## **SUPPLEMENTARY MATERIALS**

**Supplementary Figure 1**. Summary of the Consolidate Framework for Implementation Research (CFIR) Construct Classified Barriers and Facilitators by Article

• = Barrier □ = Facilitator	I. INTERVENTION CHARACTERISTICS				II. OUTER	SETTING		III.	INNER SET	TTING		IV. CHAF	RACTERIST	ICS OF INDIVI	DUALS	V. PROCESS				
	Evidence Strength & Quality	Relative Advantage	Complexity	Design Quality & Packaging	Cost	Patient Needs & Resources	External Policy & Incentives	Structural Characteris -tics	Culture	Networks & Commun -ications	Implement -ation Climate		Knowledge & Beliefs About the Intervention	Inidivdual Stage of Change	Individual Identification with Organization	Other Personal Attributes	Planning	Engaging	Executing	Reflecting & Evaluating
Clinics															, - · g-···					
Allen, et al. 2020 (2)		•	•		•	• 0	• 0			0	• 0						• 0			
Copeland, et al. 2019 (5)			•				•	•					•						•	
Eberth, et al. 2014 (11)							•	•												
Qiu, et al. 2016 (28)	0				•	•	•					•	•				0	0	•	
Watson, et al. 2021 (36)							•			• 0		• 0						• 0	•	•
Providers																				
Ahsan, et al. 2019 (1)	•					•	•				•		• 0							
Coughlin 2020 (6)	•						•				•	•	• 0							
Dukes, et al. 2020 (8)	•		•		•	•	•				•		•						•	
Duong, et al. 2017 (9)	0					•					•		• 0							
Eberth, et al. 2018 (10)	•	0	•			•	•		•		•	•	• 0						•	
Ersek, et al. 2016 (12)	• 0	0			•								• 0							
Henderson, et al. 2017 (14)	•				•	•							0							
Henderson, et al. 2019 (15)	•				•	•							•			0				
Hoffman, et al. 2015 (16)						•					•	•	•							
laccarino, et al. 2015 (17)	• 0	0			•			•				•	•					•		
Kanodra, et al. 2016 (18)	0		•			•					•	0	0					0		
Khairy, et al. 2018 (19)	• 0					•		•			•		• 0							
Leng, et al. 2020 (20)	•	0				•						0	• 0							
Lewis, et al. 2019 (21)													• 0			0				
McDonnell, et al. 2019 (24)	• 0	0				•	• 0				•	• 0	• 0							
Mukthinuthalapati, et al. 2020 (27)	• 0										•	• 0	• 0			0				0
Rajupet, et al. 2017 (29)	•										• 0		• 0							
Randhawa, et al. 2018 (30)											•		•							
Simmons, et al. 2017 (33)	•					•					•		• 0							
Patients																				
Carter-Harris & Gould. 2017 (3)						•							•							
Cataldo, et al. 2016 (4)													0							
Draucker, et al. 2019 (7)						• 0	0						• 0					• 0		
Duong, et al. 2017 (9)						0							0	0	0					
Hall, et al. 2018 (13)							0						0			0				
Kanodra, et al. 2016 (18)						•							• 0		0			• 0		
Li, et al. 2020 (22)						• 0							• 0		0	•		0		
Lillie, et al. 2017 (23)				0									• 0							
Mishra, et al. 2016 (25)						•							• 0		•			0		
Monu, et al. 2020 (26)													• 0	• 0				0		
Raz. et al. 2019 (31)						•							• 0	•				•		
Roth, et al. 2018 (32)													0		0			0		
Simmons, et al. 2017 (33)						•							• 0					• 0		
Sin, et al. 2016 (34)						•							• 0					• 0		
Tseng, et al. 2019 (35)						•							• 0					0		
Williamas, et al. 2020 (37)													• 0							

Supplementary Table 1. Quality appraisal of included studies using the modified Mixed Methods Appraisal Tool (MMAT): Quantitative Studies

