



B163 The Eyes Have It: Helping Identify Human Remains Using the Strength of Match Between Prescription Eyewear and Medical Records

Gregory E. Berg, MA, Joint POW/MIA Accounting Command, 310 Worcester Avenue, Hickam AFB, HI 96853; and Randall S. Collins, OD, Wilford Hall Medical Center, 2131 Pepperell Street, Suite 1, Lackland AFB, TX 78236*

After attending this presentation, attendees will be exposed to a new method of individuation based on the strength of match between spectacle (glass) prescriptions and medical records, and will be able to use a new web-based tool for these comparisons.

This presentation will impact the forensic community and/or humanity by providing investigators an additional tool that can increase the accuracy of identification of unknown individuals based on eyewear prescription data.

The identification of human remains is a primary focus of forensic specialists. In many instances, the results from medicolegal examination, odontology, anthropology, and nuclear or mitochondrial DNA analysis can identify unknown individuals. Alternate lines of non-biological evidence, such as identification cards, clothing, and shoe wear are often used as corroborating evidence. Using spectacle prescription data is not a new idea to law enforcement and forensic specialists, but opticians and doctors are usually constrained to a simple “match” or “no match” conclusion with the prescriptions listed in medical records. The web-based tool introduced in this paper will let doctors, analysts, and investigators easily determine the strength of individuation by calculating the frequency at which the observed prescription occurs in various U.S. populations.

The available databases draw from both military and civilian sectors of the U.S. population and currently contain more than 1.2 million individual eye prescriptions. An additional dataset contains approximately 4000 individuals with self-reported biological data (sex, age, and ethnicity). While the bulk of the prescription data is linked with individuals of military service, civilians from the Department of Defense and dependants of military service members are also included. Additional information available in the largest database includes rank or grade, job type, and type of glasses. General population information is available for the smaller database, which contains approximately 65% males and 35% females. Reported ages cluster around the late-teens to mid twenties, though every age is represented from 4 to 95 years. Self-reported ethnicity is largely White, ~60%, with other major ethnicities present (Black ~15%, Hispanic ~15%, Asian 4%, Native American ~3%, Pacific Islander ~1%, mixed ~1%).

The web-based tool introduced here allows the user to search for matching prescription information within each database. The databases can be queried for any combination of the corrective states including sphere, cylinder, cylinder axis and bifocal powers for each eye. The sphere and cylinder corrective powers are typically measured in increments of .25 diopters, while the axis correction is on a 180 degree scale. These variables have a respective minimum of 80, 72, and 180 possible conditions, giving a total of 1,036,800 possible combinations per eye, or 1×10^{12} combinations for both eyes (exclusive of bifocal corrections). As with many other types of biological data, some corrections are more common than others; common single eye corrections (using sphere and cylinder corrections only) may occur in about 12 per 1000 individuals though common dual eye corrections drop to approximately 2 per 1000. If the axis correction is added to the query, the frequency can drop to 1 per 10,000 or greater.

As eyewear is typically directly related to the genetic make-up of an individual (trauma and surgery are the major exceptions), prescription data is highly individualized. Further, the frequency of a given prescription can be combined with frequency data for other independent biological information such as dental or mtDNA data, to provide extremely strong statistical estimates of the likelihood of individual identification. The presentation will demonstrate these applications through several cases, particularly those dealing with the identification of fallen U.S. service personnel, as conducted by the Joint POW/MIA Accounting Command in Hawaii.

Personal Identification, Spectacle Prescriptions, Refractive Errors