SUPPLEMENTAL MATERIAL

Smoking Cessation in Stroke Survivors in the United States: A Nationwide Analysis

Neal S. Parikh, MD, MS; Melvin Parasram, DO, MS; Halina White, MD; Alexander E. Merkler, MD, MS; Babak B. Navi, MD, MS; Hooman Kamel, MD, MS

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Table I: Smoking Quit Ratios by State for Stroke Survivors in the United States, Lowest to Highest

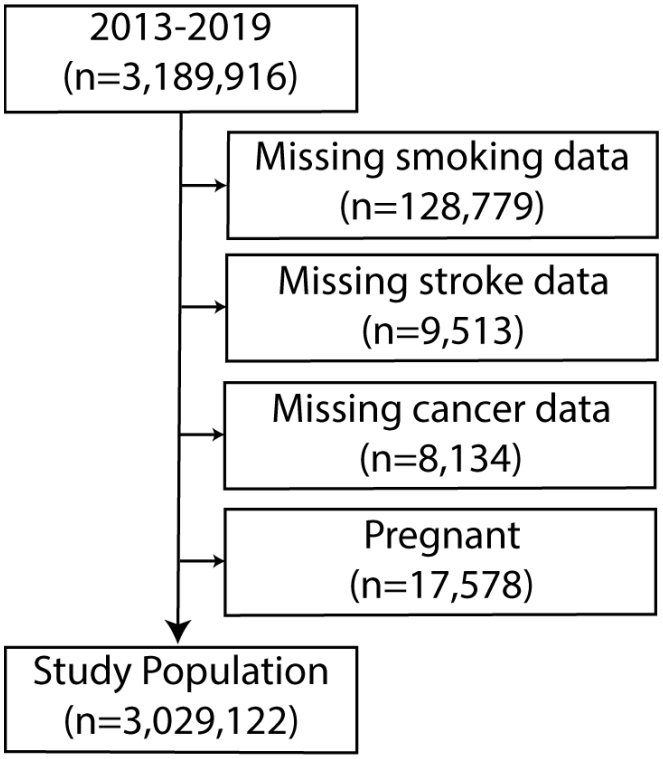
State	Quit Ratio (%)	95% Confidence Interval
KY	48.3	44.8 - 51.8
AR	51.6	47.3 - 55.9
TN	52.3	48.5 - 56.1
AK	53.2	46.8 - 59.6
LA	53.3	49.0 - 57.6
DC	53.4	48.2 - 58.7
WV	53.5	50.3 - 56.8
MS	53.9	50.1 - 57.7
GA	55.2	51.2 - 59.2
OK	55.2	51.8 - 58.7
OH	55.8	52.6 - 59.0
AL	56.3	53.1 - 59.5
IN	56.3	53.3 - 59.3
SC	56.6	53.6 - 59.7
TX	56.9	52.0 - 61.8
MO	57.0	53.4 - 60.6
KS	57.3	54.6 - 59.9
MI	57.7	54.6 - 60.9
SD	58.7	53.3 - 64.0
NV	59.5	53.7 - 65.2
VA	59.6	56.1 - 63.1
OR	60.3	56.1 - 64.5
MT	60.6	56.3 - 64.9
NC	61.2	57.4 - 65.0
ND	61.3	56.8 - 65.8
ID	61.8	56.3 - 67.3
WY	62.4	57.6 - 67.2
IL	62.4	57.9 - 67.0
PA	62.6	58.7 - 66.5
RI	62.7	57.8 - 67.6
ME	63.0	59.3 - 66.8
IA	63.3	59.7 - 66.9
DE	63.3	59.1 - 67.5
NM	63.4	59.0 - 67.8
MN	63.6	60.2 - 67.0
NH	63.6	59.0 - 68.3
MD	64.0	60.5 - 67.6
WA	64.3	61.2 - 67.4

WI	64.6	59.2 - 70.0
FL	64.6	61.6 - 67.7
CO	64.9	61.3 - 68.5
UT	65.2	60.8 - 69.5
NE	65.2	62.1 - 68.2
AZ	65.3	61.0 - 69.6
MA	65.6	61.1 - 70.0
CT	65.8	61.8 - 69.9
NY	66.0	62.7 - 69.4
NJ	66.3	61.1 - 71.5
HI	68.8	64.6 - 73.0
VT	69.1	65.0 - 73.3
CA	71.5	68.1 - 74.9

Table II: Smoking Quit Ratios by Year, for Stroke and Cancer Survivors.

