Characterization of the HIV PrEP Clinical Pathway in the United States Military Health System

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Abstract

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The use of tenofovir-emtricitabine for HIV pre-exposure prophylaxis (PrEP) has been over 99% effective in preventing HIV infection. However, despite its availability in the Military Health System (MHS) since 2014, HIV incidence remains higher among active-duty service members (ADSMs) compared to the general population. This study aimed to assess the PrEP clinical pathway in the military from 2021-2023, focusing on prescribing patterns and identifying gaps in continuity of care. We conducted a retrospective cohort study using data from the Defense Medical Surveillance System (DMSS) and the Armed Forces Health Surveillance Division (AFHSD). The study included ADSMs aged 18-55 who were at risk for HIV and received a new PrEP prescription during the study period. Excluded were individuals with less than 6 months of active service, prior HIV, non-sexually active individuals, and those with prior STIs or PrEP prescriptions. Key events measured were time to PrEP prescription, initiation, discontinuation, and restart. Results indicated that 72.6% received a PrEP prescription within a year of risk identification, with a median time to prescription of 215 days. Roughly 45% discontinued PrEP

at some point, many after just one prescription. MSM individuals had a longer median time to prescription compared to non-MSM but were more likely to restart PrEP after discontinuation. The study highlighted significant gaps in PrEP initiation and high discontinuation rates among ADSMs. These findings underscore the need for targeted interventions to improve PrEP uptake and adherence, particularly among high-risk groups, to reduce HIV incidence in the military.

Introduction

Background

The use of tenofovir-emtricitabine (Truvada® or Descovy®) for pre-exposure prophylaxis (PrEP) was approved by the Food and Drug Administration (FDA) in 2012 and has been found to be >99% effective at preventing HIV infection in seronegative individuals[1-3]. In 2021, the Centers for Disease Control and Prevention (CDC) clinical practice guidelines for the prescribing of PrEP were expanded from targeting specific risk populations to include all persons who had gonorrhea or syphilis infection(s) in the preceding six months, and men with gonorrhea, chlamydia, or syphilis infection(s) in the preceding six months[4]. The studies on which these updates were based were small and focused solely on the population of men who have sex with men (MSM), and more data and analyses may be necessary to determine their generalizability to the general population.

HIV, PrEP, and STIs in the U.S. Military

The Military Health System (MHS) may be well suited for an evaluation of PrEP prescribing and adherence among Service Members. The MHS comprises the healthcare delivery platforms of the Army, Navy, Air Force, and Defense Health Agency and serves a population of roughly 9 million people, including all 2 million active duty servicemembers (ADSM). All ADSMs are required to receive their healthcare within the MHS, and all health and prescribing data from this care is kept within the Department of Defense.

Practices unique to the U.S. military include the policy of mandatory HIV testing for all personnel at time of entry into service and biennially thereafter[5,6]. The DOD has a single database that records all reportable diseases such as HIV infection and other STIs. PrEP has been available for prescription in the military since 2014 and widely accessible since 2016, with no cost to the Service Member for clinical and laboratory evaluation or for medications. Despite this broad availability and theoretically low barrier to access, 952 Active-Duty Service Members were newly diagnosed with HIV between 2016 and 2021[7]. The current HIV incidence rate in the U.S. Military population is roughly 21 per 100,000, compared to a rate of 11.5 per 100,000 in the U.S. general population[8]. Men made up 97.4% (930/952) of all new HIV diagnoses in the U.S. military[7].

Using data from the most recent Health Related Behaviors Survey (HRBS), an annual survey administered by the RAND corporation to a representative sample of the military population, there were an estimated 38,341 MSM individuals, 9,599 intravenous drug users, and over one million sexually active heterosexual individuals in the active-duty U.S. military population in 2023[9]. Of those MSM individuals, roughly one quarter reported having an

indication for PrEP. When accounting for other indications, the total 2023 population with PrEP indications was estimated at 14,231. Another recent study identified a total of 4,495 ADSMs with a PrEP prescription in 2023, representing an estimated coverage of 31.6%[10]. This is lower than the CDC's estimated national coverage rate of 36%.

Military-Unique Population Considerations

The baseline demographic and health characteristics differ between the military and general populations for many health outcomes. Due to the strict standards of medical and mental fitness required to join and stay in the military, the ADSM population is younger, healthier, and more physically active than the general population[5]. Additionally, military service is voluntary and a negative HIV test is required to join the service, so the baseline HIV prevalence is essentially zero[5]. After joining the service, there is a requirement to be tested for HIV at least every two years[6], as well as annual Periodic Health Assessments (PHAs) that combine a wellness physical exam with a survey of health and lifestyle behaviors[11]. Acquiring HIV after entering active service is not disqualifying and servicemembers living with HIV receive standard treatment, but a diagnosis of HIV does result in restrictions on the occupation and location in which people can work. These restrictions are in place both to ensure servicemember safety and to abide by various agreements with foreign partners regarding which U.S. military personnel may be stationed in their territory.

There are also key demographic differences about the military population. Ethnic and racial minorities are over-represented in the military; these populations are more likely to encounter barriers to PrEP prescribing[12,13]. They are also more likely to participate in higher-risk sexual networks with civilians[14,15]. Rank plays a role in access to and quality of care, with higher-ranking servicemembers getting higher quality care and better outcomes[16]. Rank is often considered a proxy for socio-economic status (SES) due to its direct relation to salary. These demographic factors may be associated with the persistence of incident HIV cases in a pre-screened population, and the higher rates of HIV in non-White servicemembers[8].

Gaps in Knowledge

Medical care is guaranteed and free of charge for military servicemembers, and PrEP has been authorized for use within the MHS since 2014, yet ADSMs have a higher HIV incidence and lower PrEP coverage than the general population. Several studies have investigated aspects of PrEP prescribing in the MHS; some of the identified barriers were: prescriber hesitancy or unwillingness to prescribe[17]; lack of prescriber knowledge, and comfort with prescribing or managing PrEP[18]; lack of awareness of coverage, both among clinicians and servicemembers[19-21]; fear of stigma on behalf of servicemembers, either from their command or from clinicians[22,23]; and a reliance on peers for knowledge of how to get PrEP due to lack of messaging from the MHS[19]. These barriers are not unique to the military. Studies in the civilian sector have identified inadequate education about PrEP during medical education, as well as clinicians' inherent biases, as potential root causes of barriers[24-26].

