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RESEARCH ARTICLE

The effect of race and co-morbidities on Alzheimer's disease based on Medicare data

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Abstract

Introduction: Alzheimer's disease (AD) incidence is thought to be higher among Black than White individuals.

Methods: We studied the US Medicare population from 2000 to 2018. Cox regression was used to determine the roles of race and co-morbidities for AD incidence.

Results: We studied 11,880,906 Medicare beneficiaries, with 774,548 AD cases. Hazard ratios (HRs) by increasing numbers of co-morbidities (1–7) were 1.51, 2.00, 2.55, 3.16, 2.89, 4.77, and 5.65. Among those with no co-morbidities, Black individuals had a lower rate than those who are White (HR = 0.69), while among those with one more co-morbidities, Black individuals had a higher rate (HR = 1.19). The presence of hypertension increased AD rates by 14% for White individuals, but 69% for those who are Black.

Discussion: More co-morbidities was strongly associated with higher AD rates. The higher rates for Black versus White individuals was apparent only for those with co-morbidities and appears driven both by more co-morbidities, and the greater effect of hypertension.

KEYWORDS
Alzheimer's disease, co-morbidities, race

Highlights

- Black individuals have been shown to have higher Alzheimer's disease (AD) rates than those who are White.
- Some co-morbidities are known to increase AD risk.
- Among those In Medicare data with no co-morbidities, Black individuals have less risk than those who are White.
- Among those with co-morbidities, Black individuals have higher rates than those who are White.
- Hypertension results in a much stronger increase in AD risk for Black versus White individuals.

1 | INTRODUCTION

Several studies in recent years have pointed to higher US incidence and prevalence of Alzheimer's disease (AD) among Black compared to White individuals.[1–3] These data and others have led the Alzheimer's Association to conclude in their 2021 annual Facts and Figures Report that Black individuals have both higher prevalence and higher incidence of AD than those who are White (although others have noted that the data for greater cognitive decline among Black compared to White individuals do not show a consistent pattern,[4,5] potentially calling into question the data regarding higher AD incidence in those who are Black).[5]

The Alzheimer's Association 2022 report noted that the higher incidence and prevalence of AD among Black individuals appears unlikely to be due to different genetic risk factors, for example, the apolipoprotein E (*APOE*) variant known to increase risk of AD.[4] The most common and consistent modifiable risk factors cited in the report were lower levels of education, and increased levels of cardiovascular risk factors, including hypertension, diabetes, and smoking, which may differ between Black and White individuals.

AD is a significant and growing public health issue. There are approximately six million individuals aged 65 and older living with AD and related dementias (ADRD) in the United States, and this number is projected to grow to 12 million by 2040.[6] With no disease-modifying treatments for ADRD, there has been increased global attention on prevention and risk reduction of ADRD by maintenance of a healthy lifestyle and management of diseases such as hypertension.[7]

Here we study Black and White individuals in the Medicare population (aged 65 and above) residing in the contiguous United States from 2000 to 2018. Our goal was to disentangle the relationships among AD risk, race, and co-morbidities in the US Medicare population.

RESEARCH IN CONTEXT

1. **Systematic review**: The authors reviewed the literature using traditional sources, for example, PubMed. Alzheimer's disease (AD) incidence has been found to be higher among Black than White individuals in a number of epidemiologic studies. Most of these have adjusted for co-morbidities that are known to increase AD risk, but did not explore potential effect modification of co-morbidities on risk of AD for those who are Black versus White.
2. **Interpretation**: We used the US Medicare database from 2000 to 2018, and found that Black individuals without co-morbidities had lower AD rates than those who are White. Higher rates for Black versus White individuals was apparent only for those with co-morbidities, and appears driven both by more co-morbidities among Black individuals, and by the greater effect of hypertension-associated AD for Black versus White individuals.
3. **Future directions**: Our data provide several hypotheses about AD rates among Black and White individuals that will require confirmation in different databases.

