**Attitudes towards the integration of smoking cessation into lung cancer screening in the United Kingdom: a qualitative study of individuals eligible to attend**

**Abstract:**

**Introduction:** There is limited research exploring how smoking cessation treatment should be implemented into lung cancer screening in the United Kingdom. This study aimed to understand attitudes and preferences regarding the integration of smoking cessation support within lung cancer screening from the perspective of those eligible.

**Methods:** Thirty-one lung cancer screening eligible individuals aged 55-80 years with current or former smoking histories were recruited using community outreach and social media. Two focus groups (three participants each) and 25 individual telephone interviews were conducted. Data were analysed using the Framework approach to thematic analysis.

**Results:** Three themes were generated: (1) bringing lung cancer closer to home, where screening was viewed as providing an opportunity to motivate smoking cessation, depending on perceived personal risk and screening result; (2) a sensitive approach to cessation with uptake of cessation support considered to be largely dependent on screening practitioners’ communication style and expectations of stigma, and (3) creating an equitable service that focuses on ease of access as a key determinant of uptake, where integrating cessation within the screening appointment may sustain increased quit motivation and prevent loss to follow up.

**Conclusions:** The integration of smoking cessation into lung cancer screening was viewed positively by those eligible to attend. Screening appointments providing personalised lung health information may increase cessation motivation. Services should proactively support participants with possible fatalistic views regarding risk, and decreased cessation motivation upon receiving a good screening result. To increase engagement in cessation, services need to be person-centred.

**Patient or public contribution:** This study has included patient and public involvement throughout, including input regarding study design, research materials, recruitment strategies, and research summaries.

**Key Words:** Lung cancer, lung cancer screening, smoking cessation, qualitative, cancer prevention.

**Data Availability Statement:** The data that support the findings of this study are available from the corresponding author upon reasonable request.

**Introduction**

Successfully stopping tobacco smoking is the most important behaviour change required to reduce lung cancer risk and mortality.1 In the United Kingdom (UK), the prevalence of quit attempts has decreased since 2007.2 Individuals from deprived communities have the highest smoking prevalence, and disproportionately worse health outcomes. For example, Manchester and Liverpool, two areas in the North of England within the most deprived decile in England, have the highest premature lung-related mortality rates in the country.3,4

Research has demonstrated that low dose computed tomography scan (LDCT) screening detects early-stage disease and reduces lung cancer specific mortality in high-risk individuals.5-9 In trials such as The National Lung Screening Trial (NLST) individuals were classed as high-risk if they had 30 pack years and had smoked within 15 years.5 As such, lung cancer screening programmes have been implemented in some countries including the United States of America (US) and China, whilst the UK National Health Service has funded a ‘Targeted Lung Health Check Programme’ (TLHC) following the success of multiple pilot projects.7, 10-12 The TLHC is running in areas of England with high lung cancer mortality 13 and inviting 55–74-year-old individuals who have ever smoked to a free face-to-face, telephone or video appointment. Here, the attendees’ risk of lung cancer is calculated using set questions, and in some cases non-invasive tests such as spirometry are performed. If an individual is above a designated risk threshold, they are invited for a LDCT scan at a local screening facility.14

During the TLHC appointment, an attendee may be offered a smoking cessation intervention, however there is currently no standardised approach for provision across facilities in England. Lung cancer risk assessment, and the screening process itself, may trigger a cessation-related teachable moment: a point in time when an individual has increased desire to change behaviour 15-17 and greater receptivity to cessation support. Indeed, screening attendance as part of a research trial has been associated with increased cessation compared to usual care, particularly among attendees who receive a positive scan result.18,19 Best available evidence suggests that these differences can be maintained for 5 years.19 This success has been replicated in a UK community setting where 55% of attendees who made a successful quit attempt in the year after screening, attributed this to participation in the TLHC. 20 Implementation of smoking cessation is additionally associated with increasing the cost-effectiveness of lung cancer screening. 21,22

Quantitative and qualitative evidence in the US has demonstrated that screening eligible individuals believe offering cessation support as part of lung cancer screening is appropriate.23-26 A limited number of studies have explored attitudes in the lung cancer screening eligible population in England. Screening results have been identified as either promoting cessation through giving participants a ‘clean slate’ if clear or by abnormal findings indicating a need to stop.27-29 However, research has also highlighted concerns within the lung cancer screening population, including fatalism29, or the belief that a clear result may not always be motivational and could promote smoking continuation if evidence-based communication approaches are not implemented.28 Furthermore, those eligible for lung cancer screening have long-term smoking histories, often since childhood, and are therefore likely to have higher dependence on tobacco and greater difficulty with cessation requiring evidence-based support.

