

Information Collection Request for  
“Anthropometric Information on Law Enforcement Officers”

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**Part B: Collection of Information Employing Statistical Methods**

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## List of Attachments

**Attachment A – Applicable Laws and Regulations**

**Attachment B – 60 Day Federal Register Notice**

**Attachment C – HSRB Approval Letter**

**Attachment D- Email Confirmation of Participation**

**Attachment E- Biographical Information**

**Attachment F- Informed Consent**

**Attachment G- Data sheet**

**Attachment H1- Assessment of Challenges in Vehicle and with Body Armor (Word)**

**Attachment H2 – Assessment of Challenges in Vehicle and with Body Armor (example screen shots)**

**Attachment I- Two-dimensional Hand Scan and Three-dimensional Body Scans**

## 1. Respondent Universe and Sampling Methods

**RESPONDENT UNIVERSE:** The study will collect traditional anthropometry and three-dimensional body-size data from current law enforcement officers (LEOs) employed by police departments, sheriff’s departments or similar public safety organizations throughout the continental United States.

The target number of completed anthropometric assessments is 1,000. We anticipate collecting information from 1,005 respondents in order to reach the target. Table 1 summarizes the proposed number of participants across four regions in the U.S., taking into account the geographic density of population distributions calculated from U.S. Census 2010.

	White, Non-Hispanic (N= 714)						Black, Non-Hispanic (N= 117)		Hispanic and All Other Races (N= 169)		Total
	Male			Female			Male	Female	Male	Female	
	18-34	35-44	≥ 45	18-34	35-44	≥ 45					
Pacific West	37	34	35	15	15	15	7	3	51	21	233
North Central	45	44	43	19	18	19	15	7	15	7	232
North East	40	39	38	17	17	17	22	9	25	11	235
South	50	48	47	21	21	20	38	16	27	12	300
Total	500			214			82	35	118	51	1000

Table 1 Proposed number of participants, by racial/ethnic group, sex, region, and age

**SAMPLING METHODS:** We will collect information from a geographically diverse group of respondents with characteristics that approximate the distribution of LEOs by race/ethnicity, gender, and age group. An adequate sample will produce data on most critical body sizes and shapes of LEOs for personal protective equipment (PPE) and vehicle design purposes. There were 817,000 LEOs in 2010 in the U.S. with a distribution of 13.3% females and 86.7% males (U.S. Census Bureau, 2012). Of the LEO occupation, 71.4% was White, 11.7% Black, and 16.9% Hispanic and other races. They were about evenly distributed among three age groups: 18-34, 35-44, and ≥45. This study will use a stratified sampling plan (gender × race/ethnicity × age combinations) to collect anthropometric data in the U.S. Since “Black” and “Hispanic and others” groups are relatively few in number, it is impractical to divide them into different age groups. A total of 10 cells (2 gender × 3 age groups for White and 2 gender groups for Black and Hispanic/Other each) will be arranged for the study to represent and compare anthropometric differences among U.S. LEOs. The needed within-cell sample

size was calculated using the following equation:  $|\bar{X} - \mu| = \frac{\delta * \sigma}{\sqrt{n}}$  ,

where  $|\bar{X} - \mu|$  is within-cell accuracy,  $\bar{X}$  is the sample mean of the subgroup,  $\mu$  is the true mean of the subgroup,  $n$  is the sample size,  $\sigma$  is the standard deviation of the subgroup, and  $\delta$  is the eccentricity (1.96 for 5% two-sided probability). Stature is the most commonly used dimension in anthropometric studies for workplace and equipment design applications. Based on the standard deviation of stature (67 mm for men and 60 mm for women) from the best available service-occupation database (Hsiao et al., 2014) and the desired cell accuracy of 14 mm for this study, the estimated sample size is 88 for males and 71 for females. Namely, at a 95% confidence level the sample sizes of 88 and 71 would have sufficient power for the sample mean to be within 14 mm of the true mean of the subgroup. Thus, 100 participants per cell for a total of 1000 participants would be adequate. While 13.3% of current LEOs are female, this study will recruit 300 female LEOs in that 133 females may provide insufficient variation in the non-White ethnic groups.

## 2. Procedures for the Collection of Information

NIOSH has established a deployment team for this information collection. A contractor has identified tentative information collection sites and another contractor will aid in the recruiting and scheduling of respondents. Collection sites could initially include Laurel, MD; Glynco, GA; St. Paul, MN, Orlando, FL; Fort Worth, TX; Los Angeles, CA; and Seattle, WA. NIOSH has Memorandums of Understanding (MOU) with other members of the deployment team including, National Sheriffs Association (NSA), Federal Law Enforcement Officers Association (FLEOA), Fraternal Order of Police (FOP), and International Association of Chiefs of Police (IACP). Through the MOUs, these stakeholders have agreed to recruiting efforts through their national level membership newsletters, meetings and conferences.