	Cataldo, et al. 2016 (4)	Copeland, et al. 2019 (5)	Coughlin 2020 (6)	Duong, et al. 2017 (9)	Eberth, et al. 2014 (11)	Eberth, et al. 2018 (10)	Ersek, et al. 2016 (12)	Hall, et al. 2018 (13)	Henderson, et al. 2017 (14)	Henderson, et al. 2019 (15)	laccarino, et al. 2015 (17)	Khairy, et al. 2018 (19)	Leng, et al. 2020 (20)	Lewis, et al. 2019 (21)	Li, et al. 2020 (22)	Lillie, et al. 2017 (23)	Monu, et al. 2020 (26)	Mukthinuthalapati, et al. 2020 (27)	Rajupet, et al. 2017 (29)	Randhawa, et al. 2018 (30)	Raz et al. (31)	Williams, et al. (37)
S1. Are there clear research questions?	Υ	Υ	Y	Y	Υ	Υ	Y	Y	Y	Υ	Y	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ
S2. Do the collected data allow to address the research questions?	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ
4.1. Is the sampling strategy relevant to address the research question?	Υ	Υ	N	Υ	Υ	Υ	Υ	Y	Y	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	NS	Υ	NS	Υ	Y
4.2. Are the qualitative data collection methods adequate to address the research question?	Υ	N S	N S	Υ	Υ	Υ	N	Y	Y	Υ	Υ	NS	Υ	Y	Υ	NS	N	NS	NS	NS	Υ	NS
4.3. Are the measurements appropriate?	Υ	N S	Y	Y	Υ	Υ	Y	Y	Y	Υ	Y	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ
4.4. Is the risk of nonresponse bias low?	Υ	N S	N S	Υ	Υ	Υ	Y	Υ	Υ	Υ	Υ	Υ	Υ	Υ	NS	Υ	NS	NS	NS	NS	NS	NS
4.5. Is the statistical analysis appropriate to answer the research question?	Υ	N S	Υ	NS	NS	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	NS	Υ	Υ

Abbreviations: Y=Yes; N=No; NS=Not Sure

## **Supplementary Table 2.** Quality appraisal of included studies using the modified Mixed Methods Appraisal Tool (MMAT): Qualitative Studies

	Ahsan, et al. 2019 (1)	Allen, et al. 2020 (2)	Carter-Harris & Gould. 2017 (3)	Dukes, et al. 2020 (8)	Hoffman, et al. 2015 (16)	Kanodra, et al. 2016 (18)	Mishra, et al. 2016 (25)	Roth, et al. 2018 (32)	Simmons, et al. 2017 (33)	Sin, et al. 2016 (34)	Watson, et al. 2021 (36)
S1. Are there clear research questions?	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ
S2. Do the collected data allow to address the research questions?	Υ	Υ	Υ	Y	Υ	Υ	Υ	Υ	Υ	Υ	Υ
1.1. Is the qualitative approach appropriate to answer the research question?	Υ	Υ	Υ	Y	Υ	Υ	Υ	Υ	Υ	Υ	Υ
1.2. Are the qualitative data collection methods adequate to address the research question?	Υ	Υ	Y	Υ	Y	Y	Y	Y	Y	Y	Υ
1.3. Are the findings adequately derived from the data?	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ
1.4. Is the interpretation of results sufficiently substantiated by data?	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ
1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	Υ	Υ	Y	N	Y	Y	N	N	N	N	Υ

Abbreviations: Y=Yes; N=No; NS=Not Sure

**Supplementary Table 3.** Quality appraisal of included studies using the modified Mixed Methods Appraisal Tool (MMAT): Mixed Methods Studies