The Theoretical Domains Framework (TDF)30,31 is an integrative model comprising of fourteen domains related to behaviour change: for example, emotions, social influences, and beliefs about capabilities. The framework was specifically developed for implementation research and has demonstrable utility for aiding exploration of barriers and facilitators to engagement in smoking cessation interventions.32,33 It has also been used as a tool to develop several smoking cessation interventions.34,35 Therefore, the TDF is well suited to underpinning exploration of attitudes and preferences for smoking cessation provision, allowing researchers to identify clear targets for tailored intervention development with the aim of successful behaviour change.

The protocol for TLHC14, alongside a European position statement36, recommends that smoking cessation should be incorporated into lung cancer screening. However, no further guidance on optimal implementation or delivery has been disseminated. Gaining insight from stakeholders rather than relying solely on published literature, which is still limited given the novelty of lung cancer screening, will aid the development of UK-based guidelines that consider the wider contextual factors affecting implementation. Therefore, the aim of this study was to understand attitudes and preferences regarding the offer and provision of smoking cessation at the time of lung cancer screening, from the perspective of those eligible to attend.

**Methods**

**Design**

A qualitative design involving focus groups and semi-structured interviews was used to explore individuals’ opinions of smoking cessation provision at lung cancer screening, and preferences for cessation support delivery. Data collection began in February 2019 and was adapted from focus groups to telephone interviews from March to August 2020, due to the COVID-19 pandemic. Virtual focus groups were not used due to limited computer access highlighted by previous participants. This study adopted a limited realist approach, assuming meaning can be shared across participants, with potential relevance to wider populations (realist ontology), whilst acknowledging that participant and researcher experience is inevitably shaped by context (constructivist epistemology).37

**Participants**

Inclusion criteria were based on eligibility for lung cancer screening: (a) aged 55-80, (b) who currently smoked, or had quit within 3 months prior to study participation date and, (c) lived in one of four areas where lung cancer screening was ongoing during the data collection period. The quit period of 3 months was specified to facilitate participant recollection of their experience as a person who smokes, alongside their current experience of cessation. Three months has also been used as an endpoint to measure short-term smoking cessation.38

**Procedure**

A topic guide (see Supplementary File 1) was developed in consultation with a lay research partner who is screening eligible. Interviews were piloted with other researchers with expertise in health psychology to assess flow, clarity, and prompts to be used. The semi-structured topic guide was used flexibly to ensure that all topics of interest and any new views raised by participants were explored.

Participants were initially invited to take part using community outreach recruitment methods. This included visits to community locations to advertise the study to those eligible to participate in four screening active areas, staff members in local organisations advertising the study to visitors and disseminating paper and online posters across networks. Due to the COVID-19 pandemic, in person recruitment was suspended, and social media advertising was adopted in March 2020. Advertisements were posted on community social media groups (for example, residents’ associations) within the same screening-active areas. Interested individuals who then contacted the research team were provided with a Participant Information Sheet to review by post or email.

Two focus groups were conducted in February 2020, facilitated by two researchers (SG, LM). Focus groups were held in community locations already known to participants, and participants were offered reimbursement for travel. Both focus groups consisted of only participants who currently smoked. From March 2020, solely one-to-one telephone interviews were conducted by one researcher (SG) due to the beginning of the COVID-19 pandemic. Prior to each focus group or interview, researchers provided participants with information regarding lung cancer screening including the typical pathway. Upon finishing the focus group or interview, participants completed an optional demographic form (2 participants did not complete the form). This included questions regarding age, gender, ethnicity, occupation, education, smoking and cessation history, desire to quit, and prior lung cancer screening attendance. All participants were offered reimbursement, with the option of a £20 shopping voucher, or a Cancer Research UK donation of the same value. A debrief sheet including contact details of local smoking cessation organisations was offered to all participants.

Detailed field notes were compiled, and interviewer debrief discussions held after each interview (SG, LM). Throughout data collection, data sufficiency was discussed. Data collection ended upon a subset of the research team agreeing the research questions had been appropriately addressed.39 Both data-collecting researchers were females with postgraduate psychology training in qualitative research, and both did not smoke or have a past smoking history.

All participants provided informed consent prior to data collection. The study received ethical approval from The University of Manchester Research Ethics Committee [2019-7018-12116] and the Health Research Authority [265589].

