Access to Care: Forecasting Unmet Healthcare Need in the U.S.

Trends, disparities, and a 2025 projection of cost-related delayed and missed care using national survey data (2019–2024)

By: Stranger Strings

Riddhi Bajaj, rbajaj2@uw.edu
Disha Shetty, dishas23@uw.edu
Amrit Raj, araj0777@uw.edu
Shubhanshi Jain, shubh075@uw.edu
Sushmitha S., sushisri@uw.edu

Git Repo: https://github.com/riddhibajaj/Datathon-2026

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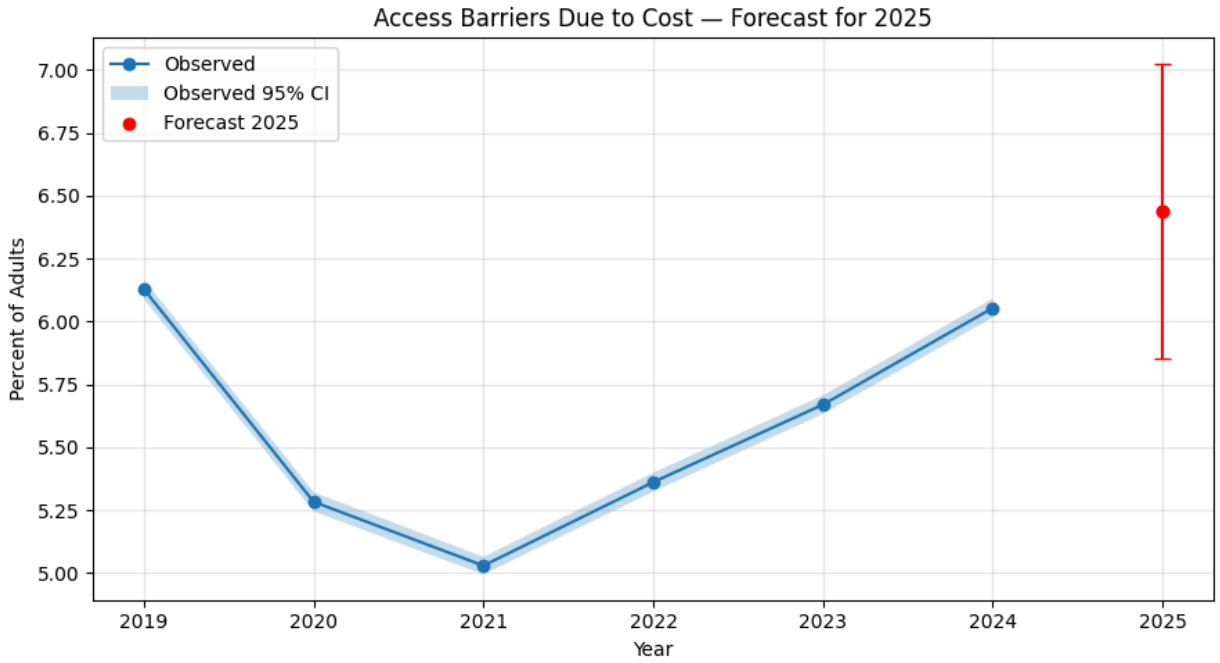
Machine Learning

Prompt: For the dataset as a whole, predict trends in delayed or missed care over the next year

This analysis examines trends in **cost-related barriers to healthcare access** in the United States and projects unmet medical need for 2025. Using nationally reported survey data from 2019–2024, the analysis focuses on four CDC-defined access barrier topics related to delayed or foregone care due to cost, capturing structural financial obstacles rather than condition-specific utilization patterns. Estimates flagged as unreliable were excluded to ensure data quality and interpretability.

Because the dataset contains multiple subgroup estimates per year with varying precision, annual population-level estimates were constructed using **inverse-variance weighting**, a standard epidemiological approach that accounts for differences in sampling uncertainty. Confidence intervals were propagated through the aggregation process, yielding statistically valid year-level estimates and uncertainty bounds.

The resulting annual series (2019–2024) was modeled using **Holt's additive Exponential Smoothing**, selected for its suitability for short, non-seasonal time series and its transparency in public health forecasting contexts. The model captures underlying trend dynamics while remaining robust to noise and small sample sizes.

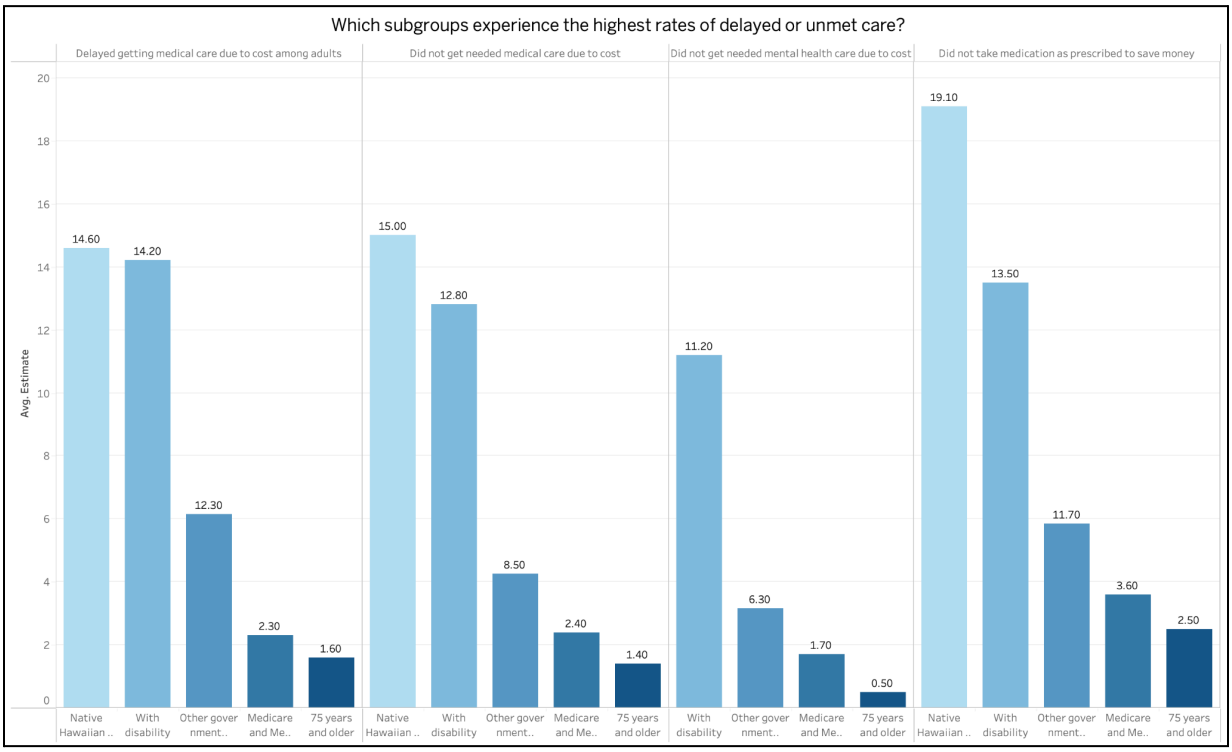


The model forecasts that **approximately 6.44% of adults will experience unmet healthcare needs due to cost in 2025**. The associated **95% confidence interval of [5.85%, 7.03%]**, corresponding to a **margin of error of ±0.59 percentage points**, reflects both historical survey measurement uncertainty and model-based forecasting error. Model accuracy was evaluated using in-sample residuals, yielding a **mean absolute error (MAE) of 0.21 percentage points** and a **root mean squared error (RMSE) of 0.34 percentage points**, indicating a stable and well-fitting trend model.

