Assessing Disparities in DoxyPEP Implementation Using the DoxyPEP-to-Need Ratio: Evidence from an HIV Primary Care Clinic in Seattle, WA

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Abstract

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Background: Doxycycline post-exposure prophylaxis (doxyPEP) is effective in preventing STIs among men who have sex with men and transgender women, but little is known about its implementation. We applied the doxyPEP-to-need ratio (DPnR), measuring the number of people prescribed doxyPEP divided by people diagnosed with an STI, to explore inequities in doxyPEP implementation at an HIV primary care clinic in Seattle, WA.

Methods: We conducted a repeat cross-sectional analysis comparing doxyPEP prescriptions relative to incident STI diagnoses. We calculated the proportion of people with an STI who received doxyPEP, as well as annual DPnRs, stratified across patient race and ethnicity, age, primary language, and type of insurance. Patient zip code of residence was used in an ecological analysis evaluating the DPnR by population-level poverty and educational attainment.

Results: From 2023 to 2025, The proportion of people with an STI receiving doxyPEP rose from 19.6% to 51.9%, and the overall DPnR increased nearly four-fold. In 2025, White, Hispanic, and Asian individuals had the highest DPnRs (1.89, 1.84, 1.90, respectively), while Black (1.27) and

Indigenous (1.13) individuals had the lowest. Compared with English speakers, Spanish speakers had 20% more and non-English/non-Spanish speakers 22% fewer doxyPEP prescriptions per STI. People with public insurance had a lower DPnR than those with private or no insurance. Geographic areas with higher poverty and lower educational attainment had lower DPnR. The DPnR standard deviation increased over time across race and ethnicity, age, language, and insurance groups, indicating growing inequity in doxyPEP prescribing patterns.

Conclusion: We found widening disparities in doxyPEP use relative to STI burden, particularly among Black, Indigenous, and non-English/non-Spanish speaking individuals, highlighting the importance of prioritizing minority populations in doxyPEP implementation efforts.

Background

In the United States (U.S.), the incidence of bacterial sexually transmitted infections (STIs), including syphilis, gonorrhea, and chlamydia, has increased by 13% in the past decade[1]. The rising rates of syphilis are of public health concern given the potential for long-term sequelae, including neurologic, ocular, cardiac, and cognitive dysfunction, and congenital syphilis among women of childbearing potential. Racial and ethnic minorities are disproportionately impacted by this epidemic; Black individuals represent 31.7% and American Indian/Alaska Native (AI/AN) individuals account for 2.7% of primary and secondary syphilis cases, despite composing only 12.6% and 0.7% of the general population, respectively[2].

To address the rising rates of STIs, there is a need for effective public health interventions. Doxycycline post-exposure prophylaxis (doxyPEP) has shown high efficacy as a novel strategy for preventing STIs among men who have sex with men (MSM) and transgender women (TGW). DoxyPEP refers to the use of a single dose of doxycycline 200mg within 24 – 72 hours after a sexual encounter and substantially reduces the risk of syphilis and chlamydia among MSM and TGW[3-5]. A meta-analysis of three randomized controlled trials evaluating doxyPEP use among MSM and TGW estimated a 77% reduction in syphilis risk and 78% reduction in chlamydia risk, with a more modest reduction in gonorrhea risk (22%), likely due to the prevalence of tetracycline resistance among gonococcal isolates[6,7]. In June 2024, the Centers for Disease Control and Prevention (CDC) published clinical guidelines recommending doxyPEP for MSM and TGW with a history of a bacterial STI within the past 12 months, paving the way for widespread implementation of this STI prevention strategy[8]. In San Francisco, California and Seattle, Washington, two interrupted time-series analyses evaluating the population-level impact of doxyPEP on bacterial STI incidence found significant decreases in chlamydia and syphilis, but

not gonorrhea, among men after doxyPEP implementation[9,10]. A large decrease in syphilis among cisgender women was also noted in Seattle, despite doxyPEP use primarily among MSM and TGW, suggesting that this strategy may have broad-reaching, population-wide health benefits, including indirect benefits for those whose sexual partners are taking doxyPEP[10].

To date, most research has focused on doxyPEP efficacy in reducing STI incidence in both research and real-world settings. However, little is known about doxyPEP implementation. Studies on doxyPEP uptake demonstrate heterogenous patterns in different settings with respect to the race, ethnicity, age, and insurance status of early adopters[11-14]. While many of these studies suggest that doxyPEP is reaching minoritized populations, the existing literature does not provide strong evidence as to whether this reach is sufficient to address need among sociodemographic groups that bear a disproportionate burden of STI incidence. One study examining doxyPEP implementation at a sexual health clinic in San Francisco, California demonstrated widening disparities in doxyPEP use relative to STI burden among Black patients, highlighting the need for equity-focused research about this novel STI prevention strategy[15].

Inequity in the distribution of and access to sexual health interventions is not a new phenomenon; research on HIV pre-exposure prophylaxis (PrEP) equity in the U.S. over the first decade of implementation identified increasing disparities in prescription patterns across race, ethnicity, sex, and geographic region[16]. In 2018, to facilitate the evaluation of PrEP equity, Siegler et. al developed the PrEP-to-need ratio, defined as the number of PrEP users divided by new HIV diagnoses[17]. This metric measures PrEP coverage relative to HIV burden, assessing whether populations at highest risk for HIV acquisition are receiving a proportionally greater number of PrEP prescriptions. Since its inception, the PrEP-to-need ratio has become a standard

method for measuring PrEP equity, highlighting gaps in coverage that require public health and clinical attention.

Prioritizing equity in doxyPEP implementation efforts is critical for maximizing the population-level benefit of this new prevention strategy. However, current literature on doxyPEP uptake does not sufficiently address disparities in intervention delivery. In this study, we use the doxyPEP-to-need ratio, adapted from the PrEP-to-need ratio, to explore inequities in doxyPEP implementation at an HIV primary care clinic in Seattle, Washington.

Materials and Methods

Study Design and Setting

We conducted a repeat cross-sectional analysis comparing doxyPEP prescriptions relative to incident STI diagnoses to evaluate doxyPEP implementation at the University of Washington Madison Clinic at Harborview Medical Center in Seattle, Washington from January 1, 2023 – December 31, 2025.

The Madison Clinic is a Ryan White HIV/AIDS Program clinic at Harborview Medical Center in Seattle, Washington that provides primary care and HIV treatment and prevention services for individuals living with HIV and those on HIV PrEP. As doxyPEP is currently recommended for cisgender men and TGW who have sex with men at greater risk for bacterial STIs[8], this analysis included all patients at Madison Clinic aged 18 years and older who reported being assigned male sex at birth or identified as a transgender woman, or whose sex was listed as “male” in the electronic medical record (when neither sex assigned at birth nor transgender identity were reported).

