

Finding paths with the greatest chance of success: enabling and focusing lung cancer screening and cessation in resource-constrained areas

Wiley D. Jenkins¹, David Gilbert², Li-Shiun Chen³, Leslie R. Carnahan⁴

¹Department of Population Science and Policy, School of Medicine, Southern Illinois University, Springfield, IL 62794, USA; ²Department of Psychology, Southern Illinois University, Carbondale, IL 62901, USA; ³Department of Psychiatry, Siteman Cancer Center, Washington University in St. Louis, St. Louis, MO 63110, USA; ⁴Center for Research on Women and Gender, College of Medicine, University of Illinois at Chicago, Chicago, IL 60607, USA

Correspondence to: Wiley D. Jenkins, PhD, MPH, FACE. Chief, Epidemiology and Biostatistics, Department of Population Science and Policy, School of Medicine, Southern Illinois University, 201 E. Madison St, Springfield, IL 62794, USA. Email: wjenkins@siumed.edu.

Comment on: Rojewski AM, Tanner NT, Dai L, *et al.* Tobacco Dependence Predicts Higher Lung Cancer and Mortality Rates and Lower Rates of Smoking Cessation in the National Lung Screening Trial. *Chest* 2018;154:110-8.

Submitted Aug 27, 2018. Accepted for publication Sep 10, 2018.

doi: 10.21037/tlcr.2018.09.11

View this article at: <http://dx.doi.org/10.21037/tlcr.2018.09.11>

The article by Rojewski *et al.* is an important contribution to the literature regarding factors influencing smoking cessation and lung cancer but we believe that it also has substantial benefit in other areas of public health and clinical care (1). For many public health and clinical interventions, applicability criteria are insufficiently specific to allow careful targeting of intervention resources to those most likely to experience maximum benefit. In contrast, the study demonstrates the utility of a quick-to-administer screening tool, time to first cigarette (TTFC), as a predictor of the likelihood of individual smoking cessation. While others studies (e.g., Baker *et al.*, 2007) have shown the efficacy of short TTFC as a predictor of abstinence success, the current study shows how the single-time TTFC question can be useful even in the context of lung cancer (LC) screening (2).

Succinctly distilled, the study had at least two findings for discussion here. First is that the single measure, TTFC, is itself significantly prognostic regarding an individual's quit likelihood based upon standard of care, i.e., higher dependence as measured by TTFC is associated with lower quit likelihood. Second, higher dependence is associated with increased LC and all-cause mortality. While there may be wide applicability of these findings, we posit that they may be especially important and applicable in rural areas which are often disproportionately limited in

resources and specialty care across the cancer continuum in comparison to urban (3).

The nearly 20% of the US population residing in rural areas continue to be disproportionately impacted by tobacco use, with increased rates of smoking (and other tobacco use) (4). Multiple studies have documented increased tobacco use among rural populations, and while the national mean smoking prevalence hovers around 18%, rural areas are frequently in the 20–25% range, depending on degree of rurality (5). Further, the nationally-observed decline in smoking is less pronounced in rural areas (6). As a consequence of this increased exposure, studies have observed disparities in both lung cancer incidence and mortality among rural areas in comparison to their urban peers (7,8). Evidence shows that tobacco cessation among lung cancer patients after diagnosis may increase overall survival (9). Data from the Lung Screening Trial (NLST) clearly show that seven years of smoking abstinence reduced lung cancer-specific mortality by 20%, which is comparable with the benefit of low-dose computed tomography screening (10). The greatest risk reduction occurs when smoking abstinence is combined with screening, highlighting the significance of smoking cessation treatments in screening programs. While cessation is obviously beneficial to all tobacco users, resource-limited areas may lack a diverse suite of offered

interventions, relying instead upon a smaller number of strategies applied equally to all users. TTFC is an easy-to-implement tool to identify smokers who would most benefit and/or most need enhanced intervention would allow for a more careful, specific, and feasible allocation of clinician time and intervention.