2 | METHODS

2.1 | Population

Data were drawn from the Medicare denominator file from the Centers for Medicare and Medicaid Services (CMS). We studied a nationwide Medicare population (age ≥65) that has been previously described by Shi et al.[8] This population is restricted to those always enrolled in the fee for service (FFS) component of Medicare, as claims data are not available for health maintenance organization (HMO) participants (i.e., they do not have data on AD). Furthermore, we required the sample to have both Part A (hospital insurance, including hospitalization) and Part B (medical insurance, including doctor's visits), so as to be better able to estimate incidence, as diagnosis is more likely to occur in a doctor's visit prior to any hospitalization. We restricted the population to those who are Black or White. The Medicare denominator file contains enrollment records for all Medicare beneficiaries in each year, including age, sex, race, Medicaid eligibility (a proxy for socioeconomic status [SES]), the date of death (if any), ZIP code of residence, the number of months enrolled in HMO, the number of months enrolled in Part A, and the number of months enrolled in Part B.

2.2 | Outcome

We defined our outcomes as the first occurrence of a diagnosis of AD, as determined via the Medicare Chronic Conditions Data Warehouse (CCW).[9] CCW includes predefined indicators for AD, which are identified using an algorithm that incorporates information from all available Medicare claims (such as inpatient and outpatient claims, carrier file, skilled nursing facility, and home health-care claims) indicating that an individual was diagnosed with AD. This algorithm applied by Medicare to define AD is primarily based on work by Taylor et al.,[10,11] and includes International Classification of Diseases (ICD)-9 codes of 331.0 and ICD-10 codes of G30.0, G30.1, G30.8, and G30.9.

Finally, we also required a 5-year "clean period" preceding diagnosis of AD, so as to better capture AD incidence rather than prevalence, following the precedent in Shi et al.[8] Therefore, study subjects entered the cohort on January 1st of the year after the "clean" period and were followed until first diagnosis of AD, death, or end of follow-up. We excluded this 5-year clean period from follow-up time as subjects were not at risk of AD during this time.

2.3 | Covariates

Individual-level age at entry, sex, race, and Medicaid eligibility were obtained from the Medicare denominator file. We also obtained

neighborhood-level covariates in our study based on ZIP code of residence, which is available in the Medicare data and updated annually. Covariates in our regression model included ZIP code–level SES variables (population density, percent of population with less than a high school education, median household income), county-level behavioral risk factors (smoking prevalence and mean body mass index) and health-care capacity variables (number of hospitals), as well as a geographical region (five regions for the United States). These covariates have been associated previously with AD,[12,13] and were judged potentially associated with race and co-morbidities, and hence potential confounders.

2.4 | Co-morbidities

Via Cox regression analyses, we identified seven co-morbidities that were a priori associated with AD and in addition showed an increased risk in our analyses. These included the CCW-defined diagnoses of diabetes, hypertension, stroke, congestive heart failure (CHF), ischemic heart disease (IHD), depression, and chronic obstructive pulmonary disease (COPD). We also considered two others, hyperlipidemia and atrial fibrillation, but these did not increase risk of AD in our cohort and were not included in final models.

2.5 | Statistical analysis

We fit a series of stratified Cox proportional-hazards models with a generalized estimating equation (GEE)[14] to estimate the associations between race and co-morbidities with AD among the elderly, where the coefficients for the race and the seven co-morbidities were the parameters of interest, and years of follow-up was the time scale. The Cox models were stratified on age at entry into Medicare, sex, and insurance status (eligible or not for Medicaid). We were interested whether the effect of race (Black vs. White) changed dependent on the presence of co-morbidities, as well as the relative importance of the type and number of co-morbidities in determining AD risk. Co-morbidities were time dependent, such that they had to occur prior to the time of AD case diagnosis, or prior to that time for associated controls in the risk set for each case. GEE was used to adjust for residual autocorrelation within ZIP code with the use of robust standard errors (and 95% confidence intervals).

We conducted a sensitivity analysis to estimate the effect of possible outcome misclassification. We fit weighted linear regression models for the rate of AD (events/person-time) with and without adjusting for correlation between counties, with weights corresponding to the proportion of a county's person time out of total population time, to give more weight to large counties. The linear regression, assuming non-differential misclassification of our AD outcomes (e.g., similar between White and Black individuals) should provide an approximately unbiased estimate of the additive effect of race.[15]

TABLE 1 Descriptive statistics on the cohort

	AD cohort	
Variables	**Number**	**%**
Number of Alzheimer's disease cases	804,668	6.5
Number of total population	11,880,906	100
Total person-years	93,278,266	100
Median follow-up years	7.0	
Age at entry 65–74	9,734,481	78.1
Age at entry 75–114	2,721,966	21.9
Male	5,107,942	41.0
Female	7,348,505	59.0
White	11,214,287	94.4
Black	666,619	6.6
Dual eligible	852,499	6.8
Non-dual eligible	11,603,948	93.2

3 | RESULTS

Table 1 provides basic descriptive information about the cohort, including 11,880,906 individuals and 804,668 incident AD cases. There were 93.3 million person-years of follow-up, with a median follow-up of 7 years. The majority of the study subjects were women (59.0%), and 6.6% were Black.

