Oregon Health & Science University
School of Medicine

Scholarly Projects Final Report

Title *(Must match poster title; include key words in the title to improve electronic search capabilities.)*

Low-Dose Lung Cancer Screenings in Rural vs. Urban Patient Populations

Student Investigator's Name

Madison Miller-McNeely

Date of Submission *(mm/dd/yyyy)*

Graduation Year

2026

Project Course *(Indicate whether the project was conducted in the Scholarly Projects Curriculum; Physician Scientist Experience; Combined Degree Program [MD/MPH, MD/PhD]; or other course.)*

Scholarly Project Curriculum

Co-Investigators *(Names, departments; institution if not OHSU)*

None

Mentor's Name

Eric Wiser

Mentor's Department

Family Medicine

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Concentration Lead's Name

Ladawna Gievers

Project/Research Question

The overarching question that my project is addressing is: Are people in rural areas who qualify to obtain low-dose lung cancer screenings less likely to get them than people in urban areas? The primary null hypothesis of the study is that there is no difference in patients from rural vs urban populations being offered low-dose lung cancer screenings and obtaining them.

Type of Project *(Best description of your project; e.g., research study, quality improvement project, engineering project, etc.)*

Retrospective, cross sectional chart review

Key words *(4-10 words describing key aspects of your project)*

Lung cancer, LDCT, lung cancer screening, rural, urban

Meeting Presentations

If your project was presented at a meeting besides the OHSU Capstone, please provide the meeting(s) name, location, date, and presentation format below (poster vs. podium presentation or other).

NA

Publications *(Abstract, article, other)*

If your project was published, please provide reference(s) below in JAMA style.

NA

Submission to Archive

Final reports will be archived in a central library to benefit other students and colleagues. Describe any restrictions below (e.g., hold until publication of article on a specific date).

NA

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Next Steps

What are possible next steps that would build upon the results of this project? Could any data or tools resulting from the project have the potential to be used to answer new research questions by future medical students?

Future prospective studies should examine geographic access and system-level barriers to identify interventions that improve lung cancer screening uptake in rural populations. Specifically, EHR reminder differences in rural and urban clinics, distance to screening facilities, and transportation barriers.

Please follow the link below and complete the archival process for your Project in addition to submitting your final report.

https://ohsu.ca1.qualtrics.com/jfe/form/SV_3ls2z8V0goKiHZP

Student's Signature/Date *(Electronic signatures on this form are acceptable.)*
This report describes work that I conducted in the Scholarly Projects Curriculum or alternative academic program at the OHSU School of Medicine. By typing my signature below, I attest to its authenticity and originality and agree to submit it to the Archive.

X Madison Miller-McNeely, 3/14/26

Student's full name

Mentor's Approval *(Signature/date)*

3/18/2026

X Eric M Wiser MD

Mentor Name

Signed by: Eric M Wiser MD

Scholarly Project Final Report

Report*: Information in the report should be consistent with the poster, but could include additional material. Insert text in the following sections targeting 1500-3000 words overall; include key figures and tables. Use Calibri 11-point font, single spaced and 1-inch margin; follow JAMA style conventions as detailed in the full instructions.*

Introduction *(≥250 words)*

Lung cancer is the leading cause of cancer-related deaths in the US. It is estimated that a total of 124,730 people (including males and females) will die from lung cancer this year. In comparison, it is estimated that 52,900 people (including males and females) will die from colon cancer this year.[1] These data highlight the substantial public health burden of lung cancer in the United States. Despite the development of low-dose lung cancer screenings, lung cancer mortality remains high. A lung cancer screening trial found that annual low-dose CT (LDCT) screenings had a relative reduction of lung cancer death by 20%.[2] Even with this reduction, lung cancer remains one of the leading causes of death in the U.S.

