Published in final edited form as:

Am J Prev Med. 2016 September ; 51(3): 368–372. doi:10.1016/j.amepre.2016.02.016.

Cancer Stage in American Indians and Alaska Natives Enrolled in Medicaid

Scott V. Adams, PhD¹, Andrea N. Burnett-Hartman, PhD^{1,2}, Andrew Karnopp, BS¹, Aasthaa Bansal, PhD^{1,3}, Stacey A. Cohen, MD^{4,5}, Victoria Warren-Mears, PhD⁶, and Scott D. Ramsey, MD, PhD¹

¹Public Health Sciences, Fred Hutchinson Cancer Research Center, Seattle, Washington

²Kaiser Permanente Colorado Institute for Health Research, Denver, Colorado

³Department of Pharmacy, University of Washington, Seattle, Washington

⁴Division of Oncology, University of Washington, Seattle, Washington

⁵Clinical Research Division, Fred Hutchinson Cancer Research Center, Seattle, Washington

⁶Northwest Portland Area Indian Health Board, Portland, Oregon

Abstract

Introduction—Nationally, a greater proportion of American Indians and Alaska Natives (AI/ANs) are diagnosed with advanced stage cancers compared with non-Hispanic whites. The reasons for observed differences in stage at diagnosis between AI/ANs and non-Hispanic whites remain unclear.

Methods—Medicaid, Indian Health Service Care Systems, and state cancer registry data for California, Oregon, and Washington (2001–2008, analyzed in 2014–2015) were linked to identify AI/ANs and non-Hispanic whites diagnosed with invasive breast, cervical, colorectal, lung, or prostate cancer. Logistic regression was used to estimate ORs and 95% CIs for distant disease versus local or regional disease, in AI/ANs compared with non-Hispanic white case patients.

Results—A similar proportion of AI/AN (31.2%) and non-Hispanic white (35.5%) patients were diagnosed with distant stage cancer in this population (AOR=1.03, 95% CI=0.88, 1.20). No significant differences in stage at diagnosis were found for any individual cancer site. Among AI/ANs, Indian Health Service Care Systems eligibility was not associated with stage at diagnosis.

Conclusions—In contrast to the general population of the U.S., among Medicaid enrollees, AI/AN race is not associated with later stage at diagnosis. Cancer survival disparities associated with AI/AN race that have been observed in the broader population may be driven by factors associated with income and health insurance that also are associated with race, as income and

Address correspondence to: Scott V. Adams, PhD, 1100 Fairview Ave N, M4-B402, Seattle WA, 98109. sadams@fredhutch.org.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

No financial disclosures were reported by the authors of this paper.

insurance status are more homogenous within the Medicaid population than within the broader population.

Introduction

American Indian and Alaska Native (AI/AN) populations experience disparities in survival following cancer diagnosis compared with other ethnic groups in the U.S., and have not experienced improvements in cancer mortality comparable to other racial groups.¹ Cancer stage at diagnosis is a strong predictor of survival, and a greater proportion of cancer patients among AI/ANs than non-Hispanic whites (NHWs) are diagnosed with advanced disease² for many cancers, including breast,³ prostate,⁴ cervical,⁵ and colorectal cancer.⁶ These disparities in cancer stage extend both nationally and within geographic regions including the Pacific Coast.^{2–6} Therefore, diagnosis stage may explain some of the observed disparities in cancer-specific survival between AI/ANs and NHWs. In turn, stage at diagnosis may be influenced by health insurance status, socioeconomic factors, and personal beliefs regarding healthcare and cancer^{7–10} through many possible mechanisms, including personal behaviors, and access to and utilization of primary healthcare such as cancer screening services.¹¹

To compare tumor stage at diagnosis between AI/ANs and NHWs, this study linked the cancer registries of three states with substantial AI/AN populations, California, Oregon, and Washington, to Medicaid and Indian Health Services Care System (IHSCS) records. The four most common cancers, breast, colorectal, lung, and prostate, and, because of previously described disparities,⁵ cervical cancer, were selected.

Medicaid is a joint federal and state insurance program serving as a “safety net” insurer for eligible low-income populations. In this context, it was plausible that because AI/ANs and NHWs enrolled in Medicaid would have similar health insurance and financial resources, differences in stage at diagnosis between NHWs and AI/ANs in this population may shed light on the extent to which other factors associated with race influence stage at diagnosis. For example, if AI/ANs were more often diagnosed with aggressive subtypes of cancer, this could be one reason for later stage at diagnosis among AI/ANs. Therefore, this study tested the hypothesis that, within the Medicaid population of California, Oregon, and Washington, AI/AN race was not associated with higher odds of distant stage at cancer diagnosis, compared to NHWs.