Table 2 provides the frequencies, at any point during Medicare enrollment, of seven co-morbidities that increased risk of AD in our cohort. These were chosen among nine a priori candidates, based on the literature, two of which did not prove to increase risk (atrial fibrillation and high cholesterol) in our data. Hypertension is the most common AD-increasing co-morbidity in the Medicare data.

Table 3 provides hazard (rate) ratios (HRs) for the occurrence of the seven specific co-morbidities, adjusted for covariates. As noted, the co-morbidities are time dependent, that is, they occurred prior to the AD diagnosis, or correspondingly, prior to the follow-up time of the case for all controls in that case's risk set. Depression has the highest HR for AD, followed by stroke and hypertension. The HR for Black versus White individuals in this model is 1.18 (95% confidence interval [CI]: 1.16–1.19), indicating that after adjusting for co-morbidities Black individuals overall have higher AD rates than those who are White. However, the increased rate for Black individuals in this model does not take into account effect modification or interaction between race and the presence of co-morbidities, which we address further below.

Table 4 shows the HRs for race and for the total number of co-morbidities prior to diagnosis. There is a very strong monotonic increase in the HRs with more co-morbidities. It should be noted that the percentage of Black individuals in the total population ever having zero, one, two, three, through seven co-morbidities during follow-up increased almost monotonically: 0.044, 0.050, 0.058, 0.057, 0.058, 0.061, 0.063, and 0.069, respectively.

TABLE 2 Frequency of ever having co-morbidities while enrolled in Medicare

	White	Black	% Black	Total	% of all co-morbidities
Total	11,214,287	666,619	5.61%	11,880,906	100.0%
Ever diabetes	3,959,973	355,494	8.24%	4,315,467	36.3%
Ever stroke	1,934,782	124,059	6.03%	2,058,841	17.3%
Ever hypertension	9,433,853	604,907	6.03%	10,038,760	84.5%
Ever IHD	5,873,895	334,678	5.39%	6,208,573	52.3%
Ever CHF	3,234,192	222,105	6.43%	3,456,297	29.1%
Ever COPD	3,139,609	161,850	4.90%	3,301,459	27.8%
Ever depression	3,680,712	154,807	4.04%	3,835,519	32.3%
None	986,336	45,387	4.40%	1,031,723	0.0%

Abbreviations: CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; IHD, ischemic heart disease.

TABLE 3 Hazard ratios for AD, by race and by co-morbidity present at time of diagnosis

	Hazard ratio (HR), 95% CI*
Diabetes	1.04 (1.04–1.05)
Hypertension	1.16 (1.15–1.17)
Stroke	1.59 (1.58–1.60)
Congestive heart failure (CHF)	1.10 (1.10–1.11)
Ischemic heart disease (IHD)	1.07 (1.07–1.08)
Depression	2.40 (2.39–2.42)
Black vs. White race	1.18 (1.16–1.19)

*Adjusted for region ($n = 5$), calendar year, race (Black vs. White), county-level smoking prevalence, mean BMI, and number of hospitals, and at ZIP-code level the log of population density, the log of mean household income, and percent with education under high-school. Stratified by sex, age at entry to cohort, and Medicaid eligibility.
Abbreviations: AD, Alzheimer's disease; BMI, body mass index; CI, confidence interval.