Adherence and linkage to PrEP has been shown to be uneven across demographic categories[12,13,27]. A 2021 study from the Kaiser Permanente Health Network characterized the system's PrEP pathway from identification of need for PrEP through to several endpoints[28]. The analysis identified drop-off at each step of the pathway and estimated proportional hazard for adherence among various demographic groups. The cited studies[17-23] investigated various aspects of PrEP prescribing in the MHS, but these studies tend to look only at initial linkage to care. There are also routine descriptive epidemiology surveillance reports published in the Medical Surveillance Monthly Report, but these are snapshots in time and provide insufficient detail. There has been less focus on measuring persistence, adherence, and attrition among ADSMs in the MHS. To date there have been no studies that assess the entire clinical pathway for HIV PrEP and STI care in the MHS. Additionally, much of the recent data about HIV and PrEP in the military were published prior to 2021, when the CDC's expanded recommendations were released, and a generic formulation of PrEP became available. Therefore, the primary knowledge gaps lie in what happens to patients after linkage to the PrEP care pathway, and what impact the updated recommendations may have had on who enters this pathway.

Methods

Aim and Hypothesis

The aim and primary objective of this study was to assess the PrEP clinical pathway in the military between 2021-2023 (the most recently available data) to characterize PrEP prescribing patterns and identify gaps in continuity of care and opportunities for system improvement. More specifically, the objective was to characterize and compare provision of PrEP among those eligible for PrEP according to pre- vs. post-2021 prescription guidelines[4]: men who have sex with men vs. anyone with a risk factor for HIV (as indicated by behaviors reported on their PHA or recent diagnosis of a bacterial STI). We sought to compare prevalence of other clinical pathway outcomes (e.g., loss to follow-up, absence of PrEP despite indication, and acquisition of HIV) across demographic groups. Based on the timing of changes to PrEP recommendations relative to the study period, and the previous work on PrEP in the military by Blaylock et al.[22], we hypothesized that MSM individuals who received PrEP would get a prescription at least 20% faster than non-MSM individuals who received prescriptions.

Study Design

We conducted a retrospective cohort, multi-endpoint time-to-event study. The time period of interest was from 1 September 2021 through 31 December 2023. This period was selected to capture the most recently available data following the updated PrEP prescription guidelines (summer 2021) and the most recent PHA version (published August 2021), which includes separate questions regarding same-sex sexual activity, as well as questions regarding individual sexual practices and risk factors.

Included in the study were all ADSMs from all military components who were identified as at-risk for HIV (either through self-report on PHA or via STI diagnosis), age 18-55, with more than 6 months continuous active service in the study period, and who received a new PrEP prescription. Excluded were those with less than 6 months of active service, those living with HIV prior to the study period (identified through serum repository lab data and diagnosis codes), those who reported on PHA that they were not sexually active, and those with an STI diagnosis or PrEP prescription prior to the study period. The intent of excluding those with prior STIs or prescriptions was to ensure any PrEP prescription started during the study period was due to prescriber recognition of current risk. We also excluded individuals who died or were deployed at any point during the study. Deployers were excluded due to the requirement to discontinue PrEP while deployed and for their low number (20 total). Finally, those who were prescribed emtricitabine/tenofovir for post-exposure prophylaxis (PEP) were excluded.

Data Collection, Assumptions, and Imputations

Variables: Demographics and Risk Factors

The data required for this study were requested from the Defense Medical Surveillance System (DMSS) and collated by analysts at the Armed Forces Health Surveillance Division (AFHSD), Epidemiology and Analysis section. The DMSS combines military demographic and personnel system data, inpatient and outpatient visits and associated diagnosis codes, medication prescription records, lab tests including HIV serum results, behavioral health visits and associated diagnosis codes, and individual PHA records. Prescription records include date prescribed, date dispensed, and amount dispensed. AFHSD is the military's primary repository of epidemiologic surveillance data and produces annual Health of the Force reports covering all domains of servicemember health.

Analysts at AFHSD identified PrEP prescriptions in the prescription database portion of DMSS by first identifying any prescription containing the brand or generic name of PrEP medications (Truvada, Descovy, or emtricitabine/tenofovir) and any antiretroviral medication during the study period. These prescriptions were then cross-referenced with lab and diagnosis data to exclude medications prescribed for treatment of HIV (via diagnosis codes and serum repository data), anyone with a diagnosis of chronic hepatitis B, anyone with an opportunistic infection diagnosis, and anyone with a diagnosis of needlestick exposure. The inclusion and exclusion criteria were then applied to the individuals with identified PrEP prescriptions.

Data were received from Armed Forces Health Surveillance Division as de-identified line listings of demographics, STI labs, PHA questions (including Alcohol Use Disorders Identification Test, or AUDIT-C, questions), substance use encounters, person time, deaths, and PrEP prescriptions. Patients were identified using a unique Study ID created by the data collection team. Within demographics, racial or ethnic identity was based on self-report and provided as non-Hispanic White, non-Hispanic Black, Hispanic, Asian American, Other, or

Unknown. The identity "other" includes mixed racial or ethnic identity, as well as American Indian and Alaska Native, as these identities are not reported uniformly across the military services.

PHA survey answers and diagnosis codes from substance use encounters, STI encounters, and lab results were used to create binary variables for analysis of condom usage, MSM status, presence of a bacterial STI diagnosis at baseline and during follow-up, and substance use. Substance use was defined as either a diagnosis of alcohol, nicotine, or substance dependence, self-reported or tobacco use, or an AUDIT-C score >4. All time calculations (e.g., time between steps of the care pathway, time of prescription, etc.) were done prior to receipt of data (to avoid identifiability and abide by HIPAA regulations) using the date at which the individual was identified as at-risk for HIV (either through self-report at the time of their PHA or via STI diagnosis date) as the baseline (Time 0). Timing of subsequent events in the care pathway was reported to be however many days after Time 0.

Outcomes: Time-to-Event Intervals

Our primary outcome (endpoint) was time to prescription from Time 0. Total person-time (i.e. follow-up time for each participant) was reported as a whole number of days relative to Time 0. This follow-up time was then separated into distinct intervals for each event of interest.