Compounding the problem of increased exposure in rural areas is a concomitant paucity of preventive services. Though some measures such as a state-level quitlines, tobacco cessation services available via toll-free telephone, may be equally, if not more so, utilized in rural areas, those which are more locally resource dependent (e.g., smoking cessation classes) are less prevalent (11,12). From the provider side, studies indicate rural clinicians may have lower rates of adhering to screening guidelines (e.g., colorectal cancer screening), with specific issues associated with lung cancer screening and equipment access specifically (13,14). Another barrier in rural healthcare is uncommon use of electronic health record-enabled tools to enhance smoking cessation care delivery (15). Overall, lack of time and training, and misalignment of provider assumptions versus patient needs, contributes to a diminished likelihood of provision and uptake of evidence-based interventions and treatments in rural community health centers (16). Thus, differential access to prevention and cessation resources, combined with local culture more encouraging of tobacco use, result in an unequal burden of lung cancer situated in the intersection of system, provider, and individual-level barriers among rural populations (17).

Smoking cessation brings a profound benefit for smokers undergoing lung cancer screening programs. A large meta-analysis of more than 12,000 ever smokers with/without lung cancer showed that quitting smoking is a highly effective preventive measure, cutting lung cancer risk approximately in half for individuals with all genotypes. Furthermore, among those who developed lung cancer, smokers who quit had a delay in onset by 7 years than smokers who continue smoking (18). Given the high mortality of lung cancer (50% within one year of diagnosis, SEER 2018), this 7-year delay in onset of lung cancer is clinically significant (19). We propose that the study results may have utility to influence smoking cessation programs—especially in rural areas. The use of TTFC as a single screening tool applied during patient intake may allow clinical staff to better identify those in most need of and direct intensive resources to those who (I) require them to increase quit success and (II) have a greater risk for LC diagnosis and death.

So how may the finding of the Rojewski *et al.* study be

applied? We believe that the finding that a single measure, TTFC, is a significant predictor of quit likelihood is of great practical importance as time is one of clinicians' most valuable resources. On average, primary care physicians spend about 20 minutes per patient consultation (20). A single question asked during visit intake can then be used to inform either standard versus intensive cessation intervention, and directly inform clinicians regarding how to structure aspects of the patient encounter, e.g., a study by Gu *et al.* showing that TTFC can help classify patients with regard to cancer risk and potentially influence clinician and smoker decision making (21). Another clinical intervention is the 5A model (Ask, Advise, Assess, Assist, and Arrange). While there is evidence of its effectiveness in research settings, practical implementation lacks fidelity at Assist and Arrange (with few smokers receiving either) (22). TTFC assessment might be useful as a motivator to both clinicians and smokers to pursue these last two aspects. The evidence suggests that TTFC is directly related to lung cancer risk, it is something that can be quickly shared with smoking patients to inform and possibly motivate. As is, smokers with assessed higher dependence may not receive sufficiently intensive information about short TTFC-associated cancer risks or sufficient intervention to significantly influence their quit attempt likelihood and success. As clinical staff may be unaware of this increased dependence and resultant impact upon quit success, cessation failure may be attributed to other factors.

The study's other findings may have disproportionately large impact in rural healthcare systems where screening is underutilized. Rural areas suffer from a paucity of specialty care, resulting in a disproportionate reliance upon primary care (family and general internal medicine) which themselves are frequently limited and difficult to access (e.g., long travel times) (23–25). Such clinicians by training lack much of the expertise of their specialist colleagues, and the relative low prevalence of cancer in the primary care patient population contributes to difficulty in identifying and assessing risk factors and diagnosing some diseases at earlier stages (26). Evidence suggests that low-burden healthcare system strategies involving decision support embedded in electronic health records holds great promise for increasing the provision of smoking cessation treatment to smokers in rural healthcare settings and increasing their likelihood of quitting as well (27).

