Association of Socioeconomic Status with Medical Assistance in Dying: A Case Control Analysis

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Association of Socioeconomic Status with Medical Assistance in Dying:

A Case Control Analysis

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ABSTRACT

Objectives: Patients with low socioeconomic status tend to experience less access to care that is typically ascribed to economic constraints. We tested whether the decreased care extends to medical assistance in dying in a healthcare system with no direct economic constraints.

Design: Population-based case-control study of adults who died.

Setting: Ontario, Canada, between June 1, 2016 and June 1, 2019.

Patients: Patients receiving palliative care under universal insurance with no user fees.

Exposure: Patient's socioeconomic status identified using standardized quintiles.

Main Outcome Measures: Whether the patient received medical assistance in dying.

Results: A total of 50,096 palliative care patients died, of whom 920 received medical assistance in dying (cases) and 49,176 did not receive medical assistance in dying (controls). Medical assistance in dying was less frequent for patients with low socioeconomic status (166 of 11,008 = 1.5%) than for those with high socioeconomic status (227 of 9,277 = 2.4%). This equaled a 39% decreased odds of receiving medical assistance in dying associated with low socioeconomic status (odds ratio = 0.61, 95% confidence interval 0.50 to 0.75, $p < 0.001$). The relative decrease was evident across diverse patient groups and after adjusting for age, sex, frailty, home location, malignancy diagnosis, healthcare utilization, and responsible physician.

Conclusions: Patients with low socioeconomic status are unlikely to receive medical assistance in dying under universal health insurance. An awareness of this imbalance may help in understanding patient choices in less extreme clinical settings.

ARTICLE SUMMARY

Strengths & Limitations

Comprehensive analysis of palliative care patients who died in Canada's largest region assessing socioeconomic inequities around medical assistance in dying.

Detailed statistics adjusting for observed factors, secondary analyses matching on exact responsible physician, and added validation survey testing for unmeasured factors.

Study limitations are inevitable since a randomized trial of medical assistance in dying is not ethical, feasible, or realistic.

Further limitations include the fallibility of estimating socioeconomic status that generally yields analyses that underestimate the magnitude of inequities.

Additional limitations involve scientific interpretation because socioeconomic status can be intertwined with patient preferences, communication patterns, or implicit bias.

INTRODUCTION

Medical assistance in dying (akin to physician-assisted suicide) is free and legal in Canada.[1] An eligible patient must have a grievous and irremediable disease that causes intolerable suffering where death is reasonably foreseeable.[2] The common indications are metastatic cancer or a progressive neurologic illness.[3] Additional requirements include informed consent, second physician verification, attestation from impartial witnesses, and an interval for reflection.[4] The protocol involves a series of medications including midazolam, propofol, and rocuronium.[5] Rates of medical assistance in dying vary substantially by region and average over 1,000 per year nationally.[6 7] Each case hinges on the concept of compassionate care for a suffering patient.

Socioeconomic status influences medical care in many situations. For example, poor patients relative to rich patients tend to be undertreated in a publicly-funded colon-cancer screening program.[8] To compensate, recommendations to provide care for poor patients have been fundamental in the practice of medicine since antiquity with persistent advocacy to treat those in most need.[9 10 11 12 13] Modern strategies to mitigate inequities tend to focus on situational barriers (eg, access to care) or patient factors (eg, personality traits or community norms) and have not been fully successful.[14 15] In theory, the causes of socioeconomic inequities can be more complicated because medical treatment also depends on human judgment.

People are prone to pitfalls of reasoning in medical care.[16 17] Poor patients, for example, may feel less able to advocate for themselves or be reluctant to express their dissatisfaction.[18 19 20] In addition, clinicians may underestimate the distress experienced by poor patients due to faulty intuitions about a life of hardships (termed the thick-skinned fallacy).[21 22 23] We hypothesized such behavioral pitfalls may have implications for medical care, thereby leading to unequal patterns of care for poor and for rich patients experiencing a similar serious situation.[24 25] Here we explore how this hypothesis might extend to an extreme condition requiring understanding and communication; namely, medical assistance in dying for palliative care patients.

METHODS

Study Setting

Most Canadian adults strongly support medical assistance in dying, as indicated by national opinion polls conducted in recent years.[26] This support is nearly as strong among poor households (<$40,000 annual income) and rich households (>$100,000 annual income).[27] The Supreme Court of Canada ruled on February 6, 2015 that competent Canadian adults have the right to assistance in dying regardless of ability-to-pay and set June 17, 2016 as the implementation date for legalization.[28] In response, medical assistance in dying became a benefit under universal health insurance in Ontario on June 6, 2016, listed as palliative care.[29 30] Ontario is Canada's largest province with a population of 13,448,494 in 2016 (study baseline).[31 32]

Patient Selection

We identified older adults (age ≥ 65 years) who died with palliative care (akin to hospice care) using valid linked databases.[33 34 35 36] We included deaths between June 1, 2016 and June 1, 2019 to reflect all years since legalization of medical assistance in dying. We identified palliative care by physician fees (OHIP code: K023) and required at least two contacts in the last month of life to ensure patients had an irremediable condition, death was reasonably foreseeable, and individuals had access to care.[37] Patients who received medical assistance in dying were identified from corresponding outpatient pharmacy prescriptions (ODB codes: 93877101 to 93877106).[38] The remaining patients were defined as receiving palliative care without medical assistance in dying.

Socioeconomic Status

We identified a patient's socioeconomic status based on the Statistics Canada official algorithm using the smallest population unit available (size about 500 persons).[39] [40] [41] These estimates reflected home neighborhood location, did not rely on self-report, and were validated in past research.[42] [43] [44] [45] [46] Individuals with missing data (<1%) were assigned to the lowest quintile to yield a fully comprehensive analysis and more conservative estimates. The purpose was to avoid limitations in past research such as small sample sizes, subjective survey responses, volunteer participants, or uncontrolled analyses of socioeconomic status. The main limitation of our approach was random misclassification which tended to bias comparisons toward the null.[47]

General Characteristics

Information on patient age, sex, and home location was based on linked demographic databases.[48] Additional linked healthcare databases were used to identify time of death (season, weekday, year), home location (urban, rural), and past medical care (clinic contacts, emergency visits, hospital admissions).[49] [50] The Johns Hopkins University Adjusted Clinical Groups (ACG) score was used as an overall index of health status and general frailty.[51] [52] Total medications during the final year of life were obtained using techniques previously validated at the

Institute for Clinical Evaluative Sciences.[53 54] The available databases lacked information on ethnic background, religious affiliation, self-identified race, formal education, advance directives, and death certificate details.

Clinical Characteristics

We further scanned individually linked outpatient databases in the year prior to death to identify serious medical illnesses with particular attention to malignancy diagnoses (eg, respiratory tract cancer), neurologic diagnoses (eg, Parkinson's disease), and other life-threatening non-malignant diagnoses (eg, congestive heart failure).[55] Further comorbid conditions included common chronic diseases (eg, hypertension). Additional potentially disqualifying psychiatric diagnoses included depression.[56] We also gathered data on specific medications (eg, opioids).[57] The available databases lacked information on functional status, symptom severity, personal rationales, family relationships, social supports, cultural traditions, and informal thoughts.

Statistical Analysis

The primary analysis examined the distribution of socioeconomic status among patients who received medical assistance in dying compared to controls who did not receive medical assistance in dying using an unpaired chi-square test. Logistic regression was used to further quantify associations using odds ratios to adjust for potential imbalances in demographic characteristics (age, sex, home location), health care utilization (prior year), and general frailty (Johns Hopkins ACG index). Logistic regression was also used to explore additional factors correlated with receiving medical assistance in dying. Calculations of attributable risk and attributable fractions were conducted using population-based methods.

We conducted secondary analyses to validate results by developing a pair-matched approach (1-to-1 ratio). To do so, we matched palliative care patients who did and did not receive medical assistance in dying according to age, sex, home location (urban, rural), and responsible physician (exact name).[58] The association between socioeconomic status and medical assistance in dying was then tested using methods suitable for matched designs.[59] [60] The protocol was conducted using privacy safeguards at the Institute for Clinical Evaluative Sciences and approved by the Sunnybrook Research Ethics board. All analyses were based on SAS software (version 9.45), used two-tailed p-values, and were accompanied by 95% confidence intervals where appropriate.

Survey Validation

We conducted a randomized test to indirectly check the association between socioeconomic status and estimates of patient suffering. In line with behavioral findings concerning differences in perceived pain among laypeople,[61] the rationale of this survey was to explore whether clinicians tend to estimate poor patients as having the same suffering as rich patients in the same situation. The survey contained a single patient scenario formulated in two versions (rich, poor) differing by only one sentence (Appendix §1). The rich version described the patient as having had a lifetime of luxury. The poor version described the patient as having had a lifetime of hardship. The two versions were otherwise the same and designed to elicit a clinician's estimate of patient suffering due to psychosocial or biomedical adverse events.[62]

Patient and Public Involvement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

RESULTS

Baseline Characteristics

During the three-year interval a total of 243,880 deaths were identified, of whom 50,096 received palliative care in the last month of life. Overall, 920 patients received medical assistance in dying and 49,176 controls did not receive medical assistance in dying (Table 1). The two groups were similar except those who received medical assistance in dying were slightly more frequent in the later half of the study, relatively more likely to die on a weekday, and somewhat less frail. The typical patient in both groups had a median age of 81 years, was diagnosed with a malignancy, and lived in a city. Three-quarters (72%, n = 36,274) were admitted to hospital in the year before dying and two-thirds (65%, n = 32,312) had an emergency visit in the year before dying.

*** Table 1 About Here ***

Table 1. Patient Characteristics

		Medical Assistance in Dying (n = 920)	Palliative Control Patients (n = 49,176)
Age	≤ 75 years	338 (37)	15,211 (31)
	> 75 years	582 (63)	33,965 (69)
Sex	Female	484 (53)	24,826 (50)
	Male	436 (47)	24,350 (50)
Home Location *	Urban	812 (88)	44,758 (91)
	Rural	108 (12)	4,418 (9)
Year of Death †	2016 - 17	207 (23)	21,532 (44)
	2018 - 19	713 (77)	27,644 (56)
Season of Year	Spring	183 (20)	10,958 (22)
	Summer	198 (22)	12,036 (24)
	Autumn	265 (29)	12,991 (26)
	Winter	274 (30)	13,191 (27)
Day of Death ¶	Weekday	778 (85)	35,849 (73)
	Weekend	142 (15)	13,327 (27)
Malignancy Diagnosis #	Present	661 (72)	35,548 (72)
	Absent	259 (28)	13,628 (28)
Total Medications in Past Month ‡	Mean	9.1 ± 5.3	9.5 ± 6.2
Clinic Contacts in Past Year	Mean	26.01 ± 16.02	29.29 ± 18.40
Emergency Visits in Past Year	Mean	1.33 ± 1.64	1.59 ± 2.06
Admissions in Past Year	Mean	0.93 ± 1.15	1.53 ± 1.53
Overall Frailty in Past Year §	Mean	8.62 ± 3.75	10.56 ± 3.65

Footnotes

data are count (percentage) except where noted as mean ± standard deviation

* missing values assigned to rural (n = 109 of 50,096)

† denotes first 18 months (2016-2017) and second 18 months (2018-2019), respectively

¶ Saturday and Sunday denote weekend
# detailed diagnoses appear in Appendix §2
‡ detailed medications appear in Appendix
§3
§ based on Johns Hopkins Ambulatory Care Groups

Diagnoses and Treatment

Analysis of individual medical records indicated the two groups of patients had a similar burden of disease in the last year of life (Appendix §2). The most frequent specific malignancies were cancers of the respiratory tract and digestive tract. Important additional diagnoses included congestive heart failure and pulmonary fibrosis. Many patients also had additional comorbidities including hypertension, diabetes, and anxiety. A formal diagnosis of depression was rare in both groups. The most common medication in the last month of life was an opioid analgesic (Appendix §3). The two groups had similar prescription profiles except patients who chose medical assistance in dying were somewhat more likely to be treated with an opioid or a benzodiazepine.

Socioeconomic Status

Medical assistance in dying was proportionately less frequent for patients with low socioeconomic status (166 of 11,008) than patients with high socioeconomic status (227 of 9,277). Stratified analysis showed intermediate findings for patients with intermediate socioeconomic quintiles (Figure 1). Based on the case-control design, this association equaled a 39% decreased frequency of receiving medical assistance in dying associated with low socioeconomic status relative to high socioeconomic status (odds ratio = 0.61, 95% confidence interval 0.50 to 0.75, $p < 0.001$). The discrepancy equated to a net difference of 306 fewer cases of medical assistance in dying than would have been expected if all patients had the pattern of those in the highest socioeconomic quintile.

*** Figure 1 About Here ***

Secondary Analyses of Subgroups

The decreased frequency of receiving medical assistance in dying associated with low socioeconomic status extended to diverse subgroups. The decrease was evident regardless of age and sex (Figure 2). The decrease was observed in the first half and the second half of the study (and regardless of weekday). Similarly, the decrease was observed for those with and those without a malignancy diagnosis. In addition, the decrease extended to patients regardless of healthcare utilization and frailty. No subgroup showed contrary findings except for rural patients (not significant). All subgroups with at least 50 cases showed a statistically significant decreased frequency of medical assistance in dying associated with low socioeconomic status.

*** Figure 2 About Here ***

Additional Predictors

Several other patient characteristics were associated with a decreased frequency of receiving medical assistance in dying (Table 2). Patients older than 75 years were less likely to receive medical assistance in dying than their younger counterparts. Similarly, patients who had relatively more frailty or relatively more hospital admissions were less likely to receive medical assistance in dying. In contrast, sex, home location, clinic contacts, and emergency department visits were not significantly associated with medical assistance in dying. Accounting for all characteristics suggested that low socioeconomic status was associated with a 37% decreased frequency of receiving medical assistance in dying (odds ratio = 0.63, 95% confidence interval 0.51 to 0.77, p < 0.001).

*** Table 2 About Here ***

Table 2. Predictors of Medical Assistance in Dying

	BASIC ANALYSIS *		ADJUSTED ANALYSIS †	
Variable	Relative Risk	Confidence Interval	Relative Risk	Confidence Interval
Income Quintile ‡	0.61	0.50 to 0.75	0.63	0.51 to 0.77
Age > 75 Years	0.77	0.67 to 0.88	0.71	0.62 to 0.82
Male Sex	0.92	0.81 to 1.05	0.97	0.85 to 1.11
Rural Home Location §	1.35	1.10 to 1.65	1.16	0.94 to 1.43
Malignancy Diagnosis ¥	0.98	0.85 to 1.13	0.99	0.98 to 1.01
Total Medications ^	1.00	1.00 to 1.01	1.02	1.01 to 1.02
Clinic Contacts in Past Year ^	0.99	0.98 to 0.99	0.99	0.99 to 1.00
Emergency Visits in Past Year ^	0.93	0.89 to 0.96	1.01	0.97 to 1.05
Admissions in Past Year ^	0.69	0.65 to 0.73	0.80	0.74 to 0.86
Overall Frailty in Past Year ¶	0.87	0.85 to 0.88	0.90	0.88 to 0.92

Footnotes

* no adjustment for baseline differences

† adjusted for age, sex, location, malignancy, medications, contacts, emergencies, admissions, frailty

‡ compares lowest to highest quintile

§ referent is urban location

¥ denotes one or more diagnoses

^ covariate coded as a continuous variable

¶ defined by Johns Hopkins frailty index

Matched Analysis

We rechecked results by comparing each patient who received medical assistance in dying with a matched control (age, sex, home location) who did not receive medical assistance in dying and who was treated by the same responsible physician. This yielded a total of 448 matched pairs (49% matching rate). Overall, the case and the matched control had the same socioeconomic status in 26% pairs (118 of 448), the case had a higher socioeconomic status in 42% pairs (186 of 448) and had a lower socioeconomic status in 32% pairs (144 of 448). This matched analysis suggested a 23% decreased frequency of medical assistance in dying associated with lower socioeconomic status (odds ratio = 0.77, 95% confidence interval 0.62 to 0.96, $p = 0.021$).

Survey Validation

We surveyed clinicians at a coffee shop inside a leading Canadian hospital that provided medical assistance in dying.[63] Each participant received one version (rich patient or poor patient) of the survey by randomized assignment (Appendix §1). The typical participant was a middle-aged woman with professional training and years of experience ($n = 494$). We found that overall mean estimates of suffering were higher when assessing a rich patient rather than a poor patient in the survey that otherwise contained identical information about an adverse patient event (7.8 vs 7.3, $p < 0.001$). This difference in estimated patient suffering extended to each of the three psychosocial adverse events and not the one biomedical adverse event (Figure 3).

