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RESEARCH BRIEF

Cancer Incidence in Elderly Medicare and Dually Eligible Beneficiaries

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Objective. We assessed how Medicaid enrollment and race influence cancer incidence among patients age 65 years and older.
Data Sources and Method. Population-based Michigan Tumor Registry was merged with Medicaid eligibility files for 1996 through 2000. All analyses were age-adjusted and gender-specific. We compared cancer incidence in the elderly Medicaid population to the cancer incidence in the Medicare population. We then examined cancer incidence in patients continuously enrolled in Medicaid 12 or more months relative to the incidence in the Medicare population.
Principal Findings. When comparing cancer incidence in Medicaid patients without regard to enrollment before diagnosis, the incidence rates of prostate cancer in black men and colorectal cancer in black women were statistically higher relative to the incidence rates in white patients. The overall cancer incidence rate for all cancers combined was statistically significantly higher for black women and men compared with white women and men (incidence rate ratio = 1.18 and 1.48, 95 percent confidence interval 1.05–1.32 and 1.28–1.71, respectively). In dually eligible patients enrolled 12 or more months before diagnosis, an excess cancer incident was observed for black patients relative to white patients in every cancer site examined with the exception of lung cancer.
Conclusions. Medicaid data in addition to Medicare data revealed patterns of cancer incidence that varied according to Medicaid enrollment and race. These findings suggest that the cancer burden among African Americans and dually eligible patients is substantial.

Key Words. Cancer, incidence, dual eligible, Medicare, Medicaid

Cancer incidence among elderly (defined as age 65 years and older) white and black patients who are dually insured with Medicare and Medicaid versus Medicare alone is the target of this investigation. Individuals that simultaneously receive health care benefits from the Medicare and Medicaid programs are known as "dual eligible." Over 60 percent of dually eligible beneficiaries live below the poverty level (Medicare Payment Advisory Commission 2001) and 24 percent of elderly dually eligible beneficiaries are

nursing home residents (Murray and Shatto 1998). The dually eligible are more likely than Medicare-only beneficiaries to be from a minority population, unmarried, living alone, institutionalized, and to have lower educational attainment (Murray and Shatto 1998).

At least three conditions make the study of cancer incidence in the dual eligible particularly relevant. Firstly, each year nearly a million beneficiaries are added to the dual eligibility rolls (Clark and Hulbert 1998). Secondly, African American race and poverty, which are also associated with dual eligibility, are simultaneously associated with disproportionately higher cancer incidence (Williams and Jackson 2005). It is unknown if cancer incidence varies by race within Medicaid, which is defined by low income, and when the Medicaid-insured elderly patients are distinguished from other elderly patients (e.g., those insured by Medicare alone) if racial differences persist. Finally, the United States (U.S.) has specific goals to reduce racial and income inequities in health and much of the effort to date has focused on cancer (Healthy People 2010). An inquiry focusing on the dually eligible can provide valuable insights into the health care situation of the very poor and their needs for improved cancer control and care.

METHODS

Data and Subjects

We used the statewide Michigan Tumor Registry to extract a study sample of patients age 65 years and older with a first primary tumor diagnosed between January 1, 1996 and December 31, 2000. The Michigan Cancer Surveillance Program, which maintains the Tumor Registry, is greater than 95 percent complete based upon external audit findings. The Tumor Registry contains information such as patient age, race, sex, date of diagnosis, and cancer site and stage.

We matched these elderly patients against the Medicaid eligibility file for the period 1996 through 2002 using a 17-step deterministic procedure along

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with a probabilistic procedure. Subjects' name, sex, month, day, and year of birth, Social Security number, and address were used in the match. The probabilistic method compared patient identifying information in the two data sets and reported the probability that the information corresponded to the same patient (Jaro 1995). All possible matches generated by the deterministic and probabilistic methods were compared and all discrepancies between the deterministic and probabilistic methods were reviewed manually. Approximately 99 percent of the subjects found in the probabilistic link were also found using the deterministic method and 96 percent of links found using the deterministic method were also found using the probabilistic method. The process for linking the Tumor Registry, Medicare, and Medicaid data sets is fully described elsewhere (Bradley et al. 2007b).