Overall, the results suggest a modest decline in cost-related unmet healthcare needs from pandemic-era levels, though financial barriers to care remain persistent for a substantial portion of the population. These findings underscore the continued relevance of affordability-focused health policy interventions and provide a statistically grounded baseline for monitoring access-to-care trends in 2025 and beyond.

Data Analysis

Prompt 1: Which subgroups experience the highest rates of delayed or unmet care?



In 2024, the highest rates of delayed and unmet care are concentrated among Native Hawaiian or Other Pacific Islander individuals and adults with disabilities.

Across three of the four financial barriers:
- Delayed medical care due to cost (14.6%)
- Did not get needed medical care due to cost (15.0%)
- Did not take medication as prescribed to save money (19.1%)

Native Hawaiian or Other Pacific Islander individuals exhibit the highest rates.

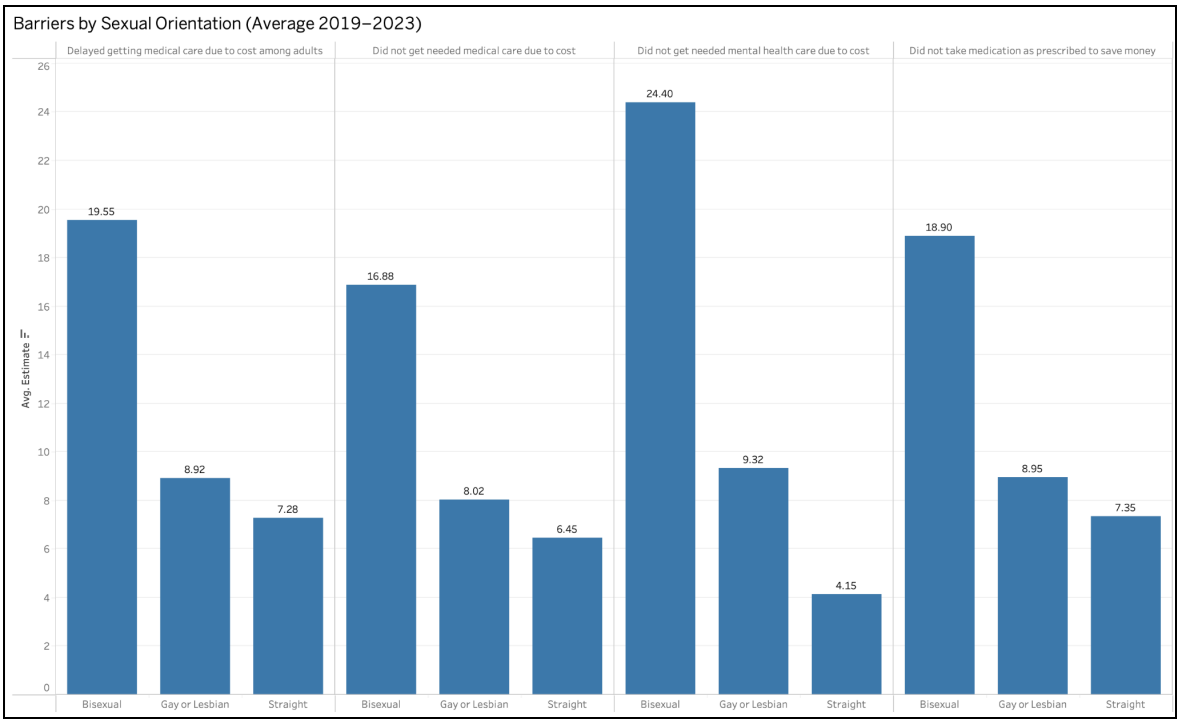
For unmet mental health care due to cost, adults with disabilities (11.2%) experience the highest burden.

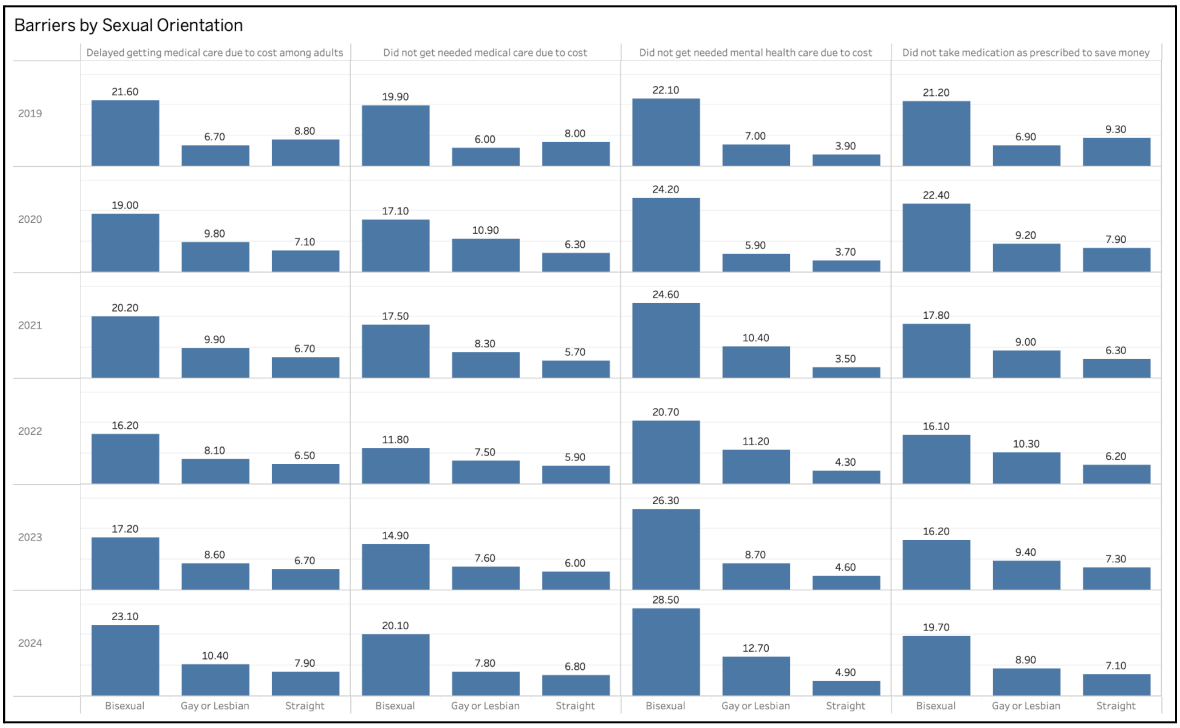
"While financial barriers affect many groups, the most severe burden is concentrated among Native Hawaiian/Pacific Islander individuals and adults with disabilities, particularly in medication adherence and unmet medical care."