Respondents will be notified of their eligibility and time/date for data collection using the Email Confirmation of Participation (Attachment D). When a participant arrives at the measuring site (a mobile lab housed in a trailer), the investigator will describe the study and how the data collection (physical measurements) will be taken. If he/she agrees to participate, the participant will read and sign an Informed Consent form (Attachment F) and complete a Biographical Data form (Attachment E). They will change clothes in a changing room—shorts for males and sports bras and shorts for females. All clothing will be provided by the study contractor and will be cleaned after each use. After clothes are changed, the participant will be asked to assume two postures: standing with heels apart and arm-forward sitting. The standing posture requires that the participant stand erect with heels 30 cm apart and hands resting 30 degrees away from trunk at each side. He/she will be told to look straight ahead and stand with the weight equally distributed on both feet. The sitting posture requires that the participant sit erect on a specially designed bench with the head facing forward. The shoulders and upper arms are relaxed, and the forearms and hands are extended forward and upward for 45 degrees with the palms facing each other. The thighs are 15-degree slope toward the front and the knees are flexed 90 degrees to the seat with the feet supported (refer as T-pose sitting hereafter). The investigator will locate a number of landmarks by palpating the bones and mark them with an

eyeliner pencil. The pencil marks can be washed off. A fresh eyeliner pencil will be used for each participant.

After the marks are properly placed on the participant's body, traditional anthropometry will be collected on the participant. For this part of the measurements, the participant will first assume a standing posture and then a sitting posture as described previously. Up to 45 dimensions will be taken on each participant using traditional anthropometric devices and data will be recorded on a Data Sheet (Attachment G). All anthropometric devices and the bench/seat will be cleaned between participants by using a disinfectant spray and wiping cloth. Participants will use a tablet computer to complete Assessment of Challenges in Vehicle and with Body Armor (Attachment H) - an assessment on challenges LEOs encounter with LEO vehicle cab space and operation, seat belt use, and armor use during the course of traditional body measurement. ***A female investigator will locate the landmarks and take measurements on female participants.***

Participants will next participate in the scanning part of the study where they will receive two whole-body scans, one head scan, one hand scan (right hand), and one foot scan (right foot). For this part of the study, an investigator will locate the landmarks on the participant's body (except those on the face) and place white dots on the landmarks for all participants. After all landmarks have been properly placed on the participant's body, he/she will be asked to step up to the whole-body scanner where they will be scanned in two postures—standing and T-pose sitting. Then, the investigator will locate and place white dots on the landmarks on their face. After this preparation, they will be asked to sit on a chair on the head scanner platform to receive one head scan. The whole-body and head scanning will take 17 seconds each to complete one scan. They will then be asked to place their right hand on a flatbed scanner (similar to a small copy machine) with the palm facing the scanner for a 2-dimensional hand scan. Next, they will place their right foot on a 3-dimensional foot scanner for a scan. The hand and foot scanning will take 5 seconds each to complete one scan. This part of data collection is described in Two-dimensional Hand Scan and Three-dimensional Body Scans (Attachment I).

After they are done with the scanning, the participants will change into their LEO uniform with the gear they use in daily work. Sixteen dimensions (with gear) will then be taken on each participant using traditional anthropometric devices. These with-gear traditional measurements are recorded on a Data Sheet (Attachment G). Finally, they will change back into street clothes.

### **3. Methods to Maximize Response Rates and Deal with Nonresponse**

NIOSH is employing a variety of strategies to encourage the participation of LEOs. First, the project is led by a contractor with 40 years of experience in data collection logistics and a NIOSH project specialist with 25 years of experience in recruiting. Respondents will be scheduled with the aid of these parties.

Second, recruitment will be facilitated through key partner organizations including the National Sheriffs Association (NSA), the Federal Law Enforcement Officers Association (FLEOA), the Fraternal Order of Police (FOP), and the International Association of Chiefs of Police (IACP).

Third, participating LEOs will have the option of scheduling their exams either during or outside of duty hours. LEOs who participate outside of duty hours will receive a token of appreciation.

Finally, each participant will receive an Email Confirmation of Participation (Attachment D). In the event an appointment is cancelled, another respondent will be substituted into that time slot. It is estimated that 5 participants may not complete the data collection due to emergency assignments and they will be replaced with substitutes. The confirmation plan and substitution plan will help ensure that data collection and analysis are conducted according to the original study design.

#### **4. Tests of Procedures or Methods to be Undertaken**

The data collection (physical body measurements) uses standard engineering anthropometry procedures which are well documented in the scientific literature. Equipment accuracy also has been evaluated based on a well-established calibration procedure.

#### **5. Individuals Consulted on Statistical Aspects and Individuals Collecting and/or Analyzing Data**

Individuals Consulted on Statistical Aspects:

- Dr. Hongwei Hsiao, NIOSH, Email: [HHsiao@cdc.gov](mailto:HHsiao@cdc.gov), Phone (304) 285-5910
- Ms. Ying Kau, University of Michigan (Statistician), Email: [kauy@med.umich.edu](mailto:kauy@med.umich.edu), Phone (734) 546-8876

Individuals Collecting and/or Analyzing Data:

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