For each study participant, the earliest prescription in the study period was marked as the first prescription, and the prescribing time (days since Time 0) for this instance was classified as that individual's time to prescription. The difference between the prescription and dispensing time was defined as time to PrEP initiation.

Individuals who discontinued PrEP were identified by checking whether the time between any dispensed prescription exceeded 120 days. This assumed an initial supply of 90 days with a grace period of 30 days for clinical follow-up and prescription renewal. For those individuals with only one recorded prescription, they were considered to have discontinued PrEP if the time to medication dispensing plus 120 days was less than their total follow-up time. Time to discontinuation was defined as the time between the first prescription and 120 days after their last prescription. For individuals who discontinued after only one prescription, time to discontinuing was 120 days. These individuals were then considered to have restarted PrEP if they initiated a prescription after discontinuation. Time to restart was defined as time between discontinuation and restart.

Statistical Analysis

Cumulative incidence of each outcome (prescription, pickup, discontinuation, restart) was estimated in the overall population using the Kaplan Meier method, as well as stratified by individual demographics and risk factors of interest. These factors were MSM status, race (non-Hispanic White vs. all others), rank, and STI status at time 0. The treatment of the race and ethnicity category as a binary was done to allow direct comparison with prior work on racial bias

in PrEP prescribing by Bunting et al.[24], Calabrese et al.[25], and Blaylock et al. 2018[20]. Median time to each outcome was calculated using a Kaplan Meier method. For each outcome, individuals were counted if they met event criteria, and censored if the individual separated from active service or reached the end of the study period.

Cox models were created to estimate unadjusted hazard ratios (HRs) to evaluate any associations between demographics or clinical factors (MSM status, race or ethnicity (binary), rank, and substance use) and likelihood of discontinuation and restart. Adjusted Cox proportional hazards models were then used to evaluate likelihood of event across subgroups in the whole population. The Cox models treated MSM status as the main effect and adjusted for age, sex, race or ethnic identity, STI status at time 0, substance use, and condom use. Analysis of race in the Cox models used all categories of racial identity available in the dataset.

Individuals who deployed at some point during the study period were excluded due to small numbers and the necessity to stop PrEP while deployed. Warrant officers (W) were also excluded from this analysis due to small number.

Results

Patient Characteristics

The total analytical sample included 672 patients (Table 1). Of these, 368 (54.8%) were 18-25 years old, 636 (94.6%) were male, and 414 (61.6%) were a lower enlisted rank. Of the males in the study group, 342 (50.9% of the population, 53.8% of males) identified as MSM. Within the total sample, 267 individuals (39.7%) were non-Hispanic White, 176 individuals (26.2%) were Hispanic, and 130 individuals (19.3%) were non-Hispanic Black. Additionally, 101 individuals (15%) were identified as having evidence of alcohol use disorder, either through a diagnosis code or a calculated AUDIT-C score >4 from their PHA.

Patients were followed for an average of 856 days from their initial identification of risk (median 474 days [305-643]). A cohort flowchart, including source of risk identification and reasons for censoring, is presented in Figure 1. For initial identification of risk, 311 individuals (46.3%) had an STI lab result or diagnosis, with the remainder self-identified on their PHA. During the entire study period, 222 individuals (33%) tested positive for an STI, including those identified through this diagnosis.

PrEP Continuum

Unadjusted Time to Event

The median time to PrEP prescription was 215 days (95% CI, 193-249) (Table 2). Once a prescription was received, 90.6% (95% CI, 88.1%-92.6%) had initiated PrEP within one month of prescription (Figure 2B). The time to each event in the pathway for those with a newly

identified risk for HIV who received PrEP is shown in Figure 2. This study cohort was selected among individuals who received a PrEP prescription and thus all cumulative incidence estimates for prescription reach 100% over the follow-up period. The shape of the prescription incidence curve represents the cumulative incidence of prescription, among individuals who ultimately received a prescription. More than one quarter of this selected group [72.6% (95% CI, 68%-74.8%)] was prescribed PrEP within 1 year from identification of initial risk.

Within this population of patients with a newly identified risk factor and a new PrEP prescription during the study period, 45.4% (95% CI, 40.2%-48.2%) discontinued at some point (Figure 2C). The majority of those who discontinued (roughly 83%) did so at 120 days, after one round of prescriptions. Among those who discontinued, 39.9% (95% CI, 33.8%-45.5%) restarted before the end of the study period (Figure 2D).

Sub-analysis: MSM Status

Among patients who received a prescription, MSM individuals were slower to receive a prescription compared to non-MSM individuals (crude hazard ratio [HR], 0.76 [95% CI, 0.65-0.89]) compared with non-MSM individuals (Table 3, Figure 3A). Median time to prescription was 274 (95% CI: 235-303) days for MSM individuals vs. 166 (95% CI: 132-197) days for non-MSM individuals (Table 2). There was no significant difference in likelihood of pickup or discontinuation (Figure 3B-C, Table 3). However, among those who discontinued, MSM individuals were more likely to restart PrEP (crude HR, 1.75 [95% CI 1.19-2.58]) (Figure 3D, Table 3). Median time between discontinuation and restart was 44 days (95% CI: 28-57) for MSM individuals vs. 32 (95% CI: 21-54) for non-MSM individuals.

Sub-analysis: Race and Ethnicity

Contrasting White individuals, who have been shown to be more likely to receive a prescription (Blaylock[20,22], Bunting[24]), with individuals of all other race/ethnicities, there were no significant differences in time to any event. Non-White individuals were no less likely to receive a timely prescription (crude HR, 1.14 [95% CI, 0.97-1.32]) (Table 3, Figure 3A). There was no difference in time to medication pickup (crude HR, 0.91 [95% CI, 0.78-1.06], Figure 3B), discontinuation (crude HR, 1.16 [95% CI, 0.91-1.48], Figure 3C), or restart (crude HR, 1.10 [95% CI, 0.75-1.63], Figure 3D).

Sub-analysis: Rank

Among the rank categories, junior officers (O1-O3) took were less likely to receive a prescription (crude HR, 0.79 [95% CI, 0.66-0.98], Table 3) relative to junior enlisted servicemembers (E1-E4) and took longer to initiate their prescriptions (crude HR, 0.75 [95% CI, 0.61-0.92], Table 3). Senior-enlisted ranks (E7-E9) also took longer to initiate a prescription (unadjusted HR, 0.65 [95% CI, 0.45-0.93], Table 3).

