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Racial Disparities in Inpatient Palliative Care Consultation among Frail Older Patients Undergoing High-Risk Elective Surgical Procedures in the United States: a cross-sectional study of the national inpatient sample

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2 Consultation among Frail Older Patients Undergoing High-Risk
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4 sectional study of the national inpatient sample
5

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1 **Abstract**

2 Surgical interventions are common among seriously ill older
3 patients, with nearly one-third of older Americans facing
4 surgery in their last year of life. Despite the potential
5 benefits of palliative care among older surgical patients
6 undergoing high-risk surgical procedures, palliative care in
7 this population is underutilized and little is known about
8 potential disparities by race/ethnicity and how frailty may
9 affect such disparities. The aim of this study was to examine
10 disparities in palliative care consultations by race/ethnicity
11 and assess whether patients' frailty moderated this association.
12 Drawing on a retrospective cross-sectional study of inpatient
13 surgical episodes using the National Inpatient Sample of the
14 Healthcare Cost and Utilization Project from 2005 to 2019, we
15 found that frail Black patients received palliative care
16 consultations least often, with the largest between-group
17 adjusted difference represented by Black-Asian/Pacific Islander
18 frail patients of 1.6 percentage points, controlling for
19 sociodemographic, comorbidities, hospital characteristics,
20 procedure type, and year. No racial/ethnic difference in the
21 receipt of palliative care consultations was observed among non-
22 frail patients. These findings suggests that in order to improve
23 racial/ethnic disparities in frail older patients undergoing
24 high-risk surgical procedures, palliative care consultations
25 should be included as the standard of care in clinical care
26 guidelines.

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29 **Keywords:** palliative care consultation, racial/ethnic
30 disparities, high-risk surgery, frail older patients

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1 Approximately 40% of all inpatient operations are performed
2 on patients aged 65 and older, and nearly a third of older
3 Americans face surgery in their last year of life.¹ Compared with
4 younger people, older adults are at a higher risk of
5 postoperative mortality and complications due to decreased
6 physiological reserve and diverse factors that contribute to
7 frailty.^{2,3} Among older surgical patients, the prevalence of
8 frailty is over 40%,⁴ and in-hospital mortality can be as high as
9 11%.⁵ With a 1-year mortality risk of 27.8%,⁶ frail older
10 patients are likely to benefit from palliative care
11 consultations when facing decisions about high-risk operations.

12 The benefits of palliative care consultations are becoming
13 increasingly clear in surgical care.⁷ These consultations can
14 help manage pain and symptoms, ascertain preferences to guide
15 treatment (including life-sustaining care), provide emotional
16 support, guide post-operative care, and help with discharge and
17 transition plans for seriously ill patients and families.⁸
18 Notably, palliative care consultations are not confined to end-
19 of-life situations. Such consultations also support patients
20 with treatable, high-risk conditions, limited daily
21 functionality, burdensome symptoms, or aim to alleviate
22 caregiver stress.⁹ Palliative care consultations do not imply
23 limiting or withdrawing care,¹⁰ but could improve patients'

1 quality of life and reduce inappropriate, potentially burdensome
2 care.⁸

3 Despite its potential benefits, palliative care
4 consultations remain underutilized. Only 3.7% of surgical
5 patients who underwent high-risk procedures received palliative
6 care consultations within the period from 30 days before to 90
7 days after surgery.¹¹ Even more concerning, the provision of
8 palliative care is strikingly limited among Black and
9 Hispanic/Latine patients who tend to be frailer,¹² and are at
10 greater risk of mortality¹³ than White patients.^{14,15}

11 Palliative care consultations, crucial for aligning care
12 with the goals of patients and their families, are
13 disproportionately underutilized in surgical patients compared to
14 medical patients¹⁶. Particularly at risk are frail older surgical
15 patients who face a disproportionate burden of pain,¹⁷ lower
16 survival rates, and other adverse postoperative outcomes,¹⁸
17 especially among certain racial and ethnic minorities.^{19,20}
18 Therefore, research focusing on examining, understanding, and
19 addressing racial and ethnic disparities in palliative care is
20 of critical importance.²¹ It is also vital to understand potential
21 racial/ethnic differences in the receipt of palliative care
22 consultations for resource distribution planning and targeted
23 interventions to provide equal access and opportunities to
24 quality care respecting the goals-of-care, dignity, and comfort

1 of patients and families. However, little is known about whether
2 disparities by race/ethnicity exist in utilization of palliative
3 care consultations,^{22,23} particularly among older patients
4 undergoing high-risk surgery. We aimed to examine the
5 association between palliative care consultations and
6 race/ethnicity during hospital stays and whether frailty
7 modified this association. We focused on elective surgical
8 procedures, since in non-elective surgeries there may be little
9 time to discuss patient preferences salient to palliative care
10 consultations.²⁴

12 **Study Data and Methods**

13 **DATA SOURCE AND STUDY SAMPLE** We used the National Inpatient
14 Sample (NIS) of the Healthcare Cost and Utilization Project
15 (HCUP), the largest all-payer administrative database, to
16 conduct a retrospective cross-sectional analysis of 569,004
17 inpatient surgical episodes, representing 3,088 stays for those
18 who received a palliative care consultation and 565,916 stays
19 for those who did not receive a palliative care consultation. We
20 included patients who were ≥ 65 years of age and admitted for
21 elective high-risk surgical procedures, with the primary
22 procedure having been performed between 2005 and 2019. We
23 identified surgical risk using a list of high-risk surgeries
24 developed by previous researchers.²⁵ Originally, high-risk

1 surgeries were identified using International Classification of
2 Diseases, Ninth Revision (ICD-9), Clinical Modification (CM)
3 codes. Because ICD codes were transitioned from ICD-9-CM to ICD-
4 10th Revision CM and Procedure Coding System (PCS) codes in the
5 fourth quarter of 2015, we converted the ICD-9-CM codes to the
6 ICD-10-PCS codes aligned with our study period (2015 Q4 - 2019)
7 using the equivalence mapping developed by the Centers for
8 Medicare and Medicaid Services and the conversion files
9 developed by the National Bureau of Economic Research.²⁶ The full
10 list of converted ICD-10-PCS codes is available in the
11 Supplement (appendix Table 1). We excluded hospitals with fewer
12 than 30 observations to avoid unstable estimates due to small
13 sample sizes and observations with missing information on key
14 study variables.^{27,28} Figure 1 shows the sample selection
15 process.