The purpose of this study is to investigate urban and rural populations and determine if they have LDCT screenings ordered and completed at the same rate. It has been shown that rural populations have higher rates of smoking and diagnosis of, as well as mortality from, lung cancer.[3] Because of this, it is imperative that LDCT screenings are being offered to, ordered, and followed up on in rural populations at the same rate as they are in urban populations. There has been minimal research done to address access differences in rural populations compared to urban populations. For example, one study found that there are fewer facilities that do lung cancer screenings in rural areas, so these patients have to travel longer distances to obtain the screenings.[4] There has not been abundant research into whether or not physicians are more or less likely to order lung cancer screenings on their patients in rural versus urban populations.

The main question we are seeking to answer is: Are people in rural areas who qualify to obtain LDCT screenings less likely to have them ordered and completed than people in urban areas? The primary null hypothesis of the study is that there is no difference in patients from rural versus urban populations being ordered LDCT screenings and completing them.

Methods *(≥250 words)*

We performed a retrospective, cross-sectional chart review comparing a rural clinic in Scappoose, OR and an urban clinic in Portland, OR. Two hundred patients from each clinic were selected who met the USPSTF criteria for lung cancer screening: age 50–80 years, ≥20 pack-year smoking history, and current smoker or quit within the past 15 years. We used SlicerDicer query in Epic to identify potential patients, and this was stratified by age, smoking status, and clinic location. Thousands of patients met the criteria for each clinic location. Patients were selected at random, and eligibility was confirmed through chart review. For each patient, we recorded whether LDCT screening had been ordered and/or completed within the past year. An order was counted if it appeared in the EHR within the past year, and completion was confirmed by documentation of imaging performed. If a patient had been offered screening within the past year and declined, they were counted as ordered but not completed. Charts were reviewed for the period of January 2024 through December 2024. Chi-square tests of independence (Pearson) were used to compare ordering and completion rates between rural and urban clinics.

Patients were grouped by rural and urban and then further grouped by lung cancer screening being ordered/not ordered and being completed/not completed. We determined smoking exposure for each subgroup to analyze whether there were similar smoking rates for all groups.

Subgroup analyses were performed to evaluate whether ordering and completion rates differed by insurance type. We looked at Medicare only, Medicaid only, dual eligibility, and commercial insurance for each subgroup. Chi-square tests were done for each subgroup in the rural and urban populations to compare differences in ordering and completion rates across insurance types.

Statistical analyses, including chi-square tests of independence, were performed in Microsoft Excel, and significance was defined as $p < 0.05$.

Results *(≥500 words)*

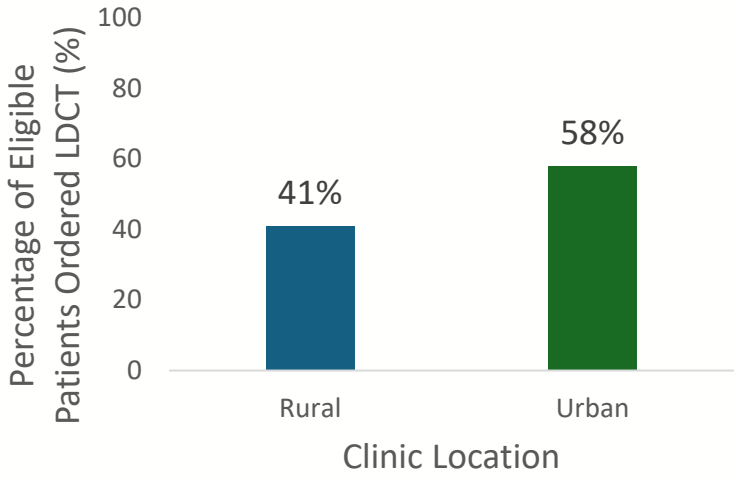
A total of 400 patients were included in the study and they all met USPSTF screening guidelines. Patient demographics across rural and urban populations were compared and can be seen in Table 1 below. Age and smoking exposure are reported as mean values with standard deviations. Smoking exposure was measured as cumulative pack-years. In the rural population (n=200), 80 (40.0%) were male and 120 (60.0%) were female; in the urban population (n=200), 83 (41.5%) were male and 117 (58.5%) were female. The mean age was 62.04 ± 6.57 years in rural patients and 63.83 ± 6.81 years in urban patients. Mean pack-years were 40.12 ± 18.82 and 40.82 ± 20.08, respectively.

