for comparable work on the geopolitics of access to safe abortion). While those who self-source PrEP mostly utilize online pharmacies, there is some evidence that (in various parts of the world) men are regularly travelling across national borders to access specialist health services at some distance from where they live. In addition to a number of specialist online pharmacies, there are a variety of websites (such as the UK-based *IWantPrEPNow* site) connecting people who might benefit from taking PrEP with reliable online pharmacies selling generic versions of the drug. Many of these pharmacies ship the medication from India or Singapore, but there are wide gaps in the countries to which they are able to send deliveries safely and securely. At least one of the main online pharmacies has restructured its European distribution arrangements, in anticipation of Brexit. A wide range of geopolitical factors impact therefore upon access to PrEP globally.

What has been notable in the adoption of PrEP, as in so many other phases of the ‘AIDS crisis’ (M Brown 1997; 1999), has been the role of grassroots community organising (principally, but not exclusively, amongst gay men) pushing for greater access to and adoption of the medication. The internet and social media have been key to sharing and mobilizing information about PrEP (and how to access it). As an example, the content analysis of over 1000 PrEP-related tweets by Schwartz and Grimm (2017) revealed that more than half of them involved awareness/information about the new drug. According to the authors this might be the result of low prescription rates, minimal promotion by the manufacturing company itself, and an uncertainty associated to the drug in news coverage. These trends suggest that gay men have been active agents in bringing the PrEP assemblage into being, thus challenging the crudest biopolitical readings of PrEP as well as those analyses reducing the whole response to HIV and AIDS in terms of neoliberalization and individual responsabilization.

It has been shown (e.g. Beckmann 2013; Colvin, Robins, and Leavens, 2010) how institutional healthcare responses to the ‘AIDS crisis’ have mostly focused on individual behaviours/practices while supporting pharmaceutical solutions, thus framing HIV-risk, prevention and therapies as individual issues. Such an analysis is also extended to the pleasures that become attached to the PrEP/undetectedness assemblage. In this perspective, barebacking (i.e. condomless gay sex) has been seen to embody the irresponsible, deviant and ‘death-wish’ elements of gay identity (Gauthier and Forsyth, 1999). In contrast, some queer scholars have emphasized its transgressive, anti-normative character (Dean, 2009). In his study on barebackers in Toronto, Adam (2005: 344) offers a different interpretation, locating barebacking in relation to neoliberal subjectivities, and arguing that it

“borrows, adapts, and reproduces some of the major planks of neoliberal ideology circulating in government, business, and the media in the metropolises. As such, it combines together notions of informed consent, contractual interaction, free market choice, and responsibility that create a platform for constructing unprotected sex as a “responsible” choice among adult men”.

For Thomann (2018), the implementation of PrEP deepens this principle, while fuelling the profit opportunities for pharmaceutical corporations. Thomann (2018: 4) defines PrEP as a “political technology of pre-emption” since the risk is anticipated and the temporality of safe sex pre-empted by adopting a solution outside the sexual encounter itself. This “biopolitical formation ... fosters a constant state of readiness for imagined sexual threats” (Thomann 2018: 4), its rationality based on the principle of moral responsibility against omnipresent risk (*c.f.* Race, 2016).

This line of enquiry has started to unveil the complex changing rationalities behind prevention and self-care in relation to structural geopolitical and geoeconomic processes like the neoliberalization of healthcare. However geographical scholarship has shown how neoliberalization is an uneven process (Brenner and Theodore, 2002) lacking internal coherence, one of its main principles being exceptionalism and the continuous creation of new exceptions (Ong, 2006). Geographers can therefore contribute to this growing field of enquiry by focusing on the colliding rationalities behind healthcare systems, institutional programs and expert knowledge at different scales. An engagement with critical and feminist geopolitical scholarship (Koopman, 2011; Pain, 2009) provides an opportunity to rethink and reframe some of the common critiques of the biopolitics of PrEP. As one of us has argued elsewhere (Brown *forthcoming*), the sustained work of grassroots advocacy groups can be seen as fostering a ‘knowledge commons’ around what PrEP is, its potential benefits, and how to access and use it safely. Similarly, in the face of slow and hesitant provision of PrEP by national health providers, the development of (not-for-profit) online pharmacies brokering access to generic medication can be interpreted as the creation of solidarity economies of pharmaceutical provision in parallel to more mainstream provision. These services are never simply individualized. In response to fears, anxieties and stigma around HIV infection, gay men have collectively sought to instantiate ‘alternative securities’ (Koopman, 2011) around their health and wellbeing. As we have argued throughout this paper, these health concerns are seldom divorced from a consideration of the ways in which PrEP might enable other individual and collective pleasures. While it is easy to offer an analysis of PrEP and undetectability that is entirely located within narratives of neoliberal governmentality, we believe that attending to the ways in which more than just HIV-related medication becomes assembled around gay men’s bodies helps draw attention to ‘what else matters’ (Horton and Kraftl, 2009).