Adjusted Cox Proportional Hazards Model

In these adjusted Cox regression models of individuals who received PrEP prescriptions, MSM individuals were less likely to receive a prescription at any given time (adj HR, 0.76 [95% CI, 0.64-0.90]; log rank: $p<0.01$; Table 4).

Those who were identified as at-risk for HIV (and thus eligible for PrEP) via an STI diagnosis or lab result were significantly more likely to receive a prescription (adj HR, 1.38 [95% CI, 1.16-1.65]) compared to those whose risk was identified from the PHA. In the adjusted model, the lower likelihoods of prescription for senior enlisted servicemembers (adj HR, 0.69 [95% CI, 0.46-1.03]) and junior officers (adj HR, 0.85 [95% CI, 0.68-1.07]) were not present (Table 4).

In the adjusted model, although likelihood of medication pickup was significantly lower among senior enlisted servicemembers and junior officers, the difference in median time to pickup was not clinically meaningful (Table 4). Median time to initiation for senior enlisted servicemembers was 1.5 days [95% CI, 0-7 days] and 1 day [95% CI, 0-4 days] for junior officers. There were no other significant differences between other demographics and risk factors for time to medication pickup or time to discontinuation. Among those who discontinued, MSM individuals were nearly twice as likely to restart PrEP (adj HR, 1.87 [95% CI, 1.37-2.56]) and MSM with an STI were more likely to restart than MSM with risk identified on a PHA alone (adj HR, 1.92 [95% CI: 1.01-3.68]. No other factors were significantly associated with PrEP restart.

Discussion

In the ADSM population, the average time from an HIV risk-identifying event to PrEP prescription was nearly 7 months. MSM individuals took longer to receive prescriptions. Most of the population initiated their prescription within one week. Roughly 45% of the study population discontinued PrEP at some point in the study, with the majority doing so after one 90-day prescription.

Based on the most recently published surveillance reports, the individuals in this study represent approximately 15% of the total population who received a PrEP prescription at any point in the U.S. military during the study period[10]. The focus of this analysis was a description of new PrEP prescriptions indicated by PHA responses of HIV risk or STI diagnoses.

Higher-Risk Subset

The median time to prescription of 7 months represents a significant amount of time during which individuals were at potentially high risk for HIV. The MSM servicemembers experienced a longer time to PrEP prescription, which was contrary to our initial hypothesis. When accounting for specific risk factors like STI diagnoses and substance use, these individuals took roughly 30% longer to receive a PrEP prescription. While MSM status itself does not

automatically confer risk, MSM sexual activity in combination with the inclusion criteria for this study puts these individuals at a much higher risk of HIV, as was shown in studies by Pathela et al. on relative HIV incidence among MSM individuals with and without bacterial STIs[29,30]. It is possible that, in the population captured by this study, non-MSM individuals had a combination of other risk factors (such as having a partner with HIV, or disclosed sharing of intravenous needles) that prompted clinicians to prescribe sooner. While there was a long lag time to getting a prescription, time to PrEP initiation was shorter. Over 80% (95% CI, 77%-83%) of individuals initiated their prescription in a week, and 91% (95% CI, 88%-93%) picked it up within thirty days of prescribing. After initiation, though, roughly 35% discontinued PrEP after four months. This short time to discontinuation indicates swift loss to follow-up after initial prescription; some of these individuals were prescribed 90-day supplies and subsequently did not renew their prescriptions, but some only received an initial 30 days' supply and never returned to clinic. Additionally, this study relied on pharmacy dispensing records and thus the actual number of pills taken (and so the true date of discontinuation) was unknown.

Comparison with Civilian Settings

The methodology of this study was intentionally closely aligned with that of a characterization study performed in the Kaiser-Permanente health system, published in 2021[28]. That study showed all events occurring in a logarithmic fashion, with particularly short times to prescription and initiation, and a 92% rate of initial prescription. While the population makeup of that study was comparable to this one (Table 1)[28], the findings differed. A likely explanation of the long time to prescription in this present study is that we used a proxy for risk identification, whereas the Kaiser study's source population was all individuals referred for PrEP in the system. The Kaiser health system used an internal PrEP-specific diagnosis code unique to their electronic health record (EHR) whereas the MHS relies exclusively on ICD-10 codes that, until 2022, did not have specific diagnoses for PrEP. This enabled assessment of a "capture rate" of those at risk for HIV. The overall discontinuation rate identified in this study was comparable with that in civilian settings, although the median time to discontinuation was much shorter (4 months vs roughly 1 year). There was no discernible individual risk factor for discontinuation.

CDC Guidelines

The 2021 revision to CDC PrEP guidelines was based on four studies that showed an increased risk of HIV infection after prior STI infection[4,29-32]. One was a meta-analysis of PrEP adherence studies on people at risk for HIV (per 2015 guidelines) and the U.S.-based studies analyzed contained only men who have sex with men (MSM) participants[31]. The other three studies focused specifically on the link between STIs and HIV acquisition in MSM populations. Among these studies, two were conducted by Pathela et al. showing higher risk of HIV infection following rectal gonorrhea (GC), chlamydia trachomatis (CT), and primary syphilis infections[29,30]. In the 2013 Pathela study, the risk of HIV infection in men who have sex with men (MSM) who had rectal GC and CT infections was 2.53%[29], many times higher than the

0.57% and 0.013% reported incidence in the MSM and general populations, respectively[3]. Our study did not show that individuals diagnosed with an STI were any more likely to receive a PrEP prescription.

Opportunities for Public Health Interventions

The swift loss to follow-up among a significant portion of the study population is concerning but presents an opportunity for simple intervention. A program such as active case management, where the onus to schedule follow-up is not entirely on the patient, could increase adherence. The significant rate of restart after discontinuation indicates that patients did not necessarily stop because they wanted to stop taking PrEP, and reducing barriers to follow-up may keep more people in care.

