Demographic Variables and Pharmacotherapy Use in Adults Who Smoke

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ABSTRACT

Nearly 1 in 5 low-income American adults smoke; adults who smoke are at risk for several chronic diseases, cancers, and premature death. Pharmacotherapies have proven to be an effective means of aiding smoking cessation – however, uptake is relatively low due to a variety of factors. Analyzing correlations between various demographic variables and pharmacotherapy use in a sample of Chicago-area adults in smoking cessation treatment determined that there was no significant difference in sex and education levels between pharmacotherapy users and non-users; however, pharmacotherapy users smoked significantly fewer cigarettes than non-users at their last treatment session.

INTRODUCTION

In the U.S., over 18% of low-income adults smoke, a proportion almost three times greater than high income adults (CDC, 2022). Mortality in middle-aged adults who smoke is roughly two to three times higher than in nonsmokers of the same age (Jha & Peto, 2014). Smoking increases risk of cancer, respiratory and cardiovascular disease, and strokes (West, 2017). Thus, smoking cessation is vital to curb the long-lasting detrimental health effects of smoking. Evidence-based cessation options include group therapies, behavioral interventions, and pharmacotherapy (West, 2017). In particular, pharmacotherapy (bupropion, varenicline, and nicotine replacement therapy [NRT: lozenges, patches, gum]) has proven to be effective in supporting quit attempts: short-term quit rates of varenicline, bupropion, and NRT were found to be around 45.5%, 38.2%, and 33% respectively, compared to a quit rate around 9.4% with placebo (Saylan et al., 2021; Rigotti et al., 2022). Overall, meta-analyses demonstrate that varenicline increases chances of quitting by 15%, and bupropion and NRT increases quit rates by 8% and 7%, respectively (Rigotti et al., 2022).

Yet, the 2020 Surgeon General's report on smoking cessation found that over two-thirds of adults who smoke and attempted to quit had not tried to use FDA-approved pharmacotherapy or behavioral counseling at any point (U.S. Department of Health and Human Services, 2024). Further,

minoritized adults, especially Black, Hispanic, and Asian adults who smoke, are significantly less likely to utilize prescription pharmacotherapy, possibly due to lack of education on pharmacotherapy, stigma around medication use, and financial barriers (Tibuakuu et al, 2019; Hooper et al., 2017). Adults with low socioeconomic status who smoke are also less likely to continue smoking cessation treatment after initiating and tend to have more doubts about using pharmacotherapy (Hiscock et al., 2012). Moreover, this population experiences a disproportionate burden of tobacco-related disease (Wang et al., 2019). An analysis by Cokkinides et al. (2005) found that among adults who smoke, only 14.9% with Medicaid, 17.5% with Medicare, and 12.5% uninsured adults attempted to use pharmacotherapy at any point, compared to 21.7% nationally. This is problematic as it makes clear that low-income adults who smoke are less able to utilize supports when attempting to quit, thus putting these individuals at greater risk for long-term smoking-related health issues. However, there are a number of barriers preventing low socioeconomic status individuals from utilizing pharmacotherapy to quit smoking.

The Surgeon General's report concluded that comprehensive, accessible healthcare would increase adoption of smoking cessation treatment (U.S. Department of Health and Human Services, 2024). Following this reasoning, lack of access to adequate healthcare significantly impedes use of pharmacotherapy. Further contributing to lack of access to pharmacotherapy is the barrier of cost. A study by Masclans & Davis (2023) found that when attempting to access either combined nicotine replacement therapy or varenicline (the most effective smoking cessation medications), 45.1% of Medicare recipients and 16% of Medicaid recipients faced financial barriers, compared to only 8% of privately insured adults who smoke. Varenicline can cost up to $1,600 for a standard 12-week treatment; nicotine patches can cost up to $250 (Dakkak, 2021). As such, inconsistent insurance coverage can make pharmacotherapy unaffordable for low-income populations. Overall, low-income adults who smoke are the least likely to attempt to quit smoking and to have success after a smoking quit attempt, which --among other factors such as high stress levels, financial troubles, and social norms -- is tied to lower exposure to and adoption of NRT and other cessation methods (Kreuter et al., 2023).