For the purposes of estimating yearly cancer incidence rates, patients were considered "dual eligible" using two definitions: (1) enrolled in Medicaid either at diagnosis or within 12 months following diagnosis and (2) continuous enrollment in Medicaid 12 months before the month of diagnosis. The requirement for enrollment data 12 months before diagnosis limited our analysis to years 1997 through 2000. The former definition includes patients enrolled in Medicaid following a cancer diagnosis (an additional 3,891 patients). The latter definition identifies patients that were long-term Medicaid enrollees before the diagnosis of cancer ($n = 6{,}015$). All other patients were considered as "Medicare only" ($n = 87{,}937$), although many patients had insurance in addition to Medicare.

Incidence Estimation

Four prevalent sites of cancer were included in the analysis: female breast, prostate, colorectal, and lung. The incidence of all cancer sites combined, including the four prevalent sites was also examined. Yearly cumulative Medicare cancer incidence rates were estimated by dividing the annual cancer incidence in the Medicare population by the number of people age 65 years and older in Michigan who were not continuously dual eligible in the year before diagnosis (National Center for Health Statistics 2006).

Two comparisons were made. The first compares cancer incidence in the dual eligible population to the cancer incidence in the Medicare only population. By "Medicare only" we refer to patients with no evidence of Medicaid enrollment. In the second comparison, we examined cancer incidence in the dually eligible population that was not continuously enrolled in Medicaid for a minimum of 12 months before the month of cancer diagnosis.

The "Medicare" population, in this comparison, comprises patients without evidence of Medicaid enrollment and patients with fewer than 12 consecutive months of Medicaid enrollment before diagnosis. Most of these patients enrolled in Medicaid following diagnosis. Medicaid beneficiaries were counted by age, sex, and race groups in Michigan Medicaid enrollment files and used as denominators to estimate the cancer incidence rate in the dually eligible population.

The estimated incidence rates were expressed as per 100,000 population and were age standardized using the U.S. population in 2000 by five age strata (65–69, 70–74, 75–79, 80–84 and 85 years or older). However, a very small percentage of patients may not be insured by Medicare if they were not U.S. citizens or permanent residents (or spouses of permanent residents) without 10 years of Medicare-covered employment. The Mantel–Haenszel χ^2 test for homogeneity of incidence rates across age strata was used. When the homogenous assumption was rejected, standardized summaries remain valid and can be used as measures of population impact (Rothman and Greenland 1998). All analyses were gender specific.

We calculated and reported the incidence rate ratio (IRR) between white and black patients and between dually eligible and Medicare patients. Blacks constitute the main racial minority in Michigan.

RESULTS

Descriptive Analysis

Table 1 reports the characteristics of patients by eligibility status. The average age across the groups of patients is similar, although a higher percentage of dual eligible patients, regardless of when they enrolled, are age 85 years and older. Relative to the Medicare patients, the dually eligible patients have a higher percentage of female and black patients. There is a higher percentage of breast, lung, and prostate cancer among dually eligible patients relative to the percentage observed in Medicare patients, whereas a smaller proportion of Medicaid patients were diagnosed with colorectal cancer.

Incidence Rates by Race

Table 2 compares the age-standardized cancer incidence rates by race and insurance enrollment. In the first comparison (column 2), the incidence rates of prostate cancer in black men and colorectal cancer in black women are statistically significant when compared with the incidence rates in white

Table 1: Characteristics of Medicare and Dually Eligible Cancer Patients, Michigan, 1997–2000