Limitations

This study had some limitations. The focus on new prescriptions in a 2-year period resulted in a relatively small sample size. Those with new risk for PrEP and new prescriptions may not be representative of all recipients of PrEP in the MHS. We did not evaluate existing prescriptions or anyone with an STI prior to September 2021. Additionally, the data selection process precluded any assessment of those with indications for PrEP who did not receive a prescription. Any conclusions regarding time to prescription or medication pickup must then be interpreted within the bounds of a population that all received and initiated a PrEP prescription. Broader capture of the population at risk may alter the observed patterns of prescribing such that this study's conclusions no longer apply.

Conclusions

Prevention of HIV in the military remains necessary for both reasons of health and operational readiness. Although the baseline prevalence of HIV in the military is low due to pre-screening, HIV incidence is higher and estimated PrEP coverage is lower than in the general population. This study, despite its limitations, showed that those individuals who received PrEP first had a risk-identifying event well before their first prescription. It further found that it took MSM individuals at risk for HIV, for whom PrEP has been routinely recommended since 2015, longer to receive a prescription. Further studies are required to assess the entire population who receives PrEP, and to identify those with risk factors who are never identified and linked to PrEP care. The findings of this study may be informative to policy decisions regarding PrEP care in the MHS and the recently mandated standardization of this care across the system. Informatics-based approaches that use the electronic health record, as well as active case management focused on high-risk populations, should be leveraged to improve PrEP care in the Military Health System and allow the military to accelerate PrEP delivery and reduce HIV incidence.

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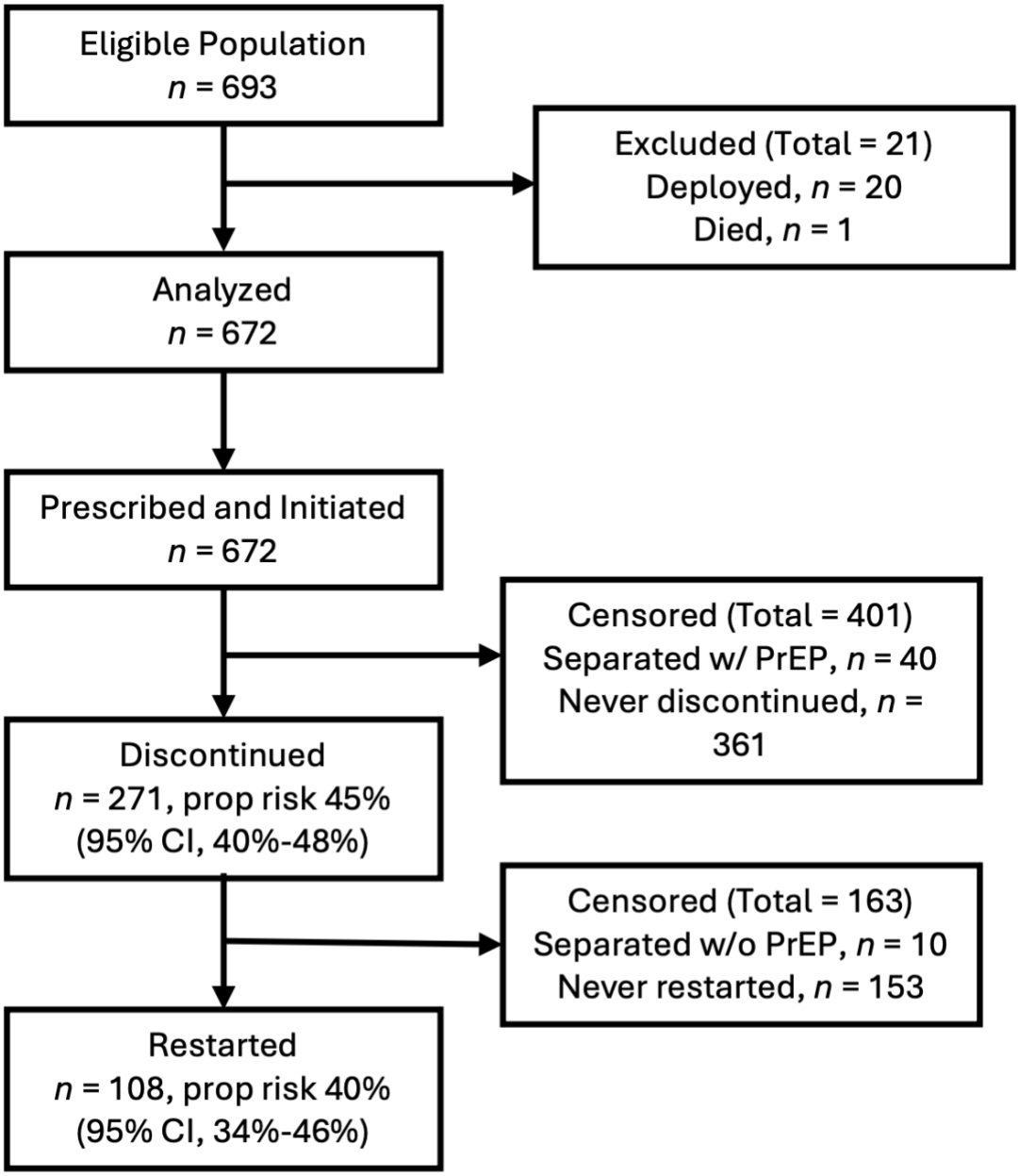

