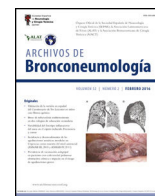




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## Scientific Letter

### Risk Perception and Intention to Quit Smoking Among High-Risk Participants Enrolled in a European Lung Cancer Screening Trial in Spain

To the Director,

Lung cancer remains the leading cause of cancer-related mortality worldwide, with tobacco use responsible for approximately 85% of cases [1]. Low-dose computed tomography (LDCT) screening reduces lung cancer mortality by 20–24% in high-risk individuals, and integrating smoking cessation into screening programs may increase life-years gained by up to 20% [2–4]. Screening also represents a teachable moment—a period of heightened motivation to quit—offering an opportunity to deliver tailored cessation support [5]. Given that smoking cessation remains one of the most cost-effective preventive interventions, its integration into screening initiatives is not only beneficial but also a public health priority [6]. However, it remains unclear whether participants intend to quit smoking and how these intentions align with their perceived and objectively calculated lung cancer risk. This study describes risk perception, attitudes toward early detection, and intention to quit smoking among high-risk participants recruited in Spain as part of the European multicenter study 4-IN-THE-LUNG-RUN (4ITLR) [7], and examines how these factors align with estimated risk according to the PLCom2012noRace model.

We conducted a cross-sectional survey nested within the 4ITLR trial framework at *Hospital del Mar* (Barcelona) between October 2024 and January 2025. Participants were high-risk individuals aged 60–79 years who were current or former smokers meeting at least one of the following criteria:  $\geq 35$  pack-years of smoking history or a 6-year lung cancer risk  $\geq 2.6\%$  according to the PLCom2012noRace model [8], based on demographic and clinical variables. A 7-item questionnaire—adapted from validated instruments used in the United States, Europe, and Canada—was self-administered on a tablet immediately after LDCT, available in Catalan and Spanish, and designed to be completed in less than 10 min. Items assessed perceived lung cancer risk, concern about future diagnosis, smoking cessation intentions, motivations for participation, information needs, and satisfaction with the screening process [9–11]. Age, sex, educational level, smoking history, chronic obstructive pulmonary disease (COPD), and family history of lung cancer were collected during the prescreening interview and pseudonymously linked to survey responses using REDCap. Descriptive statistics,  $\chi^2$  tests, and the Kruskal–Wallis test were used for analysis. The study was approved by the *Parc de Salut Mar* Ethics Committee (2023/10888/I).

A total of 245 participants completed the survey (acceptance rate, 96.9%). The sex distribution was balanced (50.2% men), with a median age of 66 years (IQR, 62–69), median cumulative tobacco exposure of 45.9 pack-years (IQR, 38.3–53.9), and a median 6-

year lung cancer risk of 4.7% (IQR, 3.3–8.1), with no statistically significant differences by sex. Most participants (88.2%) were current smokers, and nearly half (47.3%) had low or medium-low educational attainment (Table S1). Despite meeting high-risk eligibility criteria, only 35.9% of participants perceived themselves as being at risk of developing lung cancer, whereas 40.0% disagreed and 24.1% were neutral. Similarly, 62.5% reported rarely or never worrying about developing lung cancer (Table 1). Regarding cessation intentions, 75.0% of current smokers expressed a desire to quit regardless of screening results; however, 79.2% reported they would continue smoking after a negative LDCT result. Among those willing to quit, 76.5% still anticipated continuing to smoke after a negative result. Conversely, among those not intending to quit, 87.0% also reported they would continue smoking after a negative result. Notably, 20.8% of all current smokers indicated they would not continue smoking after a negative result (Table 2).

Recommendation by a health care professional was the primary motivation for participation (45.8%), followed by concern for lung health (24.5%) and awareness of smoking-related risks (20.3%). Satisfaction with the screening process was high, with 97.6% reporting being satisfied or very satisfied. Risk perception varied according to educational level and sex. Participants with lower educational attainment were less likely to perceive themselves at risk. Among those with low education, 53.3% disagreed with the statement “I believe I am at risk of developing lung cancer,” compared with 32.1% in the medium-low, 28.7% in the medium, and 31.4% in the high education groups ( $P = .007$ ). Agreement increased with educational level, from 26.7% in the low education group to 42.9%, 46.8%, and 40.0% in the medium-low, medium, and high groups, respectively ( $P = .041$ ) (Table S2).