Methods

Study Population

Washington, Oregon, and California state cancer registry data (2001–2008) were linked to tribal health services and IHSCS rosters to identify AI/AN case patients. Case data were linked to Medicaid enrollment and claims information as described.¹² Cases of invasive female breast, cervical, colorectal, lung, and prostate cancer were included and unstaged cases were excluded. Cases were either enrolled in Medicaid before diagnosis or retroactively within 3 months of diagnosis.

Statistical Analysis

Cancer stage was dichotomized as distant or local/regional. Multivariable logistic regression was used to estimate ORs and 95% CIs for distant disease, comparing AI/ANs with NHWs, and adjusting for age, sex, state, diagnosis year, Medicaid enrollment >6 months before diagnosis, urban residence, and marital status. For missing values of covariates, a categorical indicator variable was included. Separate analyses were conducted for all cancers (adjusting for cancer site) and each cancer site. In revision, age-stratified (<65 years and ≥65 years) analysis was conducted and the interaction between age stratum and AI/AN race was tested. Data were analyzed in 2014–2015 using Stata/SE, versions 13 and 14. A power calculation (Power, version 3.0) showed that with its sample size of all cancer sites, the study had 80% power ($\alpha=0.05$) to detect an OR>1.2 for distant stage at diagnosis comparing AI/ANs with NHWs.

This study was approved by the IRBs of the Fred Hutchinson Cancer Research Center, the California Rural Indian Health Board, and the Northwest Portland Area Indian Health Board. As a records linkage study, participant consent requirements were waived.

Results

Among Medicaid enrollees diagnosed with cancer, compared with NHWs, AI/ANs were on average younger (Table 1), a difference which was consistent across all examined cancers. A larger proportion of AI/ANs than NHWs were female or lived outside of an urban area (Table 1). Forty-three percent of AI/ANs were matched between cancer registries and IHSCS.

Overall, 34.6% of NHW patients and 31.2% of AI/AN patients were diagnosed at distant stage (Table 2). For all cancer sites together, the odds of distant stage did not differ significantly between AI/ANs and NHWs (OR=1.03, 95% CI=0.88, 1.20). The odds of distant stage cervical and prostate cancer were elevated for AI/ANs not in IHSCS compared with NHWs, but 95% CIs included no association (cervical, OR=1.56, 95% CI=0.65, 3.78; prostate, OR=1.51, 95% CI=0.70, 3.28). Exclusion of patients enrolled ≥6 months before diagnosis did not substantially change the OR for distant disease among AI/AN compared with NHWs (OR=1.09, 95% CI=0.90, 1.33). Results were not meaningfully different in alternative analyses adjusting only for age, sex, state, and diagnosis year or with additional adjustment for median ZIP code annual income (California only). No statistically significant differences in results were observed between older (age ≥65 years) and younger cases.

Discussion

The results of this study provided little evidence that, among California, Oregon, and Washington Medicaid enrollees diagnosed with cancer, AI/ANs were more frequently diagnosed with distant disease than were NHWs, in apparent contrast to nationwide studies as well as results from the Pacific Coast region.^{2–4,6} One potential explanation for differences between races in cancer stage, and survival following diagnosis, is heterogeneity in tumor characteristics.¹³ However, the results of the present study suggest that differences in stage observed in the broader population are not chiefly driven by such biological factors

associated with AI/AN status, because biological heterogeneity would likely persist among Medicaid enrollees.

Medicaid is a public insurance program for specific uninsured, low-income populations: pregnant women and families with children, older adults (aged ≥ 65 years), and disabled adults. Although criteria varied between states and over time, Medicaid eligibility has been consistently linked to annual household income at or near the federal poverty level (in 2005, \$19,350 for a family of four). Low-income U.S. residents aged ≥ 65 years may be eligible for Medicare and Medicaid. These individuals were included in this study of Medicaid enrollees. Thus, cancer cases in this study were very likely to have had with similarly low income, limited financial resources, health insurance, and access to health care, irrespective of personal characteristics including race and age.

In the U.S., a larger proportion of AI/ANs than NHWs rely on Medicaid as an insurer for cancer care.¹⁴ Though this study found no differences in cancer stage distribution between AI/ANs and NHWs within Medicaid, the proportion of study patients with distant disease exceeded national proportions for breast (9% vs 5%), cervical (21% vs 12%), colorectal (27% vs 20%), lung (65% vs 57%), and prostate (11 vs 4%) cancer,¹⁵ consistent with previous reports.^{8,9,16} Although later stage may be due to limited access to cancer screening,¹¹ much of the Medicaid population is below recommended screening age and, furthermore, disparities persist in lung cancer, for which there was no screening in the period of the present study.

Conclusions

No strong evidence of stage differences between AI/ANs and NHWs was found within a Medicaid population. This suggests that racial disparities in cancer stage apparent in the population outside of Medicaid, in the three studied states, may be largely driven by racial disparities in income and healthcare access. Although these states include a sizable fraction of the national AI/AN population, generalization of these results to the nationwide population must await further research.