16 (Insert Figure 1 about here)

17 **OUTCOMES AND VARIABLES** The primary outcome was a binary
18 variable indicating the receipt of a palliative care
19 consultation during hospital stays for a high-risk surgical
20 procedure. We identified receipt of a palliative care
21 consultation using the ICD 9/10-CM codes (V66.7, Z515) from
22 previous studies^{15,29,30} validated in Veterans Health
23 Administration (VHA) data, the largest health care system in the
24 United States.³¹

1 We used five race/ethnicity categories as available in the
2 HCUP data: Asian and Pacific Islander, Black, Hispanic/Latine,
3 Other, and White. Individuals who identified as Native American,
4 multiracial, and other were grouped as "Other" because of small
5 sample size. The Hispanic/Latine category includes patients
6 reported as either Hispanic or Latino. In the HCUP,
7 Hispanic/Latine ethnicity is prioritized over race. This means
8 that if person reports their ethnicity as Hispanic/Latine, they
9 are defined as Hispanic/Latine, regardless of reported race.

10 We selected known or hypothesized characteristics
11 associated with inpatient palliative care consultation as
12 covariates a priori. Patient characteristics included: frailty
13 (frail/non-frail) measured as the presence of at least 1 of 10
14 frailty diagnoses as per Johns Hopkins Adjusted Clinical Groups
15 (ACG) frailty score (appendix Table 2),³² sex (female/male), age,
16 median household income for patient's zip code by quartile, and
17 26 indicators from the modified Elixhauser comorbidity index. We
18 excluded dementia and weight loss from the comorbidity index
19 because they were accounted for in the ACG frailty index.³³ Fluid
20 and electrolyte disorders were also excluded from the
21 comorbidity index because they were not available after 2018.
22 Hospital characteristics included bed size (small/medium/large),
23 ownership (public/private), location and teaching status (rural
24 teaching and nonteaching/urban nonteaching/urban teaching), and

1 log-transformed surgical volume. We also included fixed effects
2 for procedure type (general, neurology, otorhinolaryngology,
3 cardiac, thoracic, vascular, orthopedic, urology, gynecology,
4 transplant), hospital, and year to account for secular trends.
5 We used clinical classification software developed by the HCUP
6 to categorize the surgeries into specialty groups.³⁴ Two of the
7 authors (K.K. and J.M.) with clinical expertise in surgery
8 reviewed these categories to ensure they aligned with clinical
9 practice, and we created a 10-category surgical specialty
10 variable, as indicated above.

11 **STATISTICAL ANALYSES** We summarized patient characteristics
12 descriptively based on whether a patient received a palliative
13 care consultation during their hospital stays. To compare the
14 groups of patients with and without the palliative care
15 consultations, we used standardized mean differences because
16 they are less sensitive to large sample sizes than tests of
17 significance.³⁵ We also examined patient characteristics by
18 race/ethnicity.

19 To assess the association between the receipt of a
20 palliative care consultation and race/ethnicity, we used linear
21 probability models and adjusted for all covariates listed above.
22 Linear probability models provide unbiased, consistent
23 estimation with fixed effects,^{36,37} and they outperform logistic
24 regression, particularly when the binary outcome is of low-

1 prevalence or rare.³⁸ To evaluate whether frailty moderates the
2 association between race/ethnicity and the receipt of a
3 palliative care consultation, we included an interaction term of
4 race/ethnicity and frailty in the fully adjusted model.

5 A series of sensitivity analyses were conducted to assess
6 the robustness of our results. These included repeating the main
7 analyses using logistic regression, and using a conditional
8 multiple imputation by chained equation to address concerns
9 about a moderate amount of missing race/ethnicity data in the
10 HCUP.³⁹

11 Survey weights were applied to all analyses to obtain
12 nationally representative estimates and to account for the
13 HCUP's complex survey designs. Analyses were performed using
14 Stata MP version 17.0 (StataCorp LLC) between November 2022 and
15 June 2023. All P values were from 2-sided tests, and results
16 were deemed statistically significant at the false discovery
17 rate (FDR) adjusted P value < 0.05 to address the multiple
18 comparisons between different racial/ethnic groups.^{40,41} Anderson
19 2008; Lee and Lee 2018) We employed a two-stage approach to
20 control the FDR to adjust p-values⁴² due to the greater
21 statistical power of FDR control, especially when testing a
22 large number of hypotheses (Appendix Method).^{40,41} Patient consent
23 was waived because the study comprised secondary analysis of
24 archival data prior to the analysis. The study was exempted by

1 the Stanford University Institutional Review Board. The study
2 followed the Strengthening the Reporting of Observational
3 Studies in Epidemiology (STROBE) reporting guideline for cross-
4 sectional studies.

