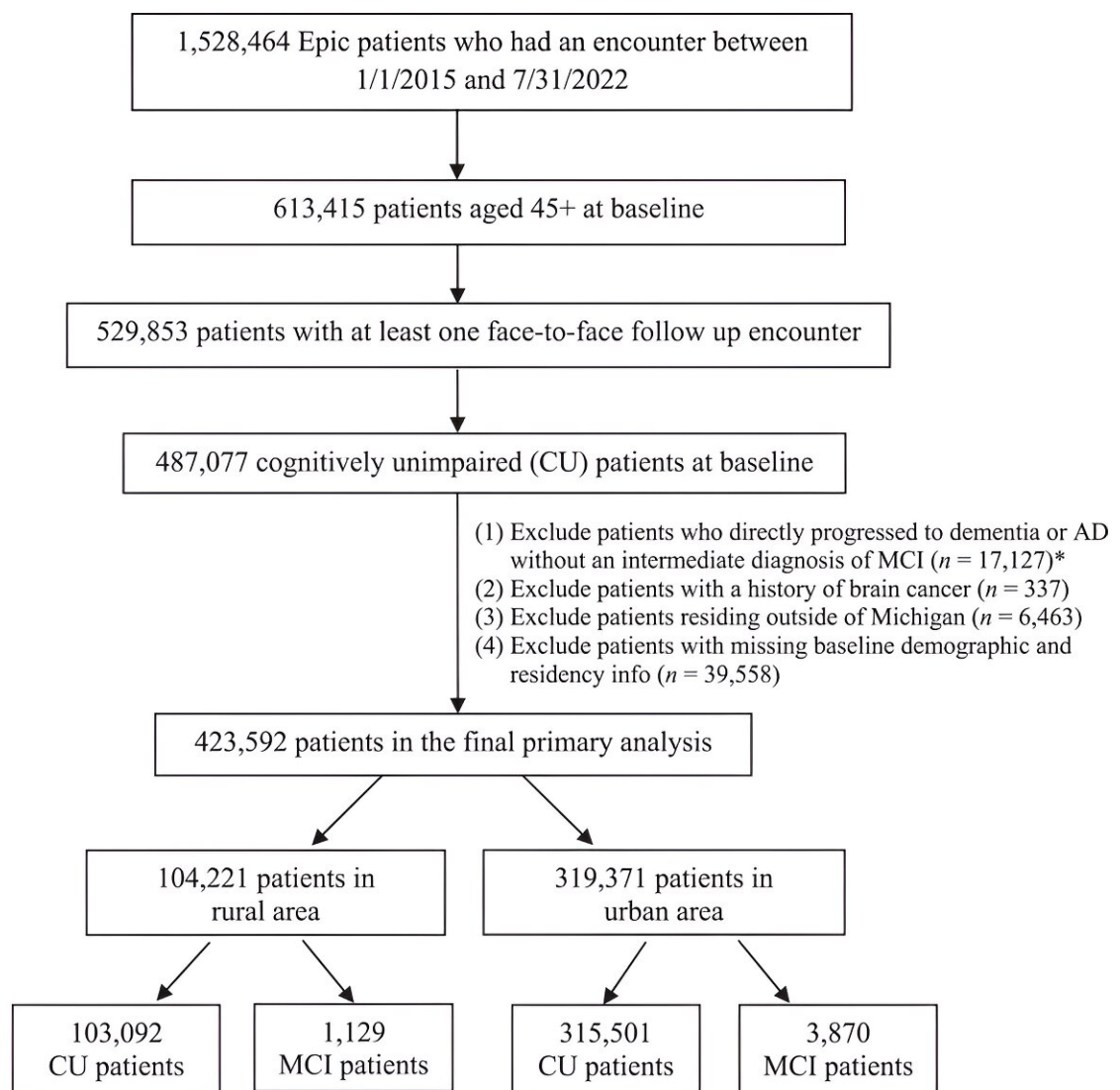# Mild cognitive impairment could be going unreported in rural areas of west Michigan, study suggests

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1,528,464 Epic patients who had an encounter between 1/1/2015 and 7/31/2022

613,415 patients aged 45+ at baseline

529,853 patients with at least one face-to-face follow up encounter

487,077 cognitively unimpaired (CU) patients at baseline

(1) Exclude patients who directly progressed to dementia or AD without an intermediate diagnosis of MCI ($n = 17,127$)*
(2) Exclude patients with a history of brain cancer ($n = 337$)
(3) Exclude patients residing outside of Michigan ($n = 6,463$)
(4) Exclude patients with missing baseline demographic and residency info ($n = 39,558$)

423,592 patients in the final primary analysis

104,221 patients in rural area

319,371 patients in urban area

103,092 CU patients

1,129 MCI patients

315,501 CU patients

3,870 MCI patients

*These patients are included in the sensitivity analysis.