Courage To Quit®-Rolling-Virtual (CTQ®-RV), an evidence-based smoking cessation group therapy developed by Dr. Andrea King at the University of Chicago Medicine (UCM), has shown promising outcomes for addressing smoking behavior; the earlier in-person, rolling model (CTQ®-R) showed a 30% decrease in mean cigarettes smoked per day across all CTQ®-R participants (Asyat et al., 2014; Brett et al., 2023). The primary site at the University of Chicago Medicine serves adults from the south and west sides of Chicago, IL, many of whom are Black and/or low income. CTQ®-RV features a rolling group model, allowing participants to join weekly sessions immediately after referral (e.g., there is no start or end date for groups) and continue treatment for as long as they need. Further, the treatment is delivered remotely via videoconference, which allows participants to receive treatment from their homes, mitigating barriers associated with

transportation, such as long commute times or lack of access to a vehicle. This model has proven to be especially effective in improving pharmacotherapy uptake and cessation success for "medically compromised, low socioeconomic status adults" who may face more difficulties attending the group on a fixed schedule due to competing appointments and other demands (e.g. childcare, mobility concerns). 81.4% of CTQ®-RV participants requested NRT, suggesting high uptake, and 33.3% of CTQ®-RV reported being smoke-free at the end of their treatment (Brett et al., in press).

Despite the relatively high adoption of pharmacotherapy in CTQ®-RV groups, the proven effectiveness of pharmacotherapy in smoking cessation demands a further increase in usage. Determining participant factors that are associated with pharmacotherapy use can help reveal mechanisms of use, and non-use, to inform treatments to better encourage medication uptake and continuation. Thus, this analysis seeks to determine whether differences in sex, education level, and average number of cigarettes smoked per day in the current CTQ®-RV group are associated with pharmacotherapy use.

METHODS

Courage to Quit-Rolling-Virtual (CTQ®-RV) participants were enrolled through referral by their medical provider. The CTQ® program was initially in-person and transitioned to the rolling version in 2016 before being adapted to a virtual format (CTQ®-RV) as a result of the COVID-19 pandemic in 2020 (Brett, in press).

Figure 1.

Data for this analysis were sourced from CTQ®-RV group rosters from March 27, 2024 to July 12, 2024. The start date was selected based on implementation of new measures of data collection (Fig. 1) as a result of University of Chicago Comprehensive Cancer Center funding awarded to allow for the analysis of outcomes related to pharmacotherapy and smoking. Partial sample of CTQ®-RV roster implemented March 27, 2024. Data will be made available on request.

Average Cigarettes per day	Zoom Video? (y/n)	Quit attempt? (0=no,1=yes)	Quit Success? (0-7 days smoke free)	Chantix? (y/n) ≥ 1x in last 7 days	NRT? (y/n) ≥ 1x in last 7 days	Wellbutrin? (y/n) ≥ 1x in last 7 days

All groups were conducted through a teleconferencing platform and were facilitated by a group leader (either a licensed clinical psychologist or licensed clinical social worker). Participants were older than 18 years and attended at least one CTQ®-RV session within the data collection time frame. CTQ®-RV groups were offered four days a week and then transitioned to five days a week in the last two weeks of the data collection period. Each session was one hour and began with a participant check-in. Data was collected verbally during this check-in through conversation with each CTQ®-RV participant (Brett, in press). Information included: average number of cigarettes smoked per day, days smoke-free in the past week, and use of Varenicline, Bupropion, and NRT. Demographic information was collected before the first visit, including age, sex, race, and highest level of education. Sessions included verbal instruction of evidence-based skills for quitting smoking paired with visual supplements in the form of a slideshow as well as facilitator-led group discussion. Participants received education on identifying triggers, managing cravings, and medication options. Group leaders were able to provide NRT and deliver it to participants' homes via express mail free of cost. The program also scheduled appointments with a nurse practitioner for interested participants to determine if prescription medication (Varenicline, Bupropion) was appropriate (Brett, in press).