Year	Stroke	Cancer
2013	60.8%	71.0%
2014	61.2%	71.7%
2015	60.9%	71.7%
2016	59.9%	71.6%
2017	59.4%	70.7%
2018	62.2%	71.4%
2019	61.5%	71.5%

Figure I. Participant Flow Diagram



Caption: We excluded participants who were pregnant and those who did not provide information about stroke, cancer, and smoking history. Some participants had multiple reasons for exclusion.

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STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No.	Recommendation	Page No.	Relevant text from manuscript
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2	"cross-sectional analysis"
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2	See entire abstract.
Introduction				
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5	See entire Introduction section.
Objectives	3	State specific objectives, including any prespecified hypotheses	5	"Therefore, our first objective was to comprehensively describe the epidemiology of smoking cessation in stroke survivors in the United States. Second, given the substantial investment in smoking cessation for patients with cancer, we hypothesized that smoking-cessation rates are higher in cancer survivors than stroke survivors. "
Methods				
Study design	4	Present key elements of study design early in the paper	6	"We performed a retrospective cross-sectional analysis of prospectively-collected data from the Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System (BRFSS)"

Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6	All elements listed in *Study Design* subsection of the Methods section: U.S. nationwide survey, 2013-2019, cross-sectional with all data collected at same timepoint.
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—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 *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	6	This was a cross-sectional study, and the eligibility criteria and methods of selection are listed in the *Population* sub-section of the Methods section. "For our analyses, we excluded respondents who were pregnant (3.9%) and those who did not provide information about stroke (0.26%), cancer (0.23%), and smoking history (5.0%)"
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case		N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-9	The *Measurements and Statistical Analyses* sub-sections of the Methods section define exposures, outcomes, covariates, and effect modifiers. Examples are: "Smoking status was self-reported in BRFSS" and "In the present analysis, the outcome of interest was

				smoking cessation. This was assessed using the quit ratio"
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	7-8	The *Measurements* section lists each variable, all of which were self-reported as detailed in the *Study Design* sub-section of the Methods section
Bias	9	Describe any efforts to address potential sources of bias	6	"The Centers for Disease Control and Prevention, in partnership with individual state governments, administers the standardized health survey by landline and cellular telephone while taking measures[10] to mitigate bias. The BRFSS system randomly selects telephone numbers for dialing, and a scripted Computer-Assisted Telephone Interview system is used for data collection by trained interviewers. Calls are made 7 days per week during both daytime and evening hours to avoid selection bias. The response rate in the most recent year (2019) was 50%, and sample weights provided by the BRFSS account for nonresponse rates while ensuring that resulting estimates are representative for the United

				States population.[11] Weights account for demographics and telephone ownership, in addition to nonresponse. To reduce misclassification error, quality assurance protocols include direct monitoring of live interviews and calling back respondents to verify responses."
Study size	10	Explain how the study size was arrived at	6	"For our analyses, we excluded respondents who were pregnant (3.9%) and those who did not provide information about stroke (0.26%), cancer (0.23%), and smoking history (5.0%); we performed complete case analysis using data for 3,029,122 respondents (representative of a weighted frequency of 236,118,585 adults)."

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Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8	Age was the main quantitative variable dichotomized for subgroup analyses: "These demographic variables included age (<60 years versus ≥ 60 years)"
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	9	"We used multivariable logistic regression models to compare the odds of having quit smoking in stroke versus cancer survivors. Models were incrementally adjusted for demographics (age, gender, race/ethnicity, income level, educational attainment, health insurance, and rurality) and then smoking-related health conditions (pulmonary and cardiovascular disease)."
		(*b*) Describe any methods used to examine subgroups and interactions	9	"Last, a formal Wald test of interaction was performed to assess if the relationship of smoking cessation by disease type (stroke versus cancer) changed over time, and trends in quit ratios were separately evaluated for each condition while adjusting for demographics and smoking-related health conditions."
		(*c*) Explain how missing data were addressed	6	"We performed complete case analysis".
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed	9	"We used survey-specific SAS functions to account for survey