Conclusions

Globally, inequalities in access to affordable and reliable anti-retroviral therapies persist (King et al. 2018); and, even within Europe and North America, there are significant asymmetries and inequalities in access to PrEP (McCormack, Nosedá and Molina, 2016; Siegler et al., 2018). For critical geographers of sexualities, challenging these inequalities and championing safe, affordable access to appropriate treatments and to PrEP remain key-tasks. At the same time, we should not overlook some of the potential problems and unintended consequences that might follow-on from the emerging biopolitics of undetectability, as proven by moralizing and pathologizing discussions on raw sex and the use of recreational drugs framing them only in terms of 'deviance' and self-harm. Against the recent silence of geographical scholarship around the new biomedical technologies concerning HIV treatment and prevention, in this paper we have called for the incorporation of theorizations of the socio-technical assemblages of HIV treatment and prevention into wider assemblage thinking about contemporary geographies of sexualities. Rather than a quest for causal relationships, our approach is aimed at starting to explore the ways these socio-spatial-technological assemblages interact with other aspects of life, producing new social practices, meanings, subjectivities and claims.

To understand these assemblages and their complex interactions, we have started by considering the materiality of (living with) the virus, acknowledging the central role of biomedical surveillance required by the new medical developments. However, we have tried to go beyond thinking just about the limits of these technologies by exploring some of the new dimensions of pleasure they favoured. In thinking through these assemblages, we have emphasized the potential contribution of geographers to this interdisciplinary field of studies while also speculating about the ways the socio-spatial-technological assemblages around HIV might reconfigure some current fields of investigation within human geography, such as geographies of sexualities, health geographies, digital geographies and geographies of home, among others. Existing interdisciplinary scholarship about the assemblages around HIV treatment and prevention does little to analyse the ways sexual practices, knowledge, care, information and networks result from socio-spatial relations they participate in shaping. Places such as bathhouses, clubs or, more generally, 'gay villages' are not just the contexts where the connections between human and non-human elements occur: they shape those relations, opening possibilities and creating boundaries to the emerging practices. On the same time, these same places result from the meanings that human actors assign to them, as well as from their practices, involving non-human elements. As discussed by several scholars (e.g. M Brown, 2014; Nash and Gorman-Murray, 2014), the meaning and use of 'gay villages' have evolved over time as

the results of different cultural, economic, political and social factors. However these analyses have tended to ignore the role of HIV-related biomedical innovations in reshaping these spaces, as proven by the lack of studies around the 'return' of explicitly 'raw' sex across several cities in the Global North (for an exception see Andersson, 2011). Villages and other commercial venues are not the only ones reconfigured by the new biomedical technologies; private houses have assumed more relevance in the experience of gay sex thanks to the diffusion of hook-up apps, becoming often semi-public spaces where access is given to anyone connected to the app. These considerations complicate hegemonic narratives around sanitization and domestication of sex under homonormativity, while reinforcing feminist and queer readings of home beyond the public/private and virtual/physical boundaries.

The geographical impact of the socio-technological assemblages around HIV is not limited to pleasure and sex, but includes also the spaces of healthcare. As discussed in the paper, the emerging sexual practices related to undetectability and PrEP are often seen by medical experts and practitioners as forms of self-harm and risk, often leading to blaming and discrimination under the label of (lack of) responsibility. This is an important field of investigation for future geographical research, especially in current times of increasing cuts to public healthcare services and their privatization. Future geographical investigations around healthcare, HIV and gay/bisexual men might also benefit from a transnational and geopolitical perspective, the uneven provision of PrEP (and the inequalities in the access of HAART) leading to the transnational circulation of pharmaceutical products and people across trajectories that remain understudied. Provisional approaches focusing on complexity and connections rather than causality and pathologies can lead future geographical research to fully understand the multi-scalar and social implications of new biomedical innovations, including also those subjects that too often remain excluded from academic scrutiny.

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