Prompt 2: How do barriers differ by age, gender, income, or other demographic categories?

"Barriers to care differ most sharply by sexual orientation and disability status, followed by income, while gender and veteran status show comparatively smaller disparities."

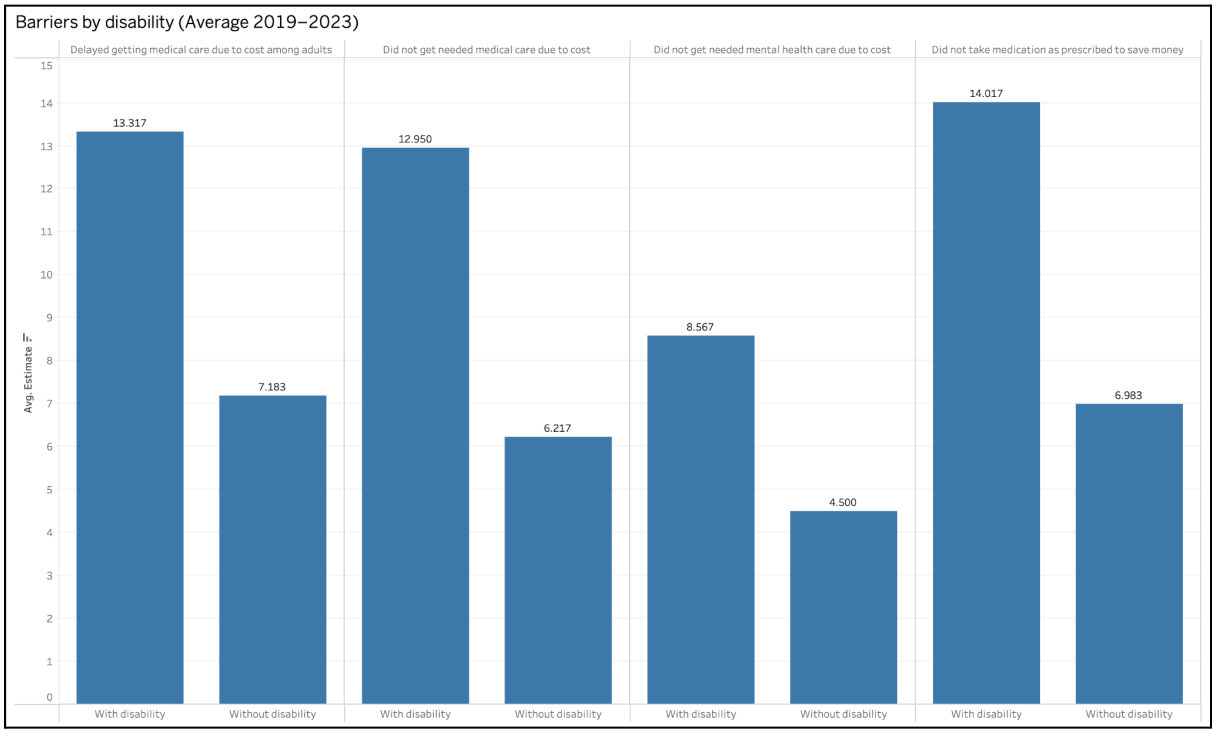
Barriers by Sexual Orientation (Average 2019–2023)





Disparities by sexual orientation persist across all years, with bisexual individuals consistently experiencing the highest rates of delayed and unmet care. Notably, unmet mental health care due to cost increases from ~22% in 2019 to ~28.5% in 2024, suggesting the gap may be widening over time. The disparity is stable and substantial, indicating structural rather than temporary barriers.

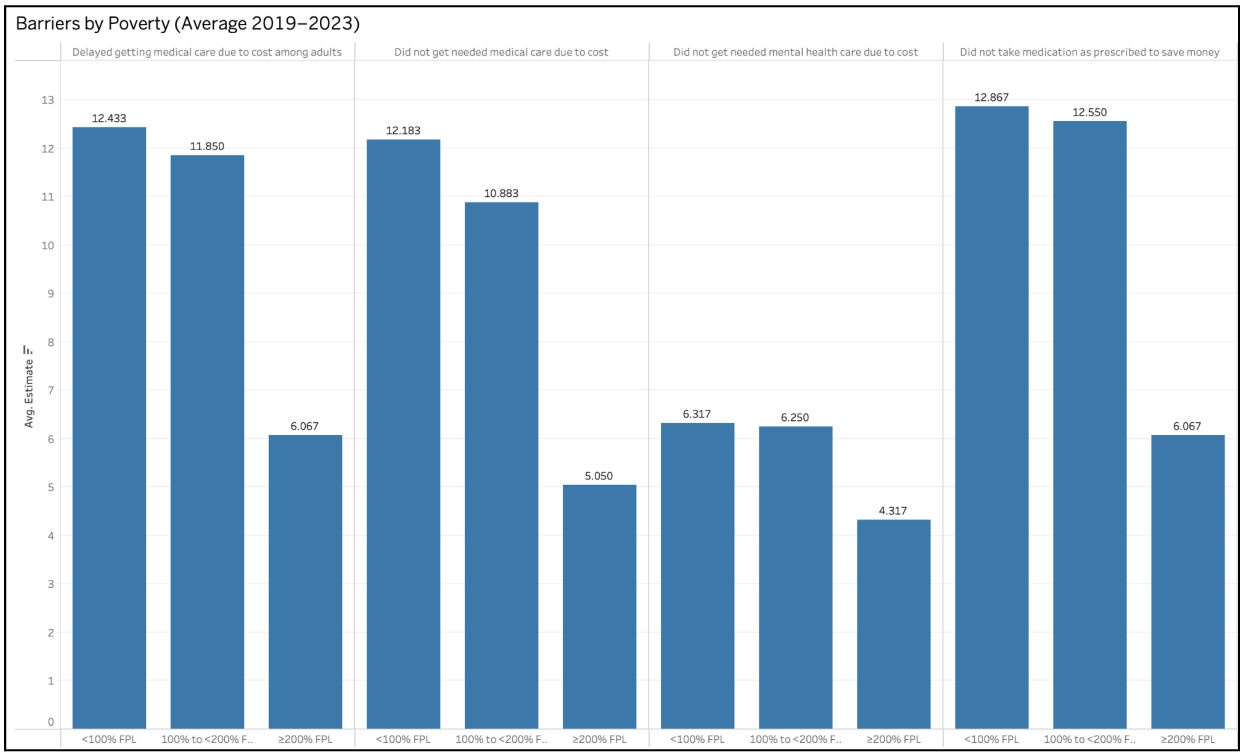
Barriers by Disability Status (Average 2019–2023)