*** Figure 3 About Here ***

DISCUSSION

We studied thousands of deaths in Canada and found that medical assistance in dying was significantly less frequent for palliative care patients with low rather than high socioeconomic status. The imbalance extended through the range of socioeconomic status and was equally strong during initial and later years of the study. The imbalance could not be easily attributed to access to care, ability to pay, medical diagnoses, intensity of medications, choice of physician, responsiveness to treatment, public preferences, thoughtless impulsivity, reciprocal compensation, or community norms.[64] [65] [66] [67] [68] The findings also differ from statistics on suicide deaths that are higher among poor rather than rich adults.[69] This practice pattern variation is robust and begs for an explanation.

Our research supports earlier patterns observed in other countries around medical assistance in dying. In particular, patients in the USA undergoing legalized assisted dying are more likely to be highly educated and financially secure compared to the population average.[70] [71] Patients in the Netherlands receiving assisted dying are prone to have comparative social, economic, and educational privileges.[72] Patients in Switzerland who undergo assisted suicide tend to live in affluent neighborhoods.[73] [74] Patients in Belgium who receive assisted dying tend to have higher education.[75] To our knowledge, these tangential findings apparent in past studies have not been rigorously analyzed and have typically been ascribed to economic constraints.[76]

Our data suggest the unequal distribution of medical assistance in dying may occur beyond aspects of care related to cost.[77] One factor could be faulty doctor-patient communication. Poor patients often feel disempowered to advocate for themselves, have lower trust in a healthcare system, and may have less rapport with clinicians who elicit their preferences.[78] [79] Religion, ethnicity, or another confounder could also contribute if rich patients plan more advance directives or suffer more existential distress.[80] [81] [82] [83] Another possibility is that clinicians dislike controversy and want to avoid appearing callous towards the poor.[84] To be sure, our study does not determine the appropriateness of medical assistance in dying and, for many, the choice is unthinkable.[85] [86] [87]

The observed unequal treatment might also reflect faulty intuition. The thick-skin bias describes a tendency to perceive individuals of lower income as less distressed by negative events and reflects an implicit belief that repeated hardships lead to increased tolerance.[88] [89] [90] Similar to other implicit biases, this might originate from a common assumption; specifically, people sometimes adapt to difficult situations, shift their expectations, and increase their tolerance.[91] [92] [93] The intuition fails, however, when hardships lead to resignation instead of resiliency. In effect, the chronic stress of poverty might not buffer against the added challenges from ill health.[94] Such faulty intuitions might add to a paradox of lesser care despite serious clinical needs.[95] [96] [97]

Several more limitations of our study merit emphasis and provide opportunities for future research. Socioeconomic status measures are imperfect, tend to bias analyses toward the null, and may underestimate disparities in care.[98] In addition, disadvantaged groups tend to access palliative care less often than privileged groups, thereby also causing our study to underestimate upstream socioeconomic gradients ahead of receiving care.[99] [100] The patients were from Canada's largest region and justify replication elsewhere. Medical assistance in dying, itself, has different meanings depending on available alternatives and on a patient's system of beliefs.[101] [102] The scientific domains of social inequities and of terminal care are, themselves, contentious topics often framed by moral principles rather than behavioral economic analysis.[103]

Together, our data address lingering misconceptions around the medical care implications of the Supreme Court of Canada decision. First, medical assistance in dying has not led to a large drop in palliative care; instead, rates of palliative care increased during the study.[104] Second, medical assistance in dying has not become widely popular despite being free and legal; instead, the practice accounts for fewer than 2% of deaths in palliative care patients.[105] Third, medical assistance in dying has not been unjustly targeted toward poor patients; instead, wealthy patients are disproportionately involved.[106] [107] [108] More broadly, the data might inform patient engagement in less extreme cases of inequities where poor patients may feel disempowered and physicians may be disinclined to push.

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CONFLICTS

The funding organizations had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; and preparation, review, or approval of the manuscript. All authors have no financial or personal relationships or affiliations that could influence the decisions and work on this manuscript.

CONTRIBUTORSHIP

The lead author (DAR) wrote the first draft. All authors (DAR, KN, DT, ES) contributed to study design, manuscript preparation, data analysis, results interpretation, critical revisions and final decision to submit. The lead author (DAR) had full access to all the data in the study, takes responsibility for the integrity of the data and is accountable for the accuracy of the analysis.

APPROVALS

The protocol was approved by the Sunnybrook Research Ethics board and conducted using privacy safeguards at the Institute for Clinical Evaluative Sciences (ID 001).

DATA SHARING

The de-identified data collected for this study are available in an appendix included at the time of original manuscript submission and also are available following publication for researchers whose proposed use of data has been approved by an independent review committee. The Johns Hopkins ACG© System is available through the Department of Health Policy and Management at the Johns Hopkins University.

TRANSPARENCY STATEMENT

The lead author affirms that the manuscript is an honest accurate and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as originally planned have been explained.

ACCOUNTABILITY

The lead author (DAR) had full access to all the data in the study, takes responsibility for the integrity of the data, and is accountable for the accuracy of the analysis.

PATIENT AND PUBLIC INVOLVEMENT STATEMENT

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research

DISSEMINATION STATEMENT

We plan to disseminate the results to patients and patient organizations.

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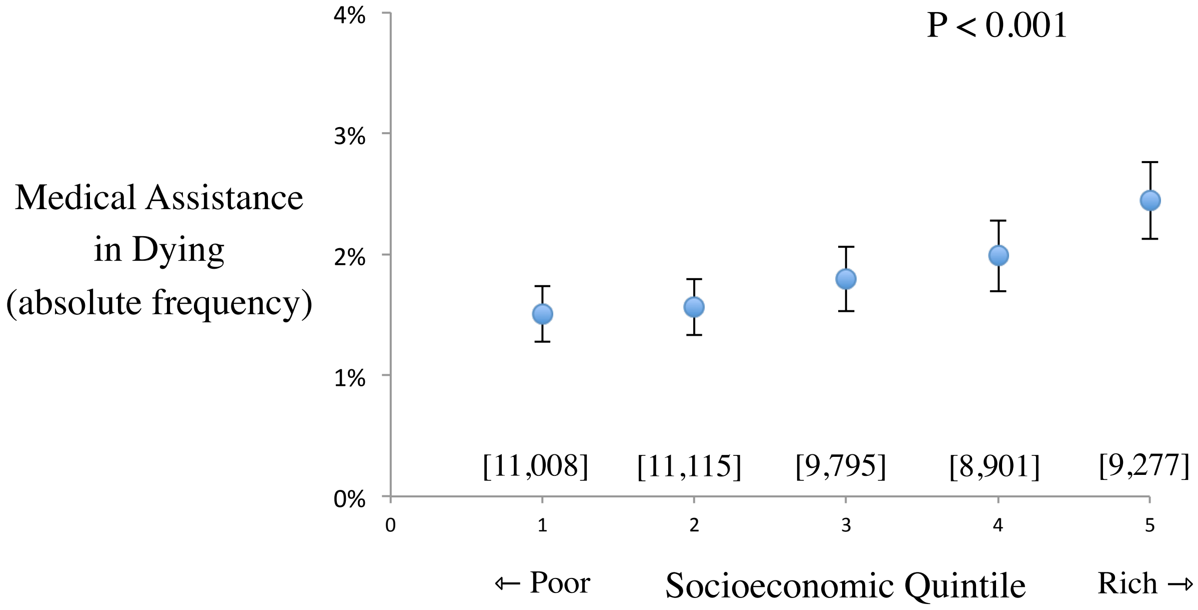
Figure 1. Frequency of Medical Assistance in Dying

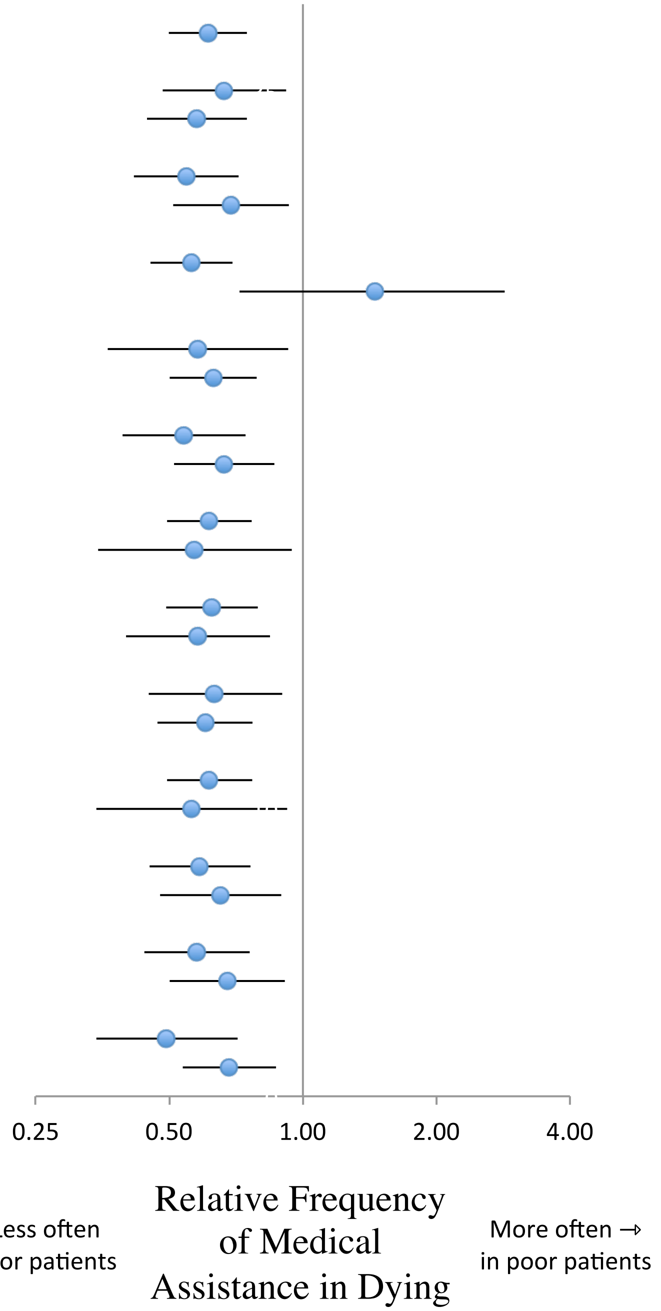


Footnotes

Plot shows frequency of receiving medical assistance in dying for patients receiving palliative care who have different socioeconomic status. X-axis denotes quintiles of socioeconomic status spanning from lowest to highest. Y-axis denotes frequency of receiving medical assistance in dying. Solid circles indicate estimate and vertical bars indicate 95% confidence interval. Square brackets denote total patients in each analysis. P-value indicates trend. Results suggest gradient where patients with lowest socioeconomic status are less likely to receive medical assistance in dying than patients with highest socioeconomic status.

Figure 2. Consistent Reductions across Subgroups

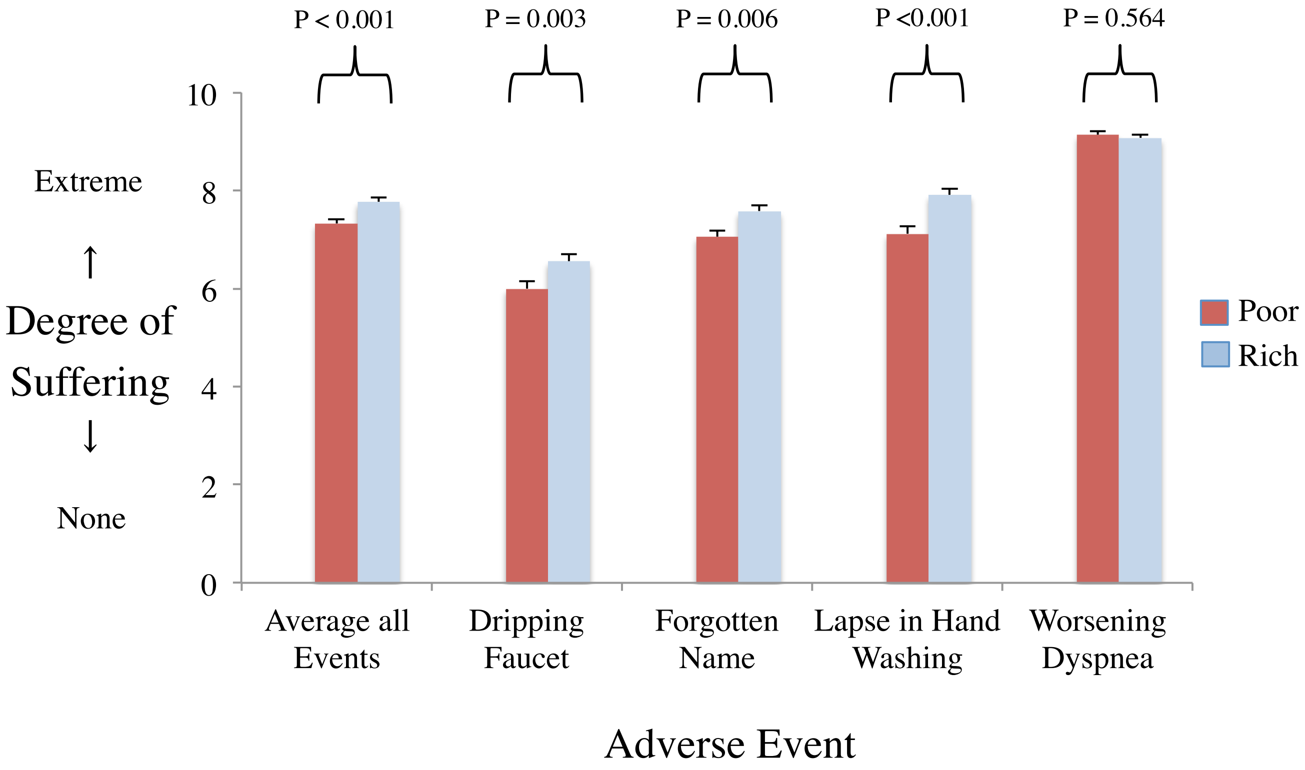
		Medical Assistance in Dying	
		Rich	Poor
TOTAL COHORT		[227]	[166]
Age	**≤ 75 years**	[86]	[69]
	> 75 years	[141]	[97]
Sex	**Female**	[126]	[91]
	Male	[101]	[75]
Home	**Urban**	[214]	[145]
	Rural	[13]	[21]
Year	**2016 to 2017**	[42]	[30]
	2018 to 2019	[185]	[136]
Season	**Summer**	[97]	[63]
	Winter	[130]	[103]
Day	**Weekday**	[189]	[141]
	Weekend	[38]	[25]
Malignancy	**Present**	[162]	[118]
	Absent	[65]	[48]
Medications	**Greater (≥ 11)**	[76]	[54]
	Fewer (≤10)	[151]	[112]
Clinic contacts	**Greater (≥ 13)**	[192]	[137]
	Fewer (≤12)	[35]	[29]
Emergencies	**Yes**	[136]	[97]
	No	[91]	[69]
Admissions	**Yes**	[126]	[89]
	No	[101]	[77]
Frailty	**More (≥ 11)**	[151]	[120]
	Less (≤ 10)	[76]	[46]



Footnotes

Forest plot of relative frequency of receiving medical assistance in dying in different subgroups. Each analysis compares patients in lowest socioeconomic quintile to those in highest socioeconomic quintile. Circles denote estimate and horizontal lines denote 95% confidence interval. Vertical line shows perfect equity. Square brackets show count of patients in each subgroup. Summary analysis for total cohort shown at top. Findings show generally reduced frequency of medical assistance in dying for patients with low socioeconomic status (exception subgroup of rural home location attributable to chance).

