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Public Preferences for Lung Cancer Screening Policies

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ABSTRACT

Background: Because early detection of lung cancer can substantially improve survival, there is increasing attention for lung cancer screening. **Objectives:** To estimate public preferences for lung cancer screening and to identify subgroups in preferences. **Methods:** Seven important attributes were selected using the literature, interviews, and a panel session. Preferences were elicited using a swing weighting questionnaire. The resulting attribute weights indicate the relative importance of swings from the worst to the best level between attributes. Hierarchical clustering was used to identify subgroups with different attribute weights. **Results:** One thousand thirty-four respondents from a representative Dutch panel aged between 40 and 80 years were included. The identified attributes were location of screening (weight = 0.18 ± 0.16), mode of screening (weight = 0.17 ± 0.14), sensitivity (weight = 0.16 ± 0.13) and specificity (weight = 0.13 ± 0.12) of the screening modality, waiting time until results (weight = 0.13 ± 0.12), radiation burden (weight = 0.13 ± 0.12), and duration of screening procedure (weight = 0.10 ± 0.09). Most respondents preferred breath analysis (45%) to giving blood samples (31%) or going through a scanner (24%) as screening modality; 59% preferred screening at the general practitioner's office instead of at the hospital. There was a significant difference in education between the five identified preference subgroups ($P < 0.01$). **Conclusions:** There is considerable variation in how people value attributes of lung cancer screening. Different screening policies and implementation strategies may be appropriate for particular preference subgroups. Our results indicate that people prefer breath analysis and that they are more likely to attend screening modalities that can be used at a primary care facility.

Keywords: cluster analysis, lung cancer screening, multi-attribute utility theory, public preferences.

Introduction

Lung cancer is one of the leading causes of cancer-related deaths worldwide [1]. Despite recent advances in treatment options, overall survival remains low [2]. Because early detection of (non–small cell) lung cancer can substantially decrease overall cancer mortality, there is increasing attention for lung cancer screening [3]. A first choice in designing a screening policy is to choose the most appropriate screening modality. Most research has been done with respect to imaging-based screening modalities, in which it was found that chest x-ray provided no additional survival benefit over sputum cytology [4] and that low-dose computed tomography (LDCT) reduced cancer-related mortality by 20% compared with chest x-ray [5,6]. Less expensive and more accessible screening modalities are breath or blood biomarkers [7,8]. Nevertheless, because these are early in development there is still insufficient evidence regarding accuracy, standardization, calibration, and method of sample collection.

Understanding the preferences of the eligible population with regard to attributes of screening policies may help policymakers to further design the screening by selecting those attribute levels that maximize screening attendance. In addition, it will help policymakers to tailor information provision for people targeted for the screening [9]. Achieving high attendance (particularly of high-risk subpopulations) is important to realize the reduction in cancer-related mortality suggested in cancer screening trials. Studies performed alongside lung cancer screening trials reported that smoking status, perceived risk of lung cancer, and result of baseline computed tomography scan were indicative of adherence to the screening protocol [10–14]. To obtain quantitative insights into the relative importance of attributes of lung cancer screening, stated preference methods can be used [9,15,16]. Stated preference questionnaires present respondents with direct questions about their preferences or have respondents make hypothetical decisions from which preferences are subsequently inferred. These types of methods are increasingly used in health care [15,17], but no results from stated preference studies for lung cancer screening are known [18]. There have, however, been stated preference studies in the context of screening for other types of cancer, namely, breast [16], colorectal [9,19–22], and prostate [23–25] cancer. Common findings in these studies were that the most important attribute according to

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respondents was test accuracy, and that respondents indicated a higher willingness to attend if they had a higher self-perceived risk of cancer. It was also found that there can be distinct differences in weights assigned to screening attributes by (groups of) people [25]. Knowledge on these differences may be useful because it would allow for concrete targets for motivating specific subgroups of the target population to attend a screening. Furthermore, making decisions while taking into account preference subgroups may be a step toward more personalized health care [26,27] and could improve shared decision making between health provider and screening program attendees.

Although lung cancer screening is currently discussed in several jurisdictions, no studies have investigated the preferences of people for different lung cancer screening strategies or what attributes drive such preferences. Furthermore, there is no knowledge of subgroups within the targeted population with specific preferences that may impact attendance. The aim of this study was therefore to measure the relative importance weights for attributes of lung cancer screening policies in a screening-eligible population and to empirically identify subgroups with regard to preferences.