Table 1. Baseline Characteristics of Rural and Urban Patients.

Characteristic	Rural Clinic (n=200)	Urban Clinic (n=200)
Age, mean (SD)	62.04 (6.57)	63.83 (6.81)
Female, n (%)	120 (60.0%)	117 (58.5%)
Male, n (%)	80 (40.0%)	83 (41.5%)
Pack-years, mean (SD)	40.12 (18.82)	40.82 (20.08)

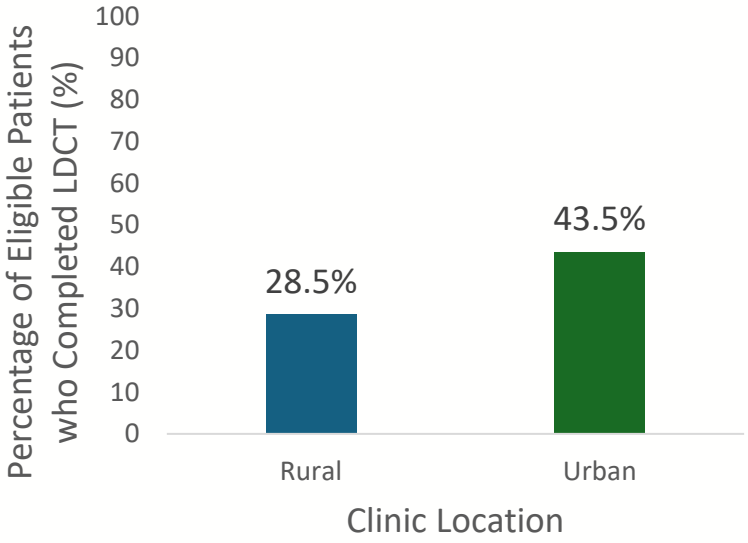
A chi-square test of independence was performed and the results comparing ordering rates between rural and urban clinics are shown in Figure 1 below. LDCT screening was ordered for 82 of 200 rural patients (41.0%) compared with 116 of 200 urban patients (58.0%), an absolute difference of 17.0% (95% CI, 7.3% to 26.7%; $P < .001$). This compares to 118 rural patients not having screening ordered and 84 urban patients not having screening ordered.

Figure 1. LDCT Ordered by Clinic Location



Chi-square test results comparing completion rates between rural and urban clinics are shown in Figure 2 below. LDCT screening was completed by 57 of 200 rural patients (28.5%) compared with 87 of 200 urban patients (43.5%), an absolute difference of 15.0% (95% CI, 5.7% to 24.3%; P = .002). There were 143 rural patients who did not complete screening compared to 113 urban patients who did not complete screening.

Figure 2. LDCT Completed by Clinic Location



Smoking exposure was descriptively compared between all subgroups in the rural and urban populations using mean pack-years. For patients with screenings not ordered, the means were 37.8 and 35.2 pack-years, respectively; for patients with screenings not completed, 37.5 and 37.2 pack-years; for patients with screenings ordered, 43.5 and 45.1 pack-years; and for patients with screenings completed, 46.6 and 45.5 pack-years.

Insurance coverage was compared in each of the subgroups in the rural and urban populations; rural ordered/not ordered, rural completed/not completed, urban ordered/not ordered, urban completed/not completed. Insurance distribution was evaluated across Medicare, Medicaid, dual-eligible, and commercial insurance groups. The calculated chi-square statistic indicated that there was no significant association between insurance coverage and patients having screening ordered or completed. ($P > .05$ for all comparisons).

Discussion *(≥500 words)*

Rural patients were significantly less likely than urban patients to have LDCT screening ordered and completed, despite similar eligibility, smoking exposure, and no significant differences by insurance type. These findings suggest that barriers beyond clinical eligibility may contribute to lower screening uptake in rural areas.

