# Prediction Equations For Respiratory Impedance In An Urban Population: Effect Of Obesity

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INTRODUCTION: Recent studies demonstrated that assessment of respiratory impedance using an impulse oscillometry system (IOS) can reveal functional abnormalities that relate to respiratory symptoms in a variety of diseases. However, interpretation of results is limited by relative lack of normative data using an IOS. The present study derived predictive equations for respiratory impedance from data collected in a healthy urban population using an IOS.

METHODS: Data were analyzed from 438 healthy subjects that resided or worked in lower Manhattan, New York. Subjects were enrollees in the World Trade Center (WTC) Health Registry of the New York City Department of Health and Mental Hygiene. Although all subjects sustained exposure to WTC dust, they had no prior history of respiratory disease and they remained asymptomatic on surveys and studies conducted on 3 separate occasions over 7 years (2003-2010). All were lifetime nonsmokers (<5 packs lifetime) and were not receiving β-blockers. All subjects underwent assessment using spirometry and IOS. Separate multivariable analyses were performed to derive predictive equations for respiratory impedance in male and female subjects.

RESULTS: The cohort comprised 222 males (age 18-79yr, height 1.54-2.03m, weight 51-170kg) and 216 females (age 18-78yr, height 1.45-1.83m, weight 43-147kg). The population was predominately Caucasian (79%) with lesser proportions of African-Americans (5%), Asians (13%) and others (3%). Spirometry findings of obstruction and restriction (~5% each) were compatible with expectations for a healthy population. Analysis of data from a detailed WTC exposure questionnaire showed that exposure magnitude was not associated with IOS measurements. Parsimonious models were derived by gender to predict resistance at 5, 10, 15 and 20Hz, frequency dependence of resistance between 5-15 and 5-20Hz, reactance at 5Hz, reactance area and resonant frequency. Independent variables in each model included height and BMI; age and race were not statistically significant. BMI was used instead of weight to allow direct analysis of the effect of excess body weight on respiratory impedance data (shown in Figure). Substitution of weight for BMI resulted in nearly identical correlation coefficients for the prediction equations. The final models demonstrated narrow confidence intervals with residual standard deviations <0.25 $cmH_2O/L/s$ or <0.25Hz for resistance/reactance parameters and resonant frequency respectively.

CONCLUSIONS: Normative prediction equations with narrow confidence intervals were successfully developed for a broad range of IOS parameters in a healthy urban population. In contrast to prior studies, prediction equations used BMI to allow direct inspection of the effect of excess body weight on respiratory impedance.

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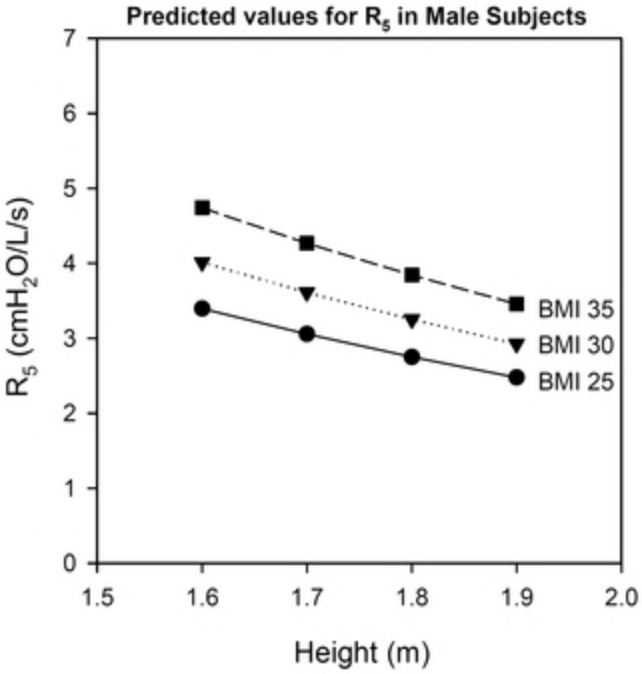


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