DoxyPEP Use

Patient-level data were obtained for all individuals who were prescribed doxycycline for any indication while seeking care at the Madison Clinic from January 1, 2023 – December 31, 2025. This period encompasses the publication of doxyPEP guidelines by Public Health– Seattle & King County in June 2023 and by the CDC in June 2024. Doxycycline has medical indications in addition to STI prevention, including but not limited to treatment of acne, empiric treatment of soft tissue and respiratory tract infections, prevention and treatment of chlamydia, syphilis, and Lyme disease, and prevention of malaria. To identify doxyPEP prescriptions within the larger doxycycline database, we used one of two algorithms described by Mullis et. al to distinguish doxycycline used for STI prevention from other indications[18].

In their work, Mullis et. al developed an algorithm (referred to as algorithm A), which included as doxyPEP any prescription with the words "sex", "encounter", "doxy-PEP", or "72" in the provider sig or with a PRN dosing schedule. They also evaluated a second algorithm (algorithm B), which included prescriptions with any of the above criteria or with the word "200" in the provider sig. To validate these algorithms with our dataset, both were tested on a subset of 200 doxycycline prescriptions using chart review of prescriber and pharmacy notes as the gold standard. Algorithm A demonstrated a

Box 1. Criteria for DoxyPEP Identification

Mullis et al Criteria	Expanded Terms
Provider Sig	
"sex"	"sex" "intercourse"
"doxy-PEP"	"doxypep" "doxy pep" "doxy-pep" "doxycycline-PEP" "doxycycline PEP" "doxycycline post exposure prophylaxis" "doxy post exposure prophylaxis"
"72"	"72"
"200"	"200"
Dosing Schedule	
PRN	"As needed" "2 times daily PRN" "Daily PRN" "Continuous PRN" "Once as needed"

sensitivity of 98.1%, specificity of 100%, and accuracy of 99.0%, while algorithm B demonstrated a sensitivity of 100%, specificity of 98.9%, and accuracy of 99.5% in identifying doxyPEP prescriptions. Given its marginally higher accuracy, algorithm B was used to identify doxyPEP prescriptions within our database. Due to heterogeneity in ordering practices at the Madison Clinic, we expanded the criteria to include any version or spelling of doxyPEP and any medication dosing schedule including PRN or as needed instructions (Box 1).

STI Incidence

Patient-level data were also obtained for all individuals who tested positive for *Treponema pallidum*, *Neisseria gonorrhoeae*, or *Chlamydia trachomatis* while seeking care at the Madison Clinic from January 1, 2023 – December 31, 2025. Determination of STI testing was based on positive Treponema pallidum IgG/IgM Antibody immunoassay (TP-Ab), Treponema pallidum particle agglutination (TP-PA), Fluorescent Treponemal Antibody Absorption (FTA-ABS), Rapid plasma reagin (RPR), or Venereal Disease Research Laboratory (VDRL) for *T. pallidum*, and nucleic acid amplification test (NAAT) at any anatomic site for *N. gonorrhoeae* or *C. trachomatis*. When an individual tested positive for syphilis during the study period, we also extracted the most recent treponemal (TP-Ab, TP-PA or FTA-ABS) and non-treponemal (RPR or VDRL) tests performed immediately prior to the positive result to identify incident syphilis cases.

A new case of gonorrhea or chlamydia was defined as a positive NAAT (from a urine, oropharyngeal, or rectal sample). At the Madison Clinic, patients without a history of syphilis are screened for syphilis using the reverse algorithm, whereby initial treponemal testing (TP-Ab) is performed and, if positive, is followed by a reflexive quantitative RPR, while patients with a history of syphilis are screened with a quantitative RPR only. Incident syphilis cases were

defined as meeting one or more of the following criteria, modified from those previously published by Menza et. al[19]:

1) A four-fold rise in consecutive RPR titers
2) An initial reactive RPR with titer 1:16 or greater in a patient with no prior syphilis test results in our dataset
3) A reactive RPR with titer 1:4 or greater in a patient with no prior RPR results and exclusively negative prior treponemal antibody test results in our dataset

During the study period, RPRs were run at the Public Health—Seattle & King County Laboratory. All reactive RPRs were then automatically forwarded to the Washington State Department of Health Laboratory for repeat testing. When an individual had multiple RPR titers within seven days, the lowest RPR titer was excluded from the dataset to account for minor expected variation in the test result due to biologic variability and/or subjective interpretation by the laboratory technician. A sensitivity analysis was performed excluding the highest RPR titer to evaluate the impact of this decision on identification of incident syphilis cases.

Sociodemographic Characteristics

Self-reported patient characteristics, including sex, gender identity, sex assigned at birth, sexual orientation, age, race, ethnicity, primary language, insurance, and zip code of residence, were collected from the electronic medical record. Race and ethnicity were combined; individuals who reported more than one racial or ethnic group were categorized according to the rarest group represented nationally in the 2024 United States Census (in ascending order: Native Hawaiian and Other Pacific Islander [NH/PI], American Indian and Alaska Native [AI/AN], Asian, Black, Hispanic, White)[20]. Sexual orientation included any identity reported by the patient over the

three-year study period. Individuals were categorized as MSM if they identified as “gay”, “bisexual”, or “pansexual/Bi+” at least once from 2023 - 2025. Among individuals assigned male at birth, CDC STI Screening Guidelines recommend extragenital testing exclusively for MSM and TGW[21]. Due to a high degree of missingness in sexual orientation data in the electronic medical record, individuals were also categorized as MSM if they had undergone oropharyngeal or rectal testing for *N. gonorrhoeae* or *C. trachomatis* from 2023 – 2025, regardless of test result.

Additional population-level socioeconomic data were collected from the 2024 American Community Survey conducted by the U.S. Census Bureau, including zip code estimates of the proportion of the population living below the federal poverty level and the proportion of adults (age 25 years and older) without a high school diploma[22].

The University of Washington Institutional Review Board approved all study protocols (STUDY00021635).

DoxyPEP-to-Need Ratio

The doxyPEP-to-need ratio (DPnR) is defined as the number of individuals prescribed doxyPEP divided by individuals diagnosed with a new STI within a distinct sociodemographic group, in which each person counted only once in the numerator and denominator. This can be interpreted as the number of people prescribed doxyPEP for each person diagnosed with an STI. Although the ideal ratio is unknown, a higher ratio indicates greater doxyPEP coverage in relation to STI burden among populations with specific characteristics (e.g., younger or minority race/ethnicity). An individual was considered a doxyPEP user if they received one or more prescriptions for doxyPEP during the period of interest. Information on doxycycline receipt, adherence, and refill rate were not available.

