Medicaid expansion is associated with increased 1-year survival for primary malignant brain tumors

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The affordable care act provision to expand access to Medicaid (Medicaid expansion, or ME) increased insurance coverage among individuals with cancer. Increasing evidence suggests ME impacts cancer outcomes, yet the implication of ME on primary malignant brain tumor (PMBT) outcomes remains unknown. This study suggests ME may result in an increase in 1-year predictive overall survival (1YPS) among PMBT patients.

Individuals with PMBTs have short survival and high morbidity,[1] with uninsured individuals more likely to: experience delayed care[2]; have greater tumor burden; receive lower levels of care; and experience greater mortality rates.[3,4] The Patient Protection and Affordable Care Act expanded the Medicaid public insurance program in the United States and by 2014 25 states had opted into the program, facilitating healthcare access to 21-million poor and low-income individuals.[5] In other cancer types, studies have linked ME with increased earlier stage diagnoses and improved survival.[6] However, the impact of ME on individuals with PMBTs has not been examined.

Data for diagnosis years 2004–2018 were obtained from the National Cancer Database (NCDB), containing clinical oncology data from more than 70% of new cancer cases from over 1500 Commission on Cancer (CoC) accredited US facilities. PMBT histopathologies were classified per the Central Brain Tumor Registry of the United States (CBTRUS) report.[1] Individuals were defined as either (1) diagnosed before 2014 in a nonexpansion state, (2) diagnosed after 2014 in a nonexpansion state, (3) diagnosed before 2014 in an expansion state, or (4) diagnosed after 2014 in an expansion state.

Demographic factors included: sex, race/ethnicity (White non-Hispanic, Black non-Hispanic, White Hispanic, Other) and age (40–64 years). Supplementary geographic location (urban, rural) was extrapolated from residence zip code. The Charlson–Deyo comorbidity index (0–3+) was included, providing the number of comorbidities at diagnosis. Individuals were excluded if any of the following were unknown: race/ethnicity, survival data, or state expansion status. The 1YPS was calculated using the pseudo-observation method.[7] Difference-in-difference (DID) models were employed, stratified by each variable (except insurance status) and including all other variables (except insurance status) as confounding factors to assess the variable (eg, 1YPS) as a percentage point change for the group of interest (ME-states) after an event (ME) adjusting for the 1YPS change in the comparison group (non-ME-states).[8] Statistical significance was considered at $P < .05$.

69 880 individuals with PMBTs were analyzed. Non-ME-states had 19 872 (a 28.4% share of total population) and 10 395 (14.9%) individuals diagnosed either before or after 2014, respectively. ME-states had 25 355 (36.2%) and 14 258 (20.4%) individuals diagnosed before and after 2014, respectively. Study population consisted of 40 463 (58%) males and 29 417 (42%) females. In expansion states, the 1YPS increased for individuals diagnosed after expansion (1YPS = 69.28%) compared with before expansion (1YPS = 66.08%). DID modeling showed an increase in 1YPS associated with ME (DID: 1.52%, 95% CI: 0.06–2.98) (Figure 1).

The impact of ME on 1YPS was observed in individuals who are White non-Hispanic (DID: 2.33%, 95% CI: 0.71 to 3.94) whereas individuals who are White Hispanics had a negative association of 1YPS (DID: −6.79%, 95% CI −12.26 to −1.32). Additionally, increases in 1YPS were shown in individuals who were either: diagnosed without comorbidities (Charlson–Deyo comorbidity score = 0; DID: 2.43%, 95% CI: 0.79–4.06) or 60–64 years old (DID: 3.59%, 95% CI: 0.66–6.52). No significant increase in 1YPS was observed for males or females.
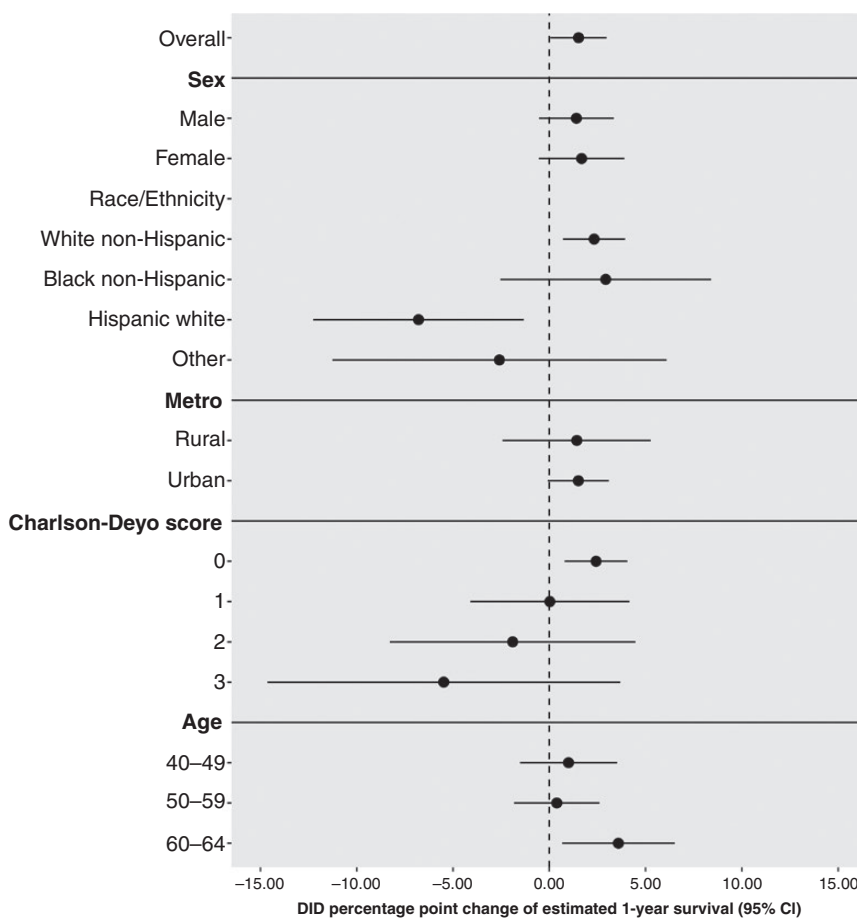
Figure 1. Difference-in-difference (DID) results, as percentage point change of 1 year predicted survival (1YPS); before versus after the Medicaid expansion in 2014, overall, and by factors associated with overall survival for primary malignant brain tumors (PMBTs).

