

FACT SHEET • JANUARY 2007

# ASSESSMENT OF THE NIOSH HEAD-AND-FACE ANTHROPOMETRIC SURVEY OF U.S. RESPIRATOR USERS

Respirators are used by millions of Americans in their workplaces to protect from exposures to such respiratory hazards as toxic vapors and gases, harmful particulate matter, and airborne pathogens. There is a wide range of respirator types and sizes—for example, some devices filter the ambient air, while others employ a separate air supply, and some cover just the nose and mouth while others include the whole head. Regardless of the type of respirator, one will only protect its user only if it fits properly—it must mold to the user's face so that no air from outside can leak in, even when the user is moving or speaking.

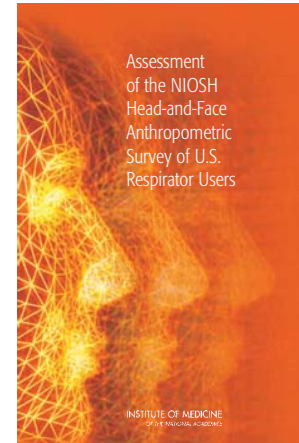
It is the responsibility of the National Institute for Occupational Safety and Health (NIOSH) to certify that respirators from manufacturers meet certain minimum performance levels. NIOSH performs this task with the help of fit-test panels, each of them a group of about 25 people who have been chosen because, collectively, their facial dimensions are assumed to be representative of the respirator-wearing workforce as a whole. However, these fit-test panels were developed in 1972 by researchers at Los Alamos National Laboratory (LANL) based upon anthropometric data available from a U.S. Air Force Study. Fit-test studies based on physical characteristics of Air Force personnel from the early 1970s are unlikely to accurately represent the broad U.S. workforce today.

To address this problem, in 2001 NIOSH contracted with Anthrotech, Inc. to collect new anthropometric data that would be representative of today's respirator-wearing workforce and to use those data to design new fit-test panels. After Anthrotech had accomplished that task, NIOSH contracted with the Institute of Medicine (IOM) to establish an ad hoc committee to review the NIOSH-sponsored Anthrotech study.

## REVIEW OF THE NIOSH-SPONSORED ANTHROTECH REPORT

The IOM committee reviewed the NIOSH-sponsored Anthrotech report, "Assessment of the NIOSH Head-and-Face Anthropometric Survey of U.S. Respirator Users." The committee examined the adequacy and validity of the NIOSH study, the data collected, and the recommended revisions to the set of facial characteristics that are to be used in testing the fit of respirators.

This review examined both the content and the form of the study, the appropriateness of its sample and its sample methodology, and the adequacy of the resultant data. Issues that were addressed included whether the revised panel of facial characteristics is representative of the diverse U.S. workforce and the adequacy of the anthropometric features and parameters considered in the revised panel.



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Three overarching themes of the committee’s findings and recommendations are the following:

- 1) The results of the NIOSH-sponsored Anthrotech study represent a clear improvement over the anthropometric data and corresponding LANL fit-test face panels that have been used since the 1970s;
- 2) Nonetheless, the NIOSH-sponsored Anthrotech study has a number of weaknesses that limit its effectiveness and reliability; and, therefore,
- 3) There are certain steps that should be taken to address the weaknesses, in order to move toward more effective testing and certification of respirators in the future.

### SUMMARY OF RECOMMENDATIONS

#### ANTHROPOMETRIC MEASUREMENTS

- Analyze measurement error (Recommendation 2-1)
- Consider utilizing three-dimensional scan data (Recommendation 2-2)

#### THE NIOSH-SPONSORED ANTHROTECH STUDY’S SAMPLING STRATEGY

- Define target populations more precisely (Recommendation 3-1)

#### DATA ANALYSIS AND FIT TEST PANELS

- Ensure appropriate representation of demographics groups (Recommendation 4-1)
- Include large and small faces in panel (Recommendation 4-2)
- Perform studies to compare the proposed face panel to the LANL face panel (Recommendation 4-3)
- Analyze an appropriate proportion of the respirator-using population that can be fitted to respirators (Recommendation 4-4)
- Determine key features related to fit using quantitative fit measures (Recommendation 4-5)
- Perform facial dimension analyses for half-facepiece respirators (Recommendation 4-6)
- Utilize multiple features in the development of face panels (Recommendation 4-7)

#### FUTURE DIRECTIONS: ADDITIONAL ANALYSES AND RESEARCH TO PRACTICE

- Update the panel more often, using a scientifically valid design (Recommendation 5-1)
- Replace isoamyl acetate with quantitative measures (Recommendation 5-2)
- Utilize the revised anthropometric face panel for filtering facepiece respirators (Recommendation 5-3)
- Modify certification requirements (Recommendation 5-4)
- Develop improved descriptions of face mask sizes (Recommendation 5-5)

#### COMMITTEE ON ASSESSMENT OF THE NIOSH HEAD-AND-FACE ANTHROPOMETRIC SURVEY OF U.S. RESPIRATOR USERS

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