Ultimately, we believe that the study results may have utility to influence lung cancer screening programs—especially in rural areas. This tool is in addition to the screening criteria (i.e., 30 pack-year history) and can be

rapidly administered to flag the most at-risk patients to screening within the primary care setting. The implementation of the dependence scale within routine clinical history collection can allow for a swift assessment of patient relative risk for lung cancer disease and death and serve as an automatic prompt to the clinician that this circumstance warrants a referral to specialty care (and perhaps enhanced cessation intervention as indicated). This addresses screening recommendations, but the same data may also serve to influence utilization by incorporation as a point of motivation with patients reticent to screening. Rural patients frequently must travel far for specialty care (e.g., screening) and this may motivate them to take the time and effort. The tool can also support CASDM processes, and be incorporated into alternate models for screening referrals, such as utilizing APNs, PAs, and community health workers and navigators.

While Rojewski *et al.* note there is a need to identify mechanisms underlying TTFC association with lung cancer and with difficulty in quitting smoking, the study provides evidence that can have high impact now. None the less, it important to note that TTFC could reflect individual differences in biological, personality traits, and/or lifestyle factors not assessed in the study. Simply saying that TTFC is an index of addiction does not explain the nature of the processes leading to an individual's tendency to continue smoking. Thus, it will be important for investigators to better characterize both why TTFC is associated with continued smoking and to assess potential mechanisms that may promote cancer in addition to greater carcinogen exposure associated with short TTFC. In addition, it is important to both use the TTFC index in future studies of predictors of lung cancer and to search for additional brief and easily assessed smoking-related predictors of cessation and lung cancer.

Acknowledgements

While there is no funding associated with this specific work, the authors do acknowledge the following current funding from the National Institutes of Health: WD Jenkins is funded by 5UG3DA044829-02 and 5P20CA192987-03, LS Chen is funded by R01 DA038076 and P30 CA091842-16S2, and D Gilbert by R01 DA036032.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

References

1. Rojewski AM, Tanner NT, Dai L, et al. Tobacco Dependence Predicts Higher Lung Cancer and Mortality Rates and Lower Rates of Smoking Cessation in the National Lung Screening Trial. *Chest* 2018;154:110-8.
2. Baker TB, Piper ME, McCarthy DE, et al. Time to first cigarette in the morning as an index of ability to quit smoking: implications for nicotine dependence. *Nicotine Tob Res* 2007;9:S555-70.
3. Meilleur A, Subramanian SV, Plascak JJ, et al. Rural residence and cancer outcomes in the United States: issues and challenges. *Cancer Epidemiol Biomarkers Prev* 2013;22:1657-67.
4. United States Census Bureau, 2017. 2010 census urban and rural classification and urban area criteria. Available online: <https://www.census.gov/geo/reference/ua/urban-rural-2010.html>, Accessed date: 9 March 2017.
5. Atkins GT, Kim T, Munson J. Residence in total areas of the United States and lung cancer mortality. Disease incidence, treatment disparities, and stage-specific survival. *Ann Am Thorac Soc* 2017;14:403-11.
6. Doogan NJ, Roberts ME, Wewers ME, et al. A growing geographic disparity: Rural and urban cigarette smoking trends in the United States. *Prev Med* 2017;104:79-85.
7. Zahnd WE, James AS, Jenkins WD, et al. Rural-Urban Differences in Cancer Incidence and Trends in the United States. *Cancer Epidemiol Biomarkers Prev* 2017. [Epub ahead of print].
8. Fogleman AJ, Mueller GS, Jenkins WD. Does where you live play an important role in cancer incidence in the U.S.? *Am J Cancer Res* 2015;5:2314-9.
9. Dobson Amato KA, Hyland A, Reed R, et al. Tobacco Cessation May Improve Lung Cancer Patient Survival. *J Thorac Oncol* 2015;10:1014-9.
10. Tanner NT, Kanodra NM, Gebregziabher M, et al. The Association between Smoking Abstinence and Mortality in the National Lung Screening Trial. *Am J Respir Crit Care Med* 2016;193:534-41.
11. Botchway A, Jenkins WD. P33. Rural-Urban Differences in Quitline Use: A Statewide Analysis of the Illinois Tobacco Quitline. *Ann Epidem* 2015;25:710.
12. Hutcheson TD, Greiner KA, Ellerbeck EF, Jeffries SK, Mussulman LM, Casey GN. Understanding smoking cessation in rural communities. *J Rural Health* 2008;24:116-24.
13. Beydoun HA, Beydoun MA. Predictors of colorectal cancer screening behaviors among average-risk older adults in the