Methods

Study Population

A public sample from the general population in the Netherlands was selected for this study through an online panel bureau Survey Sampling International (SSI). Men and women aged between 40 and 80 years who had no (history of) lung cancer were included.

Interviews and Panel Session to Establish Attributes and Levels

To identify attributes, a literature search was conducted after which exploratory interviews were held with three clinical experts (one MD/PhD student, one pulmonary oncologist, and one radiologist) and with two persons from the target population. After the initial selection of attributes, a 1-day panel session was organized with 10 respondents from the target population to identify and select the final set of attributes. After a plenary introduction of the subject matter, each participant wrote down the attributes that he or she considered important on a post-it note, after which a group discussion took place in which the group as a whole worked on removing overlapping attributes. The authors then presented the findings from the interviews, and together with the panelists a final list of attributes was defined by sorting the attributes from most to least important and picking the seven most important attributes. The selected attributes for inclusion in the questionnaire were sensitivity and specificity of the screening modality for lung cancer, radiation burden, duration of screening procedure, time until results of the screening are communicated, mode of screening, and location of screening. *Sensitivity* was defined as the probability of a positive (i.e., suspect) test result given that someone has lung cancer. *Specificity* was defined as the probability of a negative (i.e., nonsuspect) test result given that someone does not have lung cancer. *Radiation burden* was defined as the radiation (measured in millisievert [mSv]) that someone receives during a single screening procedure on top of the normal yearly background radiation in the Netherlands [28]. The *duration of screening* was defined as the time the screening attendee would spend at the facility where screening takes place and was measured in minutes. *Time until results* was defined as the time it takes until the screening attendee receives the results of the screening either through a consultation or with a letter sent to his or her home address. It was measured in days. *Mode of screening* was defined as the personal experience of someone being screened, that is, what they have to undergo to be screened. The levels for this attribute were "lie in scanner," "sustained breath into device," and "give blood," corresponding to LDCT, breath analysis, and blood-based screening [29–31]. Finally, *location of screening* is where screening takes place and could be either "at nearest hospital" or "at your general practitioner's office." The included attributes are presented in Table 1.

Measuring Attribute Weights with Swing Weighting

A multi-attribute utility theory framework was adopted [32]. This theory states that people choose between services on the basis of the value of such services, and that the value of services can be decomposed into a set of attributes. The relative importance of each attribute is denoted by an attribute weight. The interpretation of an attribute weight in a multi-attribute utility theory is the importance of an improvement from the "worst" level to the "best" level on an attribute, relative to such improvements on the other attributes [33].

Attribute weights were elicited from respondents with a method called swing weighting [34,35]. The required worst and best levels for the attributes sensitivity, specificity, and radiation burden were determined on the basis of clinical literature and then confirmed by the study clinicians through an interview. For sensitivity and specificity, the best level was 100% and the worst level was 70% [29–31]. For radiation burden, the best level was 0 mSv and the worst level was 1.5 mSv, corresponding to the radiation burden of LDCT [36]. The worst and best attribute levels for the other attributes were determined in the panel session. Each panelist wrote down what he or she considered to be the worst and best levels, after which the range of upper and lower bounds in the entire panel was chosen (Table 1). Because the preferential order for the levels of the location and mode attributes could not

Table 1 – Included attributes and levels*.

Attribute	Attribute name	Worst level	Best level
Continuous attributes	Sensitivity	70%	100%
	Specificity	70%	100%
	Radiation burden	Background + 1.5 mSv	Background
	Duration of screening procedure	45 min	15 min
	Time until results	14 d	1 d
Categorical attributes	Mode of screening	Levels: "lie in scanner," "sustained breath into device," "give blood"	
	Location of screening	Levels: "nearest hospital," "at your general practitioner's office"	

* *Sensitivity* is the probability of a positive/suspect test result given that the person has lung cancer. *Specificity* is the probability of a negative test result given that the person does not have lung cancer. The worst and best levels for the continuous attributes were defined on the basis of interviews with clinicians. For the categorical attributes, the preference order was elicited from respondents in separate questions.