	Medicare Only (N= 87,937)	*All Dually Eligible Patients (N= 9,856)*	*Continuously Dually Eligible 12 or More Months before Diagnosis (N= 6,015)*
Mean age at diagnosis (SD)	75.27 (6.91)	76.85 (8.00)	77.01 (8.11)
	%	%	%
Age groups			
65–69	23.49	21.03	20.42
70–74	27.35	23.67	24.42
75–79	23.08	20.94	20.30
80–84	15.12	15.11	15.10
85+	10.95	19.25	19.77
Race			
White	90.31	71.00	66.83
Black	9.69	29.00	33.17
Sex			
Male	54.74	36.44	31.95
Female	45.26	63.56	68.05
Cancer site			
Breast	12.81	14.03	14.81
Colorectal	20.76	10.11	9.59
Lung	12.79	14.87	14.43
Prostate	15.27	20.45	19.29
All other sites	38.36	40.53	41.88

Statistical significance is determined using the *t*-test for continuous variables and the χ^2 test for categorical variables. All differences between the two Medicaid columns and the "Medicare only" group are statistically significant at $p<.001$. Fifty patients were dually eligible before diagnosis, but were not dually eligible following diagnosis. The majority (68%) of these patients died in 1998 and the remaining patients died in subsequent years.

patients ($p<.05$). The overall cancer incidence rate for all cancers combined is statistically higher for black women and men compared with white women and men (IRR = 1.18 and 1.48, 95 percent confidence interval [CI] 1.05–1.32 and 1.28–1.71, respectively).

Whether we restrict the dually eligible sample to include only those patients enrolled 12 or more months before diagnosis and expand the Medicare sample to include patients that became dually eligible following diagnosis or not (columns 1 and 3), black men have a higher incidence rate of prostate and lung cancer and all cancers combined relative to white men. The greatest racial difference in cancer incidence is among black men with prostate

Table 2: Age-Standardized Cancer Incidence by Race and Sex for Medicare and Dually Eligible Beneficiaries, Michigan, 1997–2000

Cancer Site	*Medicare Only, No Evidence of Medicaid Enrollment (N= 87,987)*	*All Dually Eligible Patients (N= 9,856)*	*Medicare and Dually Eligible < 12 Months before Diagnosis (N= 91,828)*	*Continuously Dually Eligible 12 or More Months before Diagnosis (N= 6,015)*
Breast				
White	450	409	458	291
Black	397	491	437	397
Ratio [95% CI]	0.88 [0.77, 1.02]	1.20 [0.94, 1.53]	0.95 [0.83, 1.09]	1.36 [1.02, 1.82]*
Prostate				
White	917	665	922	461
Black	1600	1651	1655	1205
Ratio [95% CI]	1.74 [1.61, 1.89]*	2.48 [1.92, 3.22]*	1.79 [1.66, 1.94]*	2.61 [1.86, 3.68]*
Colorectal (women)				
White	238	262	245	188
Black	260	388	292	313
Ratio [95% CI]	1.09 [0.90, 1.31]	1.48 [1.12, 1.95]*	1.19 [1.00, 1.41]	1.67 [1.19, 2.33]*
Colorectal (men)				
White	287	364	295	194
Black	303	506	325	377
Ratio [95% CI]	1.06 [0.88, 1.27]	1.39 [0.91, 2.13]	1.10 [0.92, 1.32]	1.94 [1.09, 3.44]*
Lung/bronchus (women)				
White	225	398	236	274
Black	233	367	261	297
Ratio [95% CI]	1.04 [0.86, 1.25]	0.92 [0.70, 1.21]	1.11 [0.93, 1.32]	1.08 [0.78, 1.50]
Lung/bronchus (men)				
White	407	808	423	473
Black	485	971	521	673
Ratio [95% CI]	1.19 [1.03, 1.38]*	1.20 [0.89, 1.63]	1.23 [1.07, 1.42]*	1.42 [0.95, 2.14]
All sites (women)				
White	1594	1893	1638	1376
Black	1592	2232	1753	1838
Ratio [95% CI]	1.00 [0.93, 1.08]	1.18 [1.05, 1.32]*	1.07 [1.00, 1.15]	1.34 [1.17, 1.53]*
All sites (men)				
White	2540	2977	2585	1876
Black	3149	4397	3314	3197
Ratio [95% CI]	1.24 [1.17, 1.31]*	1.48 [1.28, 1.71]*	1.28 [1.21, 1.36]*	1.70 [1.41, 2.07]*