	Draucker, et al. 2019 (7)	McDonnell, et al. 2019 (24)	Qiu, et al. 2016 (28)	Tseng, et al. 2019 (35)
S1. Are there clear research questions?	Υ	Υ	Υ	Υ
S2. Do the collected data allow to address the research questions?	Υ	Υ	Υ	Υ
5.1. Is there an adequate rationale for using a mixed methods design to address the research question	Υ	Υ	Υ	Υ
5.2. Are the different components of the study effectively integrated to answer the research question?	Υ	Υ	Υ	Υ
5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?	Υ	Υ	Υ	Υ
5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed	Υ	Υ	Υ	Υ
5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?	Y	Y	Υ	Υ

Abbreviations: Y=Yes; N=No; NS=Not Sure

## **REFERENCES**

- 1. Ahsan, A., et al. (2019). "Examining Lung Cancer Screening Behaviors in the Primary Care Setting: A Mixed Methods Approach." Journal of cancer treatment and research 7(1): 1.
- 2. Allen, C. G., et al. (2020). "Successes and challenges of implementing a lung cancer screening program in federally qualified health centers: a qualitative analysis using the Consolidated Framework for Implementation Research." Translational Behavioral Medicine 11(5): 1088-1098.
- 3. Carter-Harris, L. and Gould, M.K. (2017). "Multilevel barriers to the successful implementation of lung cancer screening: why does it have to be so hard?" Annals of the American Thoracic Society 14(8): 1261-1265.
- 4. Cataldo, J. K. (2016). "High-risk older smokers' perceptions, attitudes, and beliefs about lung cancer screening." Cancer medicine 5(4): 753-759.
- 5. Copeland, A., et al. (2019). "Effectiveness of lung cancer screening implementation in the community setting in the United States." Journal of Oncology Practice 15(7): e607-e615.
- 6. Coughlin, J. M., et al. (2020). "Understanding barriers to lung cancer screening in primary care." Journal of Thoracic Disease 12(5): 2536.
- Draucker, C. B., et al. (2019). "Understanding the decision to screen for lung cancer or not: A qualitative analysis."
  Health Expectations 22(6): 1314-1321.
- 8. Dukes, K., et al. (2020). "Attitudes of Clinicians about Screening Head and Neck Cancer Survivors for Lung Cancer Using Low-Dose Computed Tomography." Annals of Otology, Rhinology & Laryngology 129(1): 23-31.
- 9. Duong, D. K., et al. (2017). "Patient and primary care provider attitudes and adherence towards lung cancer screening at an academic medical center." Preventive medicine reports 6: 17-22.
- 10. Eberth, J. M., et al. (2018). "A national survey of primary care physicians: perceptions and practices of low-dose CT lung cancer screening." Preventive medicine reports 11: 93-99.
- 11. Eberth, J. M., et al. (2014). "Computed tomography screening for lung cancer: a survey of Society of Thoracic Radiology members." Journal of thoracic imaging 29(5): 289-292.
- 12. Ersek, J. L., et al. (2016). "Knowledge of, attitudes toward, and use of low-dose computed tomography for lung cancer screening among family physicians." Cancer 122(15): 2324-2331.
- 13. Hall, D. L., et al. (2018). "Lung cancer screening uncertainty among patients undergoing LDCT." American journal of health behavior 42(1): 69-76.
- 14. Henderson, L. M., et al. (2017). "Opinions, practice patterns, and perceived barriers to lung cancer screening among attending and resident primary care physicians." Risk management and healthcare policy 10: 189.
- 15. Henderson, L. M., et al. (2019). "Opinions and practices of lung cancer screening by physician specialty." North Carolina medical journal 80(1): 19-26.
- 16. Hoffman, R., et al. (2019). "Attitudes and beliefs of primary care providers in new mexico about lung cancer screening using low-dose computed tomography (vol 16, 150112e, 2019)." Preventing chronic disease 16.
- 17. Iaccarino, J. M., et al. (2015). "A national survey of pulmonologists' views on low-dose computed tomography screening for lung cancer." Annals of the American Thoracic Society 12(11): 1667-1675.
- 18. Kanodra, N. M., et al. (2016). "Primary care provider and patient perspectives on lung cancer screening. A qualitative study." Annals of the American Thoracic Society 13(11): 1977-1982.
- 19. Khairy, M., et al. (2018). "An analysis of lung cancer screening beliefs and practice patterns for community providers compared to academic providers." Cancer Control 25(1): 1073274818806900.
- 20. Leng, J., et al. (2020). "Primary Care Providers' Knowledge, Attitudes, Beliefs, and Practice Related to Lung Cancer Screening in Five High-Risk Communities in New York City." Journal of Cancer Education: 1-10.
- 21. Lewis, J. A., et al. (2019). "Low provider knowledge is associated with less evidence-based lung cancer screening." Journal of the National Comprehensive Cancer Network 17(4): 339-346.
- 22. Li, C.-C., et al. (2020). "Adaptation and Preliminary Evaluation of a Lung Cancer Screening Decision Tool for Older Chinese American Populations." Journal of the National Medical Association 112(4): 433-444.
- 23. Lillie, S. E., et al. (2017). "What factors do patients consider most important in making lung cancer screening decisions? Findings from a demonstration project conducted in the Veterans Health Administration." Lung Cancer 104: 38-44.
- 24. McDonnell, K. K., et al. (2019). "Lung cancer screening: Practice guidelines and insurance coverage are not enough." Journal of the American Association of Nurse Practitioners 31(1): 33.
- 25. Mishra, S. I., et al. (2016). "Peer reviewed: Patient perspectives on low-dose computed tomography for lung cancer screening, New Mexico, 2014." Preventing chronic disease 13.
- 26. Monu, J., et al. (2020). "Evaluating knowledge, attitudes, and beliefs about lung cancer screening using crowdsourcing." Chest 158(1): 386-392.
- 27. Mukthinuthalapati, V. P. K., et al. (2020). "Knowledge, Attitudes, and Practices Pertaining to Lung Cancer Screening Among Primary Care Physicians in a Public Urban Health Network." Clinical lung cancer 21(5): 450-454.