5 **LIMITATIONS** This study used administrative data, which
6 relies on hospitals accurately reporting palliative care
7 consultations and identifying them using ICD-9/10-CM codes.
8 Although we used the ICD-9/10-CM codes, validated in prior
9 research for identifying specialist palliative care in the VHA,
10 surgical teams' discussion about goals of care may not be coded
11 in non-VHA administrative data. This likely resulted in an
12 underestimation of palliative care consultations in these data.
13 Nonetheless, our findings aligned with those from the VHA, known
14 for its long-standing practice of capturing palliative care
15 consultations data.^{11,43} Observed associations with race/ethnicity
16 and palliative care consultations may be underestimated owing to
17 undetected palliative care consultations prior to admission or
18 after discharge. Our results pertain specifically to US
19 inpatient surgical care and are not generalizable to other
20 contexts. While the HCUP, a large-scale data set, has been
21 widely utilized in health care research, it is known to have a
22 moderate amount of missing race and ethnicity data, which may
23 bias the estimates.³⁹ To address these concerns, we used a
24 conditional multiple imputation by chained equation and obtained

1 consistent results. Further limitations include the aggregated
2 nature of race/ethnicity data reported in the HCUP, which
3 hampers our ability to scrutinize potential differences among
4 more granular racial and ethnic groups. The heterogeneity within
5 these aggregated race/ethnic groups is well-documented, and the
6 problems associated with the lack of detailed racial and ethnic
7 data, limiting the delivery of targeted interventions, are
8 increasingly recognized.⁴⁴ Systematic disaggregation of racial
9 and ethnic data is critical during all stages of research: data
10 collection, reporting, analysis, and dissemination.⁴⁴ Finally,
11 our results may be subject to random error due to the large
12 sample size and the low prevalence of palliative care
13 consultations.^{45,46} To address this issue, we reported statistical
14 significance at the FDR adjusted P value and adhered to the
15 reporting standards for low prevalence healthcare outcomes as
16 established by the National Center for Health Statistics.^{47,48}

17

18 **Study Results**

19 Of 569,004 surgical episodes, the majority of episodes were
20 from White patients (83.2%), followed by patients identifying as
21 Black (6.4%), Hispanic/Latine (5.3%), Asian/Pacific Islander
22 (2.7%), and other (2.1%).

23 A summary of sociodemographic characteristics in Table 1
24 shows that racial/ethnic differences were the largest in income.

1 A proportion of patients residing in the zip code of the 75-100
2 percentile median household income was the largest among
3 Asian/Pacific Islander patients (46.1%) and the lowest among
4 Black patients (12.4%). Differences examined using the
5 standardized mean differences are presented in the appendix
6 Figure 1. The differences between people identifying as
7 Asian/Pacific Islander and Black were the largest in the income
8 quartile. Whereas the differences between people identifying as
9 Asian/Pacific Islander and White were the largest in location
10 and the teaching status of hospitals received care.

11 (Insert Table 2 about here)

12 Compared with the cohort who did not receive palliative
13 care consultations (99.5%) during their hospital stay, patients
14 who did receive such consultations (0.5%) tended to be frail
15 (36.1% vs. 9.7%), female (47.8% vs. 41.2%), older (mean age:
16 76.3 vs. 73.6), covered by Medicare (90.1% vs. 86.8%), and had a
17 higher prevalence of congestive heart failure (12.2% vs. 3.3%),
18 coagulopathy (21.0% vs. 10.0%), metastatic cancer (16.0% vs.
19 6.3%), neurologic disorders such as dementia (8.8% vs. 3.7%),
20 paralysis (5.8% vs. 1.2%), or renal failure (18.8% vs. 10.8%)
21 (Table 2). In addition, patients who underwent
22 otorhinolaryngology (3.7% vs. 0.7%) or general (33.8% vs. 27.5%)
23 surgeries or those in urban teaching (74.9% vs. 67.1%) or
24 private (90.4% vs. 86.4%) hospitals were more likely to receive

1 palliative care consultations compared to those who did not.
2 While 1.6% of patients who did not receive palliative care
3 consultations died during hospitalization, in-hospital mortality
4 increased to 61.1% among those who received such consultations.
5 Black patients (13.7%) were the most frail, and Asian/Pacific
6 Islanders (11.2%) were the second-most frail, and White patients
7 (9.6%) were the least frail.

8 (Insert Table 2 about here)

9 From the covariate-adjusted linear probability model,
10 estimates for receiving palliative care consultations during
11 hospital stays indicate that of those who were frail, Black
12 patients were least likely to receive palliative care
13 consultations (Figure 2). Among frail patients, the largest
14 difference in receipt of palliative care consultations was
15 between Black and Asian/Pacific Islander patients (-1.6
16 percentage points; 95% CI, -2.5 to -0.6; $P = 0.021$). The second
17 largest difference was between Black-White patients (-0.9
18 percentage points; 95% CI, -1.2 to -0.5; $P = 0.021$). No
19 racial/ethnic difference in the receipt of palliative care
20 consultations during hospital stays was observed among non-frail
21 patients.

22 (Insert Figure 2 about here)

23 Figure 3 illustrates the interaction effect between
24 race/ethnicity and frailty. The difference in slope indicates

1 that the receipt of palliative care consultations associated
2 with frailty among Black patients was relatively small compared
3 with the increased probability of receiving palliative care
4 consultations observed among Asian/Pacific Islander, White, and
5 Hispanic/Latine patients, despite racial/ethnic disparities in
6 frailty. Meanwhile, income, showing the largest racial/ethnic
7 difference among socioeconomic factors, was not attributable to
8 the racial/ethnic disparity in the receipt of palliative care
9 consultations during hospital stays (Figure 4).

10 (Insert Figures 3 & 4 about here)

11 A sensitivity analysis using logistic regression produced
12 results almost identical to those of the linear probability
13 model, indicating racial disparities in palliative care
14 consultations during hospital stays (appendix Table 3). We also
15 imputed missing race/ethnicity variables using a conditional
16 multiple imputation by chained equation and found consistent
17 results.

18 19 **Discussion**

20 In a nationally representative inpatient sample, the rate
21 of palliative care consultations during hospital stays for all
22 patients undergoing high-risk surgeries was low, at less than
23 1%. Despite an already-low overall palliative care consultations
24 rate, Black frail patients were the least likely to receive

1 palliative care consultations than any other racial/ethnic group
2 of frail patients. Approximately, Black frail patients were
3 offered palliative care consultations only one-third and one-
4 half of the rates of such consults among similar frail
5 Asian/Pacific Islander and White patients, respectively.