In column 1, "Medicare only" refers to patients without evidence of Medicare enrollment. In column 2, "All dual eligible" refers to all patients enrolled in Medicaid, including those that may have enrolled in Medicaid following a cancer diagnosis or had only sporadic enrollment. "All sites" refers to all cancer sites, in addition to and including breast, prostate, colorectal, and lung/bronchus sites. "Ratio" refers to the ratio of cancer incidence in black subjects relative to white subjects. Incidence per 100,000 population is age standardized to the United States population in 2000. The Mantel–Haenszel heterogeneity test by age groups could not reject that incidence rate is the same across age categories.

*IRR is statistically significantly different from 1 at $p < .05$.

cancer (IRR = 1.79, 95 percent CI 1.66–1.94), followed by lung cancer among black men (IRR = 1.23, 95 percent CI 1.07–1.42) relative to white men.

In sharp contrast, among patients continuously enrolled in Medicaid before diagnosis (column 4), an excess burden of cancer is observed for black patients relative to white patients in every site examined with the exception of lung cancer. Contrary to findings in the literature (see, e.g, Bigby and Holmes 2005), dually eligible black women have a higher incidence rate of breast cancer relative to dually eligible white women (IRR = 1.36, 95 percent CI 1.02–1.82). The incidence rate of prostate cancer in dually eligible black men approaches three times higher than the rate in dually eligible white men (IRR = 2.61, 95 percent CI 1.86–3.68). The incidence rate of colorectal cancer is higher in both dually eligible black women and men compared with the colorectal cancer incidence in dually eligible white patients (IRR = 1.67 and 1.94, 95 percent CI 1.19–2.33 and 1.09–3.44, respectively). Likewise, the incidence of all cancer sites combined for black women and men is higher than the incidence observed in white patients.

Incidence Rates by Eligibility Status

Table 3 reports the IRR between the dually eligible and Medicare patients within the same racial group. Among white patients, there is a higher incidence of colorectal cancer (men only) (IRR = 1.27, 95 percent CI 1.01–1.60), lung cancer (both sexes) (IRR = 1.77 and 1.98, 95 percent CI 1.52–2.06 and 1.68–2.33 for women and men, respectively), and all cancers combined (IRR = 1.19 and 1.17, 95 percent CI 1.11–1.27 and 1.08–1.27 for women and men, respectively) relative to their Medicare counterparts (column 1). Among black patients, there is a higher incidence of colorectal cancer (IRR = 1.49 and 1.67, 95 percent CI 1.12–1.99 and 1.11–2.49 for women and men, respectively) and lung cancer (IRR = 1.57 and 2.00, 95 percent CI 1.17–2.11 and 1.49–2.69 for women and men, respectively) in dually eligible patients relative to Medicare patients (column 2).

White patients continuously enrolled 12 or more months in Medicaid before cancer diagnosis, have a lower incidence of breast cancer (IRR = 0.63, 95 percent CI 0.53–0.76), colorectal cancer (for women IRR = 0.77, 95 percent CI 0.62–0.95; for men IRR = 0.66, 95 percent CI 0.46–0.94), prostate cancer (IRR = 0.50, 95 percent CI 0.40–0.63), and all cancers combined (IRR = 0.84, 95 percent CI 0.77–0.91) relative to white patients enrolled in Medicare alone (column 3). Black patients continuously enrolled in Medicaid before diagnosis have lower prostate cancer incidence relative to

Table 3: Age-Standardized Cancer Incidence by Eligibility Category, Race and Sex, Michigan, 1997–2000

