Y22   The Effect of Demographic Factors and Mortality-Related Health Conditions on Postmortem Biometric Data

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Learning Overview: After attending this presentation, attendees will understand the influence of demographic and health-related variables on the deterioration of fingerprints, which are commonly used as a biometric indicator.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by clarifying the effect of sex, age, and various antemortem health conditions on the quality of postmortem biometric data that are commonly relied upon to obtain positive identifications for previously unknown individuals.

Biometrics are measurable unique physiological or behavioral characteristics that are used to classify both living and deceased individuals. Previous research has indicated that fingerprints are comparatively the most successful biometric indicator for positive identification, generally due to the longevity of postmortem fingerprint capture. Therefore, in this study, fingerprints were used as the primary indicator to examine biometric degradation and quality data acquisition. For the purposes of this study, *quality data* refers to a threshold met by a ratio of numerical scores provided by two types of biometric scanning technologies. Fingerprint quality was determined by the National Institute for Scientific Standards (NIST) Fingerprint Image Quality (FIQ) v.2.0 algorithm where prints are scored on a 1-5 scale, with 1-3 denoting adequate to excellent prints and 4-5 denoting poor quality prints. As the purpose of the scanning technologies is to provide a match (i.e., positive identification) based on biometric indicators, the scores predict the likelihood that the fingerprint image meets the quality threshold to achieve a positive match. Along with researcher experience, these numerical scores are considered when determining enrollment for longitudinal postmortem studies at the University of Tennessee's Anthropology Research Facility. Biometric scanning technologies were used to capture digital images of all ten digits, where applicable, of 150 donated individuals upon their initial intake into the William M. Bass Body Donation program between April 2014 and July 2018. If 50% or more of the digits were at or above adequate quality (i.e., NFIQ score between 1-3), the individual was then accepted for longitudinal biometric research. Though 150 individuals, between the ages 18 and 94, have been scanned from the beginning of this study, less than 50% met the quality threshold for longitudinal data collection. Therefore, this study examines the correlation between certain demographic variables (e.g., sex and age), mortality-inducing health conditions (e.g., cancers, diabetes, heart disease, pulmonary disease), and other significant conditions (e.g., smoking and alcoholism) with the quality of biometric data during the postmortem period. For each of the 150 individuals in this study, data were collected from the Forensic Anthropology Center's donation database on the following variables: sex, age-at-death, Cause Of Death (COD), and self-reported medical history. The goal of this study was to examine the impact of these variables to overall fingerprint quality.

The preliminary results of this study show that while biometrics do remain viable over time, age was the most significant factor affecting the retention of identifying features of the fingerprints. Among individuals aged 70 years and older (n=75), 66% (n=50) were rejected for longitudinal enrollment. Similarly, 64% (n=7) of individuals 60 years and less (n=11) scanned met or exceeded the quality threshold and, therefore, were eligible for further data collection. However, proportions of individuals between 60 and 70 years of age are relatively equally distributed between enrolled and not enrolled categories. Explanations for such results warrant further analysis. There were no substantial differences when sex of individuals and fingerprint quality were examined (enrolled/not enrolled females: n=33/32; enrolled/not enrolled males: n=39/46). Furthermore, this study has yet to show any apparent trends in the relationship between health-related conditions and fingerprint quality; however, analyses are ongoing. This study builds upon previous work and continues to support the utility of physiological biometric identifiers to obtain positive identifications in postmortem contexts. Postmortem biometric research has the potential to make important contributions to forensic anthropology and the law enforcement, military, and medicolegal communities.

Biometrics, Demographics, Mortality