Flowchart of the study in the primary analysis. Credit: *Alzheimer's & Dementia: Translational Research & Clinical Interventions* (2024). DOI: 10.1002/trc2.12495

Corewell Health and Michigan State University researchers are the first in the state to use de-identified electronic health records of more than 1.5 million patients to analyze incidence rates and risk factors of mild cognitive impairment, or MCI, in rural and urban areas in West Michigan.

Results showed that many cases could be going undetected among those living in rural communities in the area, and researchers will now use the findings to develop AI tools that can detect MCI earlier among patients across the country.

The retrospective study, which included 10 years of historical patient data, is now published in the journal *Alzheimer's & Dementia: Translational Research & Clinical Interventions* and is the first large-scale analysis representing most of the population of West Michigan, with some of its findings surprising study authors.

"While we had our suspicions about what we would find; we did not expect the potential rate of underdiagnosis of MCI in some of the rural areas in West Michigan to be so high," said Bin Chen, Ph.D., associate professor in the MSU College of Human Medicine and co-principal investigator of the study.

According to Chen, typically, individuals experience MCI before developing dementia. Yet, the study found that patients who progressed directly to dementia without a prior MCI diagnosis, also referred to in the study as MCI skippers, were three times more prevalent than those

identified with MCI initially.

"This tells us MCI may be going unreported with some patients," Chen said.

David Chesla, co-principal investigator and senior director of research data management at Corewell Health Research Institute in Grand Rapids, Michigan, agreed and said that this underreporting is what may be causing the MCI incidence rates to be so much lower.

"Our hypothesis from the beginning of this work was that we would have underreporting of cognitive impairment in communities across West Michigan; we just didn't know to what extent," Chesla said. "Our suspicion was initially derived from national data that reports a growing incidence rate of MCI within our aging U.S. population. Our patient data mirrors a subset of the national data; however, our patient MCI incidence rate in West Michigan is significantly lower than national averages."

National averages can range from 10% to 18% depending on race, age and timeframe in which the data was collected.

Chesla also indicated that the research team decided to dive deeper into the geographic distribution of patients, allowing them to separate whether patients had an urban or rural location, something he said has not been done before. Doing this provided further evidence that potential underreporting exists with the ratio of MCI skippers to diagnosed MCI cases being 4.3 times higher in rural areas compared to 2.8 times in urban areas.

While lack of access to care in these communities along with other reasons could be driving the higher rate of underreporting, Chesla said that a limitation of the study was having to use information from 10

years ago when electronic record systems were in their earlier stages.

"Today, electronic health records are integrated across most health systems; however, with our work going back in time, there could be fragmentation of records that may be driving the underreporting as well," Chesla said.

Additional findings showed that while risk factors for MCI were similar between the rural and urban populations, the urban areas exhibited a larger array of risks including being African American as well as having hearing loss, inflammatory bowel disease, obstructive sleep apnea and insomnia. Most common risk factors of MCI include diabetes, stroke, Parkinson's disease and older age.

According to the researchers, the massive amount of data now gives them the ability to leverage artificial intelligence, or AI, to build high-performance machine learning models that can identify higher-risk patients earlier across the state and potentially across the country. It has been shown that early diagnosis is key to potentially reversing or delaying the progression of cognitive impairment.

"The goal is to integrate this tool into health care systems everywhere so it can assist physicians in detecting and managing MCI patients more effectively," Chen said.

But for now, Chesla suggests that if individuals are experiencing symptoms such as hearing loss, mood swings or some of the other more common symptoms, they should not hesitate to reach out to their physician or a health care provider to help.

"We are in an era where there are care plans and rehabilitation services that can aid in slowing, if not reversing, cognitive impairment when caught early," Chesla said.

The study was co-led by Xiaodan Zhang, a data scientist at MSU College of Human Medicine, and Martin Witteveen-Lane, a data engineer at Corewell Health, and supported by the Corewell Health-MSU Alliance and the National Institutes of Health.

Provided by Corewell Health