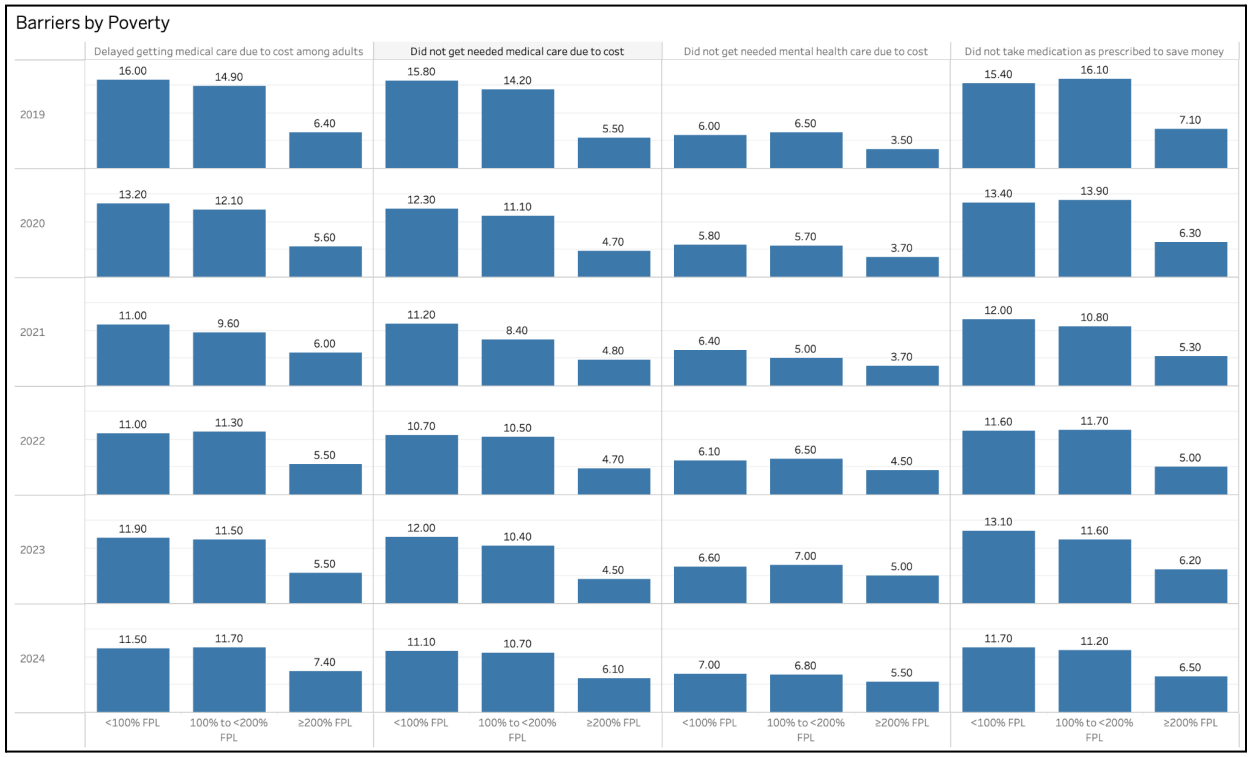


Adults with disabilities consistently experience higher financial barriers across all years and barrier types. Although overall rates fluctuate slightly during 2021–2022, the relative

gap between those with and without disabilities remains stable. This suggests persistent structural inequities rather than temporary pandemic-driven effects.

Barriers by Income Level (Average 2019–2023)





Financial barriers decrease slightly from 2019 to 2021 across income levels but maintain a clear gradient throughout all years. Adults below 100% FPL consistently experience the highest barriers, followed by 100–200% FPL, with ≥200% FPL lowest. The income-based disparity persists across time, indicating enduring socioeconomic inequities in healthcare access.

Barriers by Marital Status (Average 2019–2023)

Widowed and individuals living without a partner exhibit higher rates of delayed and unmet care compared to married individuals. Differences are moderate but consistent across barriers, suggesting social support may influence healthcare access.

Barriers by Race/Ethnicity (Average 2019–2023)

Racial disparities are present but vary by barrier type. Certain minority groups experience higher medication non-adherence and delayed care; however, patterns are less uniform than poverty or disability.

Barriers by Region (Average 2019–2023)

Regional variation exists, with the South often exhibiting higher rates. However, differences are moderate and not consistently patterned across all barriers.

Barriers by Veteran Status (Average 2019–2023)

Non-veterans show slightly higher barriers in some areas, but overall differences are small and inconsistent across barriers.

Barriers by Gender (Average 2019–2023)

Females show slightly higher rates of delayed and unmet care compared to males, but differences are modest (≈1–2 percentage points) across barrier types.

Prompt 3: Are there trends over time (2019–2023) in delayed care or health outcomes?

1. 2019 → 2021: Initial decline

- Most delayed care measures decrease from 2019 to 2021
- This likely reflects:
    1. Reduced care-seeking overall during COVID
    2. Postponement of non-urgent care
- Importantly, this decline does not mean access improved - it reflects disruption.

2. 2021 → 2023: Rebound and persistence

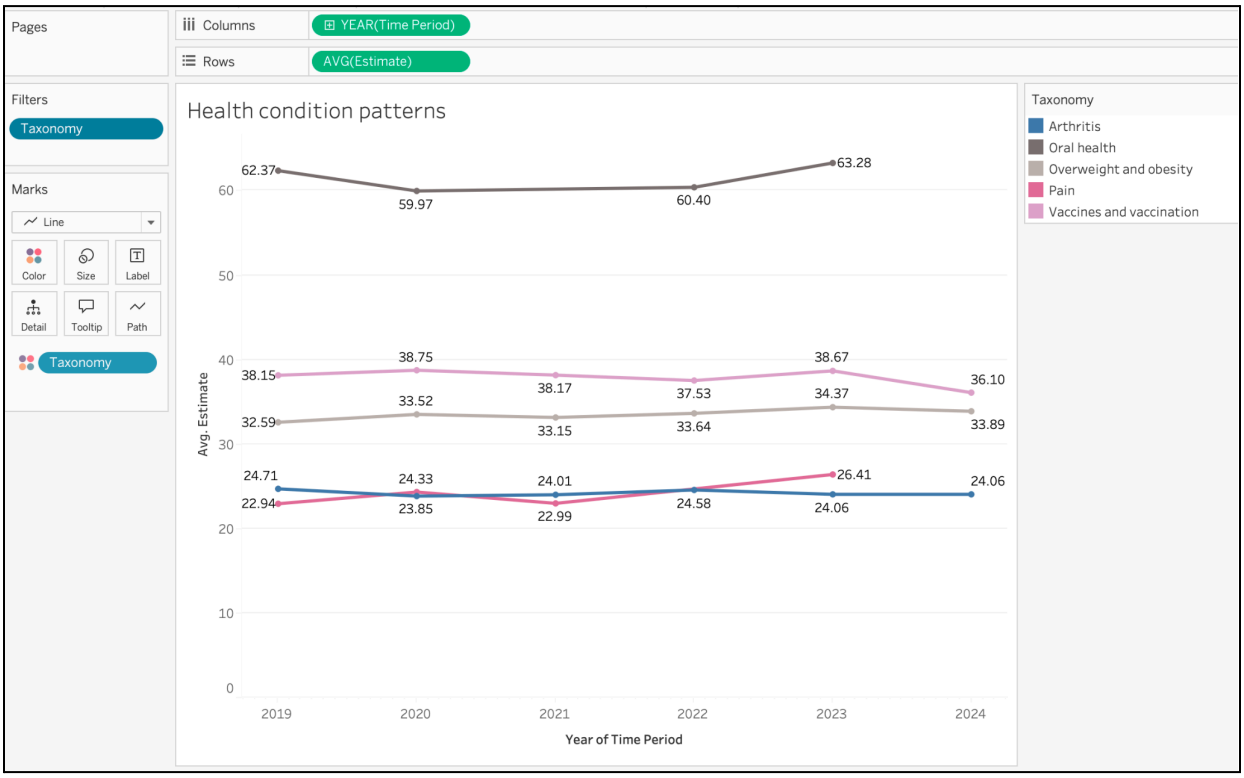
From 2021 onward:

- Delayed getting medical care due to cost rises again
- Did not get needed medical care due to cost steadily increases
- Did not take medication as prescribed to save money rebounds sharply

By 2023:

- Several indicators are at or near pre-pandemic levels
- Some exceed their 2021 lows by a wide margin

Prompt 4: How do patterns differ across health conditions or topics?



Overall takeaway

Health conditions exhibit distinct and condition-specific patterns over time, rather than moving together. While some conditions remain relatively stable, others show gradual increases or pandemic-era dips followed by recovery, highlighting that health trends are not uniform across topics.

Condition-by-condition patterns

1. Overweight and obesity

- Consistently the highest prevalence across all years
- Slight dip around 2020–2021, followed by a clear rebound by 2023
- Ends 2023 at a higher level than 2019

Interpretation: Overweight and obesity show a persistent and structurally high prevalence, with a temporary pandemic-era disruption but no long-term decline.

2. Pain

- Moderate prevalence relative to other conditions
- Noticeable increase from 2021 to 2023
- Peaks in 2023 before slightly easing in 2024

Interpretation:

> Pain-related conditions worsened more noticeably in the post-pandemic period, suggesting delayed or unmet care may have longer-term physical consequences.

3. Oral health

- Very stable trend across all years
- Minor fluctuations but no clear upward or downward shift

Interpretation: Oral health outcomes appear relatively resilient to broader system disruptions, showing minimal temporal variation compared to other conditions.

4. Arthritis

- Low-to-moderate prevalence
- Slight dip during 2020–2021
- Returns close to baseline afterward

Interpretation: Arthritis follows a slow-moving, stable pattern, consistent with chronic conditions that change gradually over time.

5. Vaccines and vaccination

- Fluctuates modestly across years
- No monotonic trend
- Ends slightly lower than its 2020 peak

Interpretation: Vaccination-related measures show short-term variation rather than sustained growth or decline, likely reflecting changing behaviors rather than underlying health deterioration.

Prompt 5 : Create visualizations showing where care breaks down or populations at risk

Visualization 1 : Concentration of Delayed and Unmet Care Due to Cost, (2019-2024)

This analysis focuses on four cost-related unmet care topics, aggregated across all years (2019-2024):

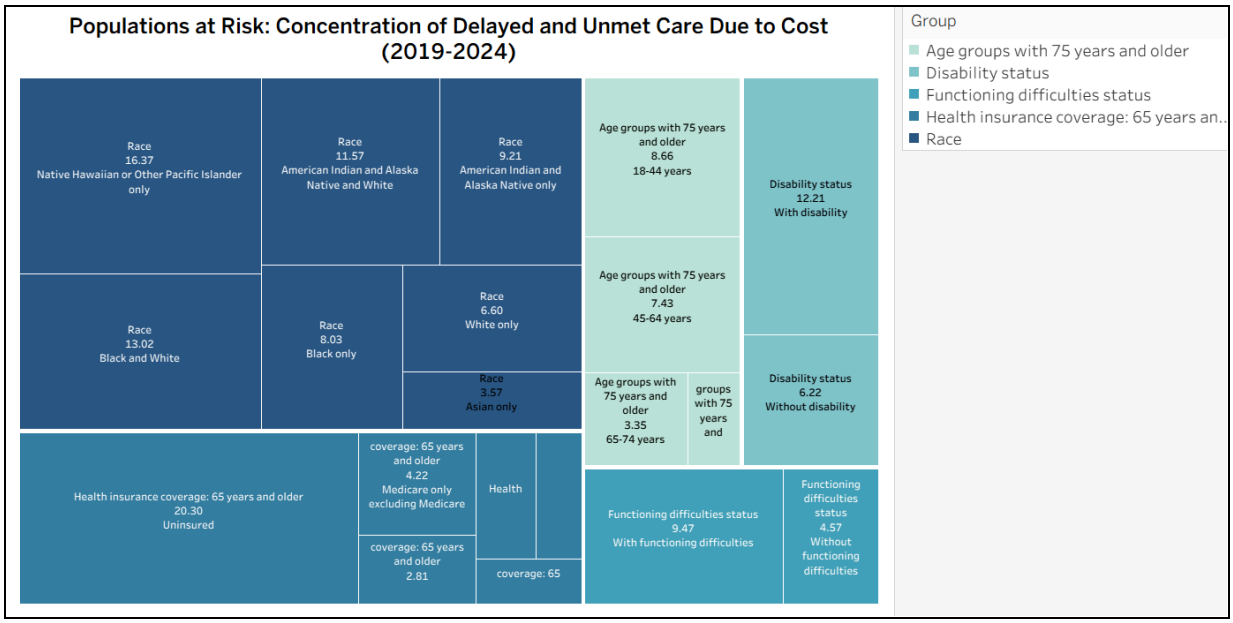
- Delayed getting medical care due to cost
- Did not get needed medical care due to cost
- Did not get needed mental health care due to cost
- Did not take medication as prescribed to save money

By combining these topics, the analysis captures the overall burden of cost-related barriers to healthcare access rather than isolated outcomes.

The top five groups most affected by unmet care due to cost are:

1. Race - particularly Native Hawaiian or Other Pacific Islander, American Indian and Alaska Native (alone or in combination), and Black populations
2. Health insurance coverage (65 years and older) - especially uninsured older adults
3. Disability status - individuals with disabilities
4. Functioning difficulties status adults with functioning difficulties
5. Age groups with 75 years and older

These groups consistently show higher levels of delayed or unmet care, indicating that cost-related barriers disproportionately impact populations with greater health needs and structural disadvantages.