Data Analysis

Descriptive statistics were used to characterize the study population and calculate the doxyPEP prescription rate, defined as the proportion of individuals diagnosed with an STI who received a prescription for doxyPEP in the same year. The DPnR was calculated for each year and stratified across participant race and ethnicity, age, primary language, type of insurance, and zip code of residence. For each stratum, we calculated the DPnR mean and standard deviation (SD). Due to low variability in gender identity and sexual orientation among our cohort, we were unable to detect meaningful differences in the DPnR across these groups.

An ecological analysis was conducted using zip code of residence, whereby zip codes were divided into quartiles based on the proportion of the population living below the federal poverty level and the proportion of the adult population without a high school diploma. The DPnR for 2025 was compared across all quartiles. To maintain confidentiality, zip codes were excluded from analysis if they contained fewer than five people diagnosed with an STI in 2025.

Statistical analyses were performed using R Software, version 4.4.1.

Results

A total of 1,768 patients were prescribed doxycycline at the Madison Clinic from January 1, 2023 – December 31, 2025, of whom 995 (56.2%) were prescribed doxyPEP. Among those prescribed doxyPEP, 35.1% were White, 31.2% Hispanic, and 11.5% Black (Table 1). Most were 30-44 years old (55.2%) and English-speaking (80.4%). The highest percentage of people prescribed doxyPEP (39.7%) were uninsured. Of the 533 people with non-missing gender identity data, 87.1% identified as male and 5.1% as transgender female. Almost all (98.0%) were MSM.

During this same period, 1,137 patients were diagnosed with at least one STI, including 396 (34.8%) with syphilis, 618 (54.4%) with gonorrhea, and 536 (47.1%) with chlamydia (Table 2). Three hundred and fifty-four people (31.0%) had more than one STI during the study period. Among those with any STI, 34.7% were White, 30.0% Hispanic, and 16.1% Black. Most were 30-44 years old (53.0%) and English-speaking (83.7%). The highest percentage of people diagnosed with an STI (39.3%) were on public insurance. Of the 597 people with non-missing gender identity data, 85% identified as male and 6.2% as transgender female. Nearly all (94.1%) were MSM.

From 2023 to 2025, the number of people prescribed doxyPEP increased by 310%, while people diagnosed with an STI decreased by 21.6%, driven by substantial reductions in syphilis (40.1%) and chlamydia (34.7%) and a more moderate reduction in gonorrhea (12.5%). The doxyPEP prescription rate among individuals diagnosed with any STI was lowest in 2023 (19.6%), rising to 51.9% in 2025 (Table 3). Among individuals testing positive for only one type of STI in 2025, those diagnosed with gonorrhea were most likely to be prescribed doxyPEP (65.6%), followed by chlamydia (40.5%) and syphilis (32.1%).

In the sensitivity analysis which excluded the highest RPR titer, rather than the lowest, when multiple RPR titers existed for the same individual within a seven-day period, 15 people were reclassified: eight as having an incident syphilis diagnosis and seven as not having an incident syphilis diagnosis.

DoxyPEP-to-Need Analysis

The doxyPEP-to-need ratio was stratified by calendar year, race and ethnicity, age, primary language, insurance type, and zip code of residence. From 2023 to 2025, the DPnR increased

from 0.44 to 1.75, demonstrating nearly a four-fold rise in people prescribed doxyPEP relative to STI burden. The DPnR increased over time, regardless of racial or ethnic group. White, Hispanic, and Asian individuals had the highest DPnRs (1.89, 1.84, 1.90 in 2025, respectively) (Figure 1). Those who were AI/AN or NH/PI consistently had the lowest DPnR, demonstrating 40% fewer people prescribed doxyPEP per STI compared to White individuals in 2025. Although the DPnR for Black patients was similar to that of White patients in 2023 (0.45 and 0.50, respectively), this gap widened by 2025, when there were 33% fewer Black than White people prescribed doxyPEP per STI.

The DPnR remained close to the mean for individuals aged 25 to 54 years over the study period. During this time, the largest change was seen among the youngest and oldest cohorts. Those aged 18 to 24 years had the lowest DPnR (0.1) in 2023, but a ratio close to the mean DPnR by 2025 (1.7). In contrast, the DPnR among those aged 55 and older was near the mean in 2023 (0.3) and increased substantially above average by 2025 (2.4). Although the DPnR was similar for all individuals regardless of primary language in 2023, by 2025, there were 20% more Spanish-speaking people prescribed doxyPEP and 22% fewer non-English/non-Spanish-speaking people prescribed doxyPEP per STI compared to English-speaking individuals. In this cohort, uninsured patients consistently received the most doxyPEP prescriptions relative to STI burden, with those on public insurance receiving the fewest. The DPnR standard deviation increased over time across groups stratified by race and ethnicity, age, language, and insurance type, indicating growing disparities in the number of people prescribed doxyPEP relative to STI burden across all sociodemographic groups.

Figure 2 shows the DPnR by participant zip code in King County, Washington. In the ecological analysis, zip codes in the highest quartile for the proportion of the population living under the

federal poverty level (>12.9%) had a lower DPnR (1.09), compared to those in the lowest quartile (<8.7% of population below the poverty level; DPnR 1.57). Zip codes in the highest quartile for the proportion of the adult population without a high school diploma (>12%) had a lower DPnR (1.00), compared to those in the lowest quartile (<1.9% of population without a diploma; DPnR 1.91).

Discussion

In this repeat cross-sectional sample of people assigned male at birth living with HIV or on HIV PrEP attending a large, Ryan White clinic in Seattle, Washington, doxyPEP prescriptions increased substantially, corresponding with a moderate decrease in bacterial STIs, particularly chlamydia and syphilis. In 2025, there were 1.3 more people prescribed doxyPEP per person diagnosed with an STI, compared to 2023. Disparities in doxyPEP use widened over time with respect to race and ethnicity, language, and insurance status. By 2025, Black and Indigenous patients received 33% and 40% fewer doxyPEP prescriptions per person with an STI, respectively, than White patients. Similarly, non-English/non-Spanish speakers received 22% fewer prescriptions per person with an STI than English speakers, while publicly insured patients received 46% fewer and uninsured patients 16% more doxyPEP prescriptions per person with an STI than those with private insurance.