		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy		design, survey strata, and sampling weights when calculating population-weighted frequencies and proportions."
		(*e*) Describe any sensitivity analyses	9	"In a sensitivity analysis, we additionally adjusted for hypertension, hyperlipidemia, and diabetes; this analysis was restricted to 2013, 2015, 2017, and 2019 as full comorbidity data were collected by BRFSS only in these years. In a post hoc sensitivity analysis, we further adjusted this sensitivity analysis model for Stroke Belt residence."
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	6	"The BRFSS survey included adult respondents 18 years of age and older. For our analyses, we excluded respondents who were pregnant (3.9%) and those who did not provide information about stroke (0.26%), cancer (0.23%), and smoking history (5.0%).
		(b) Give reasons for non-participation at each stage		See above
		(c) Consider use of a flow diagram		This is included in the Supplement.
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	10	"The median age was 68 years (interquartile range [IQR], 55-76), 45.4% were women, and 69.9% identified as Non-Hispanic White, 15.0% as Non-Hispanic Black,

				8.9% as Hispanic, 1.4% as Asian or Hawaiian or other Pacific Islander, 2.2% as Alaskan native or American Indian, and 2.5% as multiracial or other. Approximately 19.1% were Stroke Belt residents, and 22.9% lived in rural locations."
		(b) Indicate number of participants with missing data for each variable of interest	6	Participants missing key variables of interest were excluded: "stroke (0.26%), cancer (0.23%), and smoking history (5.0%)."
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)		N/A
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time		N/A
		Case-control study—Report numbers in each exposure category, or summary measures of exposure		N/A
		Cross-sectional study—Report numbers of outcome events or summary measures	10	"Among 7,538,044 stroke survivors in the United States, 58.8% (95% confidence interval [CI], 58.2-59.1%) had any history of smoking cigarettes." "…we identified 16,030,219 cancer survivors, among whom 52.9% had any history of smoking cigarettes." "The quit ratio in the overall population of people with a smoking history was 59.5% (95% CI, 59.3-59.7%)."
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	11 and Tables 2+3	"Compared to cancer survivors, stroke survivors were less likely to have quit (odds ratio [OR], 0.59;

			95% CI, 0.56-0.61) (Table 3). This remained the case after accounting for differences in demographics, rurality, and smoking-related comorbidities (OR, 0.72; 95% CI, 0.67-0.79).”
	(*b*) Report category boundaries when continuous variables were categorized	9	“age <60 years versus ≥ 60 years”
	(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period		NA

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Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	11	"Results were consistent in a sensitivity analysis adjusted for additional comorbidities. Trends analyses adjusted for demographics and comorbidities suggested that the gap between stroke and cancer survivors' quit ratios worsened over time (P=0.006 for interaction by time). The odds of having quit among cancer survivors decreased each year (OR, 0.95; 95% CI, 0.93-0.97) but not among stroke survivors (OR, 1.00; 95% CI, 0.97-1.03) in adjusted models."
Discussion				
Key results	18	Summarise key results with reference to study objectives	11	In this analysis of nationally representative U.S. health survey data, we estimated the smoking quit ratio among stroke survivors to be approximately 61%; approximately two out of five stroke survivors with a history of smoking remain active smokers. The quit ratio varied considerably with respect to demographic and geographic factors, and the quit ratio was lower among stroke survivors than cancer survivors.
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	13-14	"First, these data are cross-sectional. Second, BRFSS reaches

				people who can participate; our study does not account for institutionalized stroke survivors, institutionalized cancer survivors, and people who died. As such, temporality between medical events and smoking cessation cannot be assessed, and generalization beyond community-dwelling stroke survivors is unsupported…Third, survey data do not specify whether the prior stroke was ischemic or hemorrhagic, so we cannot determine whether smoking behavior differs by stroke type. Fourth, self-reported quit ratios may modestly overestimate true quit ratios, in which case there may be greater need to address smoking cessation than indicated by these data."
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14	"Substantial population-level variation in smoking quit ratios in stroke survivors highlights the need to optimize smoking-cessation interventions for this at-risk population."
Generalisability	21	Discuss the generalisability (external validity) of the study results	14	"generalization beyond community-dwelling stroke survivors is unsupported"

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	15	"Dr. Parikh is supported by the New York State Department of Health Empire Clinical Research Investigator Program and the Florence Gould Endowment for Discovery in Stroke."

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

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 www.strobe-statement.org.