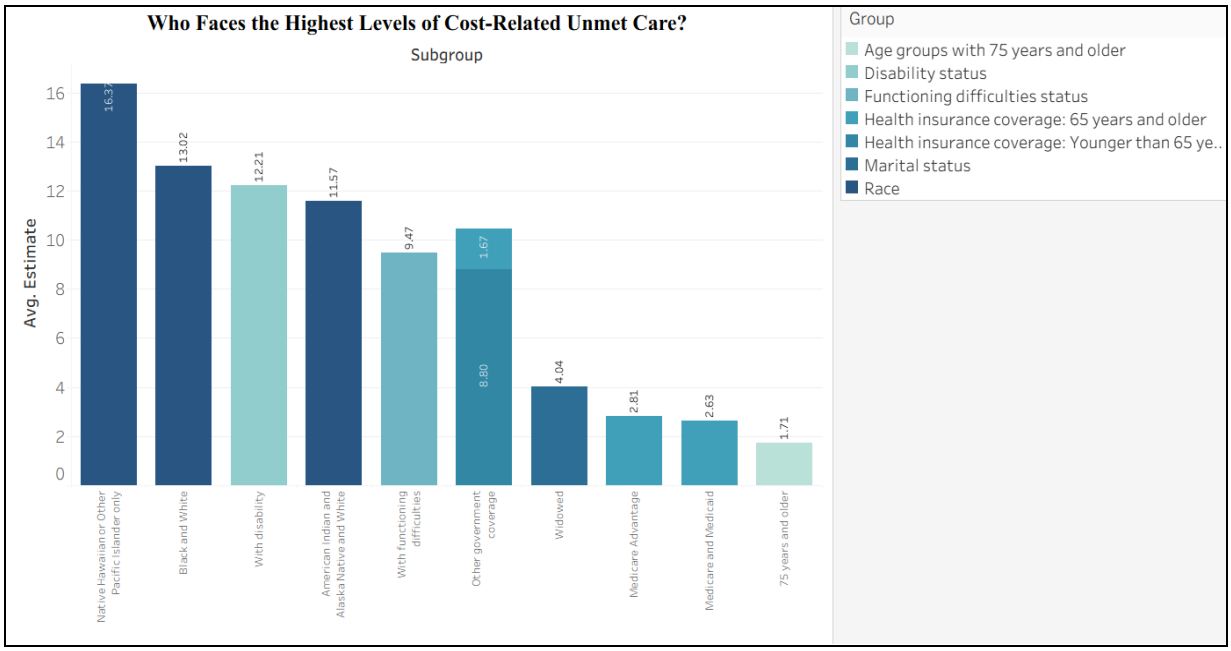


Visualization 2: Top Subgroups Experiencing Cost-Related Unmet Care

This visualization presents the top 10 subgroups with the highest levels of cost-related unmet care, aggregated across four unmet care topics (delayed care, unmet medical care, unmet mental health care, and cost-related medication nonadherence) and across 2019-2024. Color is used to highlight the broader group to which each subgroup belongs.

- Several of the highest-risk subgroups fall within the Race group, including Native Hawaiian or Other Pacific Islander, Black and White, and American Indian and Alaska Native subgroups.
- Subgroups with disabilities and with functioning difficulties also rank among the top contributors to unmet care, indicating elevated vulnerability to cost barriers.
- Insurance-related subgroups, particularly those with other government coverage, show higher unmet care compared to Medicare-based subgroups.
- Older adults aged 75 years and older appear at the lower end of unmet care among the top-ranked subgroups, suggesting comparatively better access.

Overall, this chart highlights how cost-related unmet care is concentrated within specific subgroups, helps reveal which broader demographic and socioeconomic groups are most affected, pointing to where healthcare access breaks down most severely.



Prompt 5: Explore invisible barriers by comparing expected care availability to reported access

The following topics are considered where individuals are expected to have access to healthcare services or coverage: (Expected Care Availability)

- Has a usual place of care among adults
- Doctor visit among adults
- Wellness visit
- Prescription medication use among adults
- Public health insurance coverage at time of interview among adults
- Private health insurance coverage at time of interview among adults
- Urgent care center or retail health clinic visit among adults

And these topics are considered as Lack of Access to Care (Unmet or Delayed Care)

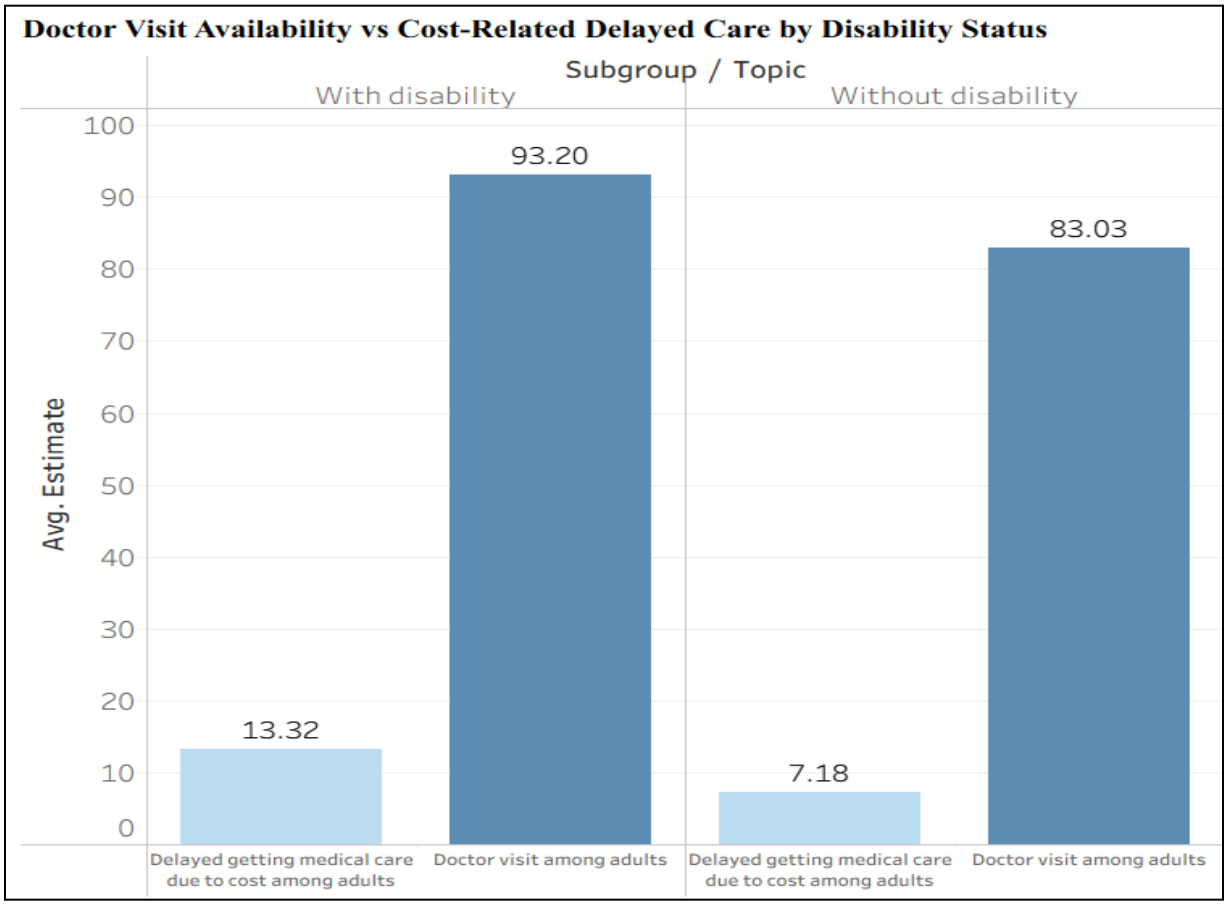
- Delayed getting medical care due to cost among adults
- Did not get needed medical care due to cost