6 Our findings align with other studies of palliative care
7 among seriously ill adults and suggest that multiple factors
8 faced by this marginalized population may similarly impact the
9 receipt of palliative care consultations: family or neighborhood
10 socioeconomic status, social group experiences (e.g., culturally
11 specific experiences differing by racial/ethnic or socioeconomic
12 groups),⁴⁹ or structural racism (e.g., provider and institutional
13 conscious and unconscious racist cultural beliefs and practices,
14 systematic underinvest in certain neighborhoods, inadequate
15 access to pain and symptom management, and a lack of
16 documentation of end of life wishes to be honored).^{50,51}

17 Racial disparities in surgical care are generally rooted at
18 the intersections of multiple factors, including higher rates of
19 comorbidities, delays in seeking care, receipt of care at low-
20 quality hospitals, and inadequate access to care.⁵² Our findings
21 suggest that frail, older Black patients also have inadequate
22 access to palliative care, which may limit their end-of-life
23 care choices and impede their access to high-quality care
24 including their family members and other caregivers.⁸

1 It is troubling both that the disparity we documented is so
2 pervasive among medical, as well as apparently surgical
3 patients, but also that so little intervention work has focused
4 on improving palliative care outcomes, among Black,
5 Hispanic/Latine and other marginalized populations. A recent
6 extensive and rigorous systematic review found only five
7 randomized controlled studies that attempted to directly address
8 such disparities.⁵³ An important gap but promising trend in
9 health services research is the adoption of co-design. This
10 approach deeply involves vulnerable individuals, allowing them
11 to identify challenges and craft solutions from their unique
12 perspective, instead of relying exclusively on insights from
13 experts or providers.^{23,54} Certainly, support for research,
14 conducted by racial/ethnically diverse investigators, focused on
15 innovations to address disparities in palliative care among
16 marginalized populations is badly needed.⁵⁴ Explicitly
17 acknowledging the impact of structural racism is also important,
18 in addition to an individual's conscious and unconscious biases
19 and stereotyping, as an uppermost factor on disparities in
20 palliative care.^{23,51}

21 Our study has two important implications. First, the
22 provider's initiation of inpatient palliative care might be
23 rooted in their assessment of the patient's frailty.⁷ Considering
24 that frail patients received inpatient palliative care about 4

1 times more often than non-frail patients (36.1% vs. 9.7%),
2 providing a tool that enables clinicians to assess frailty
3 easily might abet increasing the use of palliative care
4 consultations. Although there are emerging tools to assess
5 frailty and surgical risk, such as the Risk Analysis Index,⁵⁵ if
6 these tools are not well-incorporated into the existing workflow
7 or clinical guidelines, assessment of frailty risk will rely on
8 subjective perceptions, or it might not be performed at all.
9 Opportunities likely exist to improve the use of palliative care
10 among frail surgical patients because a palliative care
11 consultation was not offered to 98% of frail patients during
12 hospitalization. Second, despite the positive association
13 between frailty and the receipt of palliative care consultations
14 in all racial/ethnic groups, frailty had the smallest
15 contribution to Black patients' receipt of palliative care
16 consultations. Clinicians may discuss prognostic uncertainty,
17 life expectancy, and all possible care options less frequently
18 with frail Black patients⁵⁶ than they do with other racial/ethnic
19 groups of patients. Clinicians' implicit bias, such as a
20 tendency to falsely assume that non-White patients, especially
21 Black and Hispanic/Latine patients, can tolerate more pain or
22 prefer to have more aggressive end-of-life care, might be
23 associated with decreased clinician engagement in such
24 discussions.^{57,58} Further, Black patients may be concerned that

1 this type of care could compromise their access to treatment, a
2 belief possibly grounded in mistrust in the healthcare system
3 exacerbated by historical and extant racism.^{22,51,59,60}

4 Despite the main takeaway from our study being the
5 disparities in the use of palliative care consultations among
6 frail Black patients, it is important to note that the rate of
7 palliative care consultations during hospital stays for patients
8 undergoing high-risk surgeries is strikingly low at less than 1%
9 across all racial/ethnic groups. In contrast, higher utilization
10 rates were reported in the VHA system, where the documentation
11 of such consultations is mandatory.⁴³ Although clinicians
12 generally agree on the importance of palliative care, many
13 surgeons report receiving minimal to no palliative care
14 education, feel uncomfortable introducing and talking with their
15 patients about palliative care, and fear confrontations from
16 patients and their families or caregivers.⁶¹ Providing
17 appropriate education could empower clinicians to initiate these
18 consultations more often, potentially enhancing care for frail
19 older surgical patients undergoing high-risk procedures by
20 honoring the preferences and goals of care and offering
21 early/timely referral to a palliative care consultation, thereby
22 improving patients' quality of life, symptom management, end-of-
23 life care, and survival.^{62,63} Surgical care could potentially
24 learn from other specialties, such as oncology, where over 30%

1 of patients receive palliative care consultations.⁶⁴ Such efforts
2 would benefit the healthcare system, patients and their families
3 and caregivers, and may mitigate the immense costs of care while
4 expanding options and avoiding harm to patients.

5 The low utilization of palliative care among surgical
6 patients, especially Black patients, may be linked to a lack of
7 diversity in the palliative care workforce. This workforce gap
8 in surgical specialties, including surgeons and
9 anesthesiologists, is particularly concerning.⁶⁵ With only 75
10 surgeons in the US who specialize in hospice and palliative
11 care,⁶⁶ there is likely a shortage of racial and ethnic
12 representation among clinicians. This deficit potentially
13 hinders the capacity to serve the diverse needs of surgical
14 patients in palliative care. While diversifying the surgical
15 workforce may be a long-term goal, policy efforts need to be
16 initiated.

17 Our results revealed that palliative care consultations are
18 vastly underutilized in older adults undergoing high-risk
19 surgeries. Given the procedural risks in these frail older
20 adults and the associated risk of a poor prognosis, such
21 consultations should be integrated into the standard care for
22 frail older patients undergoing high-risk surgical procedures.
23 These consultations should span the full spectrum of routine
24 perioperative care,¹⁰ from discussing care goals preoperatively

1 to aiding postoperative recovery in case of severe
2 complications. Furthermore, access to these consultations should
3 be equitable, available to all seriously ill patients and their
4 families. Despite the current infrequent use of palliative care
5 consultations, our study has uncovered disparities in their use.
6 If the utilization of these consultations were to increase,
7 these disparities might persist or even widen. Therefore,
8 documenting these disparities is a crucial first step toward
9 achieving equitable access to palliative care for frail older
10 patients undergoing high-risk surgical procedures.