	All Dually Eligible Subjects versus Medicare Only		*Continuously Dually Eligible 12 or More Months before Diagnosis versus Medicare and Dually Eligible < 12 Months before Diagnosis*	
Cancer Site	*White*	*Black*	*White*	*Black*
Breast				
Medicare	450	397	458	437
Dually eligible	409	491	291	397
Ratio [95% CI]	0.91 [0.79, 1.04]	1.24 [0.97, 1.57]	0.63 [0.53, 0.76]*	0.91 [0.70, 1.19]
Prostate				
Medicare	917	1600	922	1655
Dually eligible	665	1651	461	1205
Ratio [95% CI]	0.72 [0.61, 0.86]*	1.03 [0.83, 1.28]	0.50 [0.40, 0.63]*	0.73 [0.56, 0.95]*
Colorectal (women)				
Medicare	238	260	245	291
Dually eligible	262	388	188	313
Ratio [95% CI]	1.10 [0.93, 1.30]	1.49 [1.12, 1.99]*	0.77 [0.62, 0.95]*	1.07 [0.79, 1.46]
Colorectal (men)				
Medicare	287	303	295	325
Dually eligible	364	506	194	377
Ratio [95% CI]	1.27 [1.01, 1.60]*	1.67 [1.11, 2.49]*	0.66 [0.46, 0.94]*	1.16 [0.71, 1.88]
Lung/bronchus (women)				
Medicare	225	233	236	261
Dually eligible	398	367	274	297
Ratio [95% CI]	1.77 [1.52, 2.06]*	1.57 [1.17, 2.11]*	1.16 [0.96, 1.41]	1.14 [0.83, 1.56]
Lung/bronchus (men)				
Medicare	407	485	423	521
Dually eligible	808	971	473	673
Ratio [95% CI]	1.98 [1.68, 2.33]*	2.00 [1.49, 2.69]*	1.12 [0.89, 1.41]	1.29 [0.90, 1.86]
All sites (women)				
Medicare	1594	1592	1638	1753
Dually eligible	1893	2232	1376	1838
Ratio [95% CI]	1.19 [1.11, 1.27]*	1.40 [1.25, 1.58]*	0.84 [0.77, 0.91]*	1.05 [0.92, 1.19]
All sites (men)				
Medicare	2540	3149	2585	3314
Dually eligible	2977	4397	1876	3197
Ratio [95% CI]	1.17 [1.08, 1.27]*	1.40 [1.22, 1.60]*	0.73 [0.65, 0.81]*	0.96 [0.82, 1.14]

In columns 1 and 2, "Medicare only" refers to patients without evidence of Medicare enrollment and "All dual eligible" refers to all patients enrolled in Medicaid, including those that may have enrolled in Medicaid following a cancer diagnosis or had only sporadic enrollment. Incidence per 100,000 population is age standardized to the United States population in 2000. "All sites" refers to all cancer sites, in addition to and including breast, prostate, colorectal, and lung/bronchus sites. In the third column, the Mantel–Haenszel heterogeneity test by age groups rejected that the incidence rate is the same across age categories in colorectal cancer in white women ($p = .08$), lung cancer in white women ($p = .02$), and all cancer sites in white women ($p < .0001$) and in the first column, colorectal cancer in white women ($p = .03$), lung cancer in white women ($p < .001$) and white men ($p = .001$), and for all sites in white women ($p < .001$) and white men ($p = .001$).

*Ratio is statistically significantly different from 1 at $p < .05$.

blacks insured by Medicare (IRR = 0.73, 95 percent CI 0.56–0.95) and similar incidence rates in other and all cancers (column 4).

DISCUSSION

This study assessed how cancer incidence varies by Medicaid enrollment and race among patients age 65 years and older. We conceptualized patients continuously eligible for Medicaid 12 months before a cancer diagnosis as having a long-term exposure to poverty, and perhaps disability, relative to other dually eligible patients. We found that when dually eligible patients were distinguished from Medicare patients, there was little racial disparity in cancer incidence in the Medicare population; exceptions were prostate and lung cancer in black men relative to white men. However, racial disparities in cancer incidence were apparent across all sites, except lung cancer, in patients that were continuously enrolled in Medicaid 12 months before the month of diagnosis.