Regarding sex, no significant differences were observed across most domains; however, women more frequently reported concern about developing lung cancer than men (69.9% vs 54.9%;  $P = .046$ ) (Table S3). PLCom2012noRace scores did not differ significantly across self-perceived risk categories (Kruskal–Wallis  $P = .21$ ) (Table S4).

Our findings reveal a clear disconnect between objectively calculated and self-perceived lung cancer risk in a population well above standard screening eligibility thresholds. This is consistent with previous research demonstrating both underestimation and overestimation of risk, which may undermine motivation for preventive behaviors such as smoking cessation [12]. This pattern was influenced by educational attainment, with more than half of participants with lower education not perceiving themselves at risk, highlighting the need for clear, literacy-sensitive risk communication strategies. Risk perception also varied by sex, with men more likely to report low concern despite similar objective risk, consistent with evidence that men tend to underestimate cancer risk compared with women [13].

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**Table 1**  
Distribution of participant responses across thematic areas.

Thematic area	Survey item	Response options, n (%)
Risk perception	I believe I am at risk of developing lung cancer	Agree: 88 (35.9%) Neither agree nor disagree: 59 (24.1%) Disagree: 98 (40.0%)
	Do you feel concerned about the possibility of developing lung cancer someday?	Rarely or never: 153 (62.5%) Sometimes: 54 (22.0%) Often or almost always: 38 (15.5%)
Intention to quit smoking <sup>a</sup>	Are you willing to quit smoking, regardless of the screening result?	Yes: 162 (75.0%) No: 54 (25.0%)
	If the screening result is negative, do you plan to continue smoking?	Yes: 171 (79.2%) No: 45 (20.8%)
Motivation to participate	What motivated you to undergo a test for early detection of lung cancer? <sup>b</sup>	Family history of lung cancer: 34 (8.0%) Recommendation from a health care professional: 194 (45.8%) Awareness of smoking-related risks: 86 (20.3%) Concern about lung health: 104 (24.5%) Other: 6 (1.4%)
Information to support decision-making	What type of information or support would you have liked before deciding to participate in lung cancer screening? <sup>b</sup>	Detailed information about the radiologic test: 6 (2.4%) Information about the benefits of early lung cancer detection: 19 (7.5%) Information about potential risks or adverse effects: 14 (5.6%) Testimonials from individuals who participated in screening: 6 (2.4%) No information would have changed my decision: 201 (79.8%) Other: 6 (2.4%)
Satisfaction	Are you satisfied with the screening process and referral from your primary care center?	Very satisfied: 207 (84.5%) Satisfied: 32 (13.1%) Neutral: 5 (2.0%) Dissatisfied: 1 (0.4%) Very dissatisfied: 0 (0%)

<sup>a</sup> Only current smokers were included.

<sup>b</sup> Multiple responses were allowed. Percentages are based on the total number of responses for each question, not the total number of participants.

**Table 2**  
Cross-tabulation of survey items related to intention to quit smoking among current smokers.

Are you willing to quit smoking, regardless of the screening result? <sup>a</sup>	If the screening result is negative, do you plan to continue smoking? <sup>a</sup>		
	Yes	No	Total
Yes	124 (76.5%) [72.5%]	38 (23.5%) [84.4%]	162 (75.0%)
No	47 (87.0%) [27.5%]	7 (13.0%) [15.6%]	54 (25.0%)
Total	171 (79.2%)	45 (20.8%)	216 (100%)

Values are presented as n (%). Row percentages are shown in parentheses; column percentages are shown in brackets.

<sup>a</sup> Only current smokers were included.

The discrepancy between general cessation intentions and anticipated behavior after a negative LDCT result may reflect a “false reassurance” or “health certificate” effect, in which a negative result is interpreted as permission to continue smoking [14]. Alternatively, it may reflect persistently low readiness to quit in individuals with long-standing nicotine dependence rather than a direct adverse effect of screening. Although some studies suggest that negative screening results may reduce motivation to quit, particularly among individuals with low risk perception or readiness to change [15], long-term data do not support the concern that such results reinforce smoking behavior [16]. Importantly, a substantial proportion of participants indicated they would quit after a negative LDCT, supporting the concept of screening as a teachable moment. The distinction between general desire to quit and anticipated behavior aligns with the Transtheoretical Model (TTM), in which general intention corresponds to the contemplation stage, whereas anticipated action reflects a more advanced stage of readiness [17]. Incorporating structured assessments of readiness to change into screening pathways may enable tailored cessation interventions. Effective risk communication should address emotional responses such as fear, anxiety, and relief, while reinforcing ongoing risk. Tailored strategies that account for sociodemographic characteristics, smoking behavior, and health beliefs are essential, as non-tailored counseling has shown limited

effectiveness, whereas intensive interventions yield better outcomes [16].