Acknowledgments

The content of this manuscript is the sole responsibility of the authors and does not represent the official views of the NIH, any state Medicaid program or its funders, or the Indian Health Service.

This work was supported by grants from the NIH National Cancer Institute (R01 CA125231 to S.D. Ramsey) and the National Center for Advancing Translational Sciences (KL2 TR000421 to A. N. Burnett-Hartman). Funders played no role in study design, conduct, or decision to publish.

The authors gratefully acknowledge Debbie Delaney for her careful management of the project and especially correspondence with IRBs.

References

1. White MC, Espey DK, Swan J, Wiggins CL, Ehemann C, Kaur JS. Disparities in cancer mortality and incidence among American Indians and Alaska Natives in the United States. *Am J Public Health*. 2014; 104(Suppl 3):S377–S387. <http://dx.doi.org/10.2105/AJPH.2013.301673>. [PubMed: 24754660]

2. Espey DK, Wu XC, Swan J, et al. Annual report to the nation on the status of cancer, 1975–2004, featuring cancer in American Indians and Alaska Natives. *Cancer*. 2007; 110(10):2119–2152. <http://dx.doi.org/10.1002/cncr.23044>. [PubMed: 17939129]
3. Wingo PA, King J, Swan J, et al. Breast cancer incidence among American Indian and Alaska Native women: U.S., 1999–2004. *Cancer*. 2008; 113(5 Suppl):1191–1202. <http://dx.doi.org/10.1002/cncr.23725>. [PubMed: 18720389]
4. Henderson JA, Espey DK, Jim MA, German RR, Shaw KM, Hoffman RM. Prostate cancer incidence among American Indian and Alaska Native men, U.S., 1999–2004. *Cancer*. 2008; 113(5 Suppl):1203–1212. <http://dx.doi.org/10.1002/cncr.23739>. [PubMed: 18720376]
5. Watson M, Benard V, Thomas C, Brayboy A, Paisano R, Becker T. Cervical cancer incidence and mortality among American Indian and Alaska Native women, 1999–2009. *Am J Public Health*. 2014; 104(Suppl 3):S415–S422. <http://dx.doi.org/10.2105/AJPH.2013.301681>. [PubMed: 24754650]
6. Perdue DG, Haverkamp D, Perkins C, Daley CM, Provost E. Geographic variation in colorectal cancer incidence and mortality, age of onset, and stage at diagnosis among American Indian and Alaska Native people, 1990–2009. *Am J Public Health*. 2014; 104(Suppl 3):S404–S414. <http://dx.doi.org/10.2105/AJPH.2013.301654>. [PubMed: 24754657]
7. Zhang Y, Franzini L, Chan W, Xu H, Du XL. Effects of Health Insurance on Tumor Stage, Treatment, and Survival in Large Cohorts of Patients with Breast and Colorectal Cancer. *J Health Care Poor Underserved*. 2015; 26(4):1336–1358. <http://dx.doi.org/10.1353/hpu.2015.0119>. [PubMed: 26548682]
8. Halpern MT, Bian J, Ward EM, Schrag NM, Chen AY. Insurance status and stage of cancer at diagnosis among women with breast cancer. *Cancer*. 2007; 110(2):403–411. <http://dx.doi.org/10.1002/cncr.22786>. [PubMed: 17562557]
9. Ramondetta LM, Meyer LA, Schmeler KM, et al. Avoidable tragedies: Disparities in healthcare access among medically underserved women diagnosed with cervical cancer. *Gynecol Oncol*. 2015 <http://dx.doi.org/10.1016/j.ygyno.2015.10.017>.
10. Gomez N, Guendelman S, Harley KG, Gomez SL. Nativity and neighborhood characteristics and cervical cancer stage at diagnosis and survival outcomes among Hispanic women in California. *Am J Public Health*. 2015; 105(3):538–545. <http://dx.doi.org/10.2105/AJPH.2014.302261>. [PubMed: 25602869]
11. Halpern MT, Romaine MA, Haber SG, Tangka FK, Sabatino SA, Howard DH. Impact of state-specific Medicaid reimbursement and eligibility policies on receipt of cancer screening. *Cancer*. 2014; 120(19):3016–3024. <http://dx.doi.org/10.1002/cncr.28704>. [PubMed: 25154930]
12. Burnett-Hartman AN, Bensink ME, Berry K, et al. Access to the Indian health service care system is not associated with early enrollment in Medicaid for American Indian and Alaska Natives with cancer. *Cancer Epidemiol Biomarkers Prev*. 2014; 23(2):362–364. <http://dx.doi.org/10.1158/1055-9965.EPI-13-1099>. [PubMed: 24296857]
13. Keenan T, Moy B, Mroz EA, et al. Comparison of the Genomic Landscape Between Primary Breast Cancer in African American Versus White Women and the Association of Racial Differences With Tumor Recurrence. *J Clin Oncol*. 2015; 33(31):3621–3627. <http://dx.doi.org/10.1200/JCO.2015.62.2126>. [PubMed: 26371147]
14. Ramsey SD, Zeliadt SB, Blough DK, Lopez K, Buchwald D. Cancer Care of American Indians and Alaska Natives and Other Racial Groups Enrolled in Public and Private Insurance Plans. *Poverty Public Policy*. 2010; 2(1):17–35. <http://dx.doi.org/10.2202/1944-2858.1024>.
15. Howland, N.; Noone, AM.; Krapcho, M., et al., editors. *SEER Cancer Statistics Review, 1975–2011*. Bethesda, MD: National Cancer Institute; 2014.
16. Efird JT, Landrine H, Shiue KY, O'Neal WT, Podder T, Rosenman JG, et al. Race, insurance type, and stage of presentation among lung cancer patients. *Springerplus*. 2014; 3:710. <http://dx.doi.org/10.1186/2193-1801-3-710>. [PubMed: 25674451]