The increase in doxyPEP use observed over the study period is consistent with prescribing trends noted in two Northern California studies on early doxyPEP uptake[9,14]. Our analysis encompassed publication of doxyPEP guidelines by the CDC in June 2024 and by Public Health– Seattle & King County one year earlier (June 2023), which likely contributed to a rapid rise in doxyPEP use. Many studies have also noted increasing awareness, interest, and comfort with doxyPEP by both patients and clinical providers, reflected in the observed prescribing patterns[12,23,24].

At Madison Clinic, STI diagnoses have decreased over the last several years, with substantial changes in chlamydia and syphilis more than in gonorrhea, which is notable in the post-doxyPEP era and mirrors national trends[1]. In this repeat cross-sectional analysis, we are unable to infer causality in the temporal association between rising doxyPEP use and decreasing STI incidence. However, studies looking at incident STI diagnoses pre- and post-doxyPEP implementation have consistently demonstrated greater reductions in chlamydia and syphilis compared to gonorrhea[25,26]. The differential changes observed in our study may reflect the impact of early, clinic-wide adoption of doxyPEP.

The doxyPEP prescription rate increased 2.6-fold over the study period, from 19.6% in 2023 to 51.9% in 2025. Despite evidence that doxyPEP has reduced efficacy against gonorrhea, patients at the Madison Clinic diagnosed with gonorrhea were twice as likely to receive a prescription for doxyPEP compared to those with syphilis. This may highlight a gap in provider knowledge regarding the variable efficacy of doxyPEP against gonorrhea compared to chlamydia and syphilis, a lag in translating this awareness into practice change, or recognition that prior gonococcal infection is associated with a higher risk of subsequent syphilis and chlamydia among MSM[27,28]. Indeed, among those diagnosed with gonorrhea in our cohort in 2023, 27.8% were subsequently diagnosed with chlamydia or syphilis over the next two years, suggesting that doxyPEP prescription for people with incident gonorrhea may help prevent future non-gonococcal infections.

However, the finding that doxyPEP prescription rates for chlamydia and syphilis were lower than those for gonorrhea warrants exploration. One potential explanation is that prescribers using doxycycline for chlamydia or syphilis treatment may hesitate to start doxyPEP concurrently due to concerns that patients would become confused about dosing doxycycline for STI treatment

versus prophylaxis. This issue may have worsened in the setting of recent national penicillin G benzathine shortages, which have necessitated the increased use of doxycycline for syphilis treatment[29]. Alternatively, men with gonorrhea may be more motivated to accept a doxyPEP prescription compared to those presenting with chlamydia or syphilis, as gonorrhea more commonly presents with symptoms[30]. One final possibility is that when STI test results return days after the initial evaluation, providers may be reluctant to initiate doxyPEP over the phone and instead defer prescribing to the next clinic visit, by which time the issue could have been forgotten or the patient lost to follow-up. Additional research is needed to understand the varying doxyPEP prescription rates observed in this study and their population-level impact on doxyPEP efficacy.

We found increasing disparities in doxyPEP use over time across patient race and ethnicity, language, and insurance status. In our cohort, individuals who were Black and AI/AN or NH/PI were much less likely to be prescribed doxyPEP relative to STI incidence than White patients. Though data on doxyPEP equity is limited, a study by Melo et. al using the DPnR to evaluate racial disparities in San Francisco noted similar results, demonstrating that Black patients received 28% less doxyPEP relative to STI burden compared to White patients[15]. Prior ecological literature on PrEP implementation across racial groups also supports the presence of disparities; regions with larger Black populations consistently have lower PrEP coverage per HIV diagnosis[16,31]. Indigenous populations, including American Indian, Alaska Native, Native Hawaiian, and Pacific Islander groups, are underrepresented in sexual health research and little is known about the provision of STI and HIV prevention resources to these individuals. Our study suggests that doxyPEP prescription relative to STI burden among Indigenous groups is low, though these data must be interpreted cautiously due to low numbers and high heterogeneity in

this aggregated population. National STI surveillance data demonstrate that rates of syphilis, chlamydia, and gonorrhea among Indigenous populations are substantially higher than those among White, Asian, or Hispanic people, and in 2023, Indigenous groups reported the highest rate of congenital syphilis among any racial or ethnic category[32]. Further work is needed to understand whether the inequity in doxyPEP implementation indicated by our data is reflective of broader uptake practices among Indigenous populations and how these disparities vary among different Indigenous groups.

In our study, the DPnR was higher among Spanish-speaking individuals compared to those who spoke English or other foreign languages. The Madison Clinic serves a large proportion of Spanish-speaking patients through a partnership with a local nonprofit organization for the Latino/a community, which provides access to PrEP peer navigators. The high DPnR noted among Spanish-speaking individuals may reflect prior PrEP and doxyPEP counseling received by many of these patients before arriving to the Madison Clinic, increasing the likelihood that they either inquire about doxyPEP independently or accept a doxyPEP prescription from their provider. Though this finding likely does not reflect doxyPEP implementation patterns in other settings, it offers insight into the efficacy of culturally tailored peer support and counseling in promoting doxyPEP uptake. Our study also found a lower DPnR among people who were non-English/non-Spanish speaking, which may stem from language barriers impacting clinical care, STI-related stigma, or cultural differences in care-seeking behavior, attitudes towards doxyPEP, or social norms.

Our study also demonstrated that people with public insurance received fewer doxyPEP prescriptions relative to STI burden compared to those on private insurance, with widening disparities over time. Interestingly, from 2023 – 2025, there was a larger increased in doxyPEP

prescriptions among people with public insurance than those with private insurance, but STI diagnoses declined less. This suggests that the widening disparity is driven by persistently higher STI rates among publicly insured patients. Surprisingly, we found that uninsured individuals had a higher DPnR than those with private insurance. We initially evaluated for possible correlation between uninsured status and Spanish-speaking language or self-identification as Black or Indigenous race/ethnicity; however, the correlation coefficients between all demographic variables were low (<0.3). One possible explanation for this finding is that testing rates among uninsured individuals may be low, leading to reduced detection of STIs and false inflation of the DPnR among this population. Alternatively, individuals without insurance may be perceived as higher risk for STI acquisition by clinicians, prompting a discussion about doxyPEP even in the absence of a recent STI diagnosis.

In an ecological analysis, regions with a higher degree of poverty and lower educational attainment had lower DPnRs compared to other zip codes. Prior literature evaluating differences in the PrEP-to-need ratio among counties nationwide found similar results, demonstrating that areas with higher poverty have lower PrEP coverage relative to HIV burden[33]. These analyses together highlight a relative underutilization of sexual health preventative resources among those living in areas with greater poverty. While this finding has historically been attributed to lack of sexual healthcare access in these geographic regions, our study included only individuals seen at a single clinic, suggesting that other factors beyond healthcare proximity and access, including pharmacy availability, medication cost or adherence, or doxyPEP acceptability, may drive this disparity[34].