TABLE 4 Hazard ratios for AD by number of co-morbidities at time of diagnosis

Number co-morbidities	Hazard ratio (95% CI)*
No co-morbidity	1.00
Any one	1.51 (1.49, 1.53)
Any two	2.00 (1.97, 2.03)
Any three	2.55 (2.51, 2.59)
Any four	3.16 (3.11, 3.20)
Any five	3.90 (3.83, 3.96)
Any six	4.77 (4.69, 4.85)
All seven	5.65 (5.53, 5.77)

*Adjusted for region ($n = 5$), calendar year, race (Black vs. White), county-level smoking prevalence, mean BMI, and number of hospitals, and at ZIP-code level the log of population density, the log of mean household income, and percent with education under high-school. Stratified by sex, age at entry to cohort, and Medicaid eligibility.
Abbreviations: AD, Alzheimer's disease; BMI, body mass index; CI, confidence interval.

Table 5 shows a model with the HRs for each co-morbidity, in race-specific models, as well as the *P*-value for the interaction between race and co-morbidity, based on a full model with both races combined. Hypertension stands out as the co-morbidity that most increases AD rates for Black versus White individuals, with HRs of 1.69 versus 1.14, respectively. The importance of hypertension as the co-morbidity that most increases AD rates for Black versus White individuals is underlined by the fact that hypertension is by far the most prevalent of all co-morbidities (84%).

Finally, we ran a model including race, a variable for one or more co-morbidities at time of diagnosis, and the interaction term between race and having one or more co-morbidities (Table 6). Results from this model indicate that among those with no co-morbidities, the hazard ratio for Black versus White individuals was 0.69 (95% CI: 0.65–0.74). However, the hazard ratio for Black individuals with one or more co-morbidities versus Whites with no co-morbidities was 1.29 (95% CI: 1.27–1.31).

Sensitivity analysis using weighted linear regression of country rates with race in the model, but not co-morbidities, yielded HRs of 1.16 (95% CI: 1.14–1.18) (ordinary regression) or 1.14 (95% CI: 1.11–1.17 [adjusting for correlation within countries]). These ratios can be compared to our result of 1.05 (1.04–1.06) for Black versus White individuals in a model with no adjustment for co-morbidities. The higher rate ratios in the linear regression model, not subject to outcome misclassification assuming it is not differential between Black and White individuals (there are not data showing otherwise), suggest the misclassification is likely to have biased our results toward the null, as might be expected. Full results can be found in the supporting information.

4 | DISCUSSION

Our data suggest that the widespread belief, supported by a number of epidemiologic studies, that Black individuals have higher incidence of AD compared to those who are White, may be overly simplified. Instead, we found that Black individuals without co-morbidities that increase the risk of AD, have lower rates of AD than White individuals

TABLE 5 Race-specific hazard ratios for co-morbidities (separate models for each race) with interaction term between race and co-morbidity[a]

Co-morbidity	Hazard ratio Whites (95% CI)	Hazard ratio Blacks (95% CI)	*P*-value for interaction
Diabetes	1.05 (1.04, 1.05)	1.00 (0.98, 1.02)	<0.0001
Hypertension	1.14 (1.13, 1.15)	1.69 (1.61, 1.78)	<0.0001
Stroke	1.58 (1.57, 1.59	1.70 (1.67, 1.74)	<0.0001
Congestive heart failure	1.10 (1.09, 1.11)	1.12 (1.10, 1.15)	<0.0001
Ischemic heart disease	1.07 (1.06, 1.08)	1.10 (1.08, 1.13)	<0.0001
Depression	2.41 (2.40, 2.43)	2.22 (2.17, 2.27)	0.43
Chronic obstructive pulmonary did	1.03 (1.02, 1.04)	0.98 (0.96, 1.01)	0.03

[a]Adjusted for region ($n = 5$), calendar year, county-level smoking prevalence, mean BMI, and number of hospitals, and at ZIP-code level the log of population density, the log of mean household income, and percent with education under high-school. Stratified by sex, age at entry to cohort, Medicaid eligibility, and the presence of co-morbidities at any time while enrolled in Medicare. Hazard ratio from race-specific models, reference group for each a race are those of that race with no co-morbidities. Interaction terms comes from full model with both races combine.
Abbreviations: AD, Alzheimer's disease; BMI, body mass index; CI, confidence interval.

TABLE 6 The rate of AD by race and the presence of one or more co-morbidity

	Hazard ratio (95% CI)
Race (Black vs. White)	0.69 (0.64–0.74)
One or more co-morbidity vs. no co-morbidity	1.21 (1.290, 1.24)
Interaction between race and one + co-morbidity	1.52 (1.42, 1.64)

Abbreviations: AD, Alzheimer's disease; CI, confidence interval.