Figure 1. Flowchart of Study

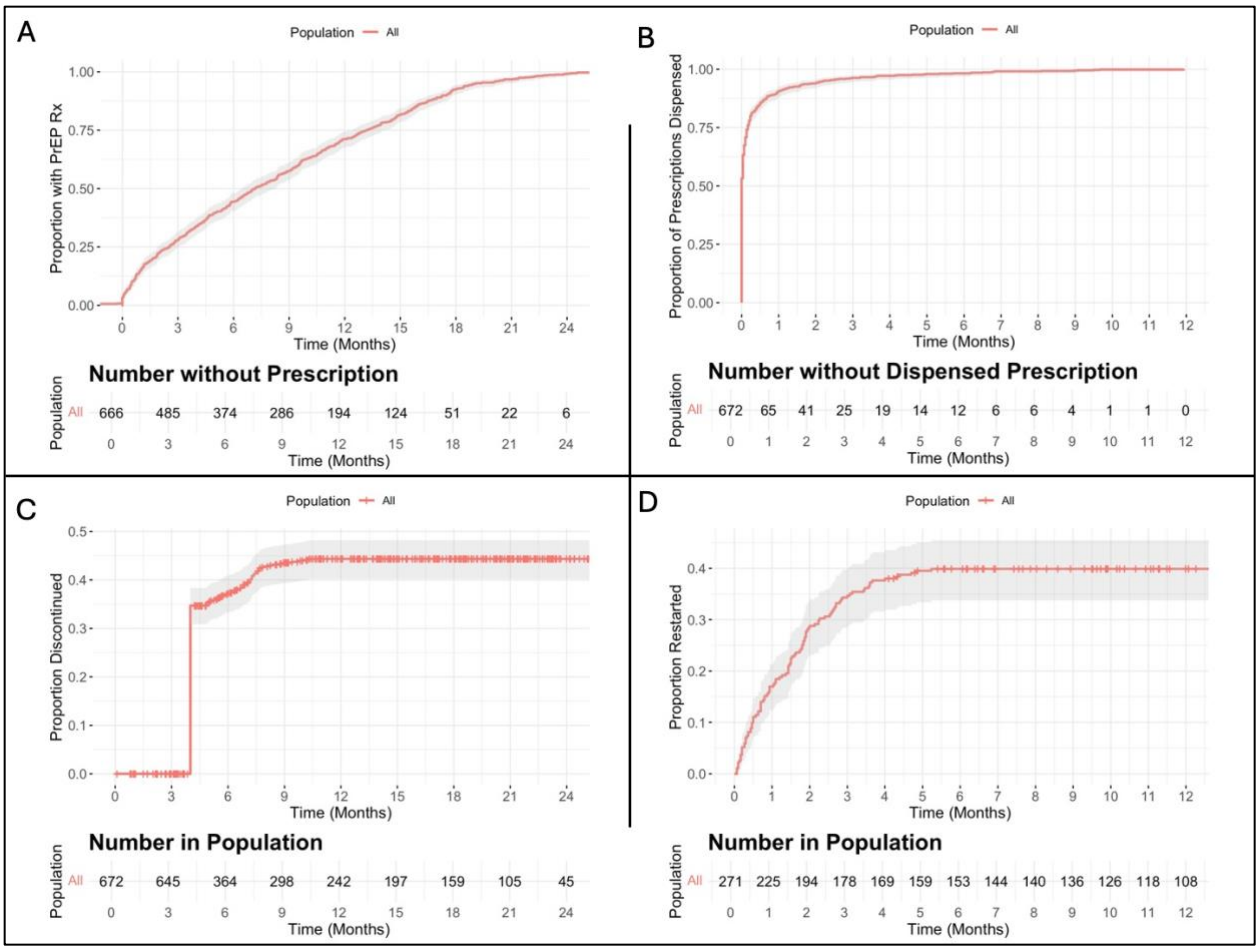

Figure 2. Overall PrEP Pathway Progression

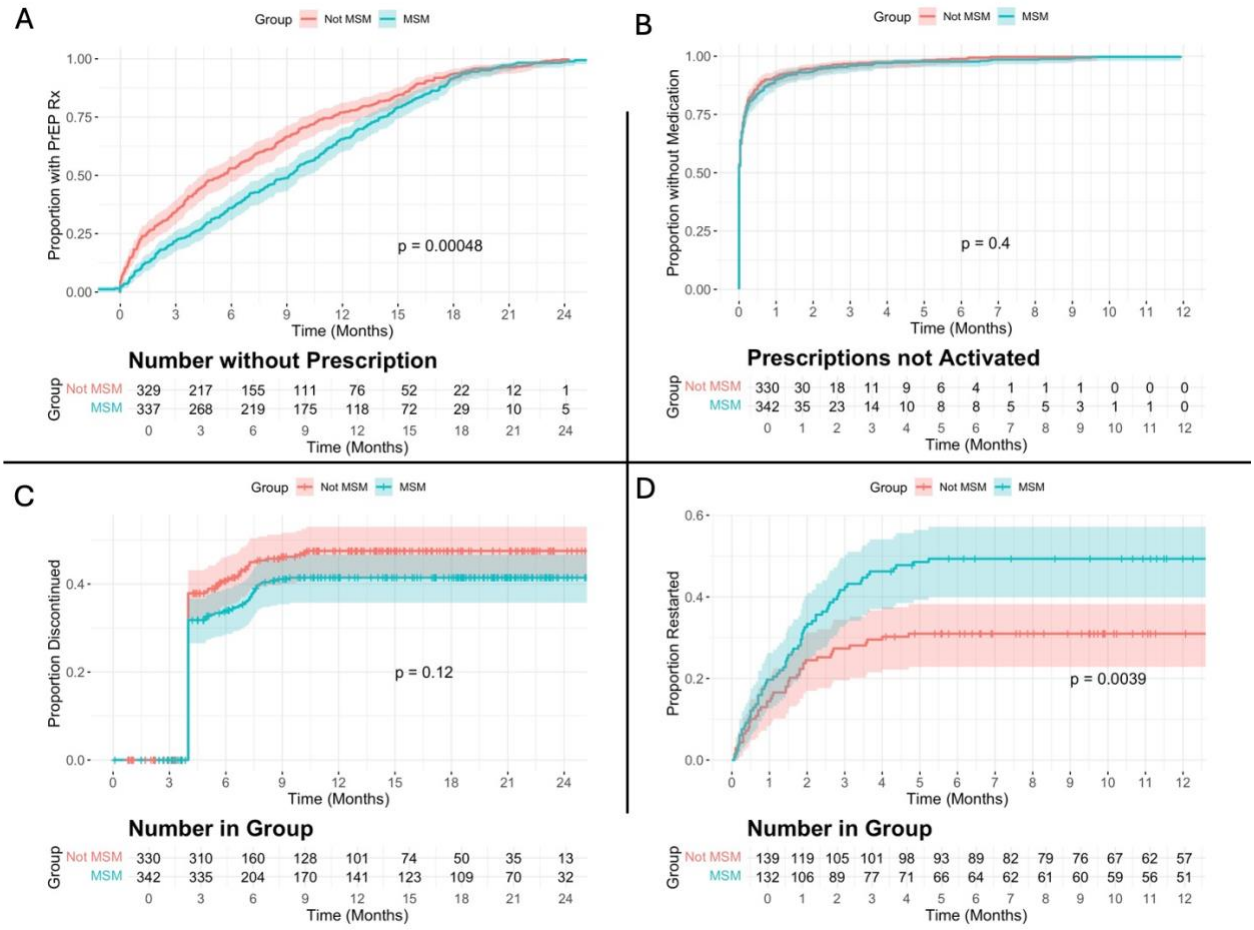

Figure 3. PrEP Pathway by MSM Status

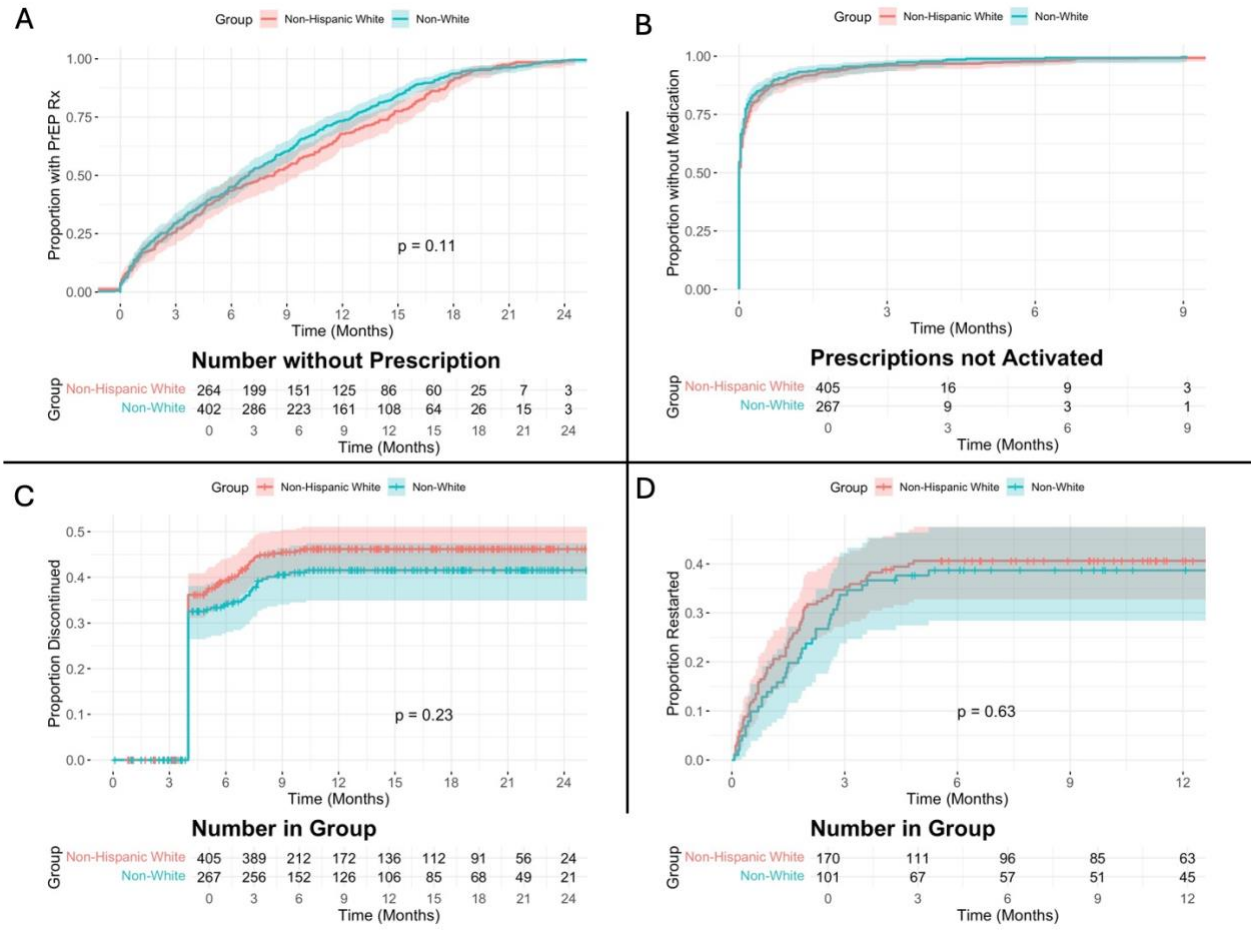

Figure 4. PrEP Pathway by Binary Racial or Ethnic Identity

Table 1. Study Population

	Overall (N=672)		Overall (N=672)
Age		**Rank**	
18-25	368 (54.8%)	E1-E4	414 (61.6%)
26-35	251 (37.4%)	E5-E6	102 (15.2%)
36-45	49 (7.3%)	E7-E9	30 (4.5%)
>45	4 (0.6%)	O1-O3	112 (16.7%)
MSM		O4-O6	12 (1.8%)
No	330 (49.1%)	W	2 (0.3%)
Yes	342 (50.9%)	**STI, Time Zero**	
Sex		No	361 (53.7%)
F	36 (5.4%)	Yes	311 (46.3%)
M	636 (94.6%)	**STI, during study**	
Race or Ethnicity		No	450 (67.0%)
Non-Hispanic White	267 (39.7%)	Yes	222 (33.0%)
Asian-Pacific Islande	38 (5.7%)	**Condom Usage**	
Hispanic	176 (26.2%)	No	540 (80.4%)
Non-Hispanic Black	130 (19.3%)	Yes	132 (19.6%)
Other	52 (7.7%)	**Alcohol Use Disorder**	
Unknown	9 (1.3%)	No	571 (85.0)
Service		Yes	101 (15.0%)
Air Force	176 (26.2%)	**Tobacco Use**	
Army	207 (30.8%)	No	616 (91.7%)
Marines	55 (8.2%)	Yes	56 (8.3%)
Navy	234 (34.8%)	**Substance Use**	
		No	661 (98.4%)
		Yes	11 (1.6%)

Table 2. Median Time to Event

	Days to Prescription(95% CI)	**Days to Restart (95% CI)**
Overall	215 (193-249)	43 (28-53)
MSM	274 (235-303)	44 (28-57)
Non-MSM	166 (132-197)	32 (21-54)
White	249 (188-289)	45 (32-67)
Non-White	208 (186-238)	33 (23-49)