**Data Analysis**

Focus group and interview recordings were transcribed verbatim by an external transcription company. Transcripts were checked for accuracy and anonymised. Data were analysed using reflexive thematic analysis using the framework approach for data organisation.40 Each transcript was read to get an overall sense of the data and a coding framework was developed using Nvivo-12 software (SG). Where possible, themes were organised around the TDF30,31 to assist with understanding the barriers and facilitators associated with cessation delivery preferences. Simultaneous inductive coding using no pre-existing framework was conducted to explore wider underpinning views and experiences. The initial codebook was developed using three initial transcripts and discussed with a smaller research team to resolve discrepancies in coding and formulate an initial framework matrix (SG, LM, GM). The matrix was iteratively modified throughout analyses to confirm all relevant codes were captured. Data were charted into the matrix for interpretation and theme generation. Focus group data were treated as a single case in the matrix to account for the unique dynamics within each group. Participant smoking status was displayed next to each case name to allow the researchers to consider the impact of the participants’ current smoking context alongside the data. The analysis focused on attitudes and experiences of screening eligible individuals regarding smoking and cessation attempts, and how this shapes preferences for cessation integration within a lung cancer screening context.

**Findings**

**Sample**

Thirty-one participants took part in this study (six took part in two focus groups, N=3 in each, and 25 in individual telephone interviews). Twenty-six participants currently smoked and five had recently quit. For additional sample characteristics, see Table 1. Focus groups and interviews ranged from 16 (incomplete interview due to participant becoming unavailable unrelated to participation, and unable to reschedule) to 69 minutes (median 48 minutes)

Data are presented as three themes: (1) bringing lung cancer closer to home; (2) a sensitive approach to smoking cessation and, (3) creating an equitable service. Quotes are presented as pseudonyms with age (years) and smoking status (currently smokes (CS) or recently quit smoking (RQS).

***Theme 1: bringing lung cancer closer to home***

The impact of smoking on health, including its causal role for lung cancer development, was widely acknowledged by participants. Participants held complex beliefs surrounding their lung cancer risk that were characterised by two dominant yet unstable perceptions of personal risk. At times, pre-existing health conditions such as COPD or experiences of losing others to lung cancer worried participants, and underpinned an amplified perceived vulnerability to smoking-related illness:

*“As time has gone on for me, I've become more aware of my own personal health […] you’ve started to talk to somebody and they’ve told you, oh, did you know who was it passed away, he had, what, cancer? […] he did used to smoke a lot though, didn’t he?”*

Arthur, 71:CS

At other times, participants discussed engaging in avoidance regarding the personal impact smoking may have. Despite worry sometimes increasing perceived risk, high levels of lung-cancer related anxiety led to some participants *“[burying their] head in the sand*” (Maxine, 59:CS), avoiding thinking about the impact of smoking on their health. Additionally, perceived good health or feeling that the consequences of smoking may never “*catch up with you*” (Christopher, 56 CS) were also described as distancing individuals from their perceived risk of lung cancer. These views underpinned a belief that preventative measures such as smoking cessation are not yet required.

 Overall, lung cancer screening was viewed by many as an opportunity to learn more about lung cancer risk, bringing the link between smoking and subsequent health consequences to the forefront of attendees’ minds. This led many participants to reflect on considering cessation. Even the thought of attending an appointment specifically about lung health was suggested as a motivator, in comparison to previous discussions about stopping smoking with health professionals:

*“…if you just go to the doctors to stop smoking and you’re given these tablets or whatever […]I need evidence of what’s going on and if you[…]just go to the doctors and you don’t see that evidence”*

Sarah, 61:CS

In the quote above, Sarah discusses the need to receive ‘*evidence’* of the impact of smoking on her health. Indeed, participants reflected on the unique opportunity provided by screening to gain a personalised picture of their lung health. At times this opportunity appeared to be able to tip the balance of perceived risk, overcoming avoidance or denial that attendees may have previously engaged in. Some suggested that without personalised evidence, they would not consider quitting:

*“Because they’re going to be a little bit more nervous because they’re going to be a little bit, ‘oh, if I’ve got to have a scan, there must be something. You know, perhaps it’s affecting my lungs.’ That’s what I would think anyway and perhaps be more receptive to further stopping”*

Esme, 77: RQS

However, some participants remained ambivalent about the impact of risk feedback, expressing fatalistic views. Clara (CS: age unknown) described being torn between wanting to give up smoking, whilst simultaneously believing “*it’s a bit too late in the tooth now”* if her LDCT scan had returned with an abnormal finding. Despite this view being shared by other participants, discussing evidence of the benefits of cessation, regardless of age or length of smoking history may have the potential to enhance motivation to consider cessation:

*“… is it going to be worth stopping if you’ve only got, you know, a few months to live or something like that, or whether it’s just a bit of damage and it’s fixable […] I saw an article […] about how the lung repairs itself now, they found that the lung repairs itself. I saw that and I thought, wow, that is amazing, if I stop smoking and my lungs repair, it’s got to be good news really, that was another reason that made me want to give up”*

Molly, 60:RQS

A minority of participants mentioned that if lung cancer screening displayed no evidence of damage, this may result in false reassurance regarding the negative consequences of smoking. Lung cancer screening staff discussing the potential for future worsening of lung health appeared to counteract this potential ‘licence to smoke’:

*“Well I hope that once you […] even though you have got the all clear, they'd show you the side effects even though you've got the all clear. Show the stuff that can go wrong if it had have been in the other scenario”*

Elizabeth, 60:RQS

***Theme 2:* A sensitive approach to smoking cessation**

The stigmatisation of people who smoke was widely discussed both by participants who currently smoke and those who had recently quit. Many felt that people who smoke are treated like a ‘*second-class citizen’.* Participants perceived having valid reasons for smoking such as a stress relief tool, which they felt are often not recognised by individuals who don’t smoke. Despite acknowledging the good intentions of friends, family, and healthcare professionals who do not smoke, being ‘*told’* to quit often had a counterproductive impact, particularly among participants who did not wish to quit:

*“I mean I've been told by friends, well, you know, you shouldn’t be doing it, you shouldn’t be doing that, and I can dig my heels in more and smoke more when I'm around them”*

Maxine, 59:CS

 Instead of external pressure, reaching a readiness on their own terms was viewed as the most likely pathway to successful cessation. Although self-initiated cessation was emphasised as important, a sense of feeling ‘trapped’ in a self-described addiction was endorsed by many, alongside internalised stigma in the form of self-blame. These feelings were intensified for some by low perceived knowledge of effective methods for quitting, or by past unsuccessful cessation attempts leading to a frustrating cycle of wanting to quit, but not knowing how, or why they cannot achieve their goal. Self-blame and guilt had a pervasive impact with one participant, feeling they were ‘deserving’ of lung cancer:

*“To be honest, if at my age I don’t realise the dangers that smoking can cause, then I deserve to pop my clogs with cancer”*

Catherine, 71:CS

Experiences of external and internalised stigma shaped participants’ opinions regarding the approach staff should take to discuss smoking and cessation during screening. Interestingly, most participants expressed a preference for support delivery from somebody who had previously smoked, and several desired the opportunity for adjunct group support to be advertised by screening staff. These preferences appeared to be underpinned by the need for a shared experience; wanting support from people who “*know what you’re going through*” (Lydia, 68: RQS), and have been through similar challenges and barriers themselves. Participants remarked that without this, support may not be as effective:

*“I mean, you know how annoying it is when somebody lectures you about something and you know that it’s all theory. They haven’t got a clue because they’ve never done it and they’ve never experienced it and they’re theorising it. You know, experience works”*

Laura, 72:CS

Despite a peer support system being described as ideal, some participants acknowledged that in practice, this may not always be feasible due to the small proportion of staff working within lung cancer screening likely to have previously smoked. Conversely, a minority of participants emphasised that they would specifically not want to receive support from individuals who had previously smoked. Instead, ensuring that staff members respect attendees’ autonomy and empower attendees to feel in control of their decision to quit, was viewed as an acceptable and feasible minimum offer. This was emphasised by those who reported they currently did not wish to quit. The approach taken by staff was viewed as an important determinant regarding uptake of the cessation offer. In the below quote, Collette reflects on the disengaging nature of a paternal and authoritative offer, which was often expected by participants. In contrast, Walter describes that appreciating attendees’ own knowledge, with a collaborative and positively framed communication approach, is much more likely to promote buy-in:

*“I don’t want someone in my face as soon as I walk in to say, stop smoking, because […] you just put the barriers up”*

Collette, 65:CS

*“[…] ‘let’s do it together, I’m here to help you. I’m not here to order you or shout at you, stop smoking, it’s bad, you know that it’s bad.’ Every smoker knows it’s bad for them. So I think you’ve got to make a team, ‘me and you, I’m here to help you’”*