- 28. Qiu, R., Copeland, Amy, Sercy, Erica, Porter, Nancy R (2016). "Planning and implementation of low-dose computed tomography lung cancer screening programs in the United States." Clinical journal of oncology nursing 20(1): 52.
- 29. Rajupet, S., et al. (2017). "Attitudes about lung cancer screening: primary care providers versus specialists." Clinical lung cancer 18(6): e417-e423.
- 30. Randhawa, S., et al. (2018). "Lung cancer screening in the community setting: Challenges for adoption." The American Surgeon 84(9): 1415-1421.
- 31. Raz, D. J., et al. (2019). "Perceptions and utilization of lung cancer screening among smokers enrolled in a tobacco cessation program." Clinical lung cancer 20(1): e115-e122.
- 32. Roth, J. A., et al. (2018). "A qualitative study exploring patient motivations for screening for lung cancer." PLoS One 13(7): e0196758.
- 33. Simmons, V. N., et al. (2017). "High-risk community and primary care providers knowledge about and barriers to low-dose computed topography lung cancer screening." Lung Cancer 106: 42-49.
- 34. Sin, M.-K., et al. (2016). "Sociocultural barriers to lung cancer screening among Korean immigrant men." Journal of community health 41(4): 790-797.
- 35. Tseng, T.-S., et al. (2019). "Knowledge and attitudes towards low dose computed tomography lung cancer screening and smoking among African Americans—a mixed method study." Transl Cancer Res 8: S431-442.
- 36. Watson, L., et al. (2021). "Implementation of a Lung Cancer Screening Program in Two Federally Qualified Health Centers." Public Health Reports: 0033354920971717.
- 37. Williams, R. M., et al. (2020). "Lung cancer screening decisional needs among African American smokers of lower socioeconomic status." Ethnicity & Health: 1-19.