Table 3. Crude Hazard Ratios

	Crude Likelihood Ratios (95% CI)			
	Prescription	**Initiation**	**Discontinuation**	**Restart**
Non-MSM	[reference]	[reference]	[reference]	[reference]
MSM	**0.76 (0.65-0.89)**	0.95 (0.82-1.10)	0.83 (0.65-1.05)	**1.75 (1.19-2.58)**
Identified by PHA	[reference]	[reference]	[reference]	[reference]
STI at Time Zero	**0.78 (0.67-0.92)**	1.14 (0.97-1.33)	0.85 (0.66-1.09)	1.20 (0.80-1.78)
MSM w/o STI	[reference]	[reference]	[reference]	[reference]
MSM w/ STI	1.11 (0.81-1.51)	1.16 (0.84-1.59)	1.09 (0.66-1.82)	0.87 (0.38-2.00)
Female Sex	[reference]	[reference]	[reference]	[reference]
Male Sex	1.20 (0.84-1.70)	**0.48 (0.35-0.65)**	**0.56 (0.35-0.9)**	**11.0 (1.56-77.3)**
Race				
White	[reference]	[reference]	[reference]	[reference]
Hispanic	1.10 (0.90-1.35)	0.90 (0.75-1.09)	1.11 (0.82-1.50)	1.30 (0.82-2.08)
Asian-American	1.07 (0.77-1.48)	0.80 (0.58-1.11)	1.04 (0.60-1.80)	0.68 (0.23-1.99)
Non-Hispanic Bla	1.22 (0.99-1.49)	0.93 (0.76-1.14)	**1.39 (1.02-1.91)**	0.93 (0.55-1.59)
Other	1.14 (0.83-1.55)	1.03 (0.73-1.45)	0.92 (0.56-1.53)	1.22 (0.57-2.6)
Unknown	1.01 (0.49-2.08)	0.62 (0.38-1.02)	0.91 (0.29-2.81)	1.79 (0.58-5.54)
Rank				
E1-E4	[reference]	[reference]	[reference]	[reference]
E5-E6	0.90 (0.73-1.11)	0.84 (0.68-1.04)	**0.66 (0.45-0.97)**	1.56 (0.90-2.71)
E7-E9	0.71 (0.49-1.01)	**0.65 (0.45-0.93)**	0.97 (0.54-1.74)	1.61 (0.70-3.72)
O1-O3	**0.79 (0.63-0.98)**	**0.75 (0.61-0.92)**	0.82 (0.59-1.13)	1.52 (0.94-2.45)
O4-O6	1.20 (0.66-2.16)	0.74 (0.48-1.15)	0.95 (0.39-2.34)	0.56 (0.08-4.06)
W	-	-	-	-
No Substance Use	[reference]	[reference]	[reference]	[reference]
Substance Use	0.97 (0.74-1.28)	0.85 (0.66-1.09)	1.16 (0.77-1.74)	0.51 (0.22-1.15)

Table 4. Adjusted Hazard Ratios

	Adjusted Likelihood Ratios (95% CI)			
	Prescription	**Initiation**	**Discontinuation**	**Restart**
Non-MSM	[reference]	[reference]	[reference]	[reference]
MSM	**0.76 (0.64, 0.90)**	0.99 (0.84, 1.17)	0.95 (0.73, 1.25)	**1.66 (1.09, 2.51)**
Identified by PHA	[reference]	[reference]	[reference]	[reference]
STI at Time Zero	**1.38 (1.16, 1.65)**	1.00 (0.85, 1.19)	1.17 (0.90, 1.52)	1.07 (0.72, 1.61)
MSM w/o STI	[reference]	[reference]	[reference]	[reference]
MSM w/ STI	1.05 (0.78-1.40)	0.99 (0.76-1.30)	1.12 (0.73-1.71)	**1.92 (1.01-3.68)**
Female Sex	[reference]	[reference]	[reference]	[reference]
Male Sex	1.41 (0.96, 2.06)	**0.47 (0.35, 0.64)**	**0.58 (0.36, 0.96)**	7.43 (1.01, 54.65)
Race				
White	[reference]	[reference]	[reference]	[reference]
Hispanic	0.99 (0.80, 1.22)	0.81 (0.66, 0.99)	1.04 (0.76, 1.43)	**1.71 (1.03, 2.82)**
Asian-American	1.01 (0.74, 1.38)	0.77 (0.56, 1.05)	1.04 (0.60, 1.80)	0.65 (0.23, 1.84)
Non-Hispanic Blac	1.08 (0.87, 1.34)	0.86 (0.69, 1.07)	1.33 (0.95, 1.86)	1.05 (0.61, 1.81)
Other	1.04 (0.77, 1.40)	0.99 (0.71, 1.39)	0.89 (0.52, 1.53)	1.34 (0.61, 2.93)
Unknown	0.89 (0.43, 1.84)	0.67 (0.41, 1.10)	0.92 (0.30, 2.83)	2.02 (0.44, 9.20)
Rank				
E1-E4	[reference]	[reference]	[reference]	[reference]
E5-E6	0.97 (0.78, 1.21)	0.83 (0.66, 1.03)	0.70 (0.47, 1.03)	1.44 (0.82, 2.52)
E7-E9	0.69 (0.46, 1.03)	**0.63 (0.44, 0.92)**	1.04 (0.57, 1.90)	1.77 (0.72, 4.36)
O1-O3	0.85 (0.68, 1.07)	**0.71 (0.57, 0.88)**	0.87 (0.62, 1.23)	1.57 (0.95, 2.59)
O4-O6	1.27 (0.74, 2.16)	0.73 (0.48, 1.12)	1.08 (0.42, 2.79)	0.71 (0.10, 5.24)
W	-	-	-	-
No Substance Use	[reference]	[reference]	[reference]	[reference]
Substance Use	0.88 (0.66, 1.19)	0.81 (0.62, 1.06)	1.06 (0.70, 1.62)	0.44 (0.18, 1.02)
No Condom Use	[reference]	[reference]	[reference]	[reference]
Condom Use	0.99 (0.80, 1.24)	0.95 (0.79, 1.14)	1.30 (0.98, 1.74)	1.38 (0.87, 2.18)