There are many possible reasons why rural patients may not complete screening at the same rate as urban patients. There are often fewer imaging facilities in rural areas, and patients may have to travel farther distances; this may discourage patients from scheduling their screening. This was seen in one 2018 study where rural residents were less likely than urban residents to have access to a screening facility within a 30-minute drive (22.2% rural vs. 83.2% urban).[5] Transportation is likely a contributing factor because patients in rural areas may not have access to personal or public transportation and the associated costs may be a barrier. A 2020 study examining barriers in a rural screening-eligible population found that not having reliable transportation or being inhibited by transportation costs was a reason screening was not completed.[6] This factor could disproportionately affect patients of lower socioeconomic status or older adults.

Patients in rural areas were also found to have significantly lower ordering rates than urban patients. Several possibilities exist as to why we saw these differences. There may be a lack of clinician awareness of screening guidelines, which could contribute to screening not being ordered on patients who are eligible. Primary care visits often have competing priorities and little time, which can result in routine screenings being pushed back to the next visit. One 2020 study surveyed 96 primary care providers and found that only 6.2% of respondents were able to correctly identify all six Centers for Medicare and Medicaid Services eligibility criteria; moreover, they found that barriers included failure of EMR reminders, patient refusal, false positives, and time constraints.[7] Additionally, there may be a perception from clinicians in rural areas that the patient may not have access to a screening facility and may not follow through, which results in lower ordering rates.

These findings are consistent with prior literature showing low overall utilization of lung cancer screening, although relatively few studies have specifically examined differences in both ordering and completion rates between rural and urban clinics. One study found that although 83% of surveyed primary care providers agreed that annual screening with LDCT is recommended, nearly one third of them reported not ordering LDCT scans for eligible patients and among those who do, 80% only order 1-3 per month.[7] An additional study analyzed LDCT screening uptake between rural and urban populations and found that out of eligible participants, only 17.54% completed screening, including 17.70% of urban and 16.30% of rural participants. This study highlighted a general low uptake of screening, but no significant rural and urban differences in completion.[8] Rural patients face several barriers to obtaining screening, including transportation[6] and distance to screening facilities.[5] Overall, our study provides novel research on lower ordering and completion rates in a rural clinical population despite similar eligibility and insurance coverage. These findings highlight areas for potential interventions that could help with not only screening completion but also ordering rates. There may be a need for more EHR reminders, more provider information on lung cancer screening eligibility guidelines, and shared decision-making aids to help increase

ordering uptake in rural areas. Increasing completion rates in rural areas may require more discussions around transportation barriers and care coordination.

Several limitations exist in this study. One limitation is the retrospective, cross-sectional design. There was also a lack of data on travel distance, which made it impossible to directly test whether this factor influenced completion rates in our study. Unmeasured confounders may exist, including social determinants, which may have influenced healthcare utilization. Additionally, the study included only two clinics in one geographic region, which may limit generalizability to other healthcare systems or populations. This study relied on EHR documentation, which may not always be accurate or complete.

Future prospective studies should examine geographic access and system-level barriers to identify interventions that could improve lung cancer screening uptake in rural populations. Additionally, future studies should examine whether these findings are reproducible by looking at the ordering and completion rates in other urban and rural clinics.

Conclusions *(2-3 summary sentences)*

Rural patients were significantly less likely than urban patients to have LDCT screening ordered and completed despite similar eligibility, demographics, and smoking exposure. These findings suggest that barriers beyond clinical eligibility may contribute to lower screening uptake in rural areas such as access to imaging facilities, transportation challenges, and system-level differences in care delivery, as well as clinician perceptions of these barriers.

References *(JAMA style format)*

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4. Sahar L, Douangchai Wills VL, Liu KK, et al. Geographic access to lung cancer screening among eligible adults living in rural and urban environments in the United States. *Cancer.* 2022;128(8):1584-1594. doi:10.1002/cncr.33996
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