Walter, 73:CS

Participants’ experiences of stigmatisation seemed to shape when participants felt smoking cessation support should be offered during lung cancer screening. Offering support at the beginning of the appointment was suggested to confirm perceived judgemental attitudes held by healthcare professionals where *“people may think that I’ll only be considered worthy of this investigative treatment if I’m a person who’s going to agree to pack it in”* (Kathleen, 55: CS). Some described that this may prevent the attendee engaging in screening at all. In comparison, an offer after receiving the lung cancer risk assessment, with the option of providing contact details for those who do not yet wish to access support within the initial appointment, was viewed as more appropriate. This made participants feel their autonomy is being respected and are not being ‘forced’ to access support. Relatedly, participants felt that staff should only offer support once during the initial screening appointment; multiple offers within a single appointment were viewed as pressuring:

*“I mean, the thing is, I haven’t forgotten since the appointment what was discussed, so therefore why would there be a need for you to reiterate it?[…]I wouldn’t be expecting somebody else to then reiterate what’s already been conveyed to me[…]it’s like you’re dictating, pressing this point”*

Bernie, 55:CS

Participants expressed a need for ongoing support if an attendee takes up the within-appointment cessation offer. This integrated approach was described as the service showing ‘*genuine care’* for attendees, without making the offer feel like a ‘*tick box’* exercise. To establish trust, having the same staff member for each cessation-specific interaction was endorsed. Participants acknowledged that there may not always be capacity to do so; however, continuity was expected to facilitate the development of a supportive relationship, increasing attendees’ likelihood of sustained cessation following a quit attempt.

*“Because, it’s more personal, you know, it just feels like, you know, sometimes when you don’t, you have to give all the information again and again and again […] seeing that same person will probably encourage more people to give up”*

Patricia, 67:CS

***Theme 3: Creating an Equitable Service***

Participants reflected on previous quit attempts, with varied success. Some experienced becoming ‘lost in the system’ when trying to access cessation services. Despite seeking help, participants were not contacted by the service, or were discharged without their knowledge. This led to a loss of confidence in services and subsequent disengagement:

*“I went to see my GP. He said ‘why [didn’t] you go for this…?’ And so I explained to him, and he said, ‘well, no, you need to challenge that, because they’ve got you down here as you failed to turn up’. I said, ‘well, that’s not the case’ […] I never bothered going back at all, if that’s the attitude, I don’t want to”*

Len, 70:CS

In contrast, a ‘*one stop shop’*, where attendees can access immediate support within the screening appointment was viewed as ideal by many. This was also suggested to minimise pessimism about the efficacy of referrals and facilitate immediate rapport building with staff. Offering support immediately provides an opportunity to capitalise on the teachable moment that occurs within the screening appointment:

*[…] you’re on a bit of like a mission. So rather than go home and cool it off, especially if…like I say, we’re all a bit of bravado, I don’t think my lungs will be overly damaged because I’m fit and healthy. But once I was there and you’re on the roll with it, yeah, I think it would be beneficial if it was offered there as well.*

Helen, 56:CS

The desire for a person-centred approach to smoking cessation was discussed as a key enabler for engagement. In addition to receipt of personalised lung health information as a gateway to an initial discussion, participants felt that cessation discussions and interventions should be tailored further. Participants often stated that there is no ‘one size fits all’ cessation method with many varied opinions on individual cessation methods such as nicotine replacement, or e-cigarettes. Participants highlighted the need for multiple methods to be available throughout ongoing support, to allow attendees to find what is right for them:

*“Explain to them, you can try this, you can try that, you can try that, it’s up to you, which one do you want to do? You know, and if it doesn’t work, we can carry on […] You know, don’t just say, well, if that doesn’t work, get out the door, you’re off, there’s no hope for you”*

Walter, 73:CS

In addition to the need for tailoring, ensuring accessible support was emphasised as important. Participants wished for attendees to be offered multiple modalities for ongoing support; wanting the choice of local, face-to-face (individual or group) or telephone support to account for the availability and possible practical barriers that attendees may have, such as work commitments, or inability to travel due to financial or mobility difficulties:

*“if it’s somewhere you can get to and it only takes half an hour to get there and back, that’s brilliant. If they told me I had to go to [further away] or somewhere, I’d tell them where to go”*

Anthony, 68:CS

**Discussion**

This study explored attitudes toward and preferences for smoking cessation support and integration within lung cancer screening from the perspective of those potentially eligible to attend. Overall, ‘in the moment’ smoking cessation support was viewed as a fundamental part of lung cancer screening, where the provision of personalised risk-based information can be a key motivator for cessation uptake. Participants highlighted the importance of offering a non-judgemental, inclusive, and accessible service to promote engagement.

