Title: Detecting changes in pupil response to light associated with cannabis consumption

Authors: Suneeta Godbole[1]*, Andrew Leroux[1], Ashley Brooks-Russell[2], Prem S. Subramanian[3,4], Michael J. Kosnett[5,6], and Julia Wrobel[1]

Affiliations:

[1]Department of Biostatistics and Informatics, Colorado School of Public Health, University of Colorado Anschutz Medical Campus, Aurora, Colorado

[2]Injury and Violence Prevention Center, Colorado School of Public Health, University of Colorado Anschutz Medical Campus, Aurora, Colorado

[3]Departments of Ophthalmology, Neurology, and Neurosurgery, Sue Anschutz-Rodgers Eye Center, CU School of Medicine, University of Colorado Anschutz Medical Campus, Aurora, Colorado

[4]Department of Surgery, Uniformed Services University of the Health Sciences, Bethesda, Maryland [5]Department of Medicine, CU School of Medicine, University of Colorado Anschutz Medical Campus, Aurora, Colorado

[6]Department of Environmental and Occupational Health, Colorado School of Public Health, University of Colorado Anschutz Medical Campus, Aurora, Colorado

***Email**: suneeta.godbole@cuanschutz.edu

Address: Department of Biostatistics & Informatics
Colorado School of Public Health
Fitzsimons Building, 4th Floor
13001 E. 17th Place
Mail Stop B119
Aurora, CO 80045

Phone: 760-889-9814

Abstract: The rate of cannabis consumption has increased with the legalization of cannabis for recreational and medical use. The implications of cannabis legalization on traffic and occupational safety are understudied, and there is a need for objective and validated measures of acute cannabis impairment that may be applied in public safety and occupational settings. Identifying a reliable, objective biomarker of recent cannabis use has proven challenging, but pupillary response to light may offer an avenue for detection that outperforms typical sobriety tests and blood THC concentrations. We use tools from functional data analysis (FDA) to model the impact of recent cannabis consumption on trajectories of pupillary light in participants. The FDA models significant differences in pupil responses after cannabis use, and better predict recent cannabis use (AUC = 0.71) when compared to traditional methods (AUC=0.66). These analyses show the promise of pairing pupil light response and FDA methods to determine recent cannabis use potentially leading to better roadway and occupational safety.