Figure 3. Perceptions of Patient Suffering

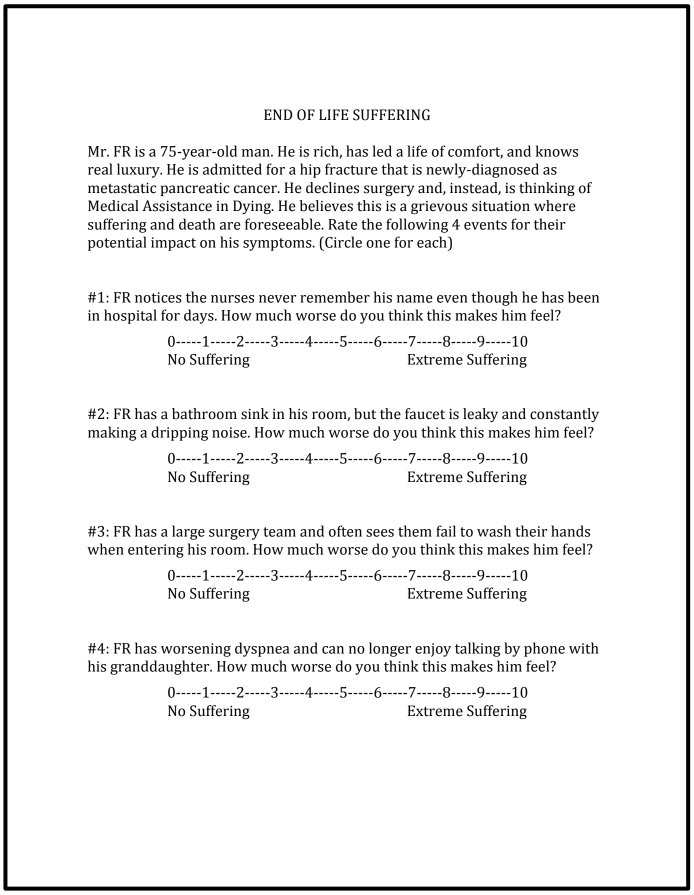


Footnotes

Plot shows mean ratings of patient suffering from survey of clinicians (n = 494). X-axis denotes average of all adverse events and each specific component (dripping faucet making noise, forgetting patient name despite being in hospital for days, failures of hand washing when entering room, and worsening dyspnea). Y-axis denotes mean ratings of patient suffering. Red bars for survey describing a poor patient. Blue bars for survey describing a rich patient. Vertical beams denote standard errors. P-values compare mean ratings of same adverse event. Results show significantly lower mean ratings of suffering in the poor version than rich version (exception of dyspnea).

Appendix §1. Wording of Different Survey Versions

Rich Version



END OF LIFE SUFFERING

Mr. FR is a 75-year-old man. He is rich, has led a life of comfort, and knows real luxury. He is admitted for a hip fracture that is newly-diagnosed as metastatic pancreatic cancer. He declines surgery and, instead, is thinking of Medical Assistance in Dying. He believes this is a grievous situation where suffering and death are foreseeable. Rate the following 4 events for their potential impact on his symptoms. (Circle one for each)

#1: FR notices the nurses never remember his name even though he has been in hospital for days. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

#2: FR has a bathroom sink in his room, but the faucet is leaky and constantly making a dripping noise. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

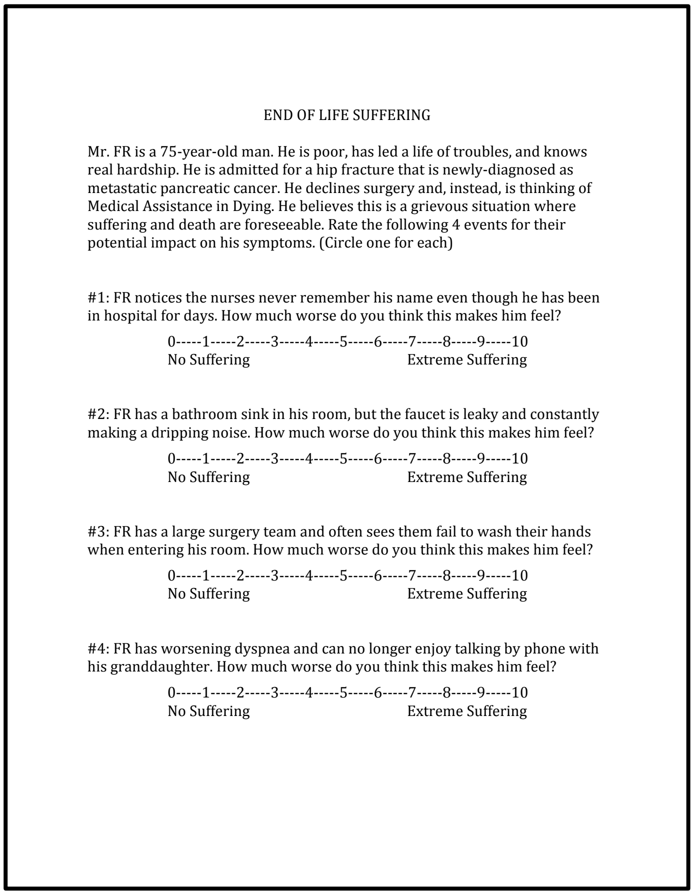
#3: FR has a large surgery team and often sees them fail to wash their hands when entering his room. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

#4: FR has worsening dyspnea and can no longer enjoy talking by phone with his granddaughter. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

Poor Version



END OF LIFE SUFFERING

Mr. FR is a 75-year-old man. He is poor, has led a life of troubles, and knows real hardship. He is admitted for a hip fracture that is newly-diagnosed as metastatic pancreatic cancer. He declines surgery and, instead, is thinking of Medical Assistance in Dying. He believes this is a grievous situation where suffering and death are foreseeable. Rate the following 4 events for their potential impact on his symptoms. (Circle one for each)

#1: FR notices the nurses never remember his name even though he has been in hospital for days. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

#2: FR has a bathroom sink in his room, but the faucet is leaky and constantly making a dripping noise. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

#3: FR has a large surgery team and often sees them fail to wash their hands when entering his room. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

#4: FR has worsening dyspnea and can no longer enjoy talking by phone with his granddaughter. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

Footnotes

Textbox showing exact wording of survey study. Rich version on left and poor version on right. Each respondent received single version by randomized assignment. Sole difference between the two versions appears in second sentence describing either wealth or poverty. Assignment based on survey randomized in advance and allocated in blinded manner (face-down orientation). Consent rate of approximately 70% (refusals not tracked). Completion rate of 100% (no faulty or incomplete responses). Time for survey completion about 1 minute.

Appendix §2. Prior Diagnoses

	Medical Assistance in Dying (n = 920)	Palliative Care Patients (n = 49,176)
Malignancy Diagnosis		
Mouth, ear, nose, throat	24 (3)	1,699 (3)
Digestive tract	239 (26)	12,327 (25)
Repiratory tract	205 (22)	11,317 (23)
Muskuloskeletal, skin, breast	151 (16)	8,387 (17)
Genitourinary tract	174 (19)	9,065 (18)
Neurologic tract	62 (7)	3,177 (6)
Miscellaneous	360 (39)	21,058 (43)
Hematologic	58 (6)	4,498 (9)
Non-Malignancy Diagnosis		
Parkinson's disease or other CNS illness	158 (17)	6,388 (13)
Stroke or other CNS vascular event	76 (8)	7,243 (15)
Concussion or other CNS trauma	64 (7)	1,327 (3)
Myasthenia gravis or other myo-neuropathy	189 (21)	15,332 (31)
Congestive heart failure or other cardiac illness	332 (36)	22,836 (46)
Pulmonary fibrosis or other lung illness	351 (38)	22,684 (46)
Cirrhosis or other liver failure	50 (5)	3,533 (7)
Uremia or other kidney failure	77 (8)	9,214 (19)
Active Comorbidity		
Hypertension	169 (18)	12,050 (25)
Acid reflux	101 (11)	6,333 (13)
Diabetes	99 (11)	10,994 (22)
Anemia	86 (9)	8,083 (16)
Glaucoma	112 (12)	4,381 (9)
Anxiety	209 (23)	10,083 (21)
Depression	50 (5)	2,075 (4)

Footnotes

data are count (percentage) of each column
data sum to above 100% due to patients having more than 1 diagnosis
diagnoses based on ICD9 codes extracted from outpatient records in year before death
CNS denotes Central Nervous System

Appendix §3. Prior Medications

	Medical Assistance in Dying (n = 920)	Palliative Care Patients (n = 49,176)
Specific Medication in Last Month of Life		
Opioid	587 (64)	24,455 (50)
Beta blocker	119 (13)	8,247 (17)
Calcium blocker	71 (8)	5,222 (11)
Acid suppressor	284 (31)	14,679 (30)
Diabetes medication	30 (3)	3,866 (8)
Statin	75 (8)	6,570 (13)
Inhaled bronchodilator	51 (6)	2,709 (6)
Glaucoma medication	34 (4)	1,472 (3)
Benzodiazepine	405 (44)	16,311 (33)
Antidepressant	225 (24)	10,841 (22)

Footnotes

data are count (percentage) of each column

data sum to above 100% due to patients having more than 1 medication

medications based on DIN codes extracted from outpatient records in month before death

BMJ Open

Association of Socioeconomic Status with Medical Assistance in Dying: A Case Control Analysis

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Association of Socioeconomic Status with Medical Assistance in Dying: A Case Control Analysis

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Running Title: Medical Assistance in Dying

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Word Count: 2,759

ABSTRACT

Objectives: Economic constraints are a common explanation for why patients with low socioeconomic status tend to experience less access to medical care. We tested whether the decreased care extends to medical assistance in dying in a healthcare system with no direct economic constraints.

Design: Population-based case-control study of adults who died.

Setting: Ontario, Canada, between June 1, 2016 and June 1, 2019.

Patients: Patients receiving palliative care under universal insurance with no user fees.

Exposure: Patient's socioeconomic status identified using standardized quintiles.

Main Outcome Measure: Whether the patient received medical assistance in dying.

Results: A total of 50,096 palliative care patients died, of whom 920 received medical assistance in dying (cases) and 49,176 did not receive medical assistance in dying (controls). Medical assistance in dying was less frequent for patients with low socioeconomic status (166 of 11,008 = 1.5%) than for patients with high socioeconomic status (227 of 9,277 = 2.4%). This equaled a 39% decreased odds of receiving medical assistance in dying associated with low socioeconomic status (odds ratio = 0.61, 95% confidence interval 0.50 to 0.75, p < 0.001). The relative decrease was evident across diverse patient groups and after adjusting for age, sex, frailty, home location, malignancy diagnosis, healthcare utilization, and overall frailty. The findings also replicated in a subgroup analysis that matched patients on responsible physician, a sensitivity analysis based on a different socioeconomic measure of low-income status, and a validation study using a randomized survey design.

Conclusions: Patients with low socioeconomic status less likely to receive medical assistance in dying under universal health insurance. An awareness of this imbalance may help in understanding patient decisions in less extreme clinical settings.

ARTICLE SUMMARY

Strengths & Limitations

Comprehensive analysis of palliative care patients who died in Canada's largest region assessing socioeconomic inequities around medical assistance in dying.

Detailed statistics adjusting for observed factors, secondary analyses matching on exact responsible physician, and additional validation survey testing for unmeasured factors.

Study limitations are inevitable since a randomized trial of medical assistance in dying is not ethical, feasible, or realistic.

Further limitations include the fallibility of estimating socioeconomic status that generally yields analyses that underestimate the magnitude of inequities.

Additional limitations involve interpretation of results because socioeconomic status can be intertwined with patient preferences, communication patterns, or implicit bias.

INTRODUCTION

Medical assistance in dying is free and legal in Canada.[1] An eligible patient must have a grievous and irremediable disease that causes intolerable suffering where death is reasonably foreseeable.[2] The common indications are metastatic cancer or a progressive neurologic illness.[3] Additional requirements include informed consent, second physician verification, attestation from impartial witnesses, and an interval for reflection.[4] These requirements are designed to avoid thoughtless impulsivity or interpersonal pressure. The protocol involves a series of medications including midazolam, propofol, and rocuronium.[5] Rates of medical assistance in dying vary substantially by region and currently average over 5,000 per year nationally.[6 7] Each case hinges on the concept of compassionate care for a suffering patient.

Socioeconomic status influences medical care in many situations. For example, poor patients relative to rich patients tend to be undertreated in a publicly-funded colon-cancer screening program.[8] To compensate, recommendations to provide care for poor patients have been fundamental in the practice of medicine since antiquity with persistent advocacy to treat those in most need.[9 10 11 12 13] Modern strategies to mitigate inequities tend to focus on situational barriers (eg, access to care) or patient factors (eg, life experience or community norms) and have not been fully successful.[14 15] In theory, the causes of socioeconomic inequities can be more complicated because medical treatment also depends on human judgment.

People are prone to pitfalls of reasoning in medical care.[16 17] Poor patients, for example, may feel less able to advocate for themselves or more reluctant to express their dissatisfaction.[18 19 20] In addition, clinicians may underestimate the distress experienced by poor patients due to faulty intuitions about a life of hardships (termed the thick-skinned fallacy).[21 22 23] We hypothesized such behavioral pitfalls may have implications for medical care, thereby leading to unequal patterns of care for poor and for rich patients experiencing a similar serious situation.[24 25] Here we explore how this hypothesis might extend to an extreme condition requiring understanding and communication; namely, medical assistance in dying for palliative care patients.

METHODS

Study Setting

Most Canadian adults strongly support medical assistance in dying, as indicated by national opinion polls conducted in recent years.[26] This support is nearly as strong among poor households (<$40,000 annual income) and rich households (>$100,000 annual income).[27] The Supreme Court of Canada ruled on February 6, 2015 that competent Canadian adults have the right to assistance in dying regardless of ability-to-pay and set June 17, 2016 as the implementation date for legalization.[28] Similar to other regions in Canada, medical assistance in dying became a benefit under universal health insurance in Ontario on June 6, 2016.[29 30 31] Ontario is Canada's largest province with a population of 13,448,494 in 2016 (study baseline).[32 33 34]

Patient Selection

We identified older adults (age ≥ 65 years) who died with palliative care using valid linked databases.[35 36 37 38] We included deaths between June 1, 2016 and June 1, 2019 to reflect all years since legalization of medical assistance in dying. We identified palliative care by physician fees (OHIP code: K023) and required at least two contacts in the last month of life to ensure patients had an irremediable condition, death was reasonably foreseeable, and individuals had access to care.[39] Patients who received medical assistance in dying were identified from specifically defined outpatient pharmacy prescriptions (ODB codes: 93877101 to 93877106).[40] The remaining patients were defined as receiving palliative care without medical assistance in dying. These stringent selection criteria undercount across cases compared to federal data sources.[41]

Socioeconomic Status

We identified a patient's socioeconomic status based on the Statistics Canada official algorithm using the smallest population unit available (size about 500 persons).[42 43 44] These estimates reflected home neighborhood location, did not rely on self-report, and were validated in past research.[45 46 47 48 49] Individuals with missing data (<1%) were assigned to the lowest quintile to yield a fully comprehensive analysis and more conservative estimates.[50] The purpose of this approach was to avoid limitations in past research such as small sample sizes, subjective survey responses, volunteer participants, or uncontrolled analyses of socioeconomic status. The main limitation of our approach was potential random misclassification that would tend to bias comparisons to the null.[51]

General Characteristics

Information on patient age, sex, and home location was based on linked demographic databases.[52] Additional linked healthcare databases were used to identify time of death (season, weekday, year), home location (urban, rural), and past medical care (clinic contacts, emergency visits, hospital admissions).[53 54] The Johns Hopkins University Adjusted Clinical Groups (ACG) score was used as an overall index of health status and general frailty.[55 56] Total medications during the final year of life were obtained using techniques previously validated at the Institute for Clinical Evaluative Sciences.[57 58] The available databases lacked information on self-identified race, ethnic background, religious affiliation, formal education, advance directives, and death certificate details.

Clinical Characteristics

We further scanned individuals linked outpatient databases in the year prior to death to identify serious medical illnesses with particular attention to malignancy diagnoses (eg, respiratory tract cancer), neurologic diagnoses (eg, Parkinson's disease), and other life-threatening non-malignant diagnoses (eg, congestive heart failure).[59] Further comorbid conditions included common chronic diseases (eg, hypertension). Additional psychiatric diagnoses included depression.[60] We also gathered data on specific medications (eg, opioids).[61] The available databases lacked information on functional status, symptom severity, personal rationales, family relationships, social supports, cultural traditions, and informal thoughts.

Statistical Analysis

The primary analysis examined the distribution of socioeconomic status among patients who received medical assistance in dying compared to controls who did not receive medical assistance in dying using an unpaired chi-square test. Logistic regression was used to further quantify associations using odds ratios to adjust for potential imbalances in demographic characteristics (age, sex, home location), health care utilization (prior year), and general frailty (Johns Hopkins ACG index). Logistic regression was also used to explore additional factors correlated with receiving medical assistance in dying. Calculations of attributable risk and attributable fractions were conducted using population-based methods.

