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# **Reflective Essay**

## BACKGROUND

Hypertension runs deep in my family. Growing up, many of my relatives struggled with high blood pressure but rarely talked about their condition or sought help. Unfortunately, many long-term consequences of hypertension are still unknown. Later, as a student in Dr. Carey's Longevity course and a participant in the Advancing Diversity in Aging Research (ADAR) program at UC Davis, I developed a strong interest in the intersection of midlife hypertension and dementia. Dr. Carey's course introduced me to broader aging-related diseases and their impacts on society, while ADAR provided hands-on exposure to epidemiological datasets and methodologies used to assess cognitive decline. Midlife may be a crucial window for active anti-hypertensive treatment to reduce risk of cognitive decline and other late-life morbidities. Given my personal experiences and pertinent information gleaned from the classroom and laboratory, I was driven to pursue a term research paper for Longevity, investigating whether midlife hypertension contributes to dementia risk.

### METHODS

Because hypertension and dementia are incredibly broad subjects, with vast amounts of literature available, I had to find a way to filter studies efficiently. I began my search in Google Scholar with only specific key words, including "midlife," "hypertension/high blood pressure," and "cognition/dementia." I typically selected articles published in the past five to ten years, although exceptions were made for classic or foundational studies in the field. Instead of reading every paper in full, I screened abstracts, paying close attention to results and conclusions. Many peer-reviewed publications addressed hypertension and dementia broadly but lacked direct relevance to my research question. For example, I came across several studies examining hypertension in elderly populations, but they were excluded because my focus was specifically on midlife hypertension. Similarly, I narrowed my search to longitudinal studies that tracked participants over several decades. In contrast, cross-sectional studies only provided a snapshot in time and were less informative for understanding long-term cognitive outcomes. I also noted if studies accounted for different grades/stages of hypertension and dementia or used precise diagnostic criteria, as vague classifications made it difficult to compare findings across different studies.

To analyze increasing volumes of information, I used forward and backward citation tracking. If I identified a highly cited study, I examined its references (backward citation) to understand prior work that shaped its conclusions, then looked at newer studies citing it (forward citation), helping me identify the latest findings with more advanced research techniques. For instance, I used forward citation tracking on the Honolulu-Asia Aging Study (Launer et. al) to find more recent studies that cited this 2001 paper, and I

discovered how newer research adjusted for additional factors like antihypertensive therapy use and variability in blood pressure over a participant's lifetime. Overall, the forward-backward citation method helped me map shifting perspectives in my field of study over time. Additionally, to maximize the use of library resources, I previewed the literary contents of several databases licensed for the UCD library. The library database website contained a search engine that allowed me to filter out relevant databases through key words, subjects/fields of study, and types of sources (the most relevant for my project were Medical/Clinical Resources and Encyclopedia/Handbook). The databases I found most useful were APA Psych Tests, where I familiarized myself with commonly used cognitive assessments, and the Reference Collection in Biomedical Sciences, where I could peruse the Encyclopedia of Cardiovascular Research and Medicine for extra background on hypertension. Finally, I used Google Scholar's filtering tools to determine which articles were accessible through UC Davis, saving time by prioritizing sources I could immediately review.

# CHALLENGES

A major challenge was that studies varied in how they defined clinical terms, making it difficult to compare studies directly. Different studies used different systolic/diastolic blood pressure thresholds in their clinical definitions of hypertension. Likewise, dementia was defined through different cognitive examinations, medical records, and even post-mortem pathology, making cross-study comparisons challenging and potentially unreliable. I initially thought I needed a precise definition, but given variability across studies, I decided it was more effective and practical to keep my definitions broad rather than accounting for all conflicting criteria. This approach allowed me to focus on recognizable trends rather than getting bogged down in minor discrepancies.

To complicate matters, numerous confounding variables made it difficult to determine causation. At first, my literature review seemed to reveal a fairly consistent positive correlation between midlife hypertension and dementia. Many studies, including the classic Framingham Heart and Honolulu-Asia Aging Studies, suggested that elevated midlife blood pressure increased risk of late-life cognitive decline. I began my research expecting to find a clear cause-and-effect link, but after digging deeper, I realized many confounding variables complicated this relationship, including age, genetic predisposition (e.g APOE genotype), and a range of comorbidities that independently increase risk of neurodegeneration. Many studies I reviewed did not properly control for these factors, and at one point, I felt my research question was impossible to answer. I struggled to see how I could write a meaningful paper without oversimplifying the science.

### LATER APPROACHES AND NOVEL METHODS

Rather than forcing a conclusion that wasn't supported by the data, I decided to shift my approach. Instead of trying to prove a direct causal link, I reframed my argument: the relationship between midlife hypertension and dementia is inherently complex, and determining causality is nearly impossible with current methodologies. My new thesis led

me to explore Recursive Partitioning Analysis (RPA) as a potential tool for untangling interactions between confounding variables. Although I didn't conduct my own statistical analysis, researching RPA helped me understand how epidemiologists attempt to control for confounding factors in large datasets.

In changing my thesis, my literature review became a step-by-step process. First, I scanned the abstract to determine the study's relevance. If it aligned with my research focus, I examined the methodology to see if as many potential variables as reasonable were accounted for, strengthening the validity of my meta-analysis. I was skeptical of any article that jumped straight to a hard association or conclusion. For extra caution, I focused less on a journal's impact factor and more on author credentials, funding sources (I looked for well-established public or private organizations like NIH, NSF, or AHA), and if findings met currently accepted statistical standards, such as sufficient sample size for statistical power and/or correction methods to reduce Type 1 Error risk (e.g Bonferroni correction).

While my primary sources were peer-reviewed journals, I later sought expert opinion pieces and editorials to understand ongoing debates in the field. Though I did not formally cite some of these pieces, they revealed different perspectives on whether the midlife hypertension-dementia association is driven by shared risk factors. For example, a new perspective in *The Lancet Neurology* questioned the hypertension-dementia link, emphasizing the importance of broader cardiovascular health and that hypertension may be a marker of other underlying pathologies, rather than a direct cause. Commentaries in *Alzheimer's & Dementia* challenged the prevailing idea that treating hypertension reduces dementia risk.

To have a better understanding, I incorporated other non-conventional sources into my research. Watching *Still Alice*, a film about a Columbia University linguistics professor diagnosed with Alzheimer's, demonstrated the daily challenges of living with dementia: not just memory and communication difficulties, but the emotional and psychological toll on both the individual and her family. I also conducted interviews with clinicians, including a neuroradiologist, geriatrician, and my uncle, who is a primary care physician managing chronic conditions like hypertension and diabetes. These conversations helped me understand the healthcare barriers to effective anti-hypertensive treatment and how they disproportionately affect dementia outcomes. Finally, consulting my epidemiology research mentors in ADAR helped me understand study design and limitations in largescale health research.

#### MAIN TAKEAWAY

My initial research approach was fairly straightforward: to find studies on the correlation between midlife hypertension and dementia, compile citations, and build an argument for any statistical association. However, as I encountered conflicting evidence, I had to shift gears and seek a wider range of perspectives. Ultimately, my biggest takeaway is that uncertainty is not a weakness in research but drives new discoveries forward.

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No AI tools/technologies were used in the writing of this essay.