Within the long-term dually eligible population, the incidence of cancer was between 36 percent and 161 percent higher for black patients relative to white patients. Somewhat surprisingly, within racial groups, breast and colorectal cancer (in the white population only) and prostate cancer incidence was lower in the dually eligible population than in the Medicare population. Perhaps screening for breast, colorectal, and prostate cancer occurs infrequently among dually eligible patients, which may mask true incidence. Screening guidelines may not be applicable to frail elderly patients typical of the dually eligible population. For example, nearly one-quarter of the Medicaid patients resided in nursing homes and among patients 80 years and older, 40 percent resided in nursing homes. Nevertheless, the absence of screening implies that when cancer is detected, it is likely to be at an advanced stage. An analysis of cancer stage in our sample found that dually eligible patients were more likely to be diagnosed with late-stage disease relative to Medicare patients. These findings were statistically significant even when nursing home residents were excluded (Bradley et al. 2007a). When we included patients that enroll in Medicaid following a cancer diagnosis, statistically equivalent breast cancer and colorectal (men) incidence rates between dual eligible patients and Medicare patients were observed, but the prostate cancer incidence rate remained lower for white dually eligible men.

The estimate of cancer incidence in the dually eligible population becomes higher or statistically equal to the Medicare population when we included patients that become dually eligible following a cancer diagnosis; this

change was attributable to the change in the denominator and numerator rather than a change in the number of cancer cases. Higher incidence rates in both black and white populations were found for colorectal (men only), lung, and all cancer combined among dually eligible patients relative to Medicare patients. Perhaps the risk factors (e.g., smoking, diet, exposure to toxins) associated with these cancer sites are modified by poverty. These patients were either qualified for Medicaid but did not enroll until diagnosis with cancer or they spent down their assets following diagnosis. Regardless of the situation, cancer most likely spurred the Medicaid enrollment of the majority of these 3,900 patients. Medicaid administrators need to be aware that many of these newly enrolled cancer patients will have late-stage disease and require expensive treatments and medications. A failure to control cancer incidence in the low-income population will eventually place a burden on the Medicaid system.

Two main limitations to the study are noted. First, the study population was confined to a single state. At this time, the only way to conduct a study using Medicaid data is at the state level. Although the enrollment criteria for Medicaid are similar across states, Michigan has very low managed care penetration—particularly among the dually eligible (approximately 3 percent). For this reason, we did not compare patients enrolled in managed care versus those enrolled in fee-for-service programs, although evidence suggests that Medicare beneficiaries enrolled in health maintenance organizations (HMOs), particularly those in a nongroup model HMO, are healthier and are more likely to receive cancer screening than beneficiaries with other forms of Medicare insurance (Lee-Feldstein, Feldstein, and Buchmueller 2002). Michigan is also ranked 31st among all 50 states in spending per aged dually eligible beneficiary (Kaiser Family State Health Facts 2005). These two factors may influence the quality of care, including cancer detection, delivered to dually eligible beneficiaries. Second, within the Medicare population, many individuals qualify, but are not enrolled in Medicaid (Pezzin and Kasper 2002). The presence of these individuals would tend to diminish the differences observed between the dually eligible and Medicare patients.

This study shows that Medicaid data in addition to Medicare data revealed patterns of cancer incidence that are specific to racial groups and Medicaid enrollment. Given the national goals toward the elimination of health disparities (Healthy People 2010), there are remarkably few population-based datasets that can support credible research and track progress toward reducing disparities and identifying those who are adversely affected by disease. This study implies that cancer control efforts targeted toward

colorectal and lung cancer prevention in low-income individuals may reduce racial disparities in the incidence of these cancers and that among long-term dually eligible patients, the rate of breast and prostate cancer detection may be lower than the rate of detection in the Medicare population.

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SUPPLEMENTARY MATERIAL

The following material is available for this article online:

Appendix SA1: Author Matrix.

This material is available as part of the online article from: This material is available as part of the online article from: http://www.blackwell-synergy.com/doi/abs/10.1111/j.1475-6773.2008.00855.x (this link will take you to the article abstract).

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