We conducted two secondary analyses to validate results. First, we used a pair-matched approach (1-to-1 ratio) to identify similar patients who did and who did not receive medical assistance in dying according to age, sex, home location (urban, rural), and responsible physician (exact name).[62] The association between socioeconomic status and medical assistance in dying was then tested using methods suitable for matched designs.[63 64] Second, a further sensitivity analysis also examined the entire cohort by reclassifying socioeconomic status in a binary manner based on the specific government indicator for a low-income senior (ODB Plan Code R).[65] All analyses followed privacy safeguards at the Institute for Clinical Evaluative Sciences and were conducted using SAS software (version 9.45).

Survey Validation

We conducted a randomized survey to indirectly check the association between socioeconomic status and estimates of patient suffering. In line with behavioral findings concerning estimating perceived discomfort among people,[66] the rationale was to explore whether clinicians tend to estimate poor patients as having the same suffering as rich patients in the same situation. The survey contained a single patient scenario formulated in two versions (rich, poor) differing by only one sentence (Appendix §1). The rich version described the patient as having had a lifetime of luxury. The poor version described the patient as having had a lifetime of hardship. The two versions were otherwise the same, randomly assigned to participants, and designed to elicit a clinician's estimate of patient suffering due to psychosocial or biomedical adverse events.[67]

Patient and Public Involvement

Patients or the public were not involved in the design, conduct, reporting, or dissemination plans of our research.

RESULTS

Baseline Characteristics

During the three-year interval a total of 243,880 deaths were identified, of whom 50,096 received palliative care in the last month of life. Overall, 920 patients received medical assistance in dying and 49,176 controls did not receive medical assistance in dying (Table 1). The two groups were similar except those who received medical assistance in dying were slightly more frequent in the later half of the study, relatively more likely to die on a weekday, and somewhat less frail. The typical patient in both groups had a median age of 81 years, was diagnosed with a malignancy, and lived in a city. Three–quarters (72%, n = 36,274) were admitted to hospital in the year before dying and two–thirds (65%, n = 32,312) had an emergency visit in the year before dying.

*** Table 1 About Here ***

Table 1. Patient Characteristics

		Medical Assistance in Dying (n = 920)	Palliative Control Patients (n = 49,176)
Age	≤ 75 years	338 (37)	15,211 (31)
	> 75 years	582 (63)	33,965 (69)
Sex	Female	484 (53)	24,826 (50)
	Male	436 (47)	24,350 (50)
Home Location *	Urban	812 (88)	44,758 (91)
	Rural	108 (12)	4,418 (9)
Year of Death †	2016 - 17	207 (23)	21,532 (44)
	2018 - 19	713 (77)	27,644 (56)
Season of Year	Spring	183 (20)	10,958 (22)
	Summer	198 (22)	12,036 (24)
	Autumn	265 (29)	12,991 (26)
	Winter	274 (30)	13,191 (27)
Day of Death ¶	Weekday	778 (85)	35,849 (73)
	Weekend	142 (15)	13,327 (27)
Malignancy Diagnosis #	Present	661 (72)	35,548 (72)
	Absent	259 (28)	13,628 (28)
Total Medications in Past Month ‡	Mean	9.1 ± 5.3	9.5 ± 6.2
Clinic Contacts in Past Year	Mean	26.01 ± 16.02	29.29 ± 18.40
Emergency Visits in Past Year	Mean	1.33 ± 1.64	1.59 ± 2.06
Admissions in Past Year	Mean	0.93 ± 1.15	1.53 ± 1.53
Overall Frailty in Past Year §	Mean	8.62 ± 3.75	10.56 ± 3.65

Footnotes

data are count (percentage) except where noted as mean ± standard deviation

* missing values assigned to rural (n = 109 of 50,096)

† denotes first 18 months (2016–2017) and second 18 months (2018–2019), respectively

¶ Saturday and Sunday denote weekend

detailed diagnoses appear in Appendix §2

‡ detailed medications appear in Appendix §3

§ based on Johns Hopkins Ambulatory Care Groups

Diagnoses and Treatment

Analysis of individual medical records indicated the two groups of patients had a similar burden of disease in the last year of life (Appendix §2). The most frequent specific malignancies were cancers of the respiratory tract and digestive tract. Important additional diagnoses included congestive heart failure and pulmonary fibrosis. Many patients also had additional comorbidities including hypertension, diabetes, and anxiety. A formal diagnosis of depression was rare in both groups. The most common medication in the last month of life was an opioid analgesic (Appendix §3). The two groups had similar prescription profiles except patients who chose medical assistance in dying were somewhat more likely to be treated with an opioid or a benzodiazepine.

Socioeconomic Status

Medical assistance in dying was proportionately less frequent for patients with low socioeconomic status (166 of 11,008) than patients with high socioeconomic status (227 of 9,277). Stratified analysis showed intermediate findings for patients with intermediate socioeconomic quintiles (Figure 1). Based on the case–control design, this association equaled a 39% reduced frequency of receiving medical assistance in dying associated with low socioeconomic status relative to high socioeconomic status (odds ratio = 0.61, 95% confidence interval 0.50 to 0.75, p < 0.001). The discrepancy equated to a net difference of 306 fewer cases of medical assistance in dying than would have been expected if all patients had the pattern of those in the highest socioeconomic quintile.

*** Figure 1 About Here ***

Secondary Analyses of Subgroups

The decreased frequency of receiving medical assistance in dying associated with low socioeconomic status extended to diverse subgroups. The decrease was evident regardless of age and sex (Figure 2). The decrease was observed in the first half and the second half of the study (and regardless of weekday). Similarly, the decrease was observed for those with and those without a malignancy diagnosis. In addition, the decrease extended to patients regardless of healthcare utilization and frailty. No subgroup showed contrary findings except for rural patients (not significant). All subgroups with at least 50 cases showed a statistically significant decreased frequency of medical assistance in dying associated with low socioeconomic status.

*** Figure 2 About Here ***

Additional Predictors

Several other patient characteristics were associated with a decreased frequency of receiving medical assistance in dying (Table 2). Patients older than 75 years were less likely to receive medical assistance in dying than their younger counterparts. Similarly, patients who had relatively more frailty or relatively more hospital admissions were less likely to receive medical assistance in dying. In contrast, sex, home location, clinic contacts, and emergency department visits were not significantly associated with medical assistance in dying. Accounting for all characteristics suggested that low socioeconomic status was associated with a 37% decreased frequency of receiving medical assistance in dying (odds ratio = 0.63, 95% confidence interval 0.51 to 0.77, $p < 0.001$).

*** Table 2 About Here ***

Table 2. Predictors of Medical Assistance in Dying

	BASIC ANALYSIS *		ADJUSTED ANALYSIS †	
Variable	Relative Risk	Confidence Interval	Relative Risk	Confidence Interval
Income Quintile ‡	0.61	0.50 to 0.75	0.63	0.51 to 0.77
Age > 75 Years	0.77	0.67 to 0.88	0.71	0.62 to 0.82
Male Sex	0.92	0.81 to 1.05	0.97	0.85 to 1.11
Rural Home Location §	1.35	1.10 to 1.65	1.16	0.94 to 1.43
Malignancy Diagnosis ¥	0.98	0.85 to 1.13	0.99	0.98 to 1.01
Total Medications ^	1.00	1.00 to 1.01	1.02	1.01 to 1.02
Clinic Contacts in Past Year ^	0.99	0.98 to 0.99	0.99	0.99 to 1.00
Emergencies in Past Year ^	0.93	0.89 to 0.96	1.01	0.97 to 1.05
Admissions in Past Year ^	0.69	0.65 to 0.73	0.80	0.74 to 0.86
Overall Frailty in Past Year ¶	0.87	0.85 to 0.88	0.90	0.88 to 0.92

Footnotes

* no adjustment for baseline differences

† adjusted for age, sex, location, malignancy, medications, contacts, emergencies, admissions, frailty

‡ compares lowest to highest quintile

§ referent is urban location

¥ denotes one or more diagnoses

^ covariate coded as a continuous variable

¶ defined by Johns Hopkins frailty index

Matched Analysis

We rechecked results by comparing each patient who received medical assistance in dying with a matched control who did not receive medical assistance in dying and who was also treated by the same responsible physician. This yielded 448 matched pairs (n = 896 patients). Overall, the case and matched control had the same socioeconomic status in 26% of pairs (118 of 448), the case had a higher socioeconomic status in 42% of pairs (186 of 448) and the case had a lower socioeconomic status in 32% of pairs (144 of 448). This matched analysis yielded results that overlapped the main analysis and showed a 23% decrease of medical assistance in dying associated with lower socioeconomic status (odds ratio = 0.77, 95% confidence interval 0.62 to 0.96, p = 0.021).

Alternate Index of Socioeconomic Status

We also retested results by characterizing each individual patient according to whether they were classified by the specific government indicator as a low-income senior. Overall, 8,029 patients were identified as low-income seniors and the remaining 42,067 patients were identified as not low-income seniors. Medical assistance in dying was proportionately less frequent for patients who were low-income seniors (65 of 8,029) than patients who were not low-income seniors (855 of 42,067). This sensitivity analysis yielded results that overlapped the main analysis and showed a 60% decrease of medical assistance in dying among low-income seniors (odds ratio = 0.40, 95% confidence interval 0.31 to 0.51, $p < 0.001$).

Survey Validation

We surveyed clinicians at a coffee shop inside a leading Canadian hospital that provided medical assistance in dying.[68] Each participant received one version (rich patient or poor patient) of the survey by randomized assignment (Appendix §1). The typical participant was a middle-aged woman with medical professional training and years of experience (n = 494). We found that overall mean estimates of suffering were higher when assessing a rich patient rather than a poor patient in the survey that otherwise contained identical information about an adverse patient event (7.8 vs 7.3, $p < 0.001$). This difference in estimated patient suffering extended to each of the three psychosocial adverse events and not the one biomedical adverse event (Figure 3).

*** Figure 3 About Here ***

DISCUSSION

We studied thousands of deaths in Canada and found that medical assistance in dying was significantly less frequent for palliative care patients who had low rather than high socioeconomic status. The imbalance extended through the range of socioeconomic status and was equally strong during initial and later years of the study. The imbalance could not be easily attributed to access to care, ability to pay, medical diagnoses, intensity of medications, choice of physician, responsiveness to treatment, public preferences, thoughtless impulsivity, or reciprocal compensation.[69 70 71 72 73] The findings also differ from statistics on suicide deaths that are higher among poor rather than rich adults.[74] This practice pattern variation is robust and begs for an explanation.

Our research supports earlier patterns observed in other countries around medical assistance in dying. In particular, patients in the USA undergoing legalized assisted dying are more likely to be highly educated and financially secure compared to the population average.[75 76] Patients in the Netherlands receiving assisted dying are prone to have comparative social, economic, and educational privileges.[77] Patients in Switzerland who undergo assisted dying tend to live in affluent neighborhoods.[78 79] Patients in Belgium who receive assisted dying tend to have higher education.[80] To our knowledge, these tangential findings apparent in past studies have not been rigorously analyzed and have typically been ascribed to economic constraints.[81]

Our data suggest the unequal distribution of medical assistance in dying may occur beyond aspects of care related to cost.[82] One factor could be faulty doctor-patient communication. Poor patients often feel disempowered to advocate for themselves, have lower trust in a healthcare system, and may have less rapport with clinicians who elicit their preferences.[83 84] Religion, ethnicity, or another confounder could also contribute if rich patients plan more advance directives or suffer more existential distress.[85 86 87 88] Another possibility is that clinicians dislike controversy and want to avoid appearing callous towards the poor.[89] To be sure, our study does not determine the appropriateness of medical assistance in dying and, for many, the choice is unthinkable.[90 91 92]

The observed unequal treatment might also reflect faulty intuition. The thick-skin bias describes a tendency to perceive individuals of lower income as less distressed by negative events and reflects an implicit belief that repeated hardships lead to increased tolerance.[93 94 95] Similar to other implicit biases, this error might originate from a common assumption; specifically, people sometimes adapt to difficult situations, shift their expectations, and increase their tolerance.[96 97 98] The intuition fails, however, when hardships lead to resignation instead of resiliency. In effect, the chronic stress of poverty might not buffer against the added challenges from ill health.[99] Such faulty intuitions might add to a paradox of lesser care despite serious clinical needs.[100 101 102]

Several limitations of our study merit emphasis for future research. Socioeconomic status measures are imperfect, tend to bias analyses toward the null, and may underestimate disparities in care.[103] In addition, disadvantaged groups tend to access palliative care less often than privileged groups, thereby causing our study to underestimate upstream socioeconomic barriers ahead of receiving care.[104 105] We also lacked data on race and patients younger than 65 years, thereby justifying further analyses in other groups. Medical assistance in dying, itself, has different meanings depending on available alternatives and a patient's own beliefs.[106 107] The scientific domains of health inequities and of terminal care are, themselves, complex topics often guided by moral principles rather than behavioral economic analysis.[108 109 110 111 112]

Additionally, our data address lingering misconceptions around the medical care implications of the Supreme Court of Canada decision. First, medical assistance in dying has not led to a large drop in palliative care; instead, rates of palliative care increased during the study.[113] Second, medical assistance in dying has not become widely popular despite being free and legal; instead, the practice accounts for fewer than 2% of deaths in palliative care patients.[114] Third, medical assistance in dying has not been unjustly targeted toward poor patients; instead, wealthy patients are disproportionately involved.[115] [116] [117] More broadly, the data might inform patient engagement for less extreme decisions where poor patients might be disempowered or clinicians may feel disinclined to push.

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CONFLICTS

The funding organizations had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; and preparation, review, or approval of the manuscript. All authors have no financial or personal relationships or affiliations that could influence the decisions and work on this manuscript.

CONTRIBUTORSHIP

The lead author (DAR) wrote the first draft. All authors (DAR, KN, DT, ES) contributed to study design, manuscript preparation, data analysis, results interpretation, critical revisions and final decision to submit. The lead author (DAR) had full access to all the data in the study, takes responsibility for the integrity of the data and is accountable for the accuracy of the analysis.

APPROVALS

The protocol was approved by the Sunnybrook Research Ethics board and conducted using privacy safeguards at the Institute for Clinical Evaluative Sciences (ID 001). Parts of this material are based on data compiled by CIHI; however, the analyses, conclusions, and statements expressed are those of the authors and not necessarily those of CIHI. We thank IMS Brogan Inc. for use of the Drug Information Database

DATA SHARING

The de-identified data collected for this study are available in an appendix included at the time of original manuscript submission and also are available following publication for researchers whose proposed use of data has been approved by an independent review committee. The Johns Hopkins ACG© System is available through the Department of Health Policy and Management at the Johns Hopkins University.

TRANSPARENCY STATEMENT

The lead author affirms that the manuscript is an honest accurate and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as originally planned have been explained.

ACCOUNTABILITY

The lead author (DAR) had full access to all the data in the study, takes responsibility for the integrity of the data, and is accountable for the accuracy of the analysis.

DISSEMINATION STATEMENT

We plan to disseminate the results to patients and patient organizations.