(HR = 0.69) with no co-morbidities. Adjusting for the number of co-morbidities, the HR for Black versus White individuals was 1.18. Black individuals with one or more co-morbidities had a still higher AD risk compared to White individuals with no co-morbidities (1.29).

Many studies comparing AD incidence and prevalence between Whites and Black individuals have controlled for the presence of some co-morbidities. Controlling for co-morbidities is often done via regression models, in which such control is equivalent to assessing the Black versus White AD rate within each stratum of co-morbidities, and then taking a weighted average across these strata to get an overall risk for Black versus White individuals. This assumes that the rate of AD for Black versus White individuals does not differ substantially by the presence or absence of co-morbidities. However, such a weighted average misses any effect modification by co-morbidities, that is, that the AD risk for Black versus White individuals may differ by the presence or absence of co-morbidities. This is indeed what we have found. The higher AD risk for Black versus White individuals is only apparent in our data among those who have co-morbidities.

In our Medicare analyses AD risk increases sharply with more co-morbidities, partially accounting for the increased AD risk for Black versus White individuals, as the former have more co-morbidities. One caveat to the increased risk of AD with more co-morbidities is that those with more co-morbidities (Black individuals) may be more likely to see a doctor more often, which may increase the opportunity to be diagnosed with AD. It is also possible that those with impaired cognitive function do not maintain their health well, resulting in an association between AD and more co-morbidities (i.e., reverse causality). On the other hand, other data dispute these hypotheses. Black individuals may be less likely to seek medical care until a clinical incident, which may lead to an emergency room (ER) admission where there would be less likely to be AD screening/detection). Arnett et al. report data from 1400 Black and White adults in low-income communities sharing the same health-care facilities, and found that Black individuals were 40% to 50% more likely than those who are White to use both ER visits and hospital outpatient visits versus primary care, and that part of this was due to increased distrust of medical care by those who are Black.[16] Dickman et al. report data from 400,000 Blacks and White individuals from 1963 to 2019 that found that in recent years (2014–2019) White individuals were three times more likely to use ambulatory care than those who are Black, even among those with health insurance; these authors also found that White individuals spent overall 30% to 40% more than those who are Black on health care.[17]

As noted, Black individuals in general have more co-morbidities than do those who are White, which may contribute to higher rates of AD for those who are Black. However, more importantly, there are two factors in particular that result in Black adults with co-morbidities having higher AD rates than White individuals with co-morbidities. First, the most common co-morbidity in our data by far is hypertension. Second, the estimated effect of hypertension on increasing AD rates is much higher in Black than in White individuals. Our data suggest this interaction between race and hypertension is the main reason Black individuals have higher rates than White adults, after adjusting for co-morbidities.

Hypertension is a known modifiable risk factor for AD,[7] and has been cited as a primary reason for increased AD incidence and prevalence among Black individuals.[18] Research suggests that blood pressure control, both via lifestyle and medication, is directly linked to lower AD neuropathology and higher cerebral blood flow.[19–22] While the exact mechanism linking AD and hypertension is unknown, the renin-angiotensin system (RAS) has been implicated in AD, and thus RAS-acting antihypertensives, (angiotensin converting enzyme

inhibitors [ACEIs], and angiotensin-II receptor blockers [ARBs]) may offer differential and additional protective benefits against AD, particularly in Black individuals.[23]

Our results are important because the Black population is expected to grow from 14% to 18% of the total population, while the non-Hispanic White population is expected to decrease from 62% to 44% by 2060.[24] Black individuals are also more likely to be hypertensive, leading to more AD risk. Thus, the rate of AD in the total population would be expected to increase due to these demographic changes. Thus, understanding the potentially beneficial effects of strict blood pressure control, and certain anti-hypertensive drugs (e.g., those acting on the RAS in the Black high-risk population) may be of great importance.[22,25] Brain health is not considered a part of published guidelines for hypertension management. The 2020 International Society of Hypertension Global Hypertension Practice Guidelines recommends first, lifestyle interventions followed by pharmacological therapy consisting of a combination calcium channel blocker plus a thiazide or a calcium channel blocker plus an ARB (a RAS-acting medication).[26] The Guidelines recommend RAS medication for all White hypertensive patients but only as one of two options for Black hypertensive patients, the choice being left to the discretion of the physician. To ensure compliance and blood pressure reduction, lifestyle interventions must be culturally appropriate and affordable. Moreover, the present pharmacological recommendations that do not include RAS-acting therapies should be reevaluated. Being at high risk for dementia, particularly AD, may warrant ARB plus a thiazide option for these individuals. A clinical trial investigating the potential off-label benefits of a RAS-acting medication on AD biomarkers in Black individuals recently completed and will shed light on this topic.[27]