12 **Conclusions**

13 Older Black frail patients undergoing surgery were less likely
14 to receive a palliative care consultation during their
15 hospitalization than other frail racial/ethnic groups. Our
16 findings suggest that proactive interventions addressing frailty
17 alone would not be sufficient to ameliorate the racial/ethnic
18 disparity in palliative care for surgical patients. Our study
19 underscores the need to continually assess disparities stemming
20 from healthcare system factors and clinician discrimination
21 (e.g., clinician unconscious bias, stereotyping).⁶⁷ Furthermore,
22 systematic efforts are warranted to improve access to palliative
23 care for all patients undergoing high-risk elective procedures,
24 particularly for frail Black patients. This would enable

1 patients to make choices that better align with their goals-of-
2 care, including expanded end-of-life care choices in surgical
3 settings.

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9

10

11 **Figure 1**

12 **Caption** Flow Diagram of Sample Selection

13 **SOURCE** Authors' analysis of the Nationwide Inpatient Sample of
 14 the Healthcare Cost and Utilization Project data for 2005-2019

15

16 **Figure 2**

17 **Caption** Covariate-Adjusted Estimates for Receiving Palliative
 18 Care Consultations during Hospital Stays by Race/Ethnicity and
 19 Frailty

20 **SOURCE** Authors' analysis of the Nationwide Inpatient Sample of
 21 the Healthcare Cost and Utilization Project data for 2005-2019.

22 **NOTES** Models adjusted for frailty, interaction between
 23 race/ethnicity and frailty, sociodemographic characteristics
 24 (sex, age, median household income for the patient's zip code),
 25 comorbidities, hospital characteristics (bed size, location and
 26 teaching status, ownership), and fixed effects for procedure
 27 type (general, neuro, otorhinolaryngology, cardiac, thoracic,
 28 vascular, ortho, urology, gynecology, transplant), hospital, and
 29 year.

30

31 **Figure 3**

32 **Caption** Interaction Effect Present Between Race/Ethnicity and
 33 Frailty: Covariate-Adjusted Estimates for Receiving Palliative
 34 Care

35 **SOURCE** Authors' analysis of the Nationwide Inpatient Sample of
 36 the Healthcare Cost and Utilization Project data for 2005-2019.

37 **NOTES** Models adjusted for frailty, interaction between
 38 race/ethnicity and frailty, sociodemographic characteristics
 39 (sex, age, median household income for the patient's zip code),
 40 comorbidities, hospital characteristics (bed size, location and

1 teaching status, ownership), and fixed effects for procedure
 2 type (general, neuro, otorhinolaryngology, cardiac, thoracic,
 3 vascular, ortho, urology, gynecology, transplant), hospital, and
 4 year. The circle represents the proportion of each racial/ethnic
 5 group at each level of frailty (i.e., frail vs. non-frail).
 6 Larger circles indicate a greater proportion. For example, the
 7 circle representing the frailty of Black patients is larger than
 8 that for Asian/Pacific Islanders, which indicates that a greater
 9 proportion of Black patients are exposed to frailty.

12 **Figure 4**

13 **Caption** No Interaction Effect Present Between Race/Ethnicity and
 14 Income: Covariate-Adjusted Estimates for Receiving Palliative
 15 Care

16 **SOURCE** Authors' analysis of the Nationwide Inpatient Sample of
 17 the Healthcare Cost and Utilization Project data for 2005-2019.

18 **NOTES** Models adjusted for frailty, interaction between
 19 race/ethnicity and frailty, sociodemographic characteristics
 20 (sex, age, median household income for the patient's zip code),
 21 comorbidities, hospital characteristics (bed size, location and
 22 teaching status, ownership), and fixed effects for procedure
 23 type (general, neuro, otorhinolaryngology, cardiac, thoracic,
 24 vascular, ortho, urology, gynecology, transplant), hospital, and
 25 year. The circle represents the proportion of each racial/ethnic
 26 group at each level of income (i.e., low vs. high). Larger
 27 circles indicate a greater proportion. For example, the circle
 28 representing low-income Black patients is larger than that for
 29 Asian/Pacific Islanders, which indicates a greater proportion of
 30 low-income Black patients. Figure 4 presents racial/ethnic
 31 disparities in income, but income does not have an interaction
 32 effect on the receipt of palliative care.

34 **Table 1**

35 **Caption** Characteristics of Hospital Stays for Patients Aged 65
 36 years and Older Admitted for Elective High-Risk Elective
 37 Surgical Procedures by Race/Ethnicity

38 **SOURCE** Authors' analysis of the Nationwide Inpatient Sample of
 39 the Healthcare Cost and Utilization Project data for 2005-2019.

40 **NOTES** The numbers of observations are unweighted raw numbers.
 41 Percentages are survey weighted. Rows may not add up to 100%,

1 due to rounding. The individuals who identified as Native
2 American, multiracial, and other were combined into a single
3 convenience category ("Other") because of the small sample size.

4
5 **Table 2**

6 **Caption** Characteristics of Hospital Stays for Patients Who
7 Received Inpatient Palliative Care Consultation and Those Who
8 Did Not Receive Inpatient Palliative Care Consultation

9 **SOURCE** Authors' analysis of the Nationwide Inpatient Sample of
10 the Healthcare Cost and Utilization Project data for 2005-2019.

11 **NOTES** The numbers of observations are unweighted raw numbers.
12 Percentages are survey weighted. Rows may not add up to 100%,
13 due to rounding. The individuals who identified as Native
14 American, multiracial, and other were combined into a single
15 convenience category ("Other") because of the small sample size.
16 Standardized mean differences between 0.2 and less than 0.5, 0.5
17 and 0.8, and greater than 0.8 are considered small, medium, and
18 large, respectively.