Table 1

Characteristics of Medicaid Enrollees in This Study

Characteristic	non-Hispanic white		American Indian / Alaska Native	
	N	%	N	%
Cancer				
Breast ^a	9,649	27	341	31
Cervical	1,106	3	59	5
Colorectal	6,976	20	229	21
Lung	13,178	37	332	31
Prostate	4,338	12	124	11
Age (y)				
20–39	1,085	3	67	6
40–54	6,689	19	308	28
55–64	8,561	24	271	25
65	18,912	54	439	40
Female Urban residence ^b	21,386	61	717	66
No	6,470	18	331	31
Yes	28,746	82	751	69
Diagnosis year				
2001–2002	4,908	14	155	14
2003–2004	9,783	28	291	27
2005–2006	10,290	29	308	28
2007–2008	10,266	29	331	31
Enrolled 6 months prior to diagnosis Married ^b	23,858	68	726	67
No	22,710	64	677	62
Yes	9,093	26	246	23
State				
California	25,931	74	691	64
Oregon	3,394	10	103	9
Washington	5,922	17	291	27
IHSCS (AI/AN only) ^b				
non-IHSCS			513	47
IHSCS			467	43
Unknown			105	10

^aFemale breast cancer only.^bNumbers may not sum to totals due to participant with missing information.

AI/AN, American Indian/Alaska Native; IHSCS, Indian Health Service Care System

Table 2

Association of Race With Stage of Cancer at Diagnosis Among Medicaid Enrollees

Race	All cancers (N=36,332)		Breast ^a (N=9,990)		Cervical (N=1,165)		Colorectal (N=7,205)		Lung (N=13,510)		Prostate (N=4,462)	
	% Distant	OR ^b (95%CI)	% Distant	OR ^b (95%CI)	% Distant	OR ^b (95%CI)	% Distant	OR ^b (95%CI)	% Distant	OR ^b (95%CI)	% Distant	OR ^b (95%CI)
NHW	34.6	ref	9.6	ref	20.8	ref	27.4	ref	65.6	ref	11.0	ref
AI/AN	31.2	1.03 (0.88, 1.20)	9.4	1.04 (0.71, 1.51)	22.0	1.21 (0.62, 2.33)	28.4	1.01 (0.74, 1.37)	63.9	0.98 (0.78, 1.24)	13.7	1.26 (0.72, 2.21)
NHW		ref		ref		ref		ref		ref		ref
AI/AN	31.6	1.06 (0.85, 1.32)	7.9	0.85 (0.48, 1.50)	25.0	1.56 (0.65, 3.78)	29.3	1.11 (0.71, 1.73)	65.4	1.03 (0.74, 1.44)	15.5	1.51 (0.70, 3.28)
non-IHSCS												
IHSCS	30.6	1.00 (0.79, 1.27)	10.4	1.22 (0.70, 2.10)	14.8	0.66 (0.21, 2.06)	25.0	0.81 (0.50, 1.32)	65.5	1.07 (0.75, 1.53)	11.1	0.91 (0.36, 2.32)

^aFemale breast cancer only.

^bOR for distant stage at diagnosis compared to local / regional disease, adjusted for age, cancer site (all cancer results only), sex (as appropriate), state (CA, OR, WA), diagnosis year (2 year intervals), urban/rural residence, marital status, and enrollment in Medicaid for 6 months or more prior to cancer diagnosis (yes/no).

NHW, non-Hispanic white; AI/AN, American Indian/Alaska Native; IHSCS, Indian Health Service Care System