Our study has several strengths. First, the large sample size gives us statistical power to detect effects, and the Medicare population we studied is likely to be largely representative of the US population >age 65, despite the fact that we only studied the Medicare FFS population who enrolled in both Part A and Part B programs, and excluded those insured via Medicare Advantage programs (HMOs).

Second, the use of Medicare claims data that include doctor's visits as well as hospitalizations, will include cases that are diagnosed earlier and hence better reflect incidence. Shi et al.[8] compared data from Medicare inpatient claims (i.e., hospitalizations alone) versus data from Medicare CCW database (i.e., using both hospitalizations as well as doctors' visits), and found that using just hospitalizations alone missed nearly 90% of dementia cases and 60% of AD cases, compared to using our data including doctor's visits. Third, we used a 5-year "clean" period during which subjects were required to be free of AD, and restricted analysis to subjects with continuous enrollment in Medicare throughout the study period. These restrictions make it more likely that cases were more likely to be newly diagnosed, and thus better approximates incidence. Finally, another strength is that we were able to control for a number of individual- and neighborhood-level covariates in our regression models.

Despite these advantages, some key limitations should be noted. One limitation, typical of using administrative records to identify disease, is potential misclassification of outcome. AD cases in our database represented only ≈40% of the dementia cases in the Medicare database we used, which is the same used by Shi et al.[8] This suggests important under-ascertainment of AD, given that AD typically represents approximately 60% to 80% of dementia cases.[4] The percentage of AD out of dementia in our database is quite similar to the findings of Goodman et al.,[28] who found that AD represented 44% of all dementia diagnoses in Medicare data in 2013, including both hospitalizations and doctor visits. It is likely that a large number of dementia cases in the Medicare database, who show no AD diagnosis, actually had AD, but physicians did not feel confident to make the more specific diagnosis. This is supported by the findings of Taylor et al.,[11] who compared Medicare data to clinical diagnoses considered the gold standard, and found that the sensitivity of dementia was 0.85 but was lower, 0.65, for AD.

To account for misclassification of AD, we have assumed that outcome misclassification is non-differential (independent of race, conditional on confounders); there are no data indicating otherwise. We have conducted a sensitivity analysis by regressing AD rates on race and co-morbidities via linear regression, which is not subject to a presumed bias to the null due to non-differential misclassification.[15] This analysis indeed suggested a bias to the null in estimating the effect of race in our Cox regression results, as expected. Hence, we think it likely that our estimates of the effect of race (and co-morbidities) are likely to be conservative.

In addition, our study is subject to unmeasured and residual confounding. While we were able to control for a number of potential confounders at the neighborhood level, we had no individual-level data on SES and education, a limitation implying some mismeasurement of confounders, which may have biased our results (moderately, given that these unmeasured confounders are not likely to act as very strong risk factors for AD), in an unknown direction.

Another limitation of the claims data is that we are unable to control for *APOE* status. However, *APOE* status does not appear to increase the risk of AD for Black individuals as much as for those who are White,[29] and may not be important in finding that Black adults have higher AD rates than White individuals, and this also is the conclusion, cited earlier, in the Alzheimer's Facts and Figure report for 2021. Finally, our analyses did not control for medications associated with co-morbidities, some of which, including antihypertensives and statins, have been shown to reduce AD risk in clinical and epidemiological studies.[30]

Overall, taking into account both strengths and limitations, we believe our study provides evidence that the AD rate for Black versus White individuals depends on the presence or absence of co-morbidities, particularly hypertension. Black adults have lower AD rates than White individuals among those with no co-morbidities, but higher rates among those with one or more co-morbidity prior to diagnosis.

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CONFLICTS OF INTEREST

No authors have a conflict of interest. Author disclosures are available in the supporting information.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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