- United States. *Cancer Causes Control* 2008;19:339-59.
14. Hoffman RM, Sussman AL, Getrich CM, et al. Attitudes and Beliefs of Primary Care Providers in New Mexico About Lung Cancer Screening Using Low-Dose Computed Tomography. *Prev Chronic Dis* 2015;12:E108.
 15. Schindler-Ruwisch JM, Abrams LC, Bernstein SL, et al. A content analysis of electronic health record (EHR) functionality to support tobacco treatment. *Transl Behav Med* 2017;7:148-56.
 16. Chen LS, Baker T, Brownson RC, et al. Smoking Cessation and Electronic Cigarettes in Community Mental Health Centers: Patient and Provider Perspectives. *Community Ment Health J* 2017;53:695-702.
 17. Jenkins WD, Matthews AK, Bailey A, et al. Rural areas are disproportionately impacted by smoking and lung cancer. *Prev Med Rep* 2018;10:200-3.
 18. Chen LS, Baker T, Hung RJ, et al. Genetic Risk Can Be Decreased: Quitting Smoking Decreases and Delays Lung Cancer for Smokers With High and Low CHRNA5 Risk Genotypes - A Meta-Analysis. *EBioMedicine* 2016;11:219-26.
 19. Noone AM, Howlander N, Krapcho M, et al. SEER Cancer Statistics Review, 1975-2015, National Cancer Institute. Bethesda, MD, Available online: https://seer.cancer.gov/csr/1975_2015/, based on November 2017 SEER data submission, posted to the SEER web site, April 2018.
 20. Irving G, Neves AL, Dambha-Miller H, et al. International variations in primary care physician consultation time: a systematic review of 67 countries. *BMJ Open* 2017;7:e017902.
 21. Gu F, Wacholder S, Kovalchik S, et al. Time to smoke first morning cigarette and lung cancer in a case-control study. *J Natl Cancer Inst* 2014;106:dju118.
 22. Quinn VP, Hollis JF, Smith KS, et al. Effectiveness of the 5-As tobacco cessation treatments in nine HMOs. *J Gen Intern Med* 2009;24:149-54.
 23. Charlton M, Schlichting J, Chioreso C, et al. Challenges of Rural Cancer Care in the United States. *Oncology (Williston Park)* 2015;29:633-40.
 24. Health Resources and Services Administration. Rural Cancer Less Common, More Deadly. Available online: <https://www.hrsa.gov/enews/2017/ruralcancer.html>. Accessed August 23, 2018.
 25. Rural Health Information Hub. Healthcare access in rural communities. Available online: <https://www.ruralhealthinfo.org/topics/healthcare-access#barriers>. Accessed August 23, 2018.
 26. Round T, Steed L, Shankleman J, et al. Primary care delays in diagnosing cancer: what is causing them and what can we do about them? *J R Soc Med* 2013;106:437-40.
 27. Chen LS, Baker TB, Korpecki JM, et al. Low-Burden Strategies to Promote Smoking Cessation Treatment Among Patients With Serious Mental Illness. *Psychiatr Serv* 2018;69:849-51.

Cite this article as: Jenkins WD, Gilbert D, Chen LS, Carnahan LR. Finding paths with the greatest chance of success: enabling and focusing lung cancer screening and cessation in resource-constrained areas. *Transl Lung Cancer Res* 2018;7(Suppl 3):S261-S264. doi: 10.21037/tlcr.2018.09.11