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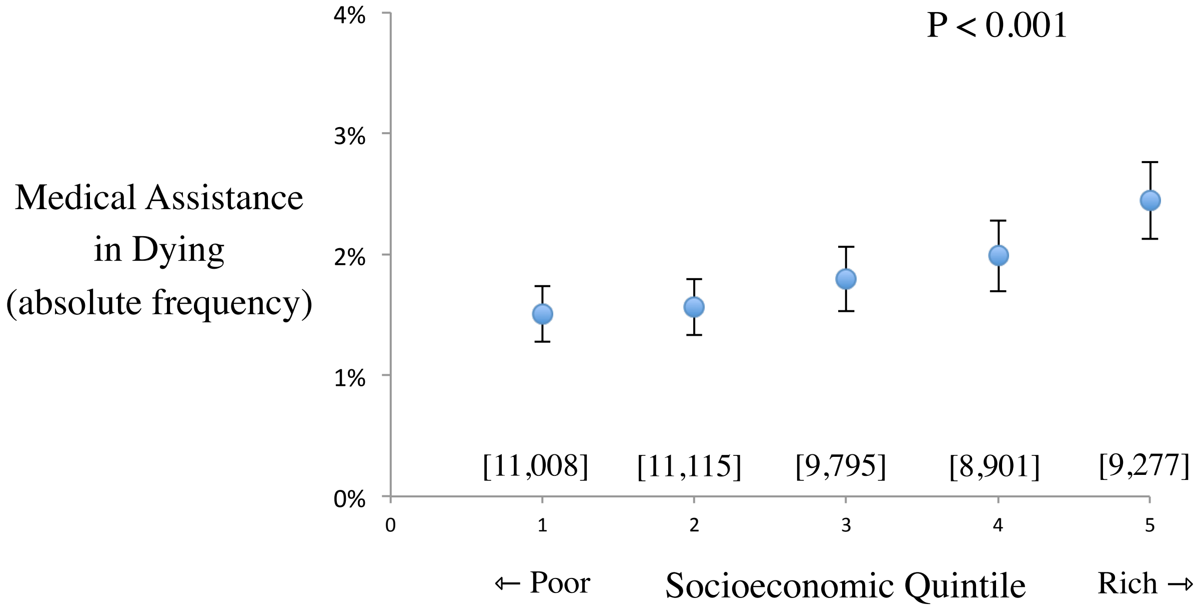
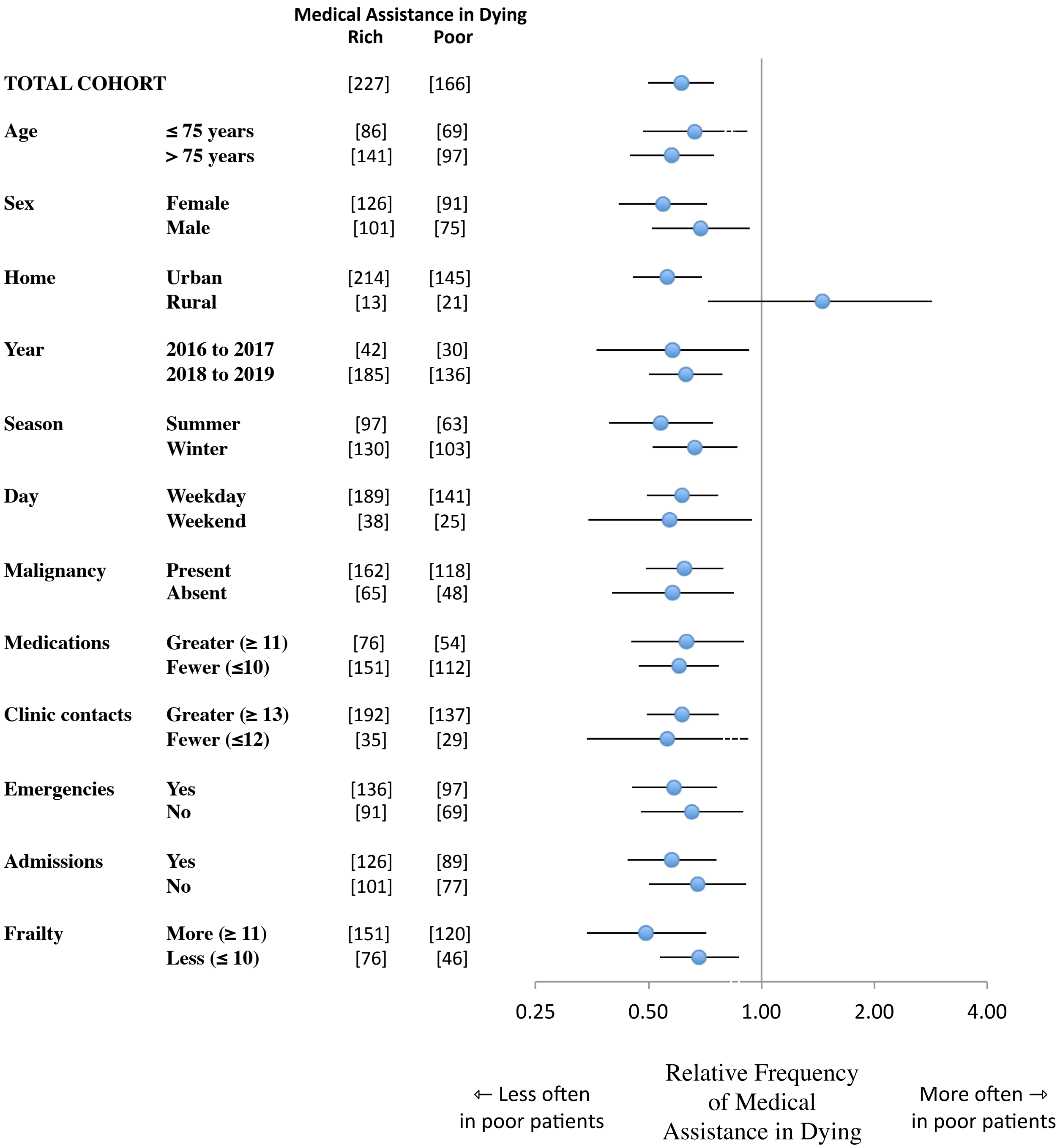
Figure 1. Frequency of Medical Assistance in Dying



Footnotes

Plot shows frequency of receiving medical assistance in dying among patients receiving palliative care who have different socioeconomic status. X-axis denotes quintiles of socioeconomic status spanning from lowest to highest. Y-axis denotes frequency of receiving medical assistance in dying. Solid circles indicate estimate and vertical bars indicate 95% confidence interval. Square brackets denote total patients in each analysis. P-value indicates trend. Results suggest gradient where patients with lowest socioeconomic status are less likely to receive medical assistance in dying than patients with highest socioeconomic status.

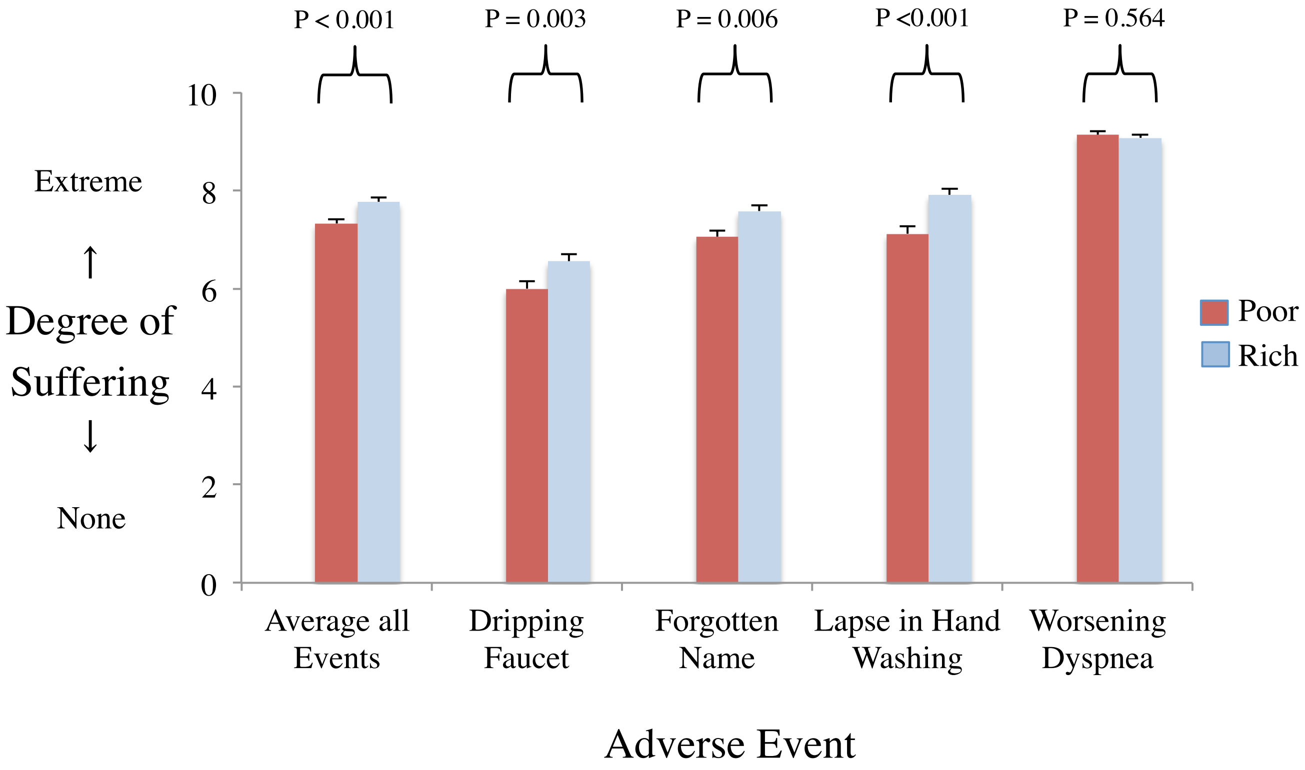
Figure 2. Consistent Reductions across Subgroups



Footnotes

Forest plot of relative frequency of receiving medical assistance in dying in different subgroups. Each analysis compares patients in lowest socioeconomic quintile to patients in highest socioeconomic quintile. Circles denote estimate and horizontal lines denote 95% confidence interval. Vertical line shows perfect equity. Square brackets show count of patients in each subgroup. Summary analysis for total cohort positioned at top. Findings show generally reduced frequency of medical assistance in dying for patients with low socioeconomic status (exception subgroup of rural home location attributable to chance).

Figure 3. Perceptions of Patient Suffering

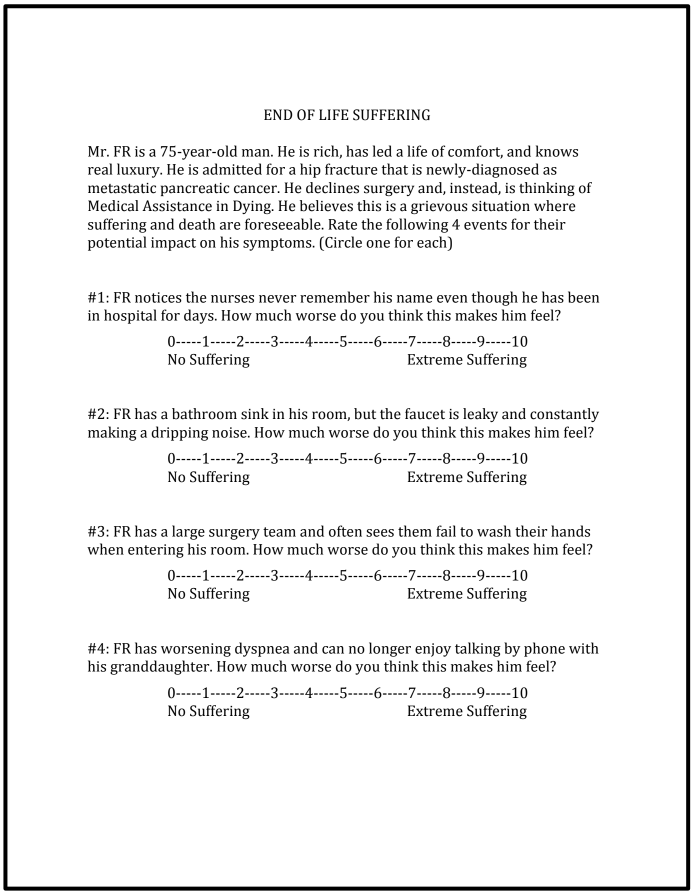


Footnotes

Plot shows mean ratings of patient suffering from survey of clinicians (n = 494). X-axis denotes average of all adverse events and the four specific components (dripping faucet making noise, forgetting patient name despite being in hospital for days, failures of hand washing when entering room, and worsening dyspnea). Y-axis denotes mean ratings of patient suffering. Red bars for survey describing a poor patient. Blue bars for survey describing a rich patient. Vertical beams denote standard errors. P-values compare mean ratings of same adverse event. Results show significantly lower mean ratings of suffering in the poor version than rich version (exception of dyspnea).

Appendix §1. Wording of Different Survey Versions

Rich Version



END OF LIFE SUFFERING

Mr. FR is a 75-year-old man. He is rich, has led a life of comfort, and knows real luxury. He is admitted for a hip fracture that is newly-diagnosed as metastatic pancreatic cancer. He declines surgery and, instead, is thinking of Medical Assistance in Dying. He believes this is a grievous situation where suffering and death are foreseeable. Rate the following 4 events for their potential impact on his symptoms. (Circle one for each)

#1: FR notices the nurses never remember his name even though he has been in hospital for days. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

#2: FR has a bathroom sink in his room, but the faucet is leaky and constantly making a dripping noise. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

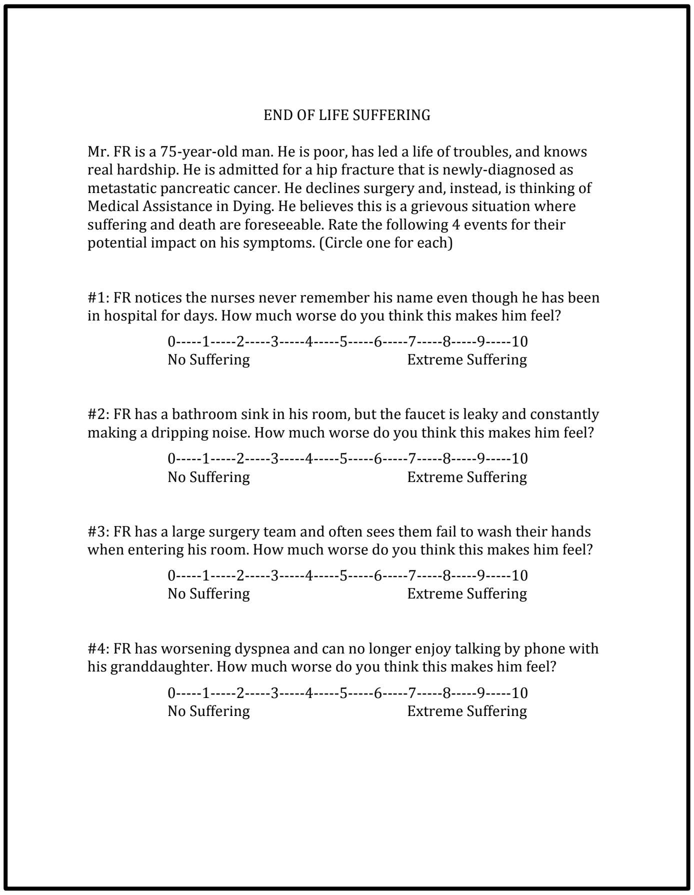
#3: FR has a large surgery team and often sees them fail to wash their hands when entering his room. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

#4: FR has worsening dyspnea and can no longer enjoy talking by phone with his granddaughter. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

Poor Version



END OF LIFE SUFFERING

Mr. FR is a 75-year-old man. He is poor, has led a life of troubles, and knows real hardship. He is admitted for a hip fracture that is newly-diagnosed as metastatic pancreatic cancer. He declines surgery and, instead, is thinking of Medical Assistance in Dying. He believes this is a grievous situation where suffering and death are foreseeable. Rate the following 4 events for their potential impact on his symptoms. (Circle one for each)

#1: FR notices the nurses never remember his name even though he has been in hospital for days. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

#2: FR has a bathroom sink in his room, but the faucet is leaky and constantly making a dripping noise. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

#3: FR has a large surgery team and often sees them fail to wash their hands when entering his room. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

#4: FR has worsening dyspnea and can no longer enjoy talking by phone with his granddaughter. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

Footnotes

Textbox showing exact wording of survey with rich version on left and poor version on right. Each respondent saw a single version. Sole difference between the two versions appears in the second sentence describing the patient as either rich or poor.

The design was specified in advanced based on earlier surveys conducted on lay people and professionals in non-healthcare settings (Cheek & Shafir, 2020). The survey offered limited clinical information and emphasized the primary distinction under investigation; namely, the patient's socioeconomic status.

The survey was pre-randomized using a computerized random number generator. The stack of surveys was then allocated in a face-down procedure to maintain concealment from the administrator. Potential respondents were medical staff identified by a tag worn around the neck or on a uniform who visited the hospital's coffee shop during the day.

The cohort was largely composed of nurses, doctors, or allied healthcare professionals and not necessarily representative of community-based practitioners. Participants were approached by a medical student unaware of clinical backgrounds to avoid targeting or excluding individuals with palliative care training. Specialization was unknown and none were disqualified from participation.

A total of 500 surveys were originally printed (250 each with the poor and rich versions), 6 reserved for pilot testing, and the remaining 494 distributed to participants. The consent rate approached 70% (refusals not tracked) and the completion rate was 100% (no faulty or incomplete responses). Surveys required about 1 minute for a participant to complete.