This study has several important limitations. Our analysis was limited to a single, urban healthcare clinic, and results cannot be used to draw conclusions about doxyPEP prescribing

patterns in other contexts. At the Madison Clinic, people of Alaska Native, American Indian, Native Hawaiian, and Pacific Island descent are underrepresented, and additional study is needed to understand doxyPEP prescribing patterns in this population. Compared to other regions, doxyPEP utilization may be higher in Seattle, Washington, which served as a primary study site for the DoxyPEP clinical trial and where MSM and TGW are granted a high degree of visibility[3]. In our study, doxyPEP use was defined as receiving a prescription for doxycycline intended for STI prevention regardless of medication receipt or adherence, and the number of people prescribed doxyPEP may overestimate true use. We were also unable to incorporate doxyPEP received outside of the Madison Clinic system, potentially underestimating doxyPEP prescriptions. However, because the Madison Clinic provides comprehensive healthcare services, including primary care, it is expected that the majority of patients receiving doxyPEP would have it prescribed at the clinic.

Data on STI testing results were available only from the Madison Clinic, which may have contributed to misclassification of incidence STI cases if patients underwent testing outside of our system. Furthermore, the number of people diagnosed with an STI within a specific demographic group is dependent on testing frequency within that population, and the DPnR may appear falsely higher for groups diagnosed with fewer STIs due to infrequent testing.

It is important to recognize that the ideal DPnR remains unknown. The individual- and population-level benefits of doxyPEP must be balanced against concerns regarding long-term antimicrobial drug resistance and impacts on the gut microbiome. We caution against the interpretation of the DPnR as an indicator of the adequacy of doxyPEP coverage within a single sociodemographic group and instead encourage its use as a marker of inequity when compared across populations.

Despite these limitations, our study provides useful insight into disparities early in doxyPEP implementation and is one of few analyses to use the doxyPEP-to-need ratio as a measure of inequity. To date, most literature on the PrEP-to-need ratio uses an ecological approach. While this method identifies broad inequities in HIV prevention to guide public health policy and funding efforts, it cannot be used for individual-level analysis. Our work offers a new perspective on the use of this metric at the individual level, paving the way for development of interventions targeting the patient and provider experience. These interventions should aim to standardize the doxyPEP eligibility assessment and prescribing protocol, ensure provider and patient education about doxyPEP indications, and implement real-time monitoring of prescribing equity. The electronic medical record can be leveraged to achieve these goals using standardized orders, nurse- or pharmacist-driven screening and counseling protocols, multilingual patient education materials, and automated prompts for both providers and patients following bacterial STI diagnosis. Furthermore, peer navigation services have been effective in connecting individuals at risk for HIV acquisition to PrEP care; culturally tailored peer support and counseling may represent a promising strategy for patients eligible for doxyPEP, as suggested by the high DPnR observed among Spanish-speaking patients at the Madison Clinic, who had access to these services[35,36].

In this study, we found widening disparities in doxyPEP use relative to STI burden with respect to race and ethnicity, insurance status, language, and zip code of residence. These results highlight the importance of intentional and systematic efforts to prioritize minority populations, particularly Black, Indigenous, and non-English/non-Spanish speaking individuals, early in the doxyPEP implementation process. The widespread dissemination of doxyPEP has considerably advanced the field of STI prevention and shows substantial promise for combating the STI

epidemic in the United States. However, inequitable distribution of this new resource could lead to worsening disparities in STI outcomes among marginalized groups, emphasizing the urgency of prioritizing minority populations in governmental, institutional, and clinic-level doxyPEP implementation efforts.

Table 1. Sociodemographic Characteristics of Individuals Prescribed DoxyPEP				
	Total n(%)	**2023 n(%)**	**2024 n(%)**	**2025 n(%)**
Unique DoxyPEP Users	995	248	601	767
Race/Ethnicity				
White	349 (35.1%)	106 (42.7%)	211 (35.1%)	250 (32.6%)
Hispanic	310 (31.2%)	71 (28.6%)	202 (33.6%)	246 (32.1%)
Black	114 (11.5%)	31 (12.5%)	70 (11.6%)	99 (12.9%)
Asian	84 (8.5%)	18 (7.3%)	50 (8.3%)	57 (7.4%)
AI/AN	12 (1.2%)	2 (0.8%)	7 (1.2%)	11 (1.4%)
NH/PI	8 (0.8%)	1 (0.4%)	6 (1.0%)	6 (0.8%)
Multi-racial	36 (3.6%)	10 (4.0%)	21 (3.5%)	25 (3.3%)
Unknown	82 (8.2%)	9 (3.6%)	34 (5.7%)	73 (9.5%)
Gender Identity				
Male	464 (46.6%)	129 (52.0%)	295 (49.1%)	336 (43.9%)
Transgender Female	27 (2.7%)	5 (2.0%)	19 (3.2%)	22 (2.9%)
Nonbinary	17 (1.7%)	7 (2.8%)	11 (1.8%)	14 (1.8%)
Gender Queer	13 (1.3%)	5 (2.0%)	9 (1.5%)	8 (1.0%)
Female	9 (0.9%)	1 (0.4%)	3 (0.5%)	6 (0.8%)
Gender Fluid	2 (0.2%)	0 (0%)	1 (0.2%)	2 (0.3%)
Two Spirit	1 (0.1%)	0 (0%)	1 (0.2%)	1 (0.1%)
Unknown	462 (46.5%)	101 (40.7%)	262 (43.6%)	378 (49.3%)
Sexual Orientation				
Men who have sex with men[a]	975 (98.0%)	246 (99.2%)	598 (99.5%)	750 (97.8%)
Other/Unknown	20 (2.0%)	2 (0.8%)	3 (0.5%)	17 (2.2%)
Age (years)				
18-24	40 (4.0%)	3 (1.2%)	18 (3.0%)	35 (4.6%)
25-29	136 (13.7%)	34 (13.7%)	76 (12.6%)	103 (13.4%)
30-34	210 (21.1%)	53 (21.4%)	127 (21.1%)	160 (20.9%)
35-44	339 (34.1%)	84 (33.9%)	211 (35.1%)	261 (34.0%)
45-54	163 (16.4%)	50 (20.2%)	104 (17.3%)	124 (16.2%)
55-64	85 (8.6%)	21 (8.5%)	53 (8.8%)	68 (8.9%)
65-74	21 (2.1%)	2 (0.8%)	11 (1.8%)	16 (2.1%)
75+	1 (0.1%)	1 (0.4%)	1 (0.2%)	0 (0%)
Primary Language				
English	800 (80.4%)	224 (90.3%)	489 (81.4%)	600 (78.2%)
Spanish	172 (17.3%)	20 (8.1%)	103 (17.1%)	147 (19.2%)
Other[b]	23 (2.3%)	4 (1.6%)	9 (1.5%)	20 (2.6%)
Insurance				
Private	298 (29.9%)	80 (32.3%)	171 (28.5%)	243 (31.7%)
Public[c]	242 (24.3%)	49 (19.8%)	138 (23%)	199 (25.9%)
Uninsured	395 (39.7%)	110 (44.5%)	261 (43.4%)	273 (35.6%)
Other	60 (6.0%)	9 (3.6%)	31 (5.2%)	52 (6.8%)