Table 1. Characteristics of Hospital Stays for Patients Aged 65 years and Older Admitted for Elective High-Risk Elective Surgical Procedures by Race/Ethnicity

	Asian/ Pacific Islander (n = 11253)		Black (n = 32961)		Hispanic/Latine (n = 27473)		Others (n = 14376)		White (n = 425102)	Downloaded from http://ajphaphapublications.org/advance-article/doi/10.1093/aphy/kpaa026/7223721 by guest on 04 August 2023
	n	%	n	%	n	%	n	%	n	
Sex										
Male	6,741	59.9	16,447	49.9	15,788	57.5	8,661	60.3	252697	5.1
Female	4,509	40.1	16,505	50.1	11,679	42.5	5,711	39.7	172329	4.1
Age, years, mean (SD)	73.3	6.2	72.4	5.9	73.0	6.1	73.2	6.0	73.7	6.1
Frailty										
Frail	1,263	11.2	4,502	13.7	2,846	10.4	1,464	10.2	40,848	9.6
Inpatient Mortality	235	2.1	667	2.0	541	2.0	272	1.9	8,056	1.9
Median Income Quartile										
0-25th percentile	1,256	11.3	15,889	49.1	9,288	34.7	3,338	23.8	88,669	20.9
26-50th percentile	1,876	16.9	7,097	21.9	6,403	23.9	3,134	22.4	112893	26.8
51-75th percentile	2,840	25.6	5,361	16.6	6,333	23.7	3,391	24.2	110750	26.3
76-100th percentile	5,110	46.1	4,013	12.4	4,732	17.7	4,146	29.6	105895	25.0
Type of Insurance										
Medicare	8,664	77.1	27,634	84	22,345	81.5	11,641	81.2	373,287	88.0
Medicaid	730	6.5	531	1.6	1,062	3.9	496	3.5	1,688	4.0
Private	1,626	14.5	4,117	12.5	3,409	12.4	1,893	13.2	44,144	10.4
Self-pay	122	1.1	166	0.5	286	1.0	167	1.2	1,447	3.4
Others										
Comorbidity										
0	1,327	11.9	2,700	8.3	2,811	10.3	1,648	11.5	48,434	11.4

1	2,789	24.8	6,692	20.3	5,976	21.8	3,350	23.3	102,882	24.2
2	3,134	27.8	8,829	26.7	7,302	26.6	3,952	27.5	114,587	27.0
≥3	4,003	35.5	14,740	44.7	11,384	41.4	5,426	37.7	159,199	37.0
Bed Size										
small	1,279	11.4	3,501	10.7	3,311	12.1	1,790	12.5	45,919	11.1
medium	2,367	21.1	8,139	24.8	6,559	23.9	2,926	20.4	99,125	21.2
large	7,589	67.5	21,209	64.6	17,571	64.0	9,597	67.1	278,773	66.7
Location and Teaching Status										
Rural	126	1.1	1,095	3.3	364	1.3	591	4.1	23,379	1.1
Urban, non teaching	2,850	25.4	6,655	20.3	8,227	30.0	3,837	26.8	120,521	26.8
Urban, teaching	8,259	73.5	25,099	76.4	18,850	68.7	9,885	69.1	279,917	73.5
Ownership										
Government	1,668	14.9	4,792	14.6	3,914	14.3	2,335	16.3	54,080	14.9
Private	9,564	85.1	28,047	85.4	23,512	85.7	11,951	83.7	368,948	85.1

Table 2. Characteristics of Hospital Stays for Patients Who Received Inpatient Palliative Care Consultation and Those Who Did Not Receive Inpatient Palliative Care Consultation

	Inpatient Palliative Care Consultation (N = 569,004)				Standardized Difference in Means ^b
	No (n = 569,916)		Yes (n = 3,088)		
	n	%	n	%	
Patient characteristics					
Race/ethnicity					
Asian/Pacific Islander	11,176	2.2	77	2.7	0.4
Black	32,762	6.4	199	6.9	0.2
Hispanic/Latine	27,320	5.4	153	5.3	0.0
Others	14,317	2.8	59	2.1	-0.5
White	422,703	83.2	2,399	83.0	-0.1
Sex					
Male	331,919	58.8	1,613	52.2	-0.4
Female	233,387	41.2	1,474	47.8	0.4
Age, years, mean (SD)	73.6	6.2	76.3	6.9	0.2
Frailty					
Non-frail	511,099	90.3	1,976	63.9	-0.6
Frail	54,817	9.7	1,112	36.1	0.6
Inpatient Mortality	8,614	1.6	1,799	61.1	1.7
Median Income Quartile					
0-25th percentile	129,304	23.2	744	24.3	0.3
26-50th percentile	148,884	26.8	847	27.9	-0.2
51-75th percentile	143,998	25.9	767	25.2	-0.4
76-100th percentile	133,935	24.1	687	22.6	-0.7
Type of Insurance					
Medicare	466,129	86.8	2,649	90.1	0.1
Medicaid	4,555	0.9	31	1.1	0.02
Private	58,876	11.0	214	7.3	-0.13

Self-pay	2,174	0.4	16	0.6	0.02
Others	5,413	1.0	29	1.0	0.00
Elixhauser Comorbidity Index					
Acquired immune deficiency syndrome	238	0.0	<5	0.0	0.00
Alcohol abuse	8,241	1.5	47	1.5	0.11
Deficiency anemias	77,936	13.7	504	16.1	0.07
Arthropathies	14,087	2.5	80	2.6	0.11
Chronic blood loss anemia	7,886	1.4	67	2.1	0.05
Congestive heart failure	18,677	3.3	382	12.2	0.44
Chronic pulmonary disease	118,209	20.9	749	24.3	0.08
Coagulopathy	56,732	10.0	647	21.0	0.00
Depression	37,342	6.6	203	6.6	-0.11
Diabetes without chronic complications	119,997	21.1	451	14.5	-0.08
Diabetes with chronic complications	41,342	7.4	237	7.7	0.11
Drug abuse	1,550	0.3	10	0.3	0.11
Hypertension	357,756	63.1	1,567	50.6	-0.07
Hypothyroidism	69,770	12.4	316	10.2	-0.07
Liver disease	8,252	1.5	98	3.2	0.11
Lymphoma	3,416	0.6	30	1.0	0.04
Metastatic cancer	35,813	6.3	496	16.0	0.11
Neurological disorders	20,880	3.7	273	8.8	0.11
Obesity	72,932	13.0	253	8.2	-0.06
Paralysis	6,523	1.2	178	5.8	0.06
Peripheral vascular disease	83,316	14.7	580	18.7	0.11
Psychoses	6,908	1.2	43	1.4	0.11
Pulmonary circulation disease	4,729	0.8	115	3.7	0.19
Renal failure	60,953	10.8	583	18.8	0.23
Solid tumor without metastasis	13,907	2.5	101	3.3	0.04