Findings illustrate the potential for increased salience towards smoking behaviour after receiving personalised evidence of the impact of smoking on lung health. The introduction of a smoking cessation discussion at appropriate points during the screening pathway (e.g., initial appointment; LDCT results provision; investigation of suspicious or incidental findings) could increase participation or re-affirm reasons for stopping in people who have recently quit. Indeed, research has shown that abnormal spirometry results28, 41, abnormal screening results including the need for further tests18,19,28, or a lung cancer diagnosis42 may lead to increased motivation and likelihood of cessation. Additionally, the time between registering for lung cancer screening and receipt of results is associated with increased ‘readiness to quit’, particularly among individuals attending their first screening.43 In comparison, cessation discussions when deciding whether to have screening itself, has been viewed as not likely to impact cessation by clinicians and individuals offered screening.44

The caveat of potential decreased motivation resulting from receiving an ‘all clear’ has also been identified as a concern amongst screening staff 45 and the current study participants. There is currently no evidence to support that a ‘licence to smoke’ occurs in practice46 although a US-based smoking cessation trial found that attrition was higher for participants who had negative LDCT scan results.47 Ongoing research will help to clarify the impact of the receipt of a personalised cessation discussion incorporating scan results alongside communication to support self-efficacy and improved health consequences from cessation regardless of the type of result.48 A self-help booklet intervention development project has also targeted negative results, with screening eligible individuals shaping a booklet-section regarding “*dodging the bullet*”; discussing the dilemma faced by individuals with a negative screening result regarding smoking cessation.49

 Fatalism was also acknowledged as a potential response to considering quitting which has been previously identified alongside low perceived efficacy of smoking cessation in reducing the risk of lung cancer as a barrier to lung cancer screening engagement among eligible individuals in the UK.29,50-53 The present study extends these findings by demonstrating that fatalism may also influence those who have already made the decision to attend, acting as a barrier to cessation uptake. Discussing the benefits of cessation regardless of age, current health or smoking history with attendees may increase intention to quit. For example, even following the diagnosis of lung cancer, smoking cessation is associated with reduced progression and mortality across cancer stages indicating that it is never ‘too late’ to consider quitting.54 The adoption of an ‘opt-out’ service delivery model for discussion of smoking cessation would ensure all attendees are able to discuss their views surrounding risk and has been shown to improve cessation uptake.55

Previous research has illustrated that individuals eligible for lung cancer screening report smoking-associated external and internalised stigma.29,56 The present study builds on this by exploring how preferences for integration of smoking cessation within lung cancer screening are shaped by these views. Judgemental communication styles by healthcare professionals may reinforce smoking behaviour and reduce motivation to quit. Participants in the present study demonstrated some avoidance and mistrust of healthcare professionals consistent with prior work demonstrating that an expectation of judgement can deter prospective attendees from screening.24 In contrast, receiving person-centred support from a healthcare professional facilitates autonomy. Consistent with prior work57, tailoring communication to the needs of screening attendees was emphasised as vital for smoking cessation uptake. Lung cancer screening invitations should emphasise a non-judgemental approach to prevent non-attendance due to expected stigmatisation. Screening staff may benefit from communication skills training to promote engagement in both cessation and future screening rounds.58 This may include staff acknowledging the difficulty of smoking cessation, discussing smoking in a sensitive and empathic manner, and framing *how* attendees are asked if they would like to access cessation support. The setting of a lung cancer screening appointment was discussed by participants as increasing consideration of cessation, in comparison to a more general setting such as a GP appointment. However, what is not known is whether attending a setting specifically tailored for individuals who smoke, decreases feelings of stigmatisation. Further work should investigate this among screening attendees.

 Participants emphasised the importance of a flexible and accessible service. Existing evidence has demonstrated that locality of screening services is an important determinant of screening uptake.59 The present study confirms that convenience and locality of smoking cessation support are also important facilitators for a screening eligible population. In contrast to brief interventions which have been predominantly provided within UK-based lung cancer screening research (e.g., National Centre for Smoking Cessation and Training’s Very Brief Advice60,61), a ‘one stop shop’ where attendees can initiate engagement in smoking cessation services within the screening appointment was highlighted as an enabler to cessation uptake. Indeed, attendees within the Italian lung screening trial (ITALUNG) receiving screening at a centre with integrated smoking cessation had greater odds of cessation compared to attendees at other screening centres.62 Additionally, a trial in England has shown that provision of immediate smoking cessation within a TLHC is associated with an increase in quit rates at 3-month follow-up.63 Integrating cessation interventions within the screening appointment and disclosure of screening results may increase cessation uptake by ensuring accessibility of the service, providing readily available treatment, and preventing referral-related disengagement. However, ability to integrate is largely dependent on the model of lung cancer screening service delivery. Yet, this remains an important consideration as poor referral processes, and appointment delays are significant barriers to cessation service uptake.57