[a]Includes individual who identified as gay, bisexual, or pansexual/Bi+ at least once from 2023 – 2025
[b]Includes Amharic, Arabic, Burmese, Farsi, Filipino, French, Mandarin, Portuguese, Russian, Samoan, Serbian, Sign Language, Somali, Thai, Turkish, Ukrainian, Vietnamese, and Wolof
[c]Includes Medicare, Medicaid, Tricare, Worker's compensation

Table 2. Sociodemographic Characteristics of Individuals Diagnosed with a Sexually Transmitted Infection (STI) at the University of Washington Harborview Madison Clinic, 2023 - 2025										
		2023			2024			2025		
	Total[a] n(%)	**Syphilis n(%)**	**Gonorrhea n(%)**	**Chlamydia n(%)**	**Syphilis n(%)**	**Gonorrhea n(%)**	**Chlamydia n(%)**	**Syphilis n(%)**	**Gonorrhea n(%)**	**Chlamydia n(%)**
Unique People Diagnosed	1137	167/560 (29.8%)	273/560 (48.8%)	251/560 (44.8%)	152/531 (28.6%)	292/531 (55.0%)	212/531 (39.9%)	100/439 (22.8%)	236/439 (53.8%)	164/439 (37.4%)
Race/Ethnicity										
White	394 (34.7%)	63 (37.7%)	108 (39.6%)	83 (33.1%)	43 (28.3%)	101 (34.6%)	68 (32.1%)	31 (31.0%)	66 (28.0%)	56 (34.1%)
Hispanic	341 (30.0%)	44 (26.3%)	92 (33.7%)	92 (36.7%)	47 (30.9%)	102 (34.9%)	76 (35.8%)	31 (31.0%)	70 (30.0%)	48 (29.2%)
Black	183 (16.1%)	20 (12.0%)	30 (11.0%)	31 (12.4%)	35 (23.0%)	42 (14.4%)	25 (11.8%)	16 (16.0%)	52 (22.0%)	25 (15.2%)
Asian	77 (6.8%)	14 (8.4%)	15 (5.5%)	27 (10.8%)	7 (4.6%)	14 (4.8%)	18 (8.5%)	4 (4.0%)	15 (6.4%)	12 (7.3%)
AI/AN	20 (1.6%)	3 (1.8%)	5 (1.8%)	4 (1.6%)	2 (1.3%)	4 (1.4%)	5 (2.4%)	5 (5.0%)	4 (1.7%)	2 (1.2%)
NH/PI	18 (1.6%)	5 (3.0%)	3 (1.1%)	2 (0.8%)	4 (2.6%)	5 (1.7%)	4 (1.9%)	1 (1.0%)	2 (0.8%)	5 (3.0%)
Multi-racial	38 (3.3%)	5 (3.0%)	8 (2.9%)	4 (1.6%)	5 (3.2%)	9 (3.1%)	11 (5.2%)	5 (5.0%)	9 (3.8%)	5 (3.0%)
Unknown	66 (5.8%)	13 (7.8%)	12 (4.4%)	8 (3.2%)	9 (5.9%)	15 (5.1%)	5 (2.4%)	7 (7.0%)	18 (7.6%)	11 (6.7%)
Gender Identity										
Male	510 (44.9%)	79 (47.3%)	134 (49.1%)	127 (50.1%)	74 (48.7%)	146 (50.0%)	100 (47.2%)	41 (41.0%)	86 (36.4%)	69 (42.1%)
Transgender Female	37 (3.3%)	5 (3.0%)	7 (2.6%)	6 (2.4%)	12 (7.9%)	9 (3.1%)	9 (4.2%)	3 (3.0%)	5 (2.1%)	4 (2.4%)
Nonbinary	19 (1.6%)	2 (1.2%)	6 (2.2%)	3 (1.2%)	1 (0.7%)	0 (0%)	4 (1.9%)	1 (1.0%)	3 (1.3%)	5 (3.0%)
Gender Queer	15 (1.3%)	2 (1.2%)	1 (0.4%)	4 (1.6%)	1 (0.7%)	6 (2.1%)	3 (1.4%)	1 (1.0%)	2 (0.8%)	0 (0%)
Female	11 (1.0%)	3 (1.8%)	3 (1.1%)	4 (1.6%)	1 (0.7%)	3 (1.0%)	2 (0.9%)	1 (1.0%)	1 (0.4%)	0 (0%)
Gender Fluid	3 (0.3%)	1 (0.6%)	1 (0.4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (1.2%)
Two Spirit	1 (0.1%)	0 (0%)	0 (0%)	0 (0%)	1 (0.7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Demiboy	1 (0.1%)	0 (0%)	1 (0.4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Unknown	540 (47.5%)	75 (44.9%)	120 (44.0%)	107 (42.6%)	62 (40.8%)	121 (41.4%)	94 (44.3%)	53 (53.0%)	139 (58.9%)	84 (51.2%)
Sexual Orientation										
Men who have sex with men[b]	1070 (94.1%)	144 (86.2%)	268 (98.2%)	248 (98.8%)	137 (90.1%)	289 (99.0%)	210 (99.1%)	88 (88.0%)	230 (97.5%)	159 (97.0%)
Other or Unknown	67 (5.9%)	23 (13.8%)	5 (1.8%)	3 (1.2%)	15 (9.9%)	3 (1.0%)	2 (0.9%)	12 (12.0%)	6 (2.5%)	5 (3.0%)
Age (years)										
18-24	53 (4.7%)	5 (3.0%)	15 (5.55)	13 (5.2%)	10 (6.6%)	12 (4.1%)	10 (4.7%)	0 (0%)	12 (5.1%)	11 (6.7%)
25-29	152 (13.4%)	24 (14.4%)	42 (15.4%)	40 (15.9%)	13 (8.6%)	46 (15.8%)	30 (14.2%)	10 (10.0%)	38 (16.1%)	27 (16.5%)
30-34	215 (18.9%)	24 (14.4%)	49 (17.9%)	48 (19.1%)	32 (21.1%)	64 (21.9%)	43 (20.3%)	18 (18.0%)	50 (21.2%)	32 (19.5%)
35-44	388 (34.1%)	49 (29.3%)	97 (35.5%)	84 (33.5%)	51 (33.6%)	100 (34.2%)	70 (33.0%)	42 (42.0%)	89 (37.7%)	55 (33.6%)
45-54	189 (16.6%)	37 (22.2%)	45 (16.5%)	38 (15.1%)	16 (10.5%)	41 (14.0%)	33 (15.6%)	21 (21.0%)	30 (12.7%)	26 (15.9%)