Appendix §2. Prior Diagnoses

	Medical Assistance in Dying (n = 920)	Palliative Care Patients (n = 49,176)
Malignancy Diagnosis		
Mouth, ear, nose, throat	24 (3)	1,699 (3)
Digestive tract	239 (26)	12,327 (25)
Repiratory tract	205 (22)	11,317 (23)
Muskuloskeletal, skin, breast	151 (16)	8,387 (17)
Genitourinary tract	174 (19)	9,065 (18)
Neurologic tract	62 (7)	3,177 (6)
Miscellaneous	360 (39)	21,058 (43)
Hematologic	58 (6)	4,498 (9)
Non-Malignancy Diagnosis		
Parkinson's disease or other CNS illness	158 (17)	6,388 (13)
Stroke or other CNS vascular event	76 (8)	7,243 (15)
Concussion or other CNS trauma	64 (7)	1,327 (3)
Myasthenia gravis or other myo-neuropathy	189 (21)	15,332 (31)
Congestive heart failure or other cardiac illness	332 (36)	22,836 (46)
Pulmonary fibrosis or other lung illness	351 (38)	22,684 (46)
Cirrhosis or other liver failure	50 (5)	3,533 (7)
Uremia or other kidney failure	77 (8)	9,214 (19)
Active Comorbidity		
Hypertension	169 (18)	12,050 (25)
Acid reflux	101 (11)	6,333 (13)
Diabetes	99 (11)	10,994 (22)
Anemia	86 (9)	8,083 (16)
Glaucoma	112 (12)	4,381 (9)
Anxiety	209 (23)	10,083 (21)
Depression	50 (5)	2,075 (4)

Footnotes

data are count (percentage) of each column

data sum to above 100% due to patients having more than 1 diagnosis

diagnoses based on ICD9 codes extracted from outpatient records in year before death

CNS denotes Central Nervous System

Appendix §3. Prior Medications

	Medical Assistance in Dying (n = 920)	Palliative Care Patients (n = 49,176)
Specific Medication in Last Month of Life		
Opioid	587 (64)	24,455 (50)
Beta blocker	119 (13)	8,247 (17)
Calcium blocker	71 (8)	5,222 (11)
Acid suppressor	284 (31)	14,679 (30)
Diabetes medication	30 (3)	3,866 (8)
Statin	75 (8)	6,570 (13)
Inhaled bronchodilator	51 (6)	2,709 (6)
Glaucoma medication	34 (4)	1,472 (3)
Benzodiazepine	405 (44)	16,311 (33)
Antidepressant	225 (24)	10,841 (22)

Footnotes

data are count (percentage) of each column

data sum to above 100% due to patients having more than 1 medication

medications based on DIN codes extracted from outpatient records in month before death

STROBE Statement—Checklist of items that should be included in reports of ***case-control studies***

	Item No	Recommendation	Page Number
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls	5-7
		(*b*) For matched studies, give matching criteria and the number of controls per case	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5-7
Bias	9	Describe any efforts to address potential sources of bias	6-7
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6-7
		(*b*) Describe any methods used to examine subgroups and interactions	6-7
		(*c*) Explain how missing data were addressed	5
		(*d*) If applicable, explain how matching of cases and controls was addressed	7
		(*e*) Describe any sensitivity analyses	6-7
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8

		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	8
Outcome data	15*	Report numbers in each exposure category, or summary measures of exposure	8-10
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-10
		(*b*) Report category boundaries when continuous variables were categorized	8-10
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	8-10
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	8-10
Discussion			
Key results	18	Summarise key results with reference to study objectives	10-11
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11-12
Generalisability	21	Discuss the generalisability (external validity) of the study results	11-12
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	13

*Give information separately for cases and controls.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.

Association of Socioeconomic Status with Medical Assistance in Dying: A Case Control Analysis

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Association of Socioeconomic Status with Medical Assistance in Dying:

A Case Control Analysis

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assisted suicide; social inequities; patient empathy

Word Count: 2,759

ABSTRACT

Objectives: Economic constraints are a common explanation for why patients with low socioeconomic status tend to experience less access to medical care. We tested whether the decreased care extends to medical assistance in dying in a healthcare system with no direct economic constraints.

Design: Population-based case-control study of adults who died.

Setting: Ontario, Canada, between June 1, 2016 and June 1, 2019.

Patients: Patients receiving palliative care under universal insurance with no user fees.

Exposure: Patient's socioeconomic status identified using standardized quintiles.

Main Outcome Measure: Whether the patient received medical assistance in dying.

Results: A total of 50,096 palliative care patients died, of whom 920 received medical assistance in dying (cases) and 49,176 did not receive medical assistance in dying (controls). Medical assistance in dying was less frequent for patients with low socioeconomic status (166 of 11,008 = 1.5%) than for patients with high socioeconomic status (227 of 9,277 = 2.4%). This equaled a 39% decreased odds of receiving medical assistance in dying associated with low socioeconomic status (odds ratio = 0.61, 95% confidence interval 0.50 to 0.75, $p < 0.001$). The relative decrease was evident across diverse patient groups and after adjusting for age, sex, home location, malignancy diagnosis, healthcare utilization, and overall frailty. The findings also replicated in a subgroup analysis that matched patients on responsible physician, a sensitivity analysis based on a different socioeconomic measure of low-income status, and a confirmation study using a randomized survey design.

Conclusions: Patients with low socioeconomic status are less likely to receive medical assistance in dying under universal health insurance. An awareness of this imbalance may help in understanding patient decisions in less extreme clinical settings.

ARTICLE SUMMARY

Strengths & Limitations

Comprehensive analysis of palliative care patients who died in Canada's largest region assessing socioeconomic inequities around medical assistance in dying.

Detailed statistics adjusting for observed factors, secondary analyses matching on exact responsible physician, and additional confirmation survey testing for unmeasured factors.

Study limitations are inevitable since a randomized trial of medical assistance in dying is not ethical, feasible, or realistic.

Further limitations include the fallibility of estimating socioeconomic status that generally yields analyses that underestimate the magnitude of inequities.

Additional limitations involve interpretation of inequities because socioeconomic status is intertwined with patient preferences, communication patterns, or implicit bias.

INTRODUCTION

Medical assistance in dying is free and legal in Canada.[1] An eligible patient must have a grievous and irremediable disease that causes intolerable suffering where death is reasonably foreseeable.[2] The common indications are metastatic cancer or a progressive neurologic illness.[3] Additional requirements include informed consent, second physician verification, attestation from impartial witnesses, and an interval for reflection.[4] These requirements are designed to avoid thoughtless impulsivity or interpersonal pressures. The protocol involves a series of medications including midazolam, propofol, and rocuronium.[5] Rates of medical assistance in dying vary substantially by region and currently average over 5,000 per year nationally.[6 7] Each case hinges on the concept of compassionate care for a suffering patient.

Socioeconomic status influences medical care in many situations. For example, poor patients relative to rich patients tend to be undertreated in a publicly-funded colon-cancer screening program.[8] To compensate, recommendations to provide care for poor patients have been fundamental in the practice of medicine since antiquity with persistent advocacy to treat those in most need.[9 10 11 12 13] Modern strategies to mitigate inequities tend to focus on situational barriers (eg, access to care) or patient factors (eg, life experience or community norms) and have not been fully successful.[14 15] In theory, the causes of socioeconomic inequities can be more complicated because medical treatment also depends on human judgment.

People are prone to pitfalls of reasoning.[16 17] Poor patients, for example, may feel less able to advocate for themselves or more reluctant to express their dissatisfaction.[18 19 20] In addition, clinicians may underestimate the distress experienced by poor patients due to faulty intuitions about a life of hardships (termed the thick-skinned fallacy).[21 22 23] We hypothesized such behavioral pitfalls may have important implications for medical care, thereby leading to unequal patterns of care for poor and for rich patients experiencing a similar serious situation.[24 25] Here we explore how this hypothesis might extend to an extreme condition requiring understanding and communication; namely, medical assistance in dying for a palliative care patient.

METHODS

Study Setting

Most Canadian adults strongly support medical assistance in dying, as indicated by national opinion polls conducted in recent years.[26] This support is nearly as strong among poor households (<$40,000 annual income) and rich households (>$100,000 annual income).[27] The Supreme Court of Canada ruled on February 6, 2015 that competent Canadian adults have the right to assistance in dying regardless of ability-to-pay and set June 17, 2016 as the implementation date for legalization.[28] Similar to other regions in Canada, medical assistance in dying became a benefit under universal health insurance in Ontario on June 6, 2016.[29 30 31] Ontario is Canada's largest province with a population of 13,448,494 in 2016 (study baseline).[32 33 34]

Patient Selection

We identified older adults (age ≥ 65 years) who died under palliative care using valid linked databases.[35 36 37 38] We included deaths between June 1, 2016 and June 1, 2019 to reflect all years since legalization of medical assistance in dying. We identified palliative care by physician fees (OHIP code: K023) and required at least two contacts in the last month of life to ensure patients had an irremediable condition, death was reasonably foreseeable, and individuals had access to care.[39] Patients who received medical assistance in dying were identified from specifically defined outpatient pharmacy prescriptions (ODB codes: 93877101 to 93877106).[40] The remaining patients were defined as receiving palliative care without medical assistance in dying. These stringent selection criteria undercount cases compared to federal data sources.[41]

Socioeconomic Status

We identified a patient's socioeconomic status based on the Statistics Canada official algorithm using the smallest population unit available (size about 500 persons).[42 43 44] These estimates reflected home neighborhood location, did not rely on self-report, and were validated in past research.[45 46 47 48 49] Individuals with missing data (<1%) were assigned to the lowest quintile to yield a fully comprehensive analysis and more conservative estimates.[50] The purpose of this approach was to avoid limitations in past research such as small sample sizes, subjective survey responses, volunteer participants, or uncontrolled analyses of socioeconomic status. The main limitation of our approach was potential random misclassification that would tend to bias comparisons to the null.[51]

General Characteristics

Information on patient age, sex, and home location was based on linked demographic databases.[52] Additional linked healthcare databases were used to identify time of death (season, weekday, year), home location (urban, rural), and past medical care (clinic contacts, emergency visits, hospital admissions).[53 54] The Johns Hopkins University Adjusted Clinical Groups (ACG) score was used as an overall index of health status and general frailty.[55 56] Total medications during the final year of life were obtained using techniques previously validated at the Institute for Clinical Evaluative Sciences.[57 58] The available databases lacked information on self-identified race, ethnic background, religious affiliation, formal education, advance directives, and death certificate details.

Clinical Characteristics

We further scanned linked outpatient medical care databases in the year prior to death to identify serious medical illnesses with particular attention to malignancy diagnoses (eg, respiratory tract cancer), neurologic diagnoses (eg, Parkinson's disease), and other life-threatening non-malignant diagnoses (eg, congestive heart failure).[59] Further comorbid conditions included common chronic diseases (eg, hypertension). Additional psychiatric diagnoses included depression.[60] We also gathered data on specific medications (eg, opioids).[61] The available databases lacked information on functional status, symptom severity, personal rationales, family relationships, social supports, cultural traditions, and informal thoughts.

Statistical Analysis

The primary analysis examined the distribution of socioeconomic status among patients who received medical assistance in dying compared to controls who did not receive medical assistance in dying using an unpaired chi-square test. Logistic regression was used to further quantify associations using odds ratios to adjust for potential imbalances in demographic characteristics (age, sex, home location), health care utilization (prior year), and general frailty (Johns Hopkins ACG index). Logistic regression was also used to explore additional factors correlated with receiving medical assistance in dying. Calculations of attributable risk and attributable fractions were conducted using population-based methods.

We conducted two secondary analyses to validate results. First, we used a pair-matched approach (1-to-1 ratio) to identify similar patients who did and who did not receive medical assistance in dying according to age, sex, home location (urban, rural), and responsible physician (exact name).[62] The association between socioeconomic status and medical assistance in dying was then tested using methods suitable for matched designs.[63 64] Second, a further sensitivity analysis also examined the entire cohort by reclassifying socioeconomic status in a binary manner based on the specific government indicator for a low-income senior (ODB Plan Code R).[65] All analyses followed privacy safeguards at the Institute for Clinical Evaluative Sciences and were conducted using SAS software (version 9.45).

Confirmation Survey

We conducted an additional randomized survey to indirectly check the association between socioeconomic status and judgments of patient suffering. In line with behavioral findings concerning estimating perceived discomfort among people,[66] the rationale was to explore whether clinicians tend to estimate poor patients as having the same suffering as rich patients in the same situation. The survey contained a single patient scenario formulated in two versions (rich, poor) differing by only one sentence (Appendix §1). The rich version described the patient as having had a lifetime of luxury. The poor version described the patient as having had a lifetime of hardship. The two versions were otherwise the same, randomly assigned to participants, and designed to elicit a clinician's judgment of patient suffering due to psychosocial or biomedical adverse events.[67]

The survey was pre-randomized using a computerized random number generator. The stack of surveys was then allocated one-by-one in a face-down procedure to maintain concealment from the administrator. Survey participants were nurses, doctors, or allied healthcare professionals and not necessarily representative of community-based practitioners. Potential respondents were medical staff identified by a tag worn around the neck or on a uniform who visited the hospital's coffee shop during the day. Individuals were approached by a medical student unaware of clinical backgrounds to avoid targeting or excluding individuals with palliative care training. Surveys required about 1 minute to complete and refusals were not tracked. Specialization was unknown and no individuals were disqualified from participation.

Patient and Public Involvement

Patients or the public were not involved in the design, conduct, reporting, or dissemination plans of our research.

RESULTS

Baseline Characteristics

During the three-year interval a total of 243,880 deaths were identified, of whom 50,096 received palliative care in the last month of life. Overall, 920 patients received medical assistance in dying and 49,176 controls did not receive medical assistance in dying (Table 1). The two groups were similar except those who received medical assistance in dying were slightly more frequent in the later half of the study, relatively more likely to die on a weekday, and somewhat less frail. The typical patient in both groups had a median age of 81 years, was diagnosed with a malignancy, and lived in a city. Three-quarters (72%, n = 36,274) were admitted to hospital in the year before dying and two-thirds (65%, n = 32,312) had an emergency visit in the year before dying.

*** Table 1 About Here ***

Table 1. Patient Characteristics

		Medical Assistance in Dying (n = 920)	Palliative Control Patients (n = 49,176)
Age	≤ 75 years	338 (37)	15,211 (31)
	> 75 years	582 (63)	33,965 (69)
Sex	Female	484 (53)	24,826 (50)
	Male	436 (47)	24,350 (50)
Home Location *	Urban	812 (88)	44,758 (91)
	Rural	108 (12)	4,418 (9)
Year of Death †	2016 - 17	207 (23)	21,532 (44)
	2018 - 19	713 (77)	27,644 (56)
Season of Year	Spring	183 (20)	10,958 (22)
	Summer	198 (22)	12,036 (24)
	Autumn	265 (29)	12,991 (26)
	Winter	274 (30)	13,191 (27)
Day of Death ¶	Weekday	778 (85)	35,849 (73)
	Weekend	142 (15)	13,327 (27)
Malignancy Diagnosis #	Present	661 (72)	35,548 (72)
	Absent	259 (28)	13,628 (28)
Total Medications in Past Month ‡	Mean	9.1 ± 5.3	9.5 ± 6.2
Clinic Contacts in Past Year	Mean	26.01 ± 16.02	29.29 ± 18.40
Emergency Visits in Past Year	Mean	1.33 ± 1.64	1.59 ± 2.06
Admissions in Past Year	Mean	0.93 ± 1.15	1.53 ± 1.53
Overall Frailty in Past Year §	Mean	8.62 ± 3.75	10.56 ± 3.65

Footnotes

data are count (percentage) except where noted as mean ± standard deviation

* missing values assigned to rural (n = 109 of 50,096)

† denotes first 18 months (2016–2017) and second 18 months (2018–2019), respectively

¶ Saturday and Sunday denote weekend

detailed diagnoses appear in Appendix §2

‡ detailed medications appear in Appendix §3

§ based on Johns Hopkins University Ambulatory Care Groups

Diagnoses and Treatment

Analysis of individual medical records indicated the two groups of patients had a similar burden of disease in the last year of life (Appendix §2). The most frequent specific malignancies were cancers of the respiratory tract and digestive tract. Important additional diagnoses included congestive heart failure and pulmonary fibrosis. Many patients also had additional comorbidities including hypertension, diabetes, and anxiety. A formal diagnosis of depression was rare in both groups. The most common medication in the last month of life was an opioid analgesic (Appendix §3). The two groups had similar prescription profiles except patients who chose medical assistance in dying were somewhat more likely to be treated with an opioid or a benzodiazepine.

Socioeconomic Status

Medical assistance in dying was proportionately less frequent for patients with low socioeconomic status (166 of 11,008) than patients with high socioeconomic status (227 of 9,277). Stratified analysis showed intermediate findings for patients with intermediate socioeconomic quintiles (Figure 1). Based on the case–control design, this association equaled a 39% reduced frequency of receiving medical assistance in dying associated with low socioeconomic status relative to high socioeconomic status (odds ratio = 0.61, 95% confidence interval 0.50 to 0.75, p < 0.001). The discrepancy equated to a net difference of 306 fewer cases of medical assistance in dying than would have been expected if all patients had the pattern of those in the highest socioeconomic quintile.

