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Reflective Essay - Lang Prize

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I have found epigenetic aging clocks fascinating since a research project in high school, but the term paper for Longevity class and the resources made available to me through the UC Davis library system have allowed me to return to the topic in more detail and depth. Epigenetic aging clocks are essentially statistical predictors of morbidities and mortality that base their estimates on the methylation status of hundreds to tens of thousands of different sites in the genome, and some cursory research suggested that in recent years, these clocks had also begun to show incredible potential as screening tools for chronic diseases and as biodemographic indicators. Thus, I decided to focus on epigenetic aging clocks as my topic in the review paper, including argumentative sections in favor of these novel uses, and began the process of research in earnest.

I chose to use Scopus to obtain the sources for the majority of my research, through the UC Davis Libraries access program, and also relied on Google Scholar for some of the sources cited. I began by looking at articles published in major journals like *Nature* and *Life*, and located the original creators of these epigenetic aging clocks through their citations, Steven Horvath and Sven Bocklandt. These original papers and some of the subsequent ones written by Horvath are cited by most papers that involve the key phrase 'epigenetic aging clock', but they also are referenced by more disparate, yet plausibly relevant articles. Thus, by investigating recent papers that either had that key phrase or referenced some of the foundational works involved in the field of DNAm aging clocks, I was able to develop a fairly complete view of emerging research in the field. I also referenced prior review articles covering epigenetic aging clocks,

making note of the works they found relevant and investigating them myself, to determine if they would be worthwhile sources for my paper.

In general, when approaching a new source, I typically first reviewed the abstract, introductions, and conclusions or discussion sections of articles when determining if they were relevant to my review, only using sources I believed were directly relevant to the history of epigenetic aging clocks (for the background section of the review article), major current use cases, or novel use cases with a good deal of potential. This unfortunately meant leaving out many early papers that were quite interesting, but not particularly significant to the development of DNAm aging clocks as a whole. There were some articles that I was unable to gain access to via Scopus, but Google Scholar provided a list of other sites they could be found at, and my Davis library access was always enough to access at least one of the hosting services for relevant papers. The NIH (National Institutes of Health) Library of Medicine was useful as well, through its PubMed program. There were also some papers on Google Scholar that I felt were likely not good candidates for investigation or reference, thanks to their being published in journals of dubious quality or simply being published in a raw, unedited state indicating they had not undergone sufficient review. Thankfully, Scopus only indexes peer-reviewed literature, and it provides an inbuilt check on author reliability with its h-indices, so I was able to do most of my research without encountering many issues on that front.

Once I determined that a source was potentially useful, I added it to my Zotero folder for promising references for this paper, and returned to it later to read the full text of the article and try to fully understand the methodology used, in the case of primary research, or simply to reference, in the case of review articles. Zotero really is a wonderful tool for organizing references and citations, and I have to thank Professor Carey for introducing it to me – it has

made compiling a bibliography something I no longer have to dread when it comes to academic writing. The ability to sort sources and citations from any website or book with just a little bit of browser setup and installation is extremely helpful, and I believe that information about this resource should be made easily available to students in lower division classes as well.

My paper went through several rounds of drafts and revisions, starting off as a general skeleton and then, midway through the writing process, ballooning to be somewhat wider in scope than I wanted. Its original working title was “Epigenetic Aging Clocks: Past, Present, and Future”, but that was excessively wordy and the format didn’t really focus on the facets of DNAm aging clocks that I thought were most relevant or interesting. Professor Carey suggested reworking much of the second half of the paper, and a natural extension of that was the subtitle’s change to become the shorter and more relevant “Measuring Mortality”. After I reduced the scope of the paper somewhat, and cut down the “Future” section to only focus on the topics I was most enthusiastic about and had the best quality sources for, I was left with a paper that I could be more confident in.

My final draft argues in favor of increased usage of many of the newly derived epigenetic aging clocks for nonhuman species to aid in biodemographical research, since they are significantly underutilized in most vertebrate animals, with exceptions for primates and mice. I was able to determine this by searching for papers that involved both aging clocks and various vertebrates that are important for biodemography, like zebrafish and naked mole rats. It is only in the past three years that many of these nonhuman clocks have been created, and I hope that their use will lead to new understanding of the underlying processes behind aging. I also argued in favor of the use of the same technology behind epigenetic aging clocks as screening tools for chronic diseases like type 1 diabetes, or even for early detection of pollutant exposures, which I

was able to ascertain are current avenues of development for this technology through visiting lab websites and the discussions and conclusions of various articles.

In conclusion, the library resources here at Davis have been key in enabling my access to the primary research and review articles necessary in writing my paper, through Scopus and various journals. They have made it possible for me to learn much more about DNAm aging clocks, and, along with utilizing Zotero to help deal with having so many sources, made the process of research less daunting and more approachable. Identifying trustworthy sources, compiling a bibliography, and synthesizing the information I learned into one complete essay was a difficult task, but I think the final product is something I can be proud of and share with others. Through the Davis library system and the information gathering skills I've learned, I fully intend to keep up to date with future developments in DNAm-based aging clocks and screening tools well into the future, and I'm very happy to have gained a continuing research interest and a good deal of writing skills from taking HDE 117 and learning from Professor Carey.