- Did not get needed mental health care due to cost
- Did not take medication as prescribed to save money

Visualization 1: Invisible Barriers to Care: Doctor Visit Availability vs Cost-Related Delayed Care by Disability Status

This visualization compares expected care availability with reported access barriers across disability status. Expected access is represented by doctor visits among adults, while reported access failure is captured by delayed getting medical care due to cost.

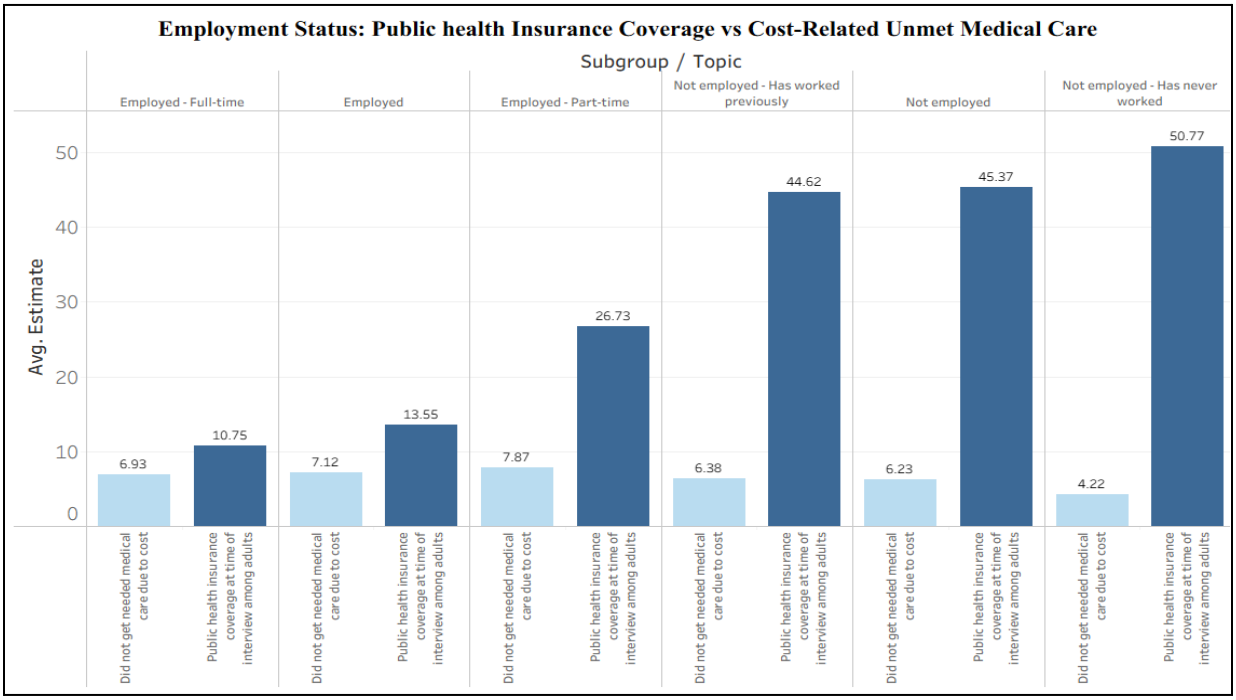
Although both subgroups report high levels of doctor visits, adults with disabilities experience substantially higher delays in receiving medical care due to cost compared to adults without disabilities. This gap suggests that having access to providers does not necessarily translate into timely or affordable care for individuals with disabilities.The results highlight the presence of hidden financial and structural barriers, such as higher healthcare needs, out-of-pocket expenses, or accessibility challenges, that disproportionately affect people with disabilities despite apparent access to care.



Visualization 2: Employment Status: Public Health Insurance Coverage vs Cost-Related Unmet Medical Care

This visualization explores invisible barriers to healthcare access by comparing an indicator of expected care availability - public health insurance coverage at the time of interview with a measure of reported access failure - did not get needed medical care due to cost across employment status subgroups.

- Public health insurance coverage increases sharply among non-employed subgroups, particularly those who have never worked or have worked previously.
- Despite this higher expected access, non-employed individuals report substantially higher levels of unmet medical care due to cost compared to employed full-time and part-time adults.
- Even among employed populations, cost-related unmet care persists, indicating that employment and insurance coverage alone do not eliminate financial barriers to care.



Overall, this chart highlights a clear disconnect between insurance coverage and actual affordability of care, revealing invisible barriers that disproportionately affect individuals outside the workforce.

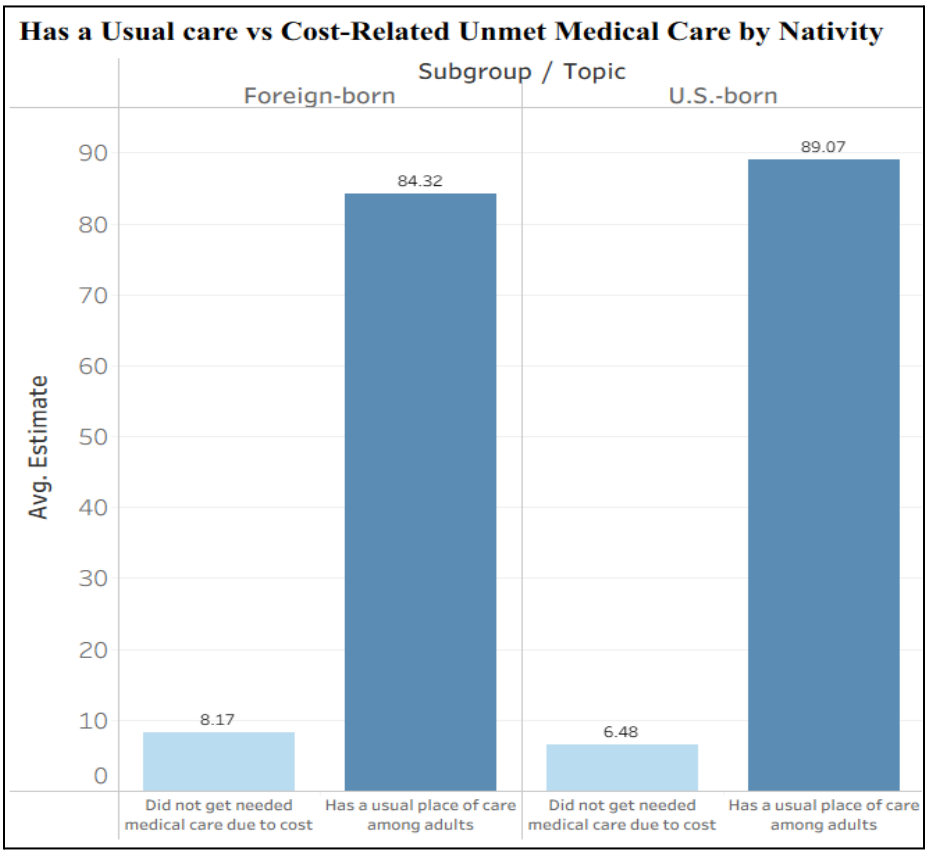
Visualization 3: Has a Usual care vs Cost-Related Unmet Medical Care by Nativity group

