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Title: Impact of spirometer change on serial lung function measurements in population studies

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Body: Subtle differences between spirometers (SP) types have been described. Prediction equations for lung function (LF) disregards effect of SP. Long-term population studies on respiratory health face changing in SP due to technologic advances or obsolescence. Assessment of bias in LF measurements due to SP is crucial to evaluate LF over time. To take into account measurement bias due to SP change, we derived SP-specific equations constructed on the 3 surveys (1991, 2002, 2010) of SAPALDIA and compared the obtained predicted values with those predicted by cross-sectional equations sets. Method SAPALDIA used heated-wire (HW) SP in 1991 and 2002 and ultrasonic (US) SP in 2010 revealing potential measurement bias. For this study, we included 6222 LF from 3380 healthy adult never smokers over the 3 SAPALDIA surveys. Prediction equations were derived from linear mixed models with height, age, sex and SP (HW or US SP). Results Compared to cross-sectional equations, SP-specific equations predicted lower FEV1 and FVC values across all ages and more so for older subjects.

Mean bias associated with HW vs US SP was 0.069 L at age 30 and 0.464 L at age 60 for a 175 cm tall man. Conclusions US SP report lower LF compared to HW SP. Measurement bias is large enough to be relevant for researchers and clinicians confronted with SP changes. Prediction equations should consider incorporating not only anthropomorphic variables but spirometer type.