The role of health care professional recommendations as the primary motivation for participation underscores their strong influence on engagement with lung cancer screening. Given persistently low participation rates worldwide, even among high-risk populations, leveraging these recommendations represents a crucial yet underused strategy to increase screening uptake [18]. Strengthening the involvement of health care providers in risk communication and patient encouragement could substantially improve participation, thereby enhancing the impact of screening on early detection and mortality reduction. The high satisfaction rate observed (97.6%) further suggests that screening programs represent an acceptable and well-received platform for delivering additional preventive interventions, including smoking cessation support.

Several limitations should be considered. The 4ITLR eligibility criteria restricted participation to older, heavy smokers, resulting in a high-risk sample that may limit generalizability. Interpretation of survey questions may have varied, particularly those distinguishing general intentions from anticipated behavior, potentially introducing misclassification. Self-reported data are subject to social desirability bias, although this is generally reduced in self-administered formats [19]. Finally, this study was conducted at

a single center in Catalonia and may not be generalizable to the broader Spanish population.

To our knowledge, this is the first study in Spain to collect direct feedback from individuals undergoing lung cancer screening in a real-world setting. Our findings highlight a clear disconnect between objectively calculated and self-perceived lung cancer risk, influenced by educational attainment and sex, and reveal important discrepancies between general smoking cessation intentions and context-specific behavior. Lung cancer screening without systematic integration of smoking cessation strategies risks failing to achieve its full potential in reducing mortality. Tailoring risk communication to different levels of health literacy, incorporating readiness-to-change frameworks, and integrating structured cessation support within screening pathways—aligned with participants' stage of readiness and reinforcing connections with primary care cessation services—may maximize the preventive benefit of lung cancer screening programs. This is particularly relevant in regions such as Catalonia, where smoking prevalence remains high (26.1% in men and 16.8% in women) [20].

### Authors' contributions

**AM:** Responsibility for manuscript content; full data access; data integrity and accuracy; study design; data collection; data analysis; manuscript drafting; results interpretation; critical revision.

**AB:** Data integrity and accuracy; data analysis; manuscript drafting; results interpretation; critical revision.

**GL:** Data analysis; manuscript drafting; results interpretation; critical revision.

**FM:** Study design; data integrity and accuracy; funding acquisition; results interpretation; critical revision.

**MCG:** Data integrity and accuracy; data collection; manuscript drafting; results interpretation; critical revision.

**JE:** Data integrity and accuracy; data collection; funding acquisition; manuscript drafting; results interpretation; critical revision.

**RC:** Data collection; results interpretation; critical revision.

**MMC:** Funding acquisition; results interpretation; critical revision.

**JM:** Data collection; results interpretation; critical revision.

**MS:** Manuscript drafting; results interpretation; critical revision.

**CA:** Manuscript drafting; results interpretation; critical revision.

**XC:** Study design; data integrity and accuracy; funding acquisition; data analysis; manuscript drafting; results interpretation; critical revision.

All authors have read and approved the final version of the manuscript.

### Disclaimer

The funding bodies had no role in the study design; data collection, analysis, or interpretation; manuscript preparation; or the decision to submit the manuscript for publication.

### Ethics approval and consent to participate

The study was approved by the ethics committee of the *Parc de Salut Mar* (study No. 2023/10888/I; protocol code PR138/22). All participants provided written informed consent prior to inclusion.

### Artificial intelligence involvement

No artificial intelligence software or tool was used in the preparation of this manuscript.

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### Conflicts of interest

The authors declare no conflicts of interest related to this work.

### Availability of data and materials

The datasets analyzed during the current study are not publicly available to protect participant privacy.

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### Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at [doi:10.1016/j.arbres.2026.04.013](https://doi.org/10.1016/j.arbres.2026.04.013).

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