Peptic ulcer disease excluding bleeding	947	0.2	21	0.7	0.08
Valvular disease	14,569	2.6	134	4.3	0.10
Weight loss	24,384	4.3	793	25.6	0.63
Type of Procedure					
Neuro	2,829	0.5	26	0.8	0.04
Otorhinolaryngology	3,856	0.7	113	3.7	0.11
Thoracic	16,205	2.9	111	3.6	0.03
Cardiac	242,750	42.9	1,197	38.7	-0.9
Vascular	38,578	6.8	196	6.3	-0.2
General	156,879	27.5	1,046	33.8	0.4
Urology	83,459	14.8	243	7.9	-0.2
Gynecology	20,177	3.6	138	4.5	0.05
Orthopedics	446	0.1	11	0.4	0.06
Transplant	737	0.1	7	0.2	0.02
Hospital characteristics					
Bed Size					
Small	61,595	10.8	275	8.9	-0.7
Medium	128,892	23.0	690	22.5	-0.1
Large	373,808	66.2	2,114	68.5	0.5
Location and Teaching Status					
Rural	30,312	5.2	125	4.0	-0.4
Urban, non teaching	157,462	27.7	660	21.1	-0.6
Urban, teaching	376,521	67.1	2,294	74.9	0.7
Ownership					
Government	77,891	13.6	297	9.6	-0.2
Private	484,901	86.4	2,781	90.4	0.2

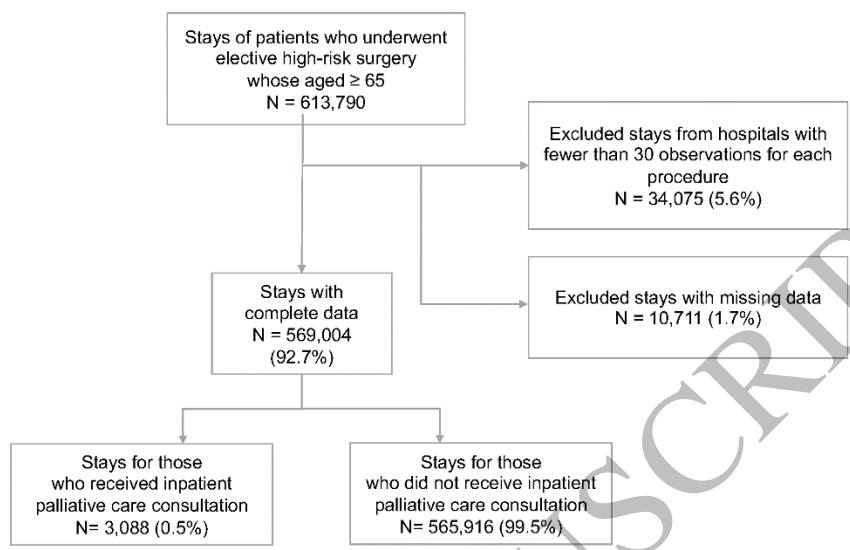


Figure 1
339x190 mm (x DPI)

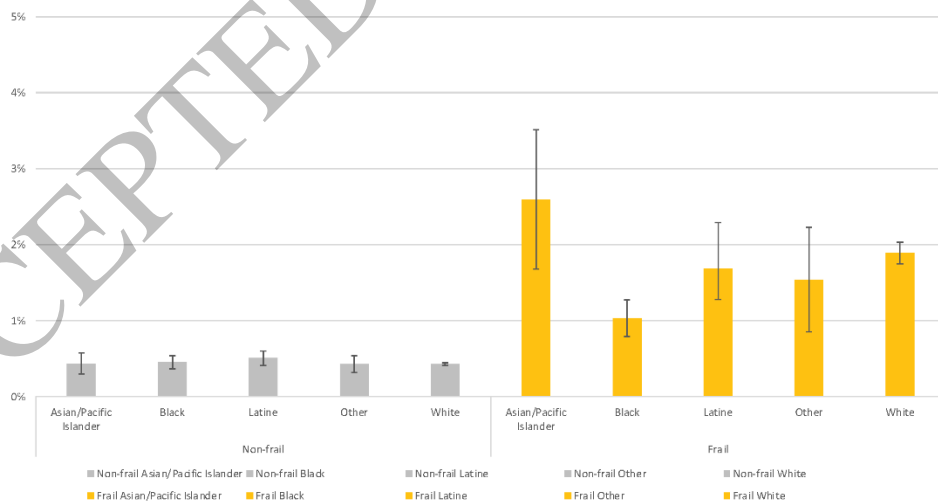


Figure 2
339x190 mm (x DPI)

