

Title: A newly developed Bivariate Panel for designing and testing respirators for Black South African respirator users

Jeanneth Manganyi^{1,2}, David Rees², Lisa M Brosseau³, Kerry Wilson^{1,2}

1 National Institute for Occupational Health, a division of the National Health Laboratory Service, Johannesburg, South Africa

2 School of Public Health, University of Witwatersrand, Johannesburg, South Africa

3 University of Minnesota, Center for Infectious Disease Research and Policy, United States of America

Correspondence: JeannethM@nioh.ac.za

Abstract:

Introduction

Filtering facepiece respirators (FFRs) manufactured in South Africa and elsewhere are supplied to South African respirator users but are commonly tested against international respirator fit test panels (RFTPs) such as those published by the US National Institute for Occupational Safety and Health (NIOSH) and the Chinese population, the Chinese RFTP. These RFTPs are based on facial measurements of their respective populations, not South Africans. This study evaluated the applicability of these panels to Black South Africans.

Methods

Thirteen head and facial dimensions were collected using traditional anthropometric tools. Black South African bivariate data (face width and face length) was overlaid on the NIOSH and Chinese bivariate fit test panels to determine the applicability by checking distribution within the panel and individual cells.

Results and Discussion

The study found statistically significant differences between the facial dimensions of Black South Africans and those of the Chinese population. Most facial dimensions for Black South Africans also differed significantly from the American NIOSH population. Panels developed for the NIOSH and Chinese populations did not adequately represent Black South Africans, necessitating the development of a new bivariate panel representative of Black South Africans.

Conclusion

It may be concluded that the 2007 NIOSH and 2009 Chinese panels do not adequately represent the Black South African population. Respirator manufacturers should use the newly developed panel representative of Black South Africans and consider identified factors affecting respirator fit.