*** Figure 1 About Here ***

Secondary Analyses of Subgroups

The decreased frequency of receiving medical assistance in dying associated with low socioeconomic status extended to diverse subgroups. The decrease was evident regardless of age and sex (Figure 2). The decrease was observed in the first half and the second half of the study (and regardless of weekday). Similarly, the decrease was observed for those with and those without a malignancy diagnosis. In addition, the decrease extended to patients regardless of healthcare utilization and frailty. No subgroup showed contrary findings except for rural patients (not significant). All subgroups with at least 50 cases showed a statistically significant decreased frequency of medical assistance in dying associated with low socioeconomic status.

*** Figure 2 About Here ***

Additional Predictors

Several other patient characteristics were associated with a decreased frequency of receiving medical assistance in dying (Table 2). Patients older than 75 years were less likely to receive medical assistance in dying than their younger counterparts. Similarly, patients who had relatively more frailty or relatively more hospital admissions were less likely to receive medical assistance in dying. In contrast, sex, home location, clinic contacts, and emergency department visits were not significantly associated with medical assistance in dying. Accounting for all characteristics suggested that low socioeconomic status was associated with a 37% decreased frequency of receiving medical assistance in dying (odds ratio = 0.63, 95% confidence interval 0.51 to 0.77, $p < 0.001$).

*** Table 2 About Here ***

Table 2. Predictors of Medical Assistance in Dying

	BASIC ANALYSIS *		ADJUSTED ANALYSIS †	
Variable	Relative Risk	Confidence Interval	Relative Risk	Confidence Interval
Income Quintile ‡	0.61	0.50 to 0.75	0.63	0.51 to 0.77
Age > 75 Years	0.77	0.67 to 0.88	0.71	0.62 to 0.82
Male Sex	0.92	0.81 to 1.05	0.97	0.85 to 1.11
Rural Home Location §	1.35	1.10 to 1.65	1.16	0.94 to 1.43
Malignancy Diagnosis ¥	0.98	0.85 to 1.13	0.99	0.98 to 1.01
Total Medications ^	1.00	1.00 to 1.01	1.02	1.01 to 1.02
Clinic Contacts in Past Year ^	0.99	0.98 to 0.99	0.99	0.99 to 1.00
Emergencies in Past Year ^	0.93	0.89 to 0.96	1.01	0.97 to 1.05
Admissions in Past Year ^	0.69	0.65 to 0.73	0.80	0.74 to 0.86
Overall Frailty in Past Year ¶	0.87	0.85 to 0.88	0.90	0.88 to 0.92

Footnotes

* no adjustment for baseline differences

† adjusted for age, sex, location, malignancy, medications, contacts, emergencies, admissions, frailty

‡ compares lowest to highest quintile

§ referent is urban location

¥ denotes one or more diagnoses

^ covariate coded as a continuous variable

¶ defined by Johns Hopkins frailty index

Matched Analysis

We rechecked results by comparing each patient who received medical assistance in dying with a matched control who did not receive medical assistance in dying and who was treated by the same responsible physician. This yielded 448 matched pairs (n = 896 patients). Overall, the case and matched control had the same socioeconomic status in 26% of pairs (118 of 448), the case had a higher socioeconomic status in 42% of pairs (186 of 448) and the case had a lower socioeconomic status in 32% of pairs (144 of 448). This matched analysis yielded results that overlapped the main analysis and showed a 23% decrease of medical assistance in dying associated with lower socioeconomic status (odds ratio = 0.77, 95% confidence interval 0.62 to 0.96, p = 0.021).

Alternate Index of Socioeconomic Status

We also retested results by characterizing each individual patient according to whether they were classified by the specific government indicator as a low-income senior. Overall, 8,029 patients were identified as low-income seniors and the remaining 42,067 patients were identified as not low-income seniors. Medical assistance in dying was proportionately less frequent for patients who were low-income seniors (65 of 8,029) than patients who were not low-income seniors (855 of 42,067). This sensitivity analysis yielded results that overlapped the main analysis and showed a 60% decrease of medical assistance in dying among low-income seniors (odds ratio = 0.40, 95% confidence interval 0.31 to 0.51, $p < 0.001$).

Confirmation Survey

We surveyed clinicians at a coffee shop inside a leading Canadian hospital that provided medical assistance in dying.[68] Each participant received one version (rich patient or poor patient) of the survey by randomized assignment (Appendix §1). The typical participant was a middle-aged woman with professional training and years of medical experience (n = 494). We found that overall mean judgments of suffering were higher when assessing a rich patient rather than a poor patient in the survey that otherwise contained identical information about an adverse event (7.8 vs 7.3, $p < 0.001$). This difference in estimated patient suffering extended to each of the three psychosocial adverse events and not the one biomedical adverse event (Figure 3).

*** Figure 3 About Here ***

DISCUSSION

We studied thousands of deaths in Canada and found that medical assistance in dying was significantly less frequent for palliative care patients who had low rather than high socioeconomic status. The imbalance extended through the range of socioeconomic status and was equally strong during initial and later years of the study. The imbalance is not easily attributed to access to care, ability to pay, medical diagnoses, intensity of medications, choice of physician, responsiveness to treatment, public preferences, thoughtless impulsivity, or reciprocal compensation.[69 70 71 72 73] The findings also differ from statistics on suicide deaths that are higher among poor rather than rich adults.[74] This practice pattern variation is robust and begs for an explanation.

Our research supports earlier patterns observed in other countries around medical assistance in dying. In particular, patients in the United States undergoing legalized assisted dying are more likely to be highly educated and financially secure compared to the population average.[75 76] Patients in the Netherlands receiving assisted dying are prone to have comparative social, economic, and educational privileges.[77] Patients in Switzerland who undergo assisted dying tend to live in affluent neighborhoods.[78 79] Patients in Belgium who receive assisted dying tend to have higher education.[80] To our knowledge, these tangential findings apparent in past studies have not been rigorously analyzed and have typically been ascribed to economic constraints.[81]

Our data suggest the unequal distribution of medical assistance in dying may occur beyond aspects of care related to cost.[82] One factor could be faulty doctor–patient communication. Poor patients often feel disempowered to advocate for themselves, have lower trust in a healthcare system, and may have less rapport with clinicians who elicit their preferences.[83 84] Religion, ethnicity, or another confounder could also contribute if rich patients plan more advance directives or suffer more existential distress.[85 86 87 88] Another possibility is that clinicians dislike controversy and want to avoid appearing callous towards the poor.[89] To be sure, our study does not determine the appropriateness of medical assistance in dying and, for many, the choice is unthinkable.[90 91 92]

The observed unequal treatment might also reflect fallible intuition. The thick–skin bias describes a tendency to perceive individuals of lower income as less distressed by negative events and reflects an implicit belief that repeated hardships lead to increased tolerance.[93 94 95] Similar to other implicit biases, this error might originate from a common assumption; specifically, people sometimes adapt to difficult situations, shift their expectations, and increase their tolerance.[96 97 98] The intuition fails, however, when hardships lead to resignation instead of resiliency. In effect, the chronic stress of poverty might not buffer against the added challenges from ill health.[99] Such fallible intuitions might add to a paradox of lesser care despite serious clinical needs.[100 101 102]

Several limitations of our study merit emphasis for future research. Socioeconomic status measures are imperfect, tend to bias analyses toward the null, and may underestimate disparities in care.[103] In addition, disadvantaged groups tend to access palliative care less often than privileged groups, thereby causing our study to underestimate upstream socioeconomic barriers ahead of receiving care.[104 105] We also lacked data on race and patients younger than 65 years, thereby justifying further analyses in other groups. Medical assistance in dying, itself, has different meanings depending on available alternatives and a patient's own beliefs.[106 107] The scientific domains of health inequities and of terminal care are, themselves, complex topics often guided by moral principles rather than behavioral economic analysis.[108 109 110 111 112]

Case control analyses are rarely accompanied by a confirmation survey for many reasons. Specifically, surveys are often fallible due to faulty sampling, imperfect response rates, social desirability bias, careless mistakes, or other artifacts that cause self-report to diverge from real behavior.[113] In addition, most surveys merely offer a superficial impression of lived reality (such as the differences between poverty and wealth). The observed discrepancy in medical assistance in dying might be explained by the observed discrepancy in judged suffering for rich and poor patients; however, other important contributors could remain. The strength of the confirmation survey was to explore intuitive clinical judgment using a randomized experimental approach.

Overall, our data address lingering misconceptions around the medical care implications of the Supreme Court of Canada decision. First, medical assistance in dying has not led to a large drop in palliative care; instead, rates of palliative care increased during the study.[114] Second, medical assistance in dying has not become widely popular despite being free and legal; instead, the practice accounts for fewer than 2% of deaths in palliative care patients.[115] Third, medical assistance in dying has not been unjustly targeted toward poor patients; instead, wealthy patients are disproportionately involved.[116] [117] [118] More broadly, the data might inform patient engagement for less extreme decisions where poor patients might be disempowered or clinicians may feel disinclined to push.

FIGURE LEGENDS

Figure 1. Frequency of Medical Assistance in Dying

Plot shows frequency of receiving medical assistance in dying among patients receiving palliative care who have different socioeconomic status. X-axis denotes quintiles of socioeconomic status spanning from lowest to highest. Y-axis denotes frequency of receiving medical assistance in dying. Solid circles indicate estimate and vertical bars indicate 95% confidence interval. Square brackets denote total patients in each analysis. P-value indicates trend. Results suggest gradient where patients with lowest socioeconomic status are less likely to receive medical assistance in dying than patients with highest socioeconomic status.

Figure 2. Consistent Reductions across Subgroups

Forest plot of relative frequency of receiving medical assistance in dying in different subgroups. Each analysis compares patients in lowest socioeconomic quintile to patients in highest socioeconomic quintile. Circles denote estimate and horizontal lines denote 95% confidence interval. Vertical line shows perfect equity. Square brackets show count of patients in each subgroup. Summary analysis for total cohort positioned at top. Findings show generally reduced frequency of medical assistance in dying for patients with low socioeconomic status (exception subgroup of rural home location attributable to chance).

Figure 3. Perceptions of Patient Suffering

Plot shows mean ratings of patient suffering from survey of clinicians (n = 494). X-axis denotes average of all adverse events and the four specific components (dripping faucet making noise, forgetting patient name despite being in hospital for days, failures of hand washing when entering room, and worsening dyspnea). Y-axis denotes mean ratings of patient suffering. Red bars for survey describing a poor patient. Blue bars for survey describing a rich patient. Vertical beams denote standard errors. P-values compare mean ratings of same adverse event. Results show significantly lower mean ratings of suffering in the poor version than rich version (exception of dyspnea).

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CONFLICTS

The funding organizations had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; and preparation, review, or approval of the manuscript. All authors have no financial or personal relationships or affiliations that could influence the decisions and work on this manuscript.

CONTRIBUTORSHIP

The lead author (DAR) wrote the first draft. All authors (DAR, KN, DT, ES) contributed to study design, manuscript preparation, data analysis, results interpretation, critical revisions and final decision to submit. The lead author (DAR) had full access to all the data in the study, takes responsibility for the integrity of the data and is accountable for the accuracy of the analysis.

APPROVALS

The protocol was approved by the Sunnybrook Research Ethics board and conducted using privacy safeguards at the Institute for Clinical Evaluative Sciences (ID 001). Parts of this material are based on data compiled by CIHI; however, the analyses, conclusions, and statements expressed are those of the authors and not necessarily those of CIHI. We thank IMS Brogan Inc. for use of the Drug Information Database

DATA SHARING

The de–identified data collected for this study are available in an appendix included at the time of original manuscript submission and also are available following publication for researchers whose proposed use of data has been approved by an independent review committee. The Johns Hopkins ACG© System is available through the Department of Health Policy and Management at the Johns Hopkins University.

TRANSPARENCY STATEMENT

The lead author affirms that the manuscript is an honest accurate and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as originally planned have been explained.

ACCOUNTABILITY

The lead author (DAR) had full access to all the data in the study, takes responsibility for the integrity of the data, and is accountable for the accuracy of the analysis.

DISSEMINATION STATEMENT

We plan to disseminate the results to patients and patient organizations.

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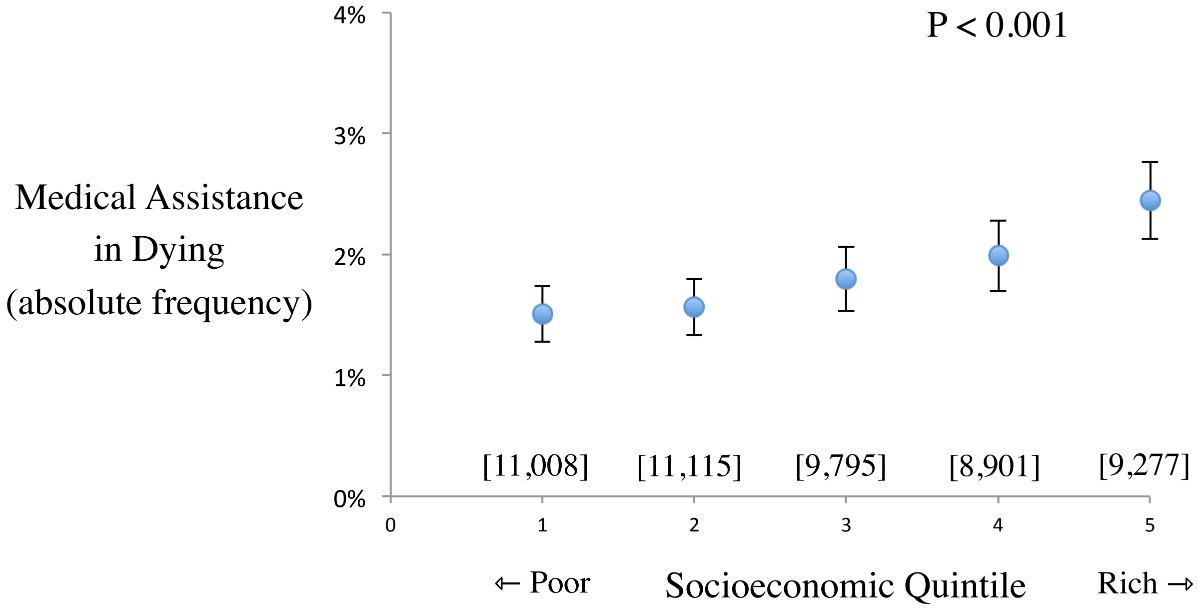
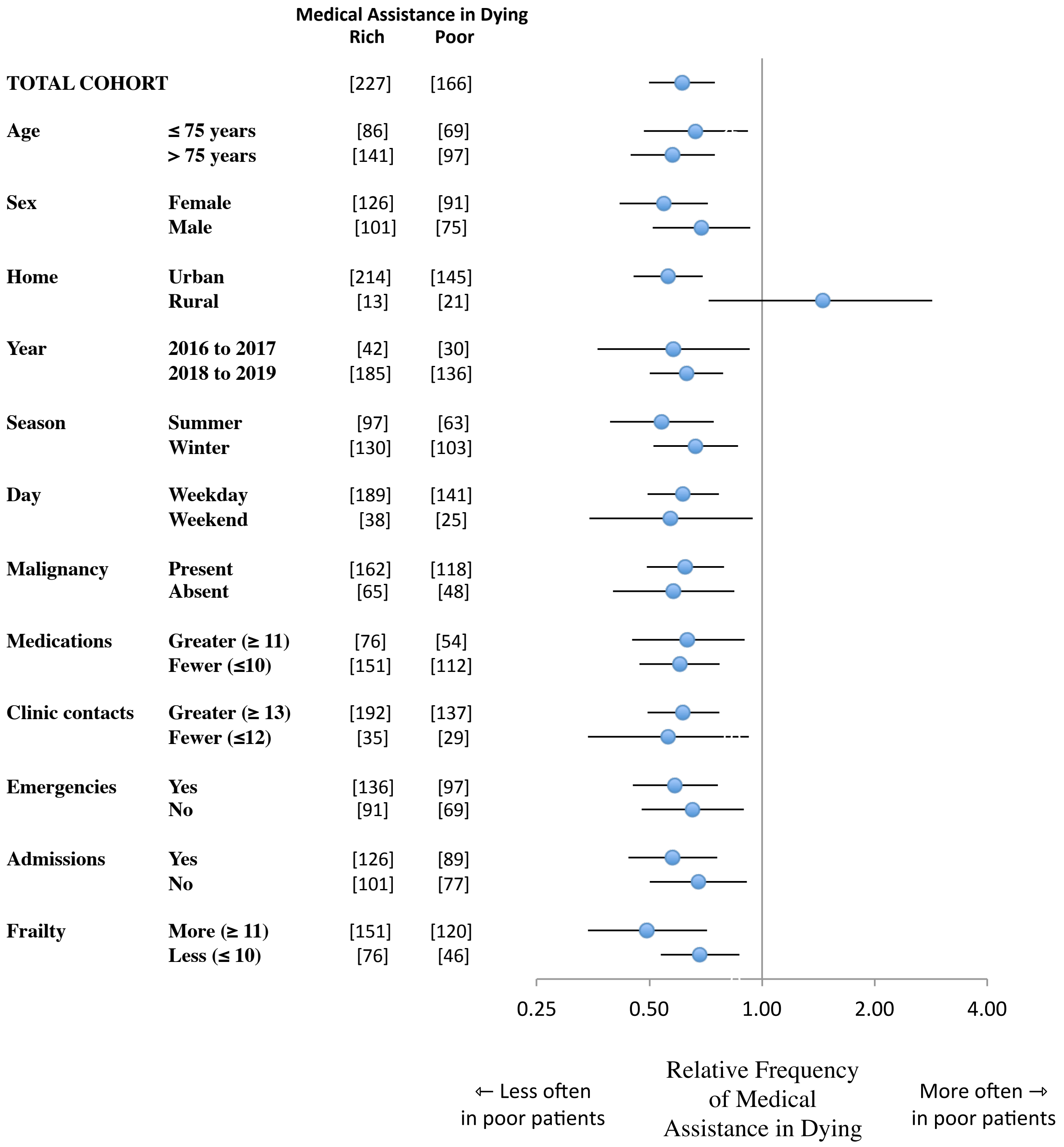
Figure 1. Frequency of Medical Assistance in Dying



Footnotes

Plot shows frequency of receiving medical assistance in dying among patients receiving palliative care who have different socioeconomic status. X-axis denotes quintiles of socioeconomic status spanning from lowest to highest. Y-axis denotes frequency of receiving medical assistance in dying. Solid circles indicate estimate and vertical bars indicate 95% confidence interval. Square brackets denote total patients in each analysis. P-value indicates trend. Results suggest gradient where patients with lowest socioeconomic status are less likely to receive medical assistance in dying than patients with highest socioeconomic status.

