

## RESPIRATORY HEALTH IN OLDER PEOPLE LIVING IN ELDERLY CARE CENTERS IN PORTUGAL

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### INTRODUCTION

It is estimated that people spend 80 to 90% of their day indoors in developed countries, and elderly are likely to spend even more time indoors, thus, indoor air pollutants may have special significance for this age group, even at low concentrations due to long exposure periods. Consistent evidences from both epidemiological and experimental studies have demonstrated that short- and long-term exposure to particulate matter (PM), in particular to the finest particles (i.e. airborne PM with aerodynamic diameter less than 2.5µm, PM<sub>2.5</sub>), is associated with cardiovascular morbidity and mortality (Martinelli, Olivieri, & Girelli, 2013). Other studies associated indoor air pollution with cardiovascular effects (Lin, Chuang, Liu, Chen, & Chuang, 2013), however, little is known about the effects of improving indoor air quality on cardiovascular health. Also, aging is associated with a decline in immune defenses and respiratory function, and predisposition to respiratory infections (Bentayeb et al., 2013). This study explore the impact of indoor air quality (IAQ) variables on respiratory health in elderly care centers (ECCs) in Portugal.

### METHODOLOGIES

Within the 1<sup>st</sup> phase of GERIA project, and based on the *Portuguese Social Chart*, 53 ECC – 33 from Lisbon and 20 from Porto – were randomly selected. From September 2012 to April 2013, the BOLD (Burden of Obstructive Lung Disease) (Buist et al., 2005) questionnaire was applied by an interviewer to the elderly who gave their informed consent and were able to participate. All the participants should had ≥ 65 years old. A descriptive analysis of the responses was performed. Until this date indoor environmental parameters were also measured twice - winter and summer - in 141 ECCs rooms within the Porto ECCs. These areas were assessed for IAQ chemical (CO<sub>2</sub>, CO, Formaldehyde, TVOC, PM<sub>10</sub>, PM<sub>2.5</sub>) and biological contaminants (total bacteria and fungi), as well as, thermal comfort (TC) indexes (PMV and PPD) following ISO 7730:2005. The results in this paper correspond to the pilot study of a population of 143 elderly interviewed randomly from 22 ECC in the city of Porto.

## RESULTS AND DISCUSSION




In elderly respondents, breathlessness (27.5%) and cough (23.1%) were the major respiratory symptoms, and allergic rhinitis (21.7%) the main self-reported illness (Table 1). Heart troubles were reported by 36.6% residents. Symptoms of wheezing (10.5%) in the last 12 months and asthma diagnosis (8.4%) were more common in females, as opposed to symptoms breathlessness (4.9%) and phlegm (3.5%), more frequent in males. Smoking habits, both past and present, were more frequent in men (11.9%).





























The preliminary results of IAQ point out that: (i)  $PM_{2.5}$  are not within the reference levels; (ii) Season significant differences for  $PM_{10}$ , TVOC, Bacteria and  $CO_2$ ; (iii) Fungi samples raise concern showing incidence of *Aspergillus fumigatus* that can cause invasive lung infections in susceptible individuals as elderly; (iv) winter season PMV index show results in the 'slightly cool' thermal sensation scale which may potentiate respiratory tract infections.

Table 1. BOLD questionnaires outputs of the elderly subjects

	n (%)
Do you usually have a cough?	33 (23.1)
Do you usually bring up phlegm from your chest?	17 (11.9)
Have you ever had an attack of wheezing that has made you feel short of breath?	31 (21.7)
Disability from walking by breathlessness or any condition other than heart or lung disease?	39 (27.5)
Nature of condition(s)?	
Respiratory Illness	4 (33.3)
Cardio circulatory	3 (25.0)
Musculoskeletal	4 (33.3)
Others	1 (8.3)
Has a doctor ever told you that you had emphysema?	2 (1.4)
Has a doctor ever told you that you have asthma?	12 (8.4)
Has a doctor ever told you that you had tuberculosis?	6 (4.2)
Has a doctor ever told you that you had pneumonia?	20 (14.1)
Has a doctor ever told you that you had allergic rhinitis?	31 (21.7)
Has a doctor ever told you that you had another respiratory disease?	9 (6.6)
Nature of condition(s)?	
Bronchitis	3 (50.0)
Pleurisy	2 (33.3)
Sinusitis	1 (16.7)
Do you still have it (another respiratory disease)?	5 (62.5)
Has a doctor ever told you that you had heart trouble?	52 (36.6)

To explore some of the possible link between IAQ and respiratory symptoms was performed a univariate association between the environmental parameters and all the questions in the health questionnaire (Table 2). These results will help performing the logistic regression models, where will be taken into consideration all the significant results plus the confounders (age, gender and number of years living in the ECCs). Table 2 show a strong association between wheezing symptoms and PMV and PPD indexes, as well as, some border line association between: (i) phlegm and  $PM_{10}$ ; (ii) wheezing and TVOC; (iii) breathlessness and volatile organic compounds and thermal environmental parameters.

Table 2. Association between respiratory symptoms (BOLD Questionnaire) and indoor air parameters:  p < 0.01;  p < 0.05;  p < 0.10

<b>BOLD QUESTIONNAIRE</b>	PM <sub>10</sub>	PM <sub>2.5</sub>	TVOC	HCHO	CO	CO <sub>2</sub>	Temp	RH	AirV	PPD	PMV
<b>COUGH</b>											
Do you usually cough as much as 4 to 6 times a day, 4 or more days out of the week?											
Do you usually cough like this on most days for 3 consecutive months or more during the year?											
<b>PHLEGM</b>											
Do you usually bring up phlegm from your chest?											
For how many years have you had trouble with phlegm?											
<b>WHEEZING</b>											
Have you ever had an attack of wheezing that has made you feel short of breath?											
Have you ever required medicine or treatment for the attack(s)?											
Have you ever had an attack of wheezing in the past 12 months?											
<b>BREATHLESSNESS</b>											
Disability from walking by breathlessness or any condition other than heart or lung disease?											
Are you troubled by shortness of breath when hurrying on the level or walking up a slight hill?											
Do you ever have to stop for breath when walking at your own pace on the level?											
Do you ever have to stop for breath after walking about 100 meters on the level?											
Are you too breathless to leave the house or breathless on dressing or undressing?											

## CONCLUSIONS

Investigations are still needed to better understand the links between indoor air pollution and respiratory health impairment in elderly. In this sense, logistic regression analysis is ongoing, thus focusing on the impact of IAQ and respiratory health symptoms on ECCs residents.

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