 The need for tailoring and flexibility of services regarding ongoing support modality (face-to-face, telephone, online), treatment method (e.g., nicotine replacement products, medications e-cigarettes, individual or group support), and discussion content (e.g., exploring and debunking any myths regarding cessation that an attendee has concerns about) were emphasised by participants as key to creating acceptable, effective cessation services. Indeed, the ability to provide tailored, multimodal cessation interventions has been shown to potentially support smoking cessation among older individuals who smoke, from deprived backgrounds; many of whom may be eligible for lung cancer screening.64 The ability to be flexible has also been identified as an important facilitator of successful implementation of smoking cessation services within hospitals65, and appears to also be important within a lung cancer screening context. However, the set up and commissioning of UK smoking cessation services within public health (where each local authority commissions their own cessation services) may limit the scope of what lung cancer screening services are able to offer. For example, as of 2021 only 76% of surveyed local authorities in England offer a specialist stop smoking service.66

 The use of the Theoretical Domains Framework30,31 for data analysis allows specific theoretical components to be identified which can be targeted by subsequent staff and attendee centred interventions. For example, providing attendees with personalised information regarding their lung health including further information after screening result may increase the ‘*perceived consequences’* of smoking, thus encouraging cessation uptake. Staff training centred around ‘*social influences’* of cessation discussions (e.g., prior stigmatisation, need for an empathic approach) may promote appropriate communication styles among staff. Additionally, interventions containing components aiming to increase self-efficacy, and positively ‘*reinforcing’* quit attempts may assist attendees to overcome the low ‘*belief in capabilities’* held by some participants regarding smoking cessation.

To the research team’s knowledge, this is the first qualitative study conducted in the UK, which investigates attitudes towards and preferences for cessation delivery as part of lung cancer screening. Using qualitative methods facilitated the collection of rich data, including unique insights for inclusion in clinical guidelines and for service development. The community engagement strategy facilitated the recruitment of individuals in areas of high deprivation, including those without access to computers. Additionally, we recruited individuals with a wide range of educational achievement, and smoking histories, reflecting the target audience of screening-eligible individuals. Although adaptation to social media recruitment allowed data collection to continue during the first COVID-19 lockdown, it also meant that individuals without internet access could not be recruited. The final sample was also not diverse with regards to race and ethnicity. Future research should include purposive sampling across race and ethnicities to reflect diversity in screening active areas as international research has shown racial and ethnic disparities are prevalent across the lung cancer screening pathway, for example eligibility, uptake, and follow-up care.67 Finally, throughout interviews participants who had recently quit smoking largely discussed how cessation support could be provided to attendees who smoke, rather than those who had previously quit. Future research could explore the role that lung cancer screening may play in relapse prevention among individuals who previously smoked, regardless of eligibility of LDCT scanning.

**Conclusion**

To conclude, integrating smoking cessation within lung cancer screening was viewed by those eligible as necessary and expected, regardless of smoking status and plans to quit. The ability of lung cancer screening to provide attendees with personalised information regarding the impact of smoking on their health was viewed as a key factor affecting the potential uptake of smoking cessation. A non-judgemental, accessible, and inclusive service, which addresses patient-level barriers such as fatalism, anxiety, and avoidance provides a unique opportunity to engage attendees in smoking cessation.