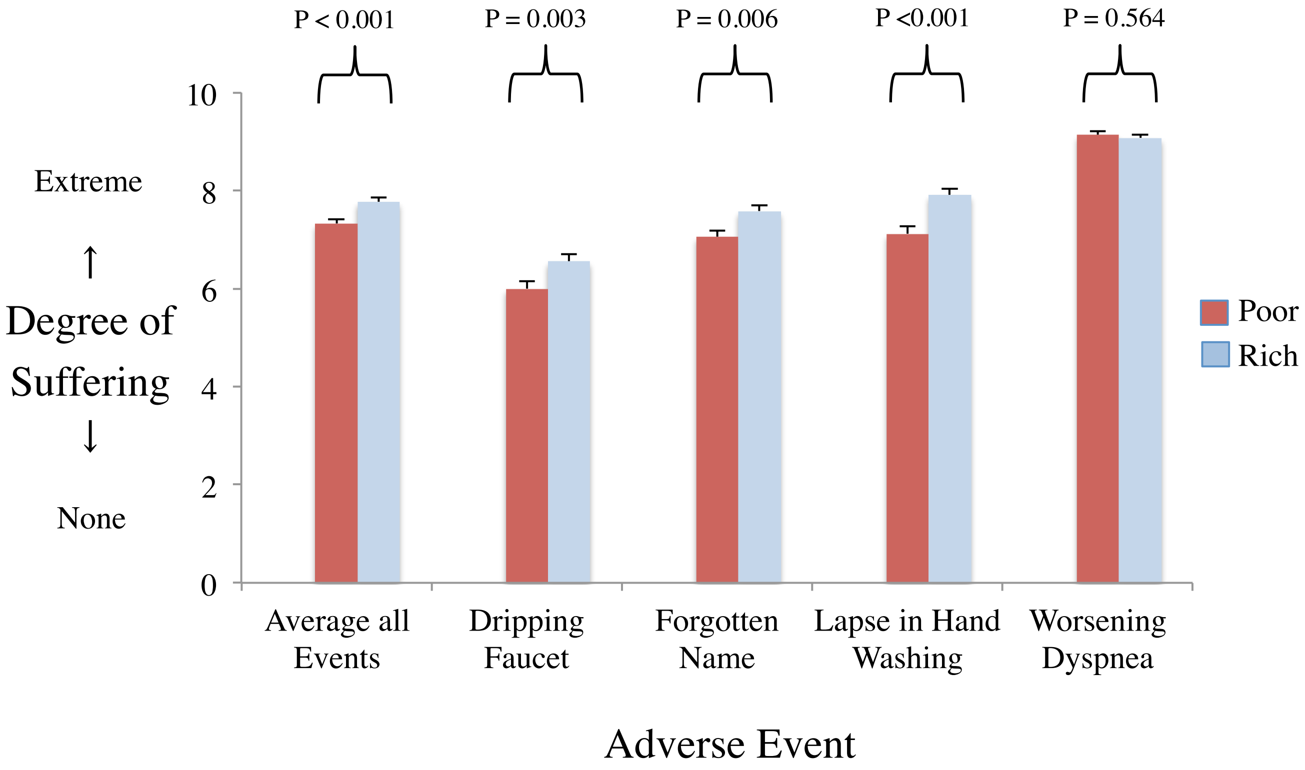
Figure 2. Consistent Reductions across Subgroups



Footnotes

Forest plot of relative frequency of receiving medical assistance in dying in different subgroups. Each analysis compares patients in lowest socioeconomic quintile to patients in highest socioeconomic quintile. Circles denote estimate and horizontal lines denote 95% confidence interval. Vertical line shows perfect equity. Square brackets show count of patients in each subgroup. Summary analysis for total cohort positioned at top. Findings show generally reduced frequency of medical assistance in dying for patients with low socioeconomic status (exception subgroup of rural home location attributable to chance).

Figure 3. Perceptions of Patient Suffering

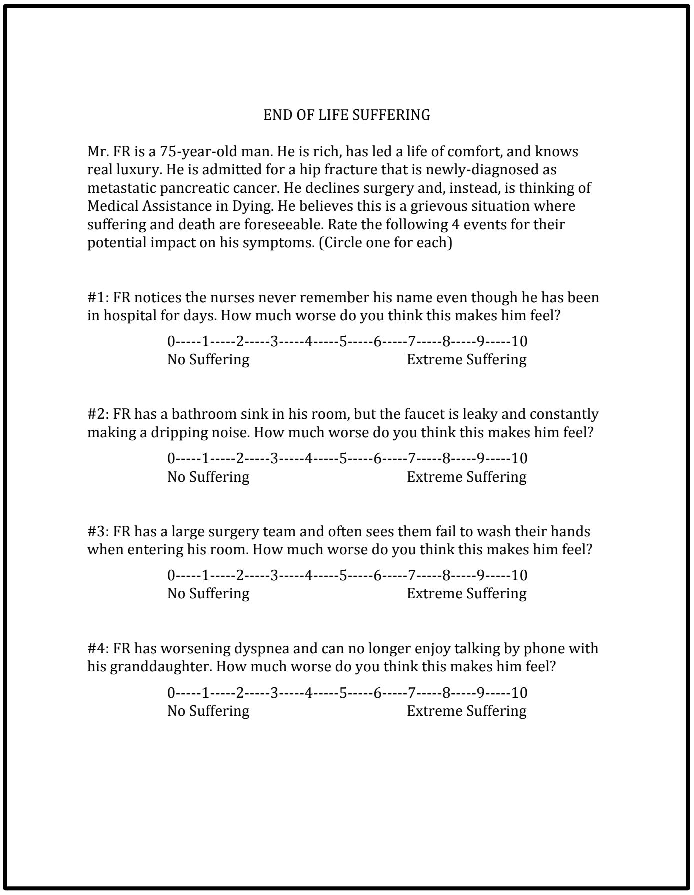


Footnotes

Plot shows mean ratings of patient suffering from survey of clinicians (n = 494). X-axis denotes average of all adverse events and the four specific components (dripping faucet making noise, forgetting patient name despite being in hospital for days, failures of hand washing when entering room, and worsening dyspnea). Y-axis denotes mean ratings of patient suffering. Red bars for survey describing a poor patient. Blue bars for survey describing a rich patient. Vertical beams denote standard errors. P-values compare mean ratings of same adverse event. Results show significantly lower mean ratings of suffering in the poor version than rich version (exception of dyspnea).

Appendix §1. Wording of Different Survey Versions

Rich Version



END OF LIFE SUFFERING

Mr. FR is a 75-year-old man. He is rich, has led a life of comfort, and knows real luxury. He is admitted for a hip fracture that is newly-diagnosed as metastatic pancreatic cancer. He declines surgery and, instead, is thinking of Medical Assistance in Dying. He believes this is a grievous situation where suffering and death are foreseeable. Rate the following 4 events for their potential impact on his symptoms. (Circle one for each)

#1: FR notices the nurses never remember his name even though he has been in hospital for days. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

#2: FR has a bathroom sink in his room, but the faucet is leaky and constantly making a dripping noise. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

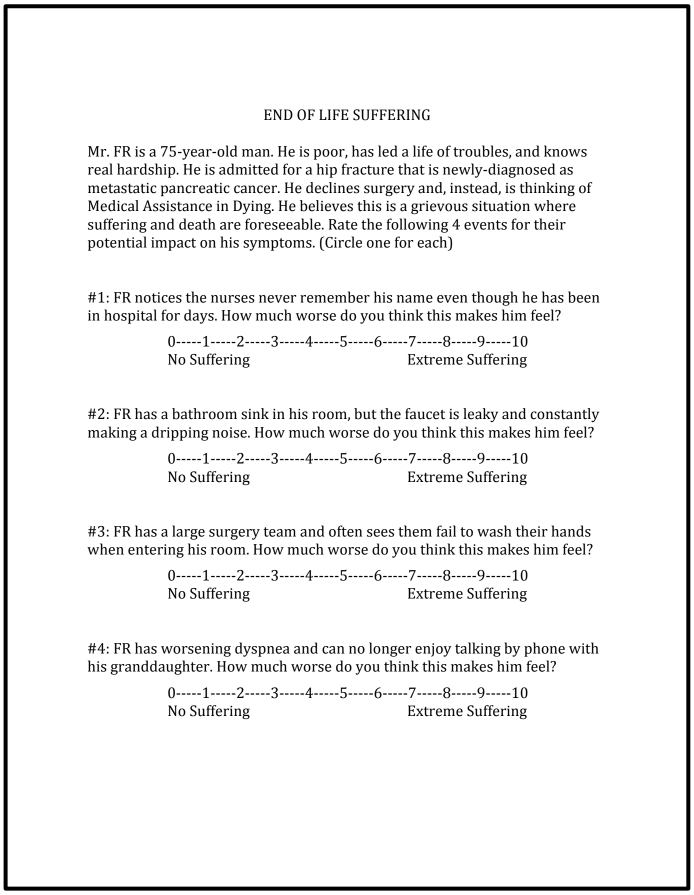
#3: FR has a large surgery team and often sees them fail to wash their hands when entering his room. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

#4: FR has worsening dyspnea and can no longer enjoy talking by phone with his granddaughter. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

Poor Version



END OF LIFE SUFFERING

Mr. FR is a 75-year-old man. He is poor, has led a life of troubles, and knows real hardship. He is admitted for a hip fracture that is newly-diagnosed as metastatic pancreatic cancer. He declines surgery and, instead, is thinking of Medical Assistance in Dying. He believes this is a grievous situation where suffering and death are foreseeable. Rate the following 4 events for their potential impact on his symptoms. (Circle one for each)

#1: FR notices the nurses never remember his name even though he has been in hospital for days. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

#2: FR has a bathroom sink in his room, but the faucet is leaky and constantly making a dripping noise. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

#3: FR has a large surgery team and often sees them fail to wash their hands when entering his room. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

#4: FR has worsening dyspnea and can no longer enjoy talking by phone with his granddaughter. How much worse do you think this makes him feel?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10
No Suffering Extreme Suffering

Footnotes

Textbox showing exact wording of survey with rich version on left and poor version on right. Each respondent saw a single version. Sole difference between the two versions appears in the second sentence describing the patient as either rich or poor.

The design was specified in advanced based on earlier surveys conducted on lay people and professionals in non-healthcare settings (Cheek & Shafir, 2020). The survey offered limited clinical information and emphasized the primary distinction under investigation; namely, the patient's socioeconomic status.

A total of 500 surveys were originally printed (250 each with the poor and rich versions), 6 reserved for pilot testing, and the remaining 494 distributed to participants. The consent rate approached 70% (refusals not tracked) and the completion rate was 100% (no faulty or incomplete responses).

Appendix §2. Prior Diagnoses

	Medical Assistance in Dying (n = 920)	Palliative Care Patients (n = 49,176)
Malignancy Diagnosis		
Mouth, ear, nose, throat	24 (3)	1,699 (3)
Digestive tract	239 (26)	12,327 (25)
Repiratory tract	205 (22)	11,317 (23)
Muskuloskeletal, skin, breast	151 (16)	8,387 (17)
Genitourinary tract	174 (19)	9,065 (18)
Neurologic tract	62 (7)	3,177 (6)
Miscellaneous	360 (39)	21,058 (43)
Hematologic	58 (6)	4,498 (9)
Non-Malignancy Diagnosis		
Parkinson's disease or other CNS illness	158 (17)	6,388 (13)
Stroke or other CNS vascular event	76 (8)	7,243 (15)
Concussion or other CNS trauma	64 (7)	1,327 (3)
Myasthenia gravis or other myo-neuropathy	189 (21)	15,332 (31)
Congestive heart failure or other cardiac illness	332 (36)	22,836 (46)
Pulmonary fibrosis or other lung illness	351 (38)	22,684 (46)
Cirrhosis or other liver failure	50 (5)	3,533 (7)
Uremia or other kidney failure	77 (8)	9,214 (19)
Active Comorbidity		
Hypertension	169 (18)	12,050 (25)
Acid reflux	101 (11)	6,333 (13)
Diabetes	99 (11)	10,994 (22)
Anemia	86 (9)	8,083 (16)
Glaucoma	112 (12)	4,381 (9)
Anxiety	209 (23)	10,083 (21)
Depression	50 (5)	2,075 (4)

Footnotes

data are count (percentage) of each column

data sum to above 100% due to patients having more than 1 diagnosis

diagnoses based on ICD9 codes extracted from outpatient records in year before death

CNS denotes Central Nervous System

Appendix §3. Prior Medications

	Medical Assistance in Dying (n = 920)	Palliative Care Patients (n = 49,176)
Specific Medication in Last Month of Life		
Opioid	587 (64)	24,455 (50)
Beta blocker	119 (13)	8,247 (17)
Calcium blocker	71 (8)	5,222 (11)
Acid suppressor	284 (31)	14,679 (30)
Diabetes medication	30 (3)	3,866 (8)
Statin	75 (8)	6,570 (13)
Inhaled bronchodilator	51 (6)	2,709 (6)
Glaucoma medication	34 (4)	1,472 (3)
Benzodiazepine	405 (44)	16,311 (33)
Antidepressant	225 (24)	10,841 (22)

Footnotes

data are count (percentage) of each column

data sum to above 100% due to patients having more than 1 medication

medications based on DIN codes extracted from outpatient records in month before death

STROBE Statement—Checklist of items that should be included in reports of ***case-control studies***

	Item No	Recommendation	Page Number
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls	5-7
		(*b*) For matched studies, give matching criteria and the number of controls per case	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5-7
Bias	9	Describe any efforts to address potential sources of bias	6-7
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6-7
		(*b*) Describe any methods used to examine subgroups and interactions	6-7
		(*c*) Explain how missing data were addressed	5
		(*d*) If applicable, explain how matching of cases and controls was addressed	7
		(*e*) Describe any sensitivity analyses	6-7
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8

		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	8
Outcome data	15*	Report numbers in each exposure category, or summary measures of exposure	8-10
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-10
		(*b*) Report category boundaries when continuous variables were categorized	8-10
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	8-10
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	8-10
Discussion			
Key results	18	Summarise key results with reference to study objectives	10-11
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11-12
Generalisability	21	Discuss the generalisability (external validity) of the study results	11-12
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	13

*Give information separately for cases and controls.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.