55-64	125 (11.0%)	24 (14.4%)	23 (8.4%)	25 (10.0%)	25 (16.4%)	26 (8.9%)	23 (10.8%)	7 (7.0%)	16 (6.8%)	13 (7.9%)
65-74	14 (1.2%)	4 (2.4%)	1 (0.4%)	3 (1.2%)	5 (3.3%)	3 (1.0%)	3 (1.4%)	2 (2.0%)	1 (0.4%)	0 (0%)
75+	1 (0.1%)	0 (0%)	1 (0.4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Primary Language										
English	952 (83.7%)	150 (89.8%)	230 (84.2%)	205 (81.7%)	126 (82.9%)	237 (81.2%)	170 (80.2%)	82 (82.0%)	187 (79.2%)	136 (82.9%)
Spanish	155 (13.6%)	14 (8.4%)	38 (13.9%)	40 (15.9%)	20 (13.2%)	48 (16.4%)	35 (16.5%)	14 (14.0%)	43 (18.2%)	22 (13.4%)
Other[c]	28 (2.5%)	3 (1.8%)	5 (1.8%)	6 (2.4%)	6 (3.9%)	7 (2.4%)	4 (1.9%)	4 (4.0%)	6 (2.5%)	6 (3.7%)
Unknown	2 (0.2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (0.9%)	0 (0%)	0 (0%)	0 (0%)
Insurance										
Private	318 (28.0%)	42 (25.1%)	89 (32.6%)	83 (33.1%)	32 (21.1%)	92 (31.5%)	71 (33.5%)	21 (21.0%)	61 (25.8%)	49 (29.9%)
Public[d]	447 (39.3%)	75 (44.9%)	87 (31.9%)	80 (31.9%)	75 (49.3%)	106 (36.3%)	74 (34.9%)	51 (51.0%)	94 (30.8%)	68 (41.5%)
Uninsured	302 (26.6%)	38 (22.8%)	83 (30.4%)	75 (29.9%)	34 (22.4%)	80 (27.4%)	56 (26.4%)	19 (19.0%)	60 (25.4%)	36 (22.0%)
Private + Public	4 (0.4%)	1 (0.6%)	1 (0.4%)	1 (0.4%)	1 (0.6%)	1 (0.3%)	1 (0.5%)	1 (1.0%)	1 (0.4%)	0 (0%)
Other	66 (5.8%)	11 (6.6%)	13 (4.8%)	12 (4.8%)	10 (6.6%)	13 (4.5%)	10 (4.7%)	8 (8.0%)	20 (8.5%)	11 (6.7%)

[a]People diagnosed with multiple STIs over the designated time period are counted only once. In 2023, 122 were people diagnosed with more than one pathogen (22 with syphilis and gonorrhea, 77 gonorrhea and chlamydia, 14 syphilis and chlamydia, and 9 all three). In 2024, 113 people were diagnosed with more than one pathogen (20 with syphilis and gonorrhea, 67 gonorrhea and chlamydia, 14 syphilis and chlamydia, and 12 all three). In 2025, 56 people were diagnosed with more than one pathogen (8 with syphilis and gonorrhea, 40 gonorrhea and chlamydia, 3 syphilis and chlamydia, and 5 all three).

[b]Includes individual who reported a sexual orientation of gay, bisexual, or pansexual/Bi+ OR who received oropharyngeal or rectal gonorrhea or chlamydia testing at least once from 2023 – 2025

[c]Includes Amharic, Arabic, Burmese, Farsi, Filipino, French, Mandarin, Portuguese, Russian, Samoan, Serbian, Sign Language, Somali, Thai, Turkish, Ukrainian, Vietnamese, and Wolof

[d]Includes Medicare, Medicaid, Tricare, Worker's compensation

Table 3. Proportion of Individuals with a Sexually Transmitted Infection (STI) Prescribed DoxyPEP						
	2023		2024		2025	
	Diagnosed[a]	Prescribed DoxyPEP[b] N (%)	Diagnosed[a]	Prescribed DoxyPEP[b] N (%)	Diagnosed[a]	Prescribed DoxyPEP[b] N (%)
Syphilis[c]	122	11 (9.0%)	106	25 (23.6%)	84	27 (32.1%)
Gonorrhea[c]	165	42 (25.5%)	193	98 (50.8%)	183	120 (65.6%)
Chlamydia[c]	151	22 (14.6%)	119	48 (40.3%)	116	47 (40.5%)
Any STI	560	110 (19.6%)	531	226 (42.6%)	439	228 (51.9%)

[a]Unique individuals diagnosed with an STI
[b]Unique individuals prescribed doxyPEP
[c]Individuals diagnosed with more than one different STI in a given year are excluded.

Figure 1. DoxyPEP-to-Need Ratio (DPnR), Stratified by Sociodemographic Characteristics