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**Table 1 Participants who currently smoke:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pseudonym  | Age | Gender | Ethnicity  | Qualifications | Employment  | Years Smoking  | Number Cigarettes or grams Tobacco Smoked per day | Already attended lung cancer screening  | Want to stop smoking? | Ever Quit more than 3 months |
| Arthur | 71 | Male | White/White British (Irish/ Other) | No formal qualifications  | Retired | 56 | 5 cigarettes | No | Yes | No |
| Norman | 64 | Male | White/White British (Irish/ Other) | No formal qualifications | Unable to work | 10 | 4 cigarettes | No | No | No |
| Louise | 63 | Female | White/White British (Irish/ Other) | No formal qualifications | Unable to work | 50 | 20 cigarettes | No  | No | No |
| Collette  | 65 | Female | White/White British (Irish/ Other) | GCSE/O-Levels/ ONC/BTEC/other | Full-time carer/ home-maker | 40 | 30g tobacco | Yes | Yes  | Yes  |
| Alan  | 68 | Male | White/White British (Irish/ Other) | No formal qualifications | Retired | 53 | 60g tobacco | Yes | Yes  | No |
| Eleanor  | 73 | Female | White/White British (Irish/ Other) | No formal qualifications | Unable to work | 50 | 40 cigarettes | Yes | No  | No |
| Sarah  | 61 | Female  | White/White British (Irish/ Other) | A-levels/higher education below degree | Employed  | 41 | 9 cigarettes  | No | Yes  | Yes  |
| Clara  | Did not provide demographic details (had attended lung cancer screening) |
| Julia  | 62 | Female  | White/White British (Irish/ Other) | A-levels/higher education below degree | Employed | 46 | 5g tobacco | Yes | Yes  | Yes  |
| Diane | 62 | Female  | White/White British (Irish/ Other) | A-levels/higher education below degree | unable to work | 3 | 10 cigarettes | Yes | Yes  | Yes  |
| Anthony  | 68 | Male | White/White British (Irish/ Other) | University Degree | Retired  | 50 | 10 cigarettes | Yes  | Yes | No |
| Rebecca  | 66 | Female | White/White British (Irish/ Other | GCSE/O-Levels/ ONC/BTEC/other | Employed | 35 | 16 cigarettes  | No | Yes | No |
| Laurence  | 62 | Male | Any other mixed background (White/ Caribbean) | University Degree | Employed | 42 | 7.5 cigarettes | No | Yes | Yes |
| Humphrey  | Did not provide demographic details (had attended lung cancer screening) |
| Walter | 73 | Male | White/White British (Irish/ Other | No formal qualifications | Retired | 60 | 40 cigarettes  | No | Yes | Yes |
| Bernie | 55 | Female | Prefer not to say | A-levels/higher education below degree | Employed | 37 | 10 cigarettes | No | No | Yes |
| Len | 70 | Male | White/White British (Irish/ Other | GCSE/O-Levels/ ONC/BTEC/other | Retired | 61 | 20 cigarettes | No | Yes | Yes |
| Catherine  | 71 | Female | White/White British (Irish/ Other | A-levels/higher education below degree | Retired | 57 | 7g tobacco | No | No | No |
| Patricia  | 67 | Female | White/White British (Irish/Other | GCSE/O-Levels/ ONC/BTEC/other | Retired | 59 | 25 cigarettes  | No | Don’t know | Yes  |
| Maxine | 59 | Female | White/White British (Irish/Other | A-levels/higher education below degree | Employed | 30 | 20 cigarettes | No | Yes | Yes |
| William  | 56 | Male | White/White British (Irish/Other | University Degree | Retired | 40 | 20 cigarettes | No | Yes | No |
| Laura | 72 | Female | White/White British (Irish/Other | University Degree | Retired | 30 | 15 cigarettes | No | Yes | No |
| Helen | 56 | Female | White/White British (Irish/Other | GCSE/O-Levels/ ONC/BTEC/other | Employed | 25 | 7.5 cigarettes | No | Yes | Yes |
| Lee  | 69 | Male | White/White British (Irish/Other | University Degree | Retired | 54 | 10 cigarettes | No | Yes | No |
| Christopher | 56 | Male | White/White British (Irish/Other | GCSE/O-Levels/ ONC/BTEC/other | Retired | 43 | 25 cigarettes | No | Yes | No |
| Kathleen  | 55 | Female | White/White British (Irish/Other | University Degree | Employed | 43 | 20 cigarettes | No | Yes | Yes |

**Participants who have recently quit:**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pseudonym  | Age | Gender | Ethnicity  | Qualifications | Employment  | Already attended lung cancer screening | How long Quit at time Interview  | Years Smoked  | Number Cigarettes or grams Tobacco Smoked per day |
| Elizabeth | 60 | Female  | White/White British (Irish/Other) | No formal qualifications  | Unable to work | No | 2 months  | 47 | 25 cigarettes 5g tobacco |
| Esme | 77 | Female | White/White British (Irish/Other) | GCSE/O-Levels/ ONC/BTEC/other | Retired | No | 3 months  | 60 | 15 cigarettes |
| Frances  | 57 | Female | White/White British (Irish/Other) | University Degree | Employed | No | 1 month | 22.5 | 2 cigarettes |
| Lydia | 68 | Female | White/White British (Irish/Other | No formal qualifications | Retired | No | 2 months | 49 | 22.5 cigarettes |
| Molly  | 60 | Female | White/White British (Irish/Other | Prefer not to say | Retired | No | 3 months | 45 | 10 cigarettes  |