This visualization compares expected care availability (having a usual place of care) with reported access failure (not getting needed medical care due to cost) across nativity subgroups of foreign-born and U.S.-born adults aggregated across all selected years.

Both subgroups report high levels of having a usual place of care, with U.S.-born adults showing slightly higher access than foreign-born adults. However, despite this apparent access, foreign-born adults experience a higher rate of cost-related unmet medical care compared to U.S.-born adults.

This gap highlights an invisible barrier: having an established source of care does not necessarily translate into receiving needed services. For foreign-born populations in particular, financial constraints, affordability concerns, and potential systemic barriers may prevent individuals from utilizing care even when a usual provider is available.

Overall, the chart demonstrates that nativity influences how effectively access to care converts into actual care received, revealing disparities that are not visible when examining access indicators alone.

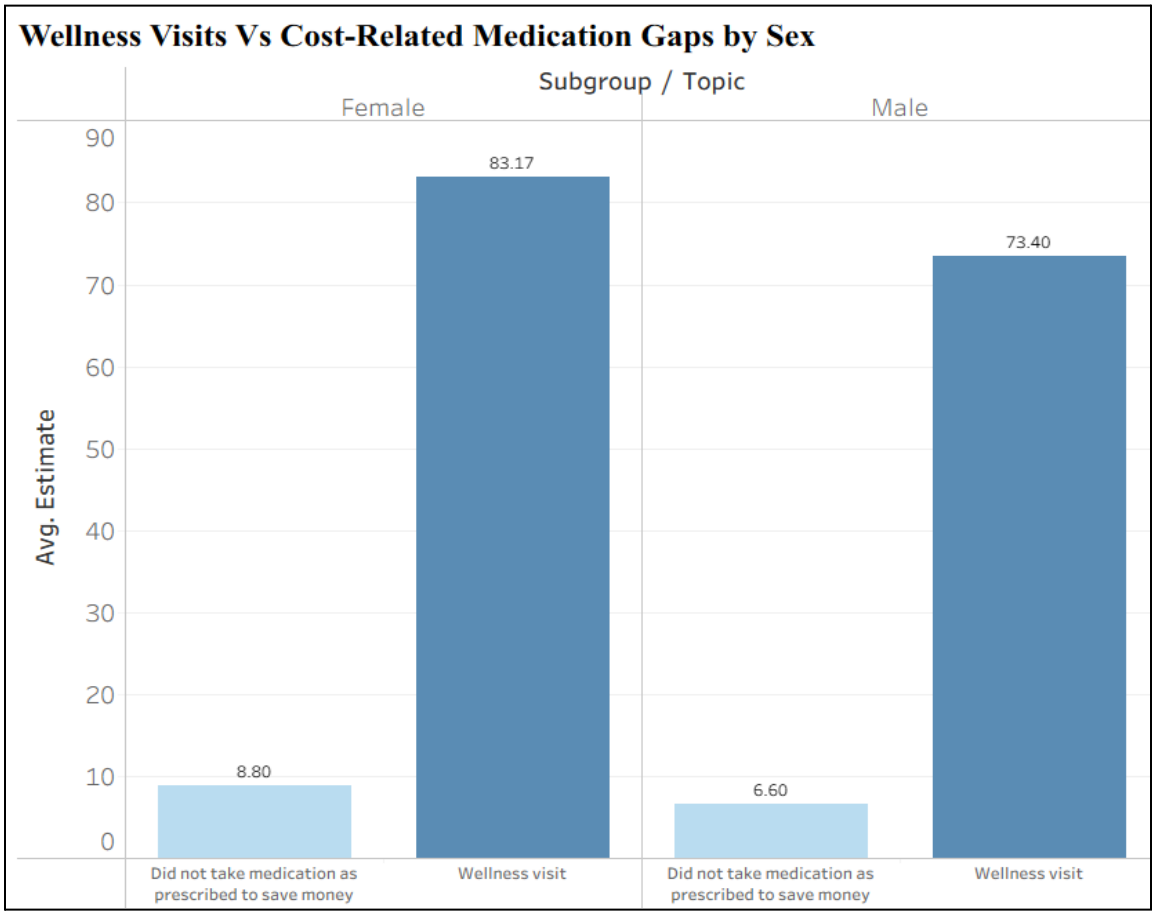


Visualization 4: Wellness Visits and Cost-Related Medication Gaps by Sex

This visualization compares two indicators of expected and actual care access across sex subgroups: participation in wellness visits (expected care availability) and not taking prescribed medication due to cost (reported access barrier).

Across both subgroups, wellness visit rates are substantially higher than cost-related medication non-adherence, indicating that preventive care access exists for both females and males. However, females show a higher rate of not taking medication as prescribed due to cost (8.8%) compared to males (6.6%), despite also having higher wellness visit participation (83.2% vs. 73.4%).

This pattern highlights an invisible barrier: even when individuals particularly females are engaged with the healthcare system through preventive visits, financial constraints continue to limit follow through on prescribed treatments. By group, this suggests that sex-based differences in cost burden and care continuity may affect outcomes beyond initial access to care.



This analysis identifies a clear gap between expected healthcare availability and actual access to care. Although many populations report having a usual place of care, participating in doctor or wellness visits, using prescription medications, or holding insurance coverage, several subgroups continue to experience delayed or unmet care due to cost.

The persistence of unmet medical care, unmet mental health care, and cost-related medication non-adherence among populations with apparent access reveals invisible barriers such as affordability challenges, coverage limitations, and structural inequities. These barriers disproportionately affect vulnerable groups, including individuals with disabilities, non-employed adults, foreign-born populations, racial and ethnic minorities, and women.

Overall, the findings show that access to healthcare on paper does not ensure effective or affordable care in practice, highlighting the need to address hidden barriers beyond service availability.