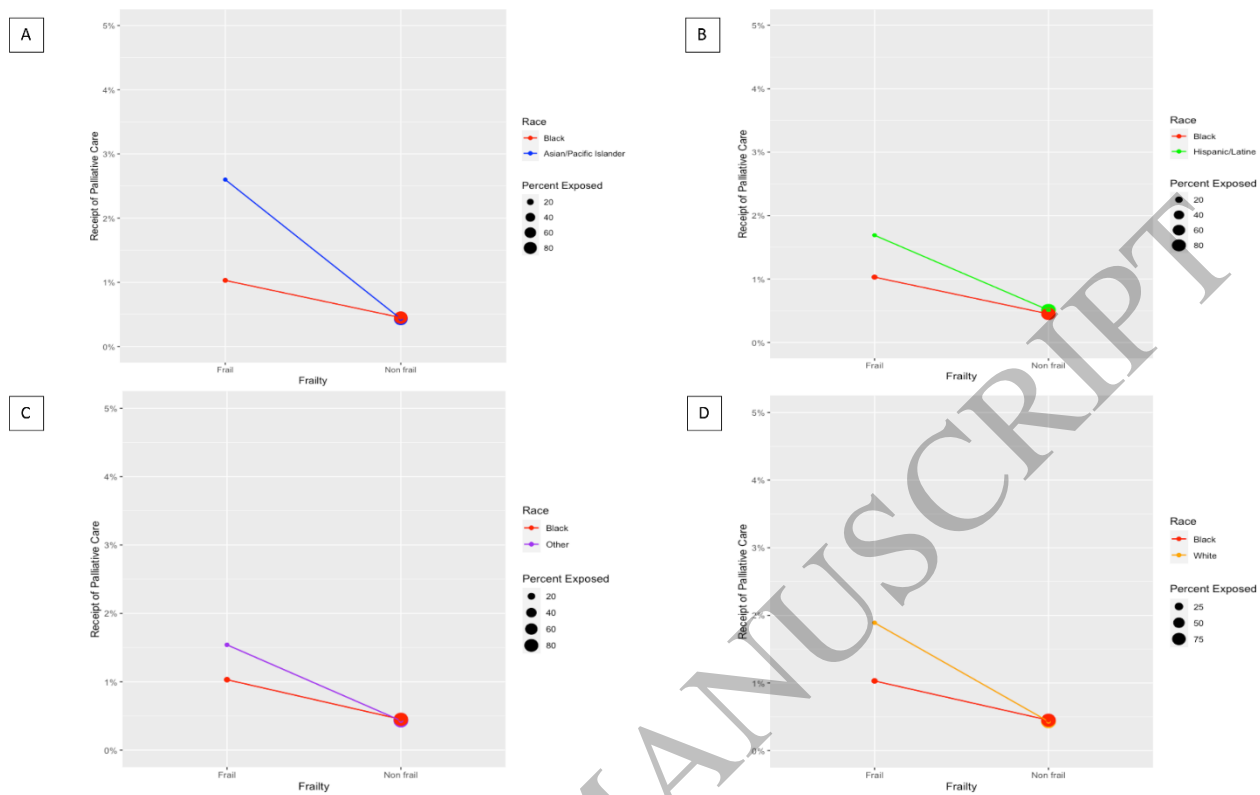


Figure 3
290x182 mm (x DPI)

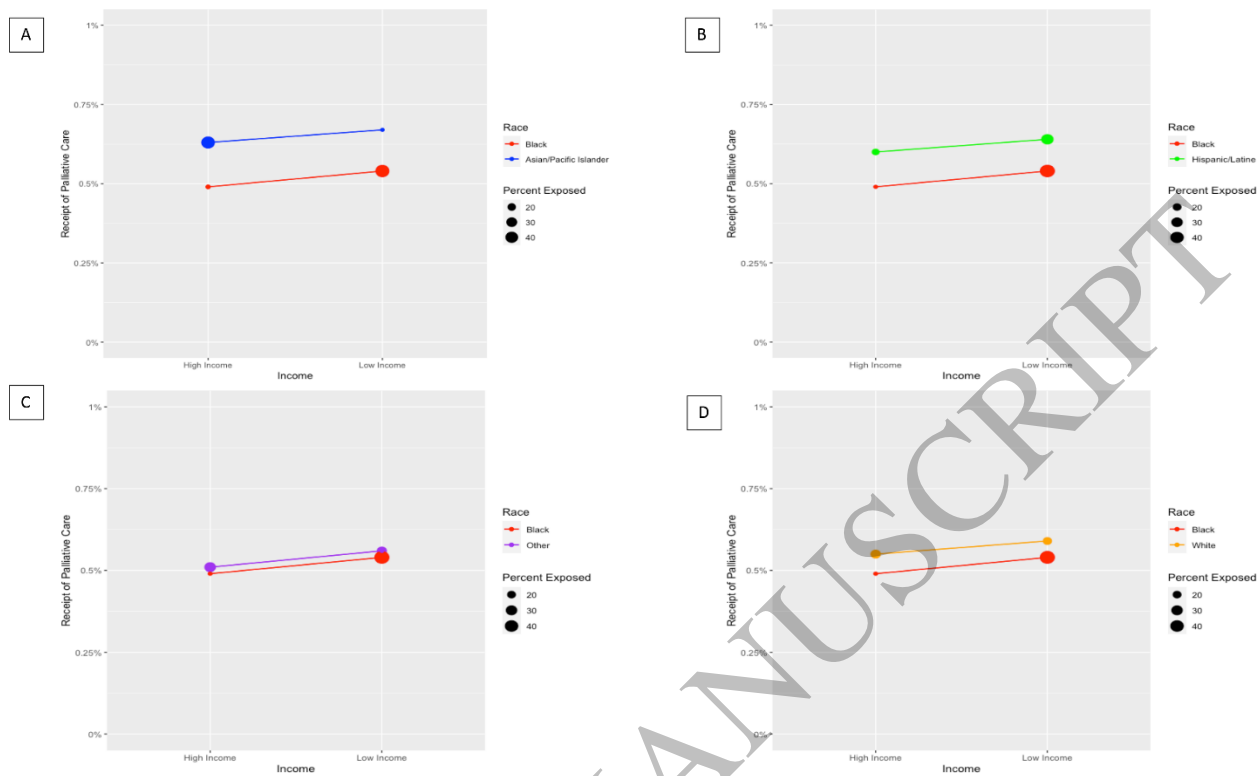


Figure 4
290x177 mm (x DPI)