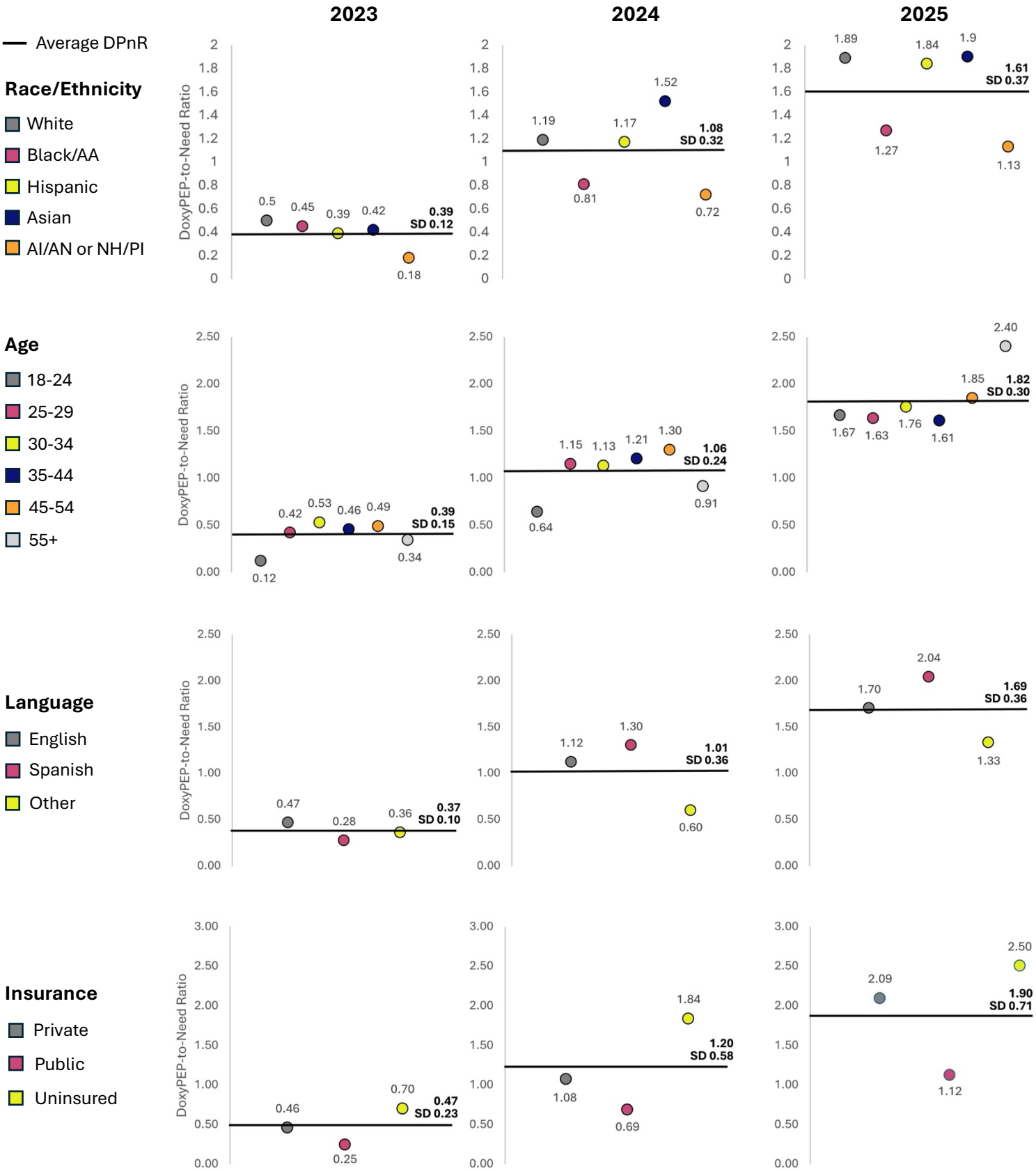
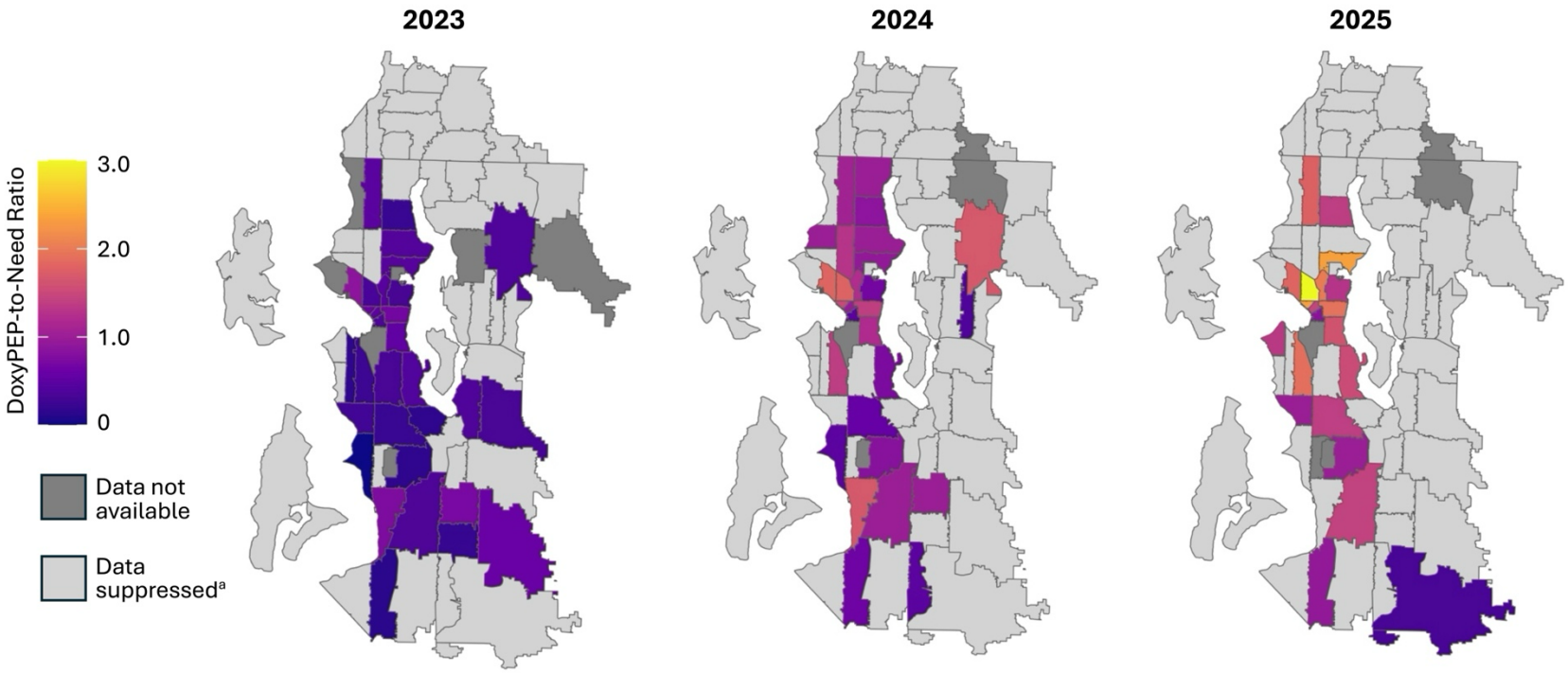


Figure 2. DoxyPEP-to-Need Ratio Among King County Zip Codes, 2025



[a]Zip codes with fewer than five sexually transmitted infections in a given year are suppressed for confidentiality

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