When calculating the number of cigarettes per day reported at the last session, some participants reported use of alternate tobacco/nicotine products. For the purpose of this study, one vape was converted to 40 cigarettes, one average cigar was converted to four cigarettes, and one dip was converted to three cigarettes (Stanford REACH Lab, 2023; NIH, 2010; SmokeFreeVet, n.d.).

Chi-square tests for independence were conducted to explore possible differences in medication uptake by sex, educational attainment, and the categorical variable of cigarettes/day at baseline. A t-test was conducted to examine differences in uptake and the number of cigarettes/day at the last session. Due to the limited sample size, education level was classified as low attainment (high school/GED or below) or high attainment (some college up to graduate school).
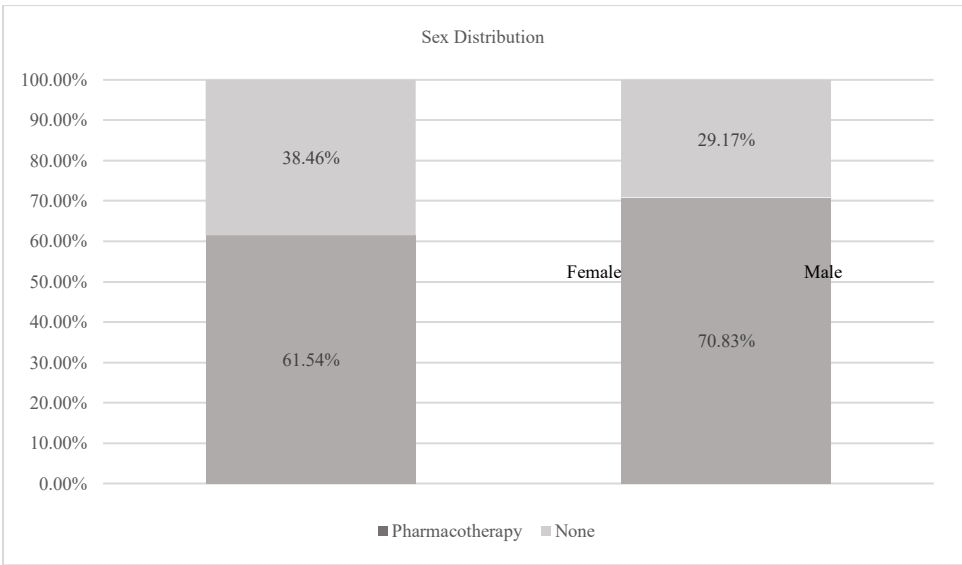
RESULTS

From March 27, 2024 to July 12, 2024, a total of 63 individuals attended at least one CTQ®-RV session. Of these, 41 participants (65.08%) reported pharmacotherapy use at any point. From this group, 15 of the participants attended only one CTQ®-RV session; of these participants, 12 reported no pharmacotherapy use at the session they attended. Additionally, over half of the total sample (n=35) were not using pharmacotherapy at the start of the

data recording period, but more than a third of that group (n=13) transitioned to pharmacotherapy use after attending more sessions. Between males and females, pharmacotherapy uptake was similar, with 61.54% of females and 70.83% of males using pharmacotherapy at any point; any differences were non-significant (p=0.61; Fig. 2).
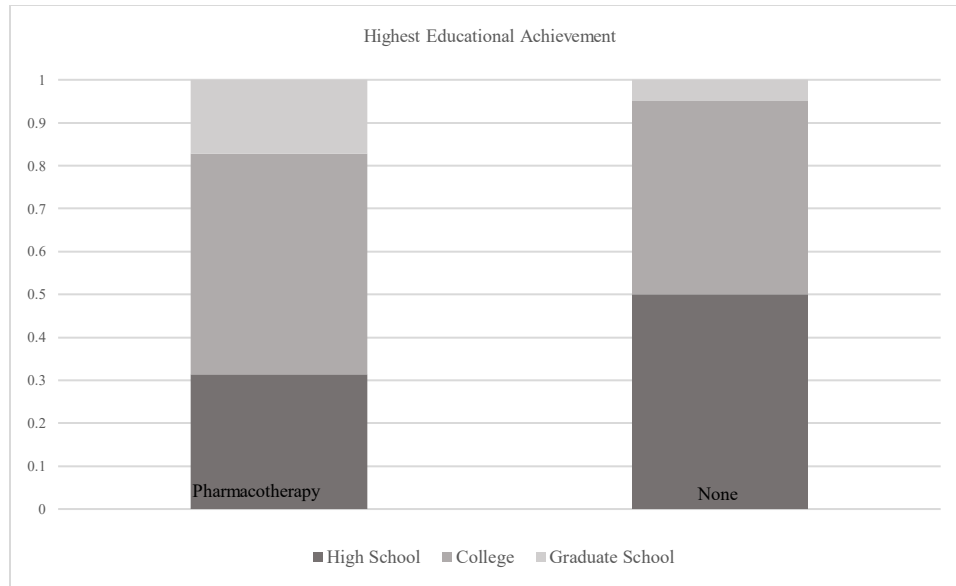
Figure 2.

Pharmacotherapy use between male and female participants.

Education levels between both groups varied. 31% of pharmacotherapy users' highest education level was high school, compared to 50% of the non-using group. Further, 52% of the pharmacotherapy users had acquired some college education; similarly, 45% of non-users had some college education. However, 17% of the pharmacotherapy users had attended or completed graduate school, compared to only 5% of non-users (Fig. 3).
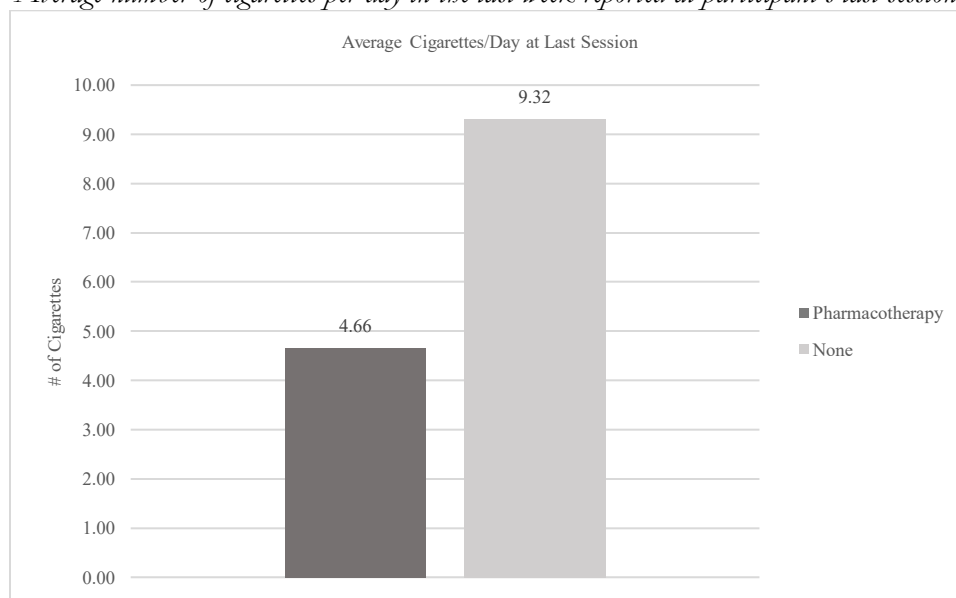
Figure 3.

Highest educational achievement (some high school, some college, some graduate school) for individuals who took or did not take pharmacotherapy.

Highest Educational Achievement

Based on the given definition, 31% of pharmacotherapy users and 50% of non-users were classified as low educational attainment. 69% of pharmacotherapy users were classified as high attainment, compared to 50% of non-users. However, these differences proved to be non-significant (p=0.44), potentially due to the small sample size. Finally, participants who utilized pharmacotherapy reported smoking an average of 4.66 cigarettes a day at their last session, while participants who did not smoked 9.32 cigarettes on average (Fig. 4).

Figure 4.

Average number of cigarettes per day in the last week reported at participant's last session.

Average Cigarettes/Day at Last Session

Individuals who used any pharmacotherapy reported significantly fewer cigarettes smoked per day on average than those reporting no pharmacotherapy use ($t(29.4) = 2.40$, $p = 0.02$). Baseline levels of smoking were similar between both groups.

DISCUSSION

Overall, 65.1% of the sample used pharmacotherapy at some point–greater than the national average--indicating high medication uptake (CDC, 2023). However, given the proven effectiveness of pharmacotherapy in smoking cessation, further increasing uptake is of great importance.

Notably, daily cigarette consumption in non-users at their last session attended was nearly double that of pharmacotherapy users. Thus, it can be concluded that individuals who used pharmacotherapy reported smoking significantly fewer cigarettes daily as compared to non-using participants. Further analysis also determined that baseline cigarette smoking between pharmacotherapy users and non-users was not significantly different, indicating that pharmacotherapy users showed a greater reduction in smoking compared to non-users. For education level and sex, though some differences were observed between individuals who used pharmacotherapy and those who did not, results were not statistically significant. Sex differences were minimal, though there were slightly more females than males who chose not to use pharmacotherapy. Education levels were broadly similar, though pharmacotherapy users were more likely to have attended graduate school. It is plausible that the small sample size contributed to the lack of statistically significant differences between groups; therefore, reassessing sex and education in the future with a larger group may be beneficial.

Furthermore, a larger sample would make it possible to analyze demographic differences between types of pharmacotherapies. Future analyses could explore demographic differences between varenicline, bupropion, NRT, and combination users (simultaneous NRT and medication use), given that varenicline boasts the highest quit rates but tends to report lower uptake by patients. Even more specific analysis could warrant restructuring the data collection process to assess combination NRT use and include that in the analysis.

Additionally, the cut-off date of 7/12 was necessary for this project to ensure sufficient time for data analysis and completion. As a result of the rolling model, the number of individuals who did not use pharmacotherapy may be overrepresented, as some individuals had their first session on 7/12 and did not have an opportunity to request pharmacotherapy from the program and report use as a result. Since the 15 participants who only attended one CTQ®-RV session were not excluded from the sample, the data may have been skewed to increase the sample size for the "non-pharmacotherapy" group, as 12 of the 15 reported no pharmacotherapy use at their session. Since one-time attendees do not attend a second session,

they cannot report new use of any pharmacotherapy they requested during the first session. Thus, they are counted as non-users, though it is possible that they are still utilizing pharmacotherapy without attending sessions. To specifically determine the success of the CTQ®-RV program in improving medication uptake, the study could be redone using only participants who have attended a minimum of four sessions (which is considered a full "dose" of treatment; Brett et al., in press). This would be valuable to assess the effectiveness of the program specifically in improving medication uptake, and to determine if there are any adjustments necessary to the program to ensure that all demographics are equally represented and encouraged to use pharmacotherapy. Another notable point on the design on the study is that only NRT was offered and delivered to participants without charge; prescription medications were provided at the discretion of the nurse practitioner and had to be picked up and paid for by the participant/their insurance. This may have increased use rates of NRT over medication.