In expansion states, the number of uninsured individuals dropped by more than half (5.2%–2.3%) after expansion, while the number of individuals with Medicaid increased (10.3%–15.1%) while in non-ME-states not-insured dropped by only 0.7% (8.6%–7.9%) and Medicaid partici-pants increased by 0.6% (7.7%–8.3%). The ME reduced dis-parity gap in minority groups as the drop in uninsured and an increase in those insured in ME-states was observed through all racial/ethnical groups, in accordance with find-ings in other studies.[9]

For all demographic groups, there is an association be-tween ME and an increase in 1YPS for individuals with PMBTs. The greatest impact of ME among ethnic and racial groups was observed in non-Hispanic Whites, the popula-tion most likely to develop PMBTs.[1] The decrease in 1YPS following ME in Hispanic Whites may be the result of a de-crease in care quality, or other factors beyond access to ME. This is the first finding, to our knowledge, that dem-onstrates a decrease in OS following ME. Other groups have either found no change in OS with Hispanic patients diagnosed with gynecological cancer.[10] Interestingly, Han et al. found there was a decreased trend in 2-year OS in Hispanics newly diagnosed with cancer,[6] suggesting this

is an area, while beyond the scope of this study, that war-rants further investigation.

Compared with other age groups, individuals diagnosed between 60 and 64 years of age had the greatest increase in 1YPS. This is likely because the risk of developing a brain tumor increases significantly with age reaching a peak at ~60 years. Similar findings were reported by Duarte et al. who found that access to insurance resulted in increased cancer detection among this near-elderly population after ME. This may be due to better and earlier tumor detection as well as improved access to treatments for insured popu-lations resulting in improved outcomes.

It has been well established that comorbidities impact survival prognosis.[11] Thus, it might be expected that ME would impact those individuals with the greatest number of comorbidities, yet this was not observed. The positive impact of ME on 1YPS was only observed in individuals with no comorbidities at the time of diagnosis. It is pos-sible that the presence of comorbidities drives individuals to obtain insurance, and access to care, compared with those who have fewer health conditions and limited ac-cess. In this situation, the positive impact of ME may not be as easily observed in individuals with comorbidities. A

limitation of NCDB data is the lack of ME status information on individuals under 40 years of age. Therefore, these individuals were excluded from this analysis. These data lack quality of life (QOL) information preventing any analysis of the impact on ME on QOL.

Taken together, these data demonstrate that ME positively impacts individuals with PMBTs as there was a significant increase in 1YPS in individuals with PMBT after the ME in 2014.

Conflict of Interest Statement

The authors have no conflict of interest to declare. J.S.B.-S. is a full-time employee of the NIH/NCI. G.C. and K.A.W. are full-time contractors of the NIH/NCI. M.D. is a full-time postdoctoral fellow of the NIH/NCI.

Authorship Statement

Mantas Dmukauskas: investigation, methodology, formal analysis, visualization, writing original draft and editing; Gino Cioffi: data curation, investigation, methodology, formal analysis, visualization, writing original draft and editing; Corey Neff and Mackenzie Price: investigation, methodology, formal analysis, reviewing final draft; Kristin A. Waite: funding acquisition, investigation, formal analysis, writing original draft and editing, project administration, resources, supervision; Quinn T. Ostrom: data curation, conceptualization, formal analysis, investigation, methodology, visualization, reviewing final draft; Carol Kruchko: funding acquisition, investigation, project administration, resources, supervision, reviewing final draft; Jill S. Barnholtz-Sloan: conceptualization, investigation, project administration, resources, supervision, reviewing final draft.

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