

## Linkage strategy and vulnerabilities in the barriers to HIV/AIDS treatment for men who have sex with men

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**Abstract** *This study aims to analyze the linkage to HIV/AIDS treatment among Men who have Sex with Men (MSM) of the project “A Hora é Agora” in Curitiba, Paraná, Brazil. The concept of vulnerability with its three axes, namely, the individual, social, and programmatic, was the theoretical framework. The barriers from testing up to the onset of the treatment were mapped through linkage registration and minutes from supervisory meetings. In the individual axis, the data revealed that the MSM struggled to address the HIV diagnosis, besides psychological problems that could cause the delay in starting treatment. Considering the social axis, stigma/discrimination was identified in the service at the Basic Health Care Network and within the families, delaying the disclosure of serology. Lastly, in the programmatic axis, the MSM found barriers in accessing the health services due to requests to repeat the HIV test, changing doctors due to poor service, and difficulties in conducting further tests, which adversely reflected on health care. In order to overcome these barriers, it is recommended not only a macro-structural work within this group, but also an investment in the micropolitics, which will enable a real change of attitude, continued care, and a stance related to approaches of care and the defense of life.*

**Key words** *HIV, Male homosexuality, Health vulnerability, Health care, Periodic care*

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## Introduction

More than 80 million people have been infected with HIV<sup>1</sup> from the beginning of the AIDS epidemic to the end of 2019. The obstacles are still significant despite expanding access to antiretroviral drugs in several continents and people's gradual increase in life expectancy<sup>2</sup>. According to a report by the Joint United Nations Program on HIV/AIDS (UNAIDS)<sup>3</sup>, data from eight countries showed that 25% of people living with HIV/AIDS (PLWHA) did not access hospitals for fear of stigma and discrimination due to their serology.

In Brazil, 1,011,617 AIDS cases were reported as of June 2020<sup>4</sup>. An increasing trend is observed in the prevalence of cases in Men who have Sex with Men (MSM), up from 12.1% in 2009 to 18.4% in 2016<sup>5</sup>, indicating the increased vulnerability of this population and encompassing structural, biological, and behavioral aspects that act jointly and synergistically, increasing the likelihood of HIV infection.

The constant violation of the social rights of MSM is related, in part, to the stigma and discrimination<sup>6</sup> that affect the barriers to accessing HIV testing and treatment, which can be expressed as characteristics: individual, such as the fear of suffering discrimination and judgment due to sexual orientation and gender identity; lack of interest in taking the HIV test because they trust their partners, among others; of health services, seen in disrespect and religious moralism by health professionals; breaches of confidentiality and lack of information; and HIV-related stigma. Such barriers are configured in structural and psychosocial serology-related difficulties<sup>7,8</sup>.

In 2013, Brazil invested heavily in expanding the diagnosis of HIV and early onset of treatment for more significant support to prevention. This policy was called "treatment as prevention" (TasP) and is in line with international guidelines for reducing HIV transmission<sup>9</sup>. This policy led to creating the "*Viva Melhor Sabendo*" (Live better through knowledge) strategy, associating prevention, testing, and counseling confidentially and in the interactive places of vulnerable populations<sup>10</sup>.

Located in the southern region of Brazil, Curitiba has nearly two million inhabitants. Until September 2020, it registered 13,182 AIDS cases, of which 9,253 were men. In a temporal analysis of the exposure categories of HIV/AIDS cases concerning bisexual cases and MSM, a significant increase was observed from 29% of cases in 2004 to 59.3% in 2019<sup>11</sup>.

In light of this perspective, the "*A Hora é Agora*" (PAHA)<sup>12</sup> project was established in 2014 in Curitiba on implementation science, which aimed to expand rapid HIV testing and linkage to treatment for gay men and other MSM residing in the municipality. Through a partnership between the Sergio Arouca National School of Public Health (ENSP/FIOCRUZ), the Municipal Health Secretariat of Curitiba (SMS), the U.S. Centers for Disease Control and Prevention (CDC), the Brazilian Ministry of Health, and the NGO *Dignidade*, strategies for rapid HIV testing were developed in easily accessible environments free from stigma and discrimination at alternative times and locations: mobile unit (trailer), Non-Governmental Organization (NGO), Guidance and Counseling Center (COA) and Street Clinic (SC). Another option was the user requesting the HIV self-test, using oral fluid<sup>13</sup>, through the website <https://www.ahoraegora.org/> and receive it at home or pick it up at the popular pharmacy, anonymously and free of charge.

The innovative linkage strategy<sup>14</sup>, known as "patient navigation"<sup>15</sup>, was launched to ensure linkage to HIV treatment in the healthcare network in Curitiba and offered to all MSM who were HIV-reagent and Curitiba residents<sup>16</sup>. The linkage started after the confirmation of the HIV diagnosis at one of the PAHA testing points, except for the SC, which had its linkage strategy due to the specific characteristics of the population served. Professionals who supported MSM who accepted the link were called "linkers", who supported the registration at the Basic Health Care Network (UBS) chosen by the user, the scheduling of medical visits and tests, and access to antiretroviral therapy (ART) for three months after diagnosis. Also, a series of articulations were made to expand the information and communication of the PAHA to the key population, as described in another publication<sup>13</sup>.

According to Duncombe<sup>17</sup>, innovative and people-centered approaches are fundamental to breaking the chain of HIV transmission. They are potentially being associated with an increased life expectancy and a declining number of new HIV infections<sup>18</sup>.

Given the above, this paper aims to characterize the advances and barriers faced by MSM during the linking process in Curitiba. It is assumed that the support of linkers to HIV-reagent MSM would increase their likelihood to be linked to prevention and treatment and reduce their vulnerabilities<sup>19</sup>. After all, the change in approach and relationship to be established changes how the

subject, care, networks, and system address HIV/AIDS as such a complex public health problem.

## Methods

This is a documentary, qualitative study<sup>20</sup> that analyzes secondary data and characterizes the linkage/binding strategy to the treatment of HIV/AIDS for those tested in the different PAHA strategies. Those eligible for linkage were gay men and other HIV-positive MSM residing in Curitiba and who accepted the linkage after clarification and signed the term.

The linkage data collected refer to the linker's user-monitoring records over three years (2015-2017). The records contained user information, contact description, outcome, initiation of treatment or not, and process-related barriers. Those who did not have information about the start of treatment but had the information "linked" with a positive result for HIV and who adhered to the treatment were also considered. In total, 22 records were excluded, 17 of which were not linked and underwent the HIV test and did not accept the linkage or respond to the linkers. Five users did not start ART. These data were validated and analyzed from the sequence of different methodological steps (Figure 1). Finally, data review and database analysis in Excel were performed.

Regarding the barriers found, several variables were included in the linkage monitoring records, such as: "First contact"; "User does not respond"; "Register at UBS"; "Visit at the UBS"; "Medical visit"; "Laboratory tests"; "Returning Visit"; "Start of treatment". Linkers could complete "Other barriers", where they could better describe the identified hurdles or those that were not included in the options suggested by the records. However, this space was also used to indicate that there was no problem during the linkage or that it happened quickly in a few days.

The following categories of analysis can be reached after an exhaustive reading of the data: linkage organization and flow; advances in the MSM strategy; the barriers faced by MSM; psychological issues; stigma, discrimination, and prejudice. These categories were related to the different components of the vulnerability of MSM to HIV/AIDS. The minutes of the meetings between the PAHA supervisor and the linkers were also part of the scope of the analysis, using the same categories applied in the records and with the separation of the corresponding excerpts.

As a methodological framework for the study, the anchorage was based on the "vulnerability concept" developed by Ayres *et al.*<sup>21,22</sup>, which encompasses three dimensions. The "individual dimension" exposes the notion of intersubjectivity; that is, identity is built from the interaction between individuals and the understanding of the personal capacity to identify the different aspects of life that end up causing exposure to infection or illness. The "social dimension" addresses the different contexts of interaction between individuals and brings the concrete experience of intersubjectivity linked to various economic, racial, religious, generational, social exclusion, and gender relationships. The "programmatic dimension" refers to institutionalized interaction forms, whether a set of health policies or institutions, which can reduce, reproduce or increase the susceptibility of specific individuals.

Regarding the steps of "organization and linking flow", this was addressed from the onset of rapid HIV testing, when MSM went to one of the PAHA testing sites, either by walk-in demand or invitation of a peer educator. Responsible for approaching MSM in specific spaces, such as squares and public restrooms, the peer educators were men who identified with the researched group, informed about the project, and referred MSM to undergo the test in some strategy, except in the Street Clinic. In turn, all those who performed the self-test and reagents were instructed to seek out the COA to perform the confirmation.

After the positive HIV test, the counselor explained the linkage process and helped define the UBS of choice. The linkers were qualified professionals with good communication skills and at least high school level. They did not need to be from the key population, but they should have some experience in HIV/AIDS.

Upon acceptance of the linkage, MSM signed the Informed Consent Form (ICF), containing the research objectives, the guarantee of voluntary participation and confidentiality, and the Consent Form for Linkage with the Health Service, which contained the information and the preferred contact form. If the participant was under 18 years of age, the participant signed the "Assent Term", and the parents or legal guardian signed the consent form. From the description of the linking flow, Figure 2 shows the path taken by MSM until the end of the process, in the user's capture, in the rapid HIV test, the offer of the linkage, and from the onset of follow-up until the start of ART. Another flow started from the link-

Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
. reading and checking the completed data to identify inconsistencies and necessary adjustments	. thorough reading of reports and quantitative data	. analyzing paper records, completed by linkers	. separating linked and unlinked MSM records	. exploring notes on the prints of documents and recording from these	. reading and separating the most relevant excerpts from the minutes of the linker meetings with the coordination of the linkage

**Figure 1.** Methodological steps of linkage data collection.

Source: Authors, 2020.

age – that of information: all linking data were reviewed and entered into a PAHA database.

The HIV/Aids coordination of the SMS of Curitiba monitored the reagent tests, the problems faced by users, and reported by the linkers. When necessary, the matrix supporter (a reference infectologist at the Family Health Support Center) was called to support the UBS doctors, especially to answer questions about the prescription of antiretroviral drugs. The coordination and matrix support also took place until the onset of ART (Figure 3).

The research was approved by the Research Ethics Committee of ENSP/Fiocruz and by the National Research Ethics Committee (CONEP), under Opinion N° 977.803, on March 10, 2015. All study participants signed the consent form and accepted the linkage.

## Results

A total of 133 individuals were approached for linkage, but 22 records were excluded from the analysis due to the MSM's refusal to participate in the linkage or because they had not started ART, totaling 111 studied records. Of the analyzed records, 89 (80%) were classified as linked users, that is, users who achieved the research objective and started ART. The results presented here followed the analysis categories for a better characterization of linkage as a linkage strategy for treatment-reactive MSM, considering their advances and barriers.

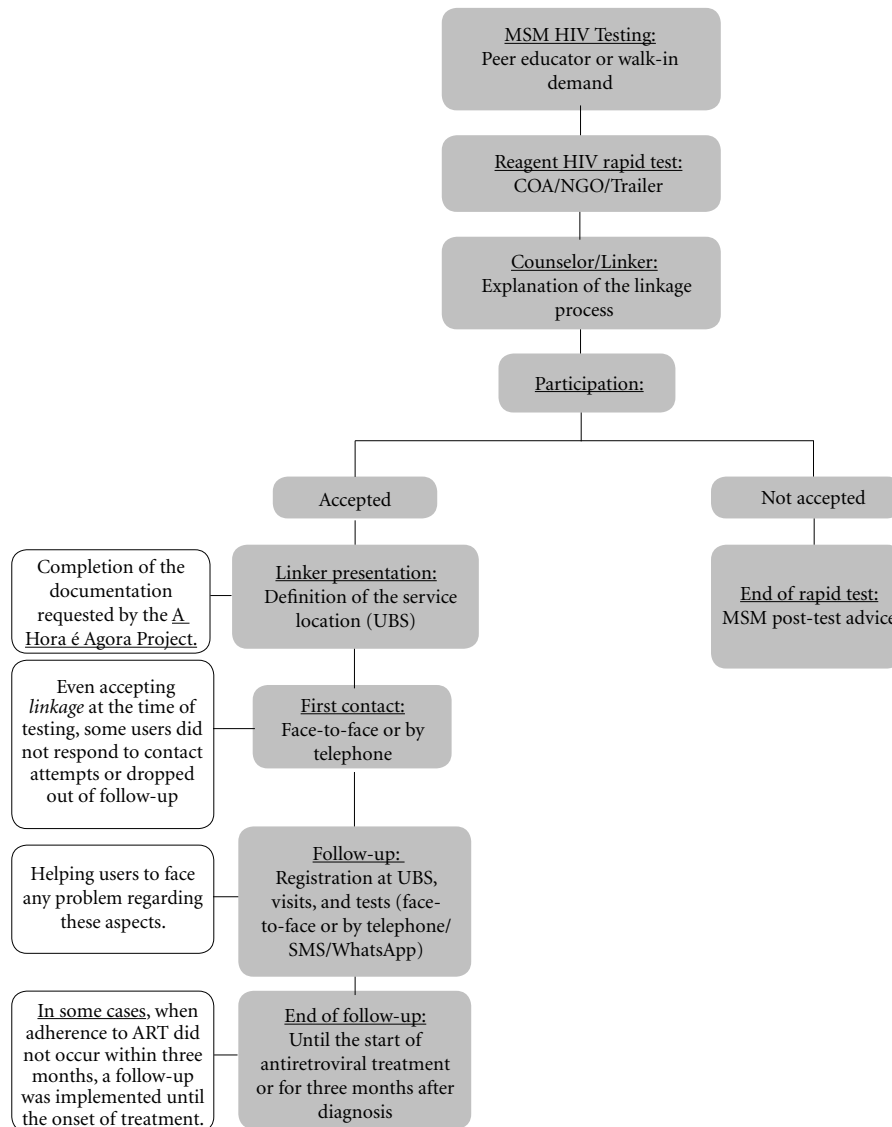
Regarding the “barriers faced by MSM in the linkage process”, almost half of those linked were

related to different components of vulnerability: *Individual*, consistent with the acceptance of the diagnosis and psychological issues; *Social*, regarding stigma, discrimination, and prejudice; and *Programmatic*, concerning testing and counseling and access to appointments and exams.

Regarding “strategies and obstacles to contact with MSM”, all ten linkers indicated difficulty in the first attempt. Few mentioned the delay in contacting MSM due to the year-end holiday season and the user's delay in returning after a few attempts. In these cases, the contact occurred via SMS or WhatsApp. The flow in the linkage followed with greater ease when the first contact took place in person. Half of the linked MSM interacted with the linker in person during the first contact and, among these, the second contact of most was made by phone, SMS, or WhatsApp with great success.

Noteworthy are the blocking of linkers when they attempted to communicate with specific users in the minutes of supervising meetings; the lack of response to messages when the first contact was made via SMS; the search for linkers due to difficulties found in UBS; and confusion by users who thought another linker was following them. Also, some communication strategies were unsuccessful in the linkage process, such as sending emails and forwarding private messages on Facebook.

Regarding individual vulnerability barriers, some users did not want to talk about the linkage after performing the rapid test, even after they agreed to participate in the research and filled out all the necessary documents. These users asked for time to “digest” the diagnosis, and many re-



**Figure 2.** Flow of MSM in carrying out the rapid HIV test in the “A Hora é Agora” Project.

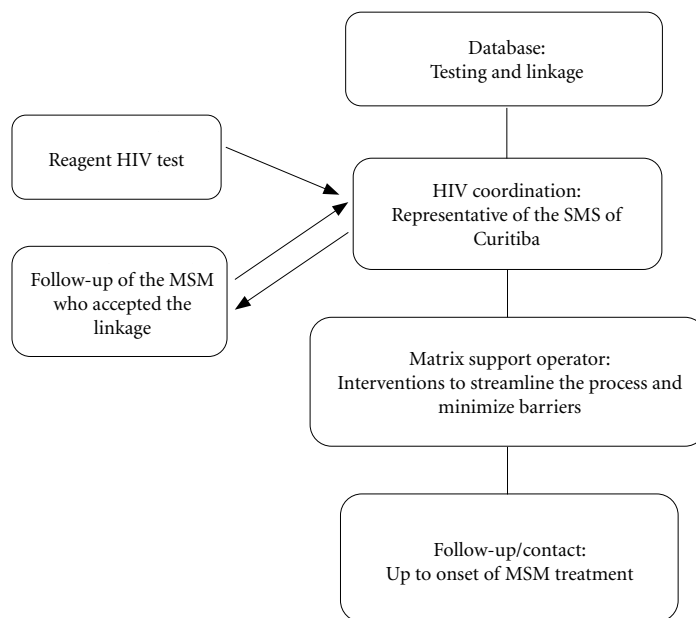
Source: Authors, 2020.

turned to contact the linkers later. Some linkers got in touch again with users who had signed the term authorizing the contact, mainly because they understood the difficulty of deciding on linkage right after a positive HIV diagnosis.

In the minutes of the meetings, the linkers mentioned difficult moments after the diagnosis of HIV, such as an MSM who wanted to commit suicide or even in cases where the partner was considered responsible for transmitting the virus. There were also reports of referrals of MSM to psychologists to face the emerging crisis and

achieve linkage acceptance. In any case, regardless of serological status, it was common to repeat the test for confirmation. The problem of “accepting the diagnosis” was strongly revealed when users reported looking for the private network to take the test due to mistrust of the result of the one performed in one of the PAHA strategies.

Few users in the follow-up records highlighted the psychological issue, and the following was reported: the difficulty due to lack of health, visits, and disagreements with the doctor at one of the UBS; an MSM stopped responding to the



**Figure 3.** “A Hora é Agora” Project information flow.

Source: Prepared by the authors, 2020.

linker’s messages when he started to be seen by the psychologist; and one user requiring support to handle diagnostics and linkage.

In the reports of the linkers’ meetings, users’ psychological aspect was seen as a problematic issue in the linkage flow, especially in the following cases: psychological follow-up as a reason for dismissing the linker; end of the affective relationship due to the discovery of the HIV diagnosis, discouraging registration at the UBS; difficult diagnosis acceptance; users’ personal issues, affecting counseling and linkage and disrupting the linkage process; difficulty in accepting sexual orientation and relationship problems with the family; personal conflicts and even a suicide attempt.

The most recurrent individual barriers of users in the linkage were fear of starting treatment, impatience, and demand (especially by the more educated) regarding monitoring, requiring more time from the linkers. In one of the cases, it was necessary to gradually distance the linker because there was a lack of interest in performing the linkage within the follow-up period, and, in another case, this process was hampered by evangelical parents, and the MSM preferred not to tell them about the diagnosis. In these cases, the

linkage was essential for users’ adherence to ART, with the linkers providing support for those with a fragile family and social context.

Concerning social barriers, the problems of “stigma/discrimination” appeared in the minutes of the meetings between the linkers and the coordination. The minutes confirmed the presence of stigma/discrimination based on the need to transfer participants to other UBS and the registration of professionals who refused to receive and provide care to some MSM. Other situations were perceived by MSM and mentioned by linkers, such as the report of a user who was evicted from home due to HIV infection; a form of care for a transsexual; and informing a friend’s cell phone number to the linker, fearful that the family would discover the diagnosis.

Although such difficulties have happened to health professionals, they were treated as social barriers in the linkage, considering the form of expression of “prejudice and discrimination” in the interaction with the service and care for MSM. An example is the resistance of primary care doctors in receiving patients referred by the PAHA, as some were unaware of the care protocol for PLWHA, even undergoing training in Curitiba.

Another issue was the refusal to attend to MSM during the return visit. These cases generated resistance from users to return to the chosen UBS and even the request to replace the professional. The most resistant doctors refused the guidance of the matrix operator. There were also cases of poor service due to territoriality and for transsexuals (generating a change of UBS); adaptation of antiretrovirals for drug users (deferring adherence); waiting for the start of treatment due to the arrival of a new drug; mismatched information between UBS and COA; and difficulties in understanding procedures due to low social status.

Finally, concerning aspects related to programmatic barriers, specifically in carrying out the test, a frequent problem of users referred to start treatment at the health service was the request for a new HIV test, especially those MSM who were tested at the PAHA. In some cases, the HIV test was repeated more than once, and the intervention of linkers or an SMS professional from Curitiba was necessary to make appointments.

In counseling, the position of counselors was highlighted within one of the strategies, as these professionals hindered, and did not facilitate, the provision of care. They did not forward users to linkers; lack of guidance was observed during testing; and there was little interaction with users. When any of these problems occurred, the health service supervisor was contacted so that she could take the necessary steps to resolve the cases. The most cited issue in the monitoring records of the linkers and the minutes of the meetings with the coordination were the obstacles for MSM to start the procedures within the health services. The most recurrent problem was the registration in the UBS chosen by the users, which was still a significant hurdle even with care decentralization.

The users' home territory was an issue only for some health units. Thus, those who did not fit into the territory were prevented from registering at a specific UBS. Another point was the request for proof of residence by users, even for those who did not have this document, as they did not have a fixed residence. Despite the obstacle, the two users identified in the monitoring records with the problem were registered and started treatment.

Another hurdle emerged after the barrier to registration at the UBS was overcome: visits and tests. In some cases, the first appointment was difficult to schedule, taking up to two months

and generating the transfer of UBS. The delay was motivated, in some instances, by the doctor's busy schedule, the impossibility of the user being able to get to the UBS due to working hours, and even a user's attempt to make an appointment in several UBS.

## Discussion

There was an overlap of vulnerability dimensions, as several fragments could be classified into more than one category. For example, the difficulty in accepting the HIV diagnosis for MSM is related to both the individual and social level, regarding the components of vulnerability presented by Ayres *et al.*<sup>22</sup>. At the individual level, one of the aspects is how each individual receives the HIV diagnosis and the difficulty, for some, in accepting seropositivity<sup>23</sup>. On the social plane, the difficulty appeared in keeping the diagnosis secret, especially in the family, friends, and work.

A study carried out in São Paulo<sup>24</sup> identified that the increased vulnerability among gay men and other MSM, at the individual level, is related to difficulty in negotiating the use of condoms during sexual intercourse, especially the "passive"; inability, at the time of sexual intercourse, to control desire; and difficulty in applying prevention information, especially in oral sex, anal penetration (without ejaculation), or when the appearance of the sexual partner is associated with a "healthy" aspect and, consequently, with seronegativity.

Also, in this axis, the individual and psychosocial trajectory of each one depends on their intersubjective contexts (power relationships), how they address their discourses, and the various conflicting personal values or desires, produced in different ways, whether in social networks or friendship relationships and family or the professional space<sup>25</sup>. Thus, it is essential to know the protective conditions, so that one can claim their rights, as each person, according to Ayres *et al.*<sup>22</sup>, is understood [...] *as a subject of law, to then identify which aspects of their life (physical and psychosocial observed in the dynamics of their daily lives) exposes them to infection or illness.*

Regarding the social plane, psychological aspects and stigma/discrimination/prejudice were related to the context of interaction<sup>19</sup>: committing suicide; the insecurity in developing a bond with the linkers and health professionals of the UBS; the difficulty in accepting sexual orientation; the family problems of most MSM and

maintaining the secrecy about the diagnosis are in line with intersubjective experiences. Such experiences are traversed by several contextual aspects, such as the generational and religious spheres in families, social exclusion, which may also be linked to sexual orientation, the end of the affective-sexual relationship after the discovery of HIV, and the onset of ART and its effects<sup>19</sup>.

Discrimination and prejudice are also present on the social plane. For example, the difficulty in accepting the diagnosis for fear of discrimination by society (friends, family, and partner) or the resistance of certain health professionals, especially doctors, to assist them. According to Monteiro *et al.*<sup>6</sup>, the national literature corroborates the linkage data in the PAHA, revealing that the effects of AIDS stigma are related to the non-disclosure of the diagnosis; to preventing women from breastfeeding; to social isolation; to unemployment; to the problems of adherence to ART; and the reception in the health units.

Discriminatory action occurs<sup>25</sup> from the concept that a particular subject or group should not be part of society. This situation is expressed when evicting an MSM from home after serological disclosure to the family or providing a friend's phone to hide HIV status from the family. Thus, discrimination is seen as a behavioral response to negative attitudes.

Still reflecting on the social dimension, some elements can be considered to increase vulnerability among MSM, such as issues related to personal problems linked to sexuality, self-esteem, and their difficulty in feeling that they have rights, raising hurdles to access to information and search for health services<sup>23</sup>. This can lead to perceived stigma<sup>24</sup> or self-discrimination, triggering the fear of seeking HIV testing<sup>26</sup> or treatment in the public network<sup>27</sup>.

The interaction between counselors and MSM was carried out institutionalized through the health service but was hampered by the type of contact established<sup>22</sup>. This negative experience may have occurred due to the different markers carried by MSM, judged negatively by counselors, revealing sexual orientation, ethnical, and social prejudice, hampering access to comprehensive health<sup>22</sup>. This could negatively impact the inclusion of MSM in the process because the linkage could be harmed if there was not good receptiveness in the first contact, affecting treatment adherence<sup>28</sup>, or even not start.

Several international studies have indicated similar barriers to linking PLWHA, such as quality of post-test counseling, access to UBS, stigma

associated with UBS<sup>29</sup>, and internalized stigma<sup>30</sup>. Therefore, access to the UBS and the performance of visits/tests are linked to the programmatic axis of vulnerability. They are the most significant barriers faced by MSM to complete the linkage process in the PAHA.

The posture adopted by the coordinators or health professionals of these UBS of hindering MSM registration was not consistent with some of the structuring principles of the Unified Health System (SUS), such as universality, which advocates universal access in guaranteeing the right to health for all. Another principle of the SUS affected by this posture was equity, which is based on individual, community, or social group needs to achieve equal opportunities and, thus, have good health conditions. Thus, access to health services is essential, considering the social, ethnic, economic, or cultural disparities<sup>19,31</sup>. The issue of vulnerability can transcend aspects related to sexuality around HIV, as the poorest of a particular race/ethnicity with low education and financial conditions become vulnerable in terms of access to healthcare services and care. For this reason, vulnerability is considered to be the vulnerability achieved<sup>32</sup>.

The delay in carrying out CD4 and VL tests in the health network hindered the scheduling of appointments, indicating the programmatic vulnerability due to the difficulty of attending and treating the population, increasing the likelihood of illness. Thus, the treatment given to some MSM by health professionals in the services became a critical barrier to access, generating stigma/discrimination. This can also explain the poor service provided to transsexuals who were linked. When this occurred, the embarrassment of users was evident, and, in some instances, there was even a breach of the confidentiality of the diagnosis. We tried to review the problem, including the matrix operator or the SMS supervisor, and strengthen the training and awareness of health professionals to serve this public. However, it is still necessary to improve the interface of the linkers with the PHC<sup>14</sup>.

This indicates the insufficient articulation between communication, dissemination, and training in the services and professionals involved in the PHC of Curitiba, which is the study's main limitation. There is a need for changes in the reception, enrollment, and registration of health teams, whose professionals should sign a term of knowledge and commitment to the PAHA, which may affect the non-discrimination of vulnerable populations in the PHC of this city.



This barrier may have been reflected in the care of MSM and PLWHA in general, as the interaction between health professionals and UBS users occurs in contexts of intersubjectivity. There is a dialogue between the characters, permeated by both sides' knowledge and experiences (scientific or not). Thus, the most varied resources are identified and mobilized to achieve prevention, treatment, and recovery of various health situations<sup>19</sup>.

Thus, the approach to the care of MSM of the PAHA was directly influenced by the relationship between them and health professionals and was essential for building a relationship of trust. However, the individual barriers of research participants may also have affected health care, whether in the "traditional" domain (territory, health beliefs, and social structure) or the "vulnerable" domain (mental illness and drug use)<sup>33</sup>.

## Conclusion

We can conclude by saying that individual, social, and programmatic vulnerability are intertwined and found in different health practices. In the case of these MSM, it involves the receptivity of the diagnosis, the fear of disclosure, the psychological aspects of living with HIV, the relationship with sexuality/stigma/social discrimination, and the unwelcoming and intolerant attitude of some health professionals. These points are permeated by the imminent fear of going through such experiences in different places, such as the

UBS, which should be a place of reception and listening. Associated with this are the various social markers that MSM carry beyond HIV, creating greater vulnerability and difficulty for health care.

While having caused delays in treatment or changes in the health service, the experiences did not prevent MSM from starting ART. An essential factor for this achievement was the linker's monitoring, providing unrelenting support during the linkage process. A reflection on the role of a mediator/facilitating agent in MSM linkage points to the need to review the approach and care for the subjectivities and singularities of those seeking health services.

It is true that, although the PAHA has promoted access to testing and treatment for MSM in the city of Curitiba, there were limitations to the study. Not all follow-up records were completed in full and in detail with the barriers faced by MSM. Furthermore, not all records of those linked by the project and in the database were analyzed, as some linkers were not using the form for registration properly at the beginning of the strategy.

The experience of linking MSM to treatment, considering the existing barriers, reveals the need for comprehensive care in the SUS. Finally, investing in the health of the groups most vulnerable to HIV/AIDS requires not only a macro-structural action in health policies and programs but, above all, a micro-political action to change attitudes and posture in the approach to care and defense of life.

### Collaborations

CR Pereira wrote the paper, developed the methodology, analyzed the data, and carried out the bibliographic research; MM Cruz and VL Cota conceived, guided, and wrote the paper, and approved the final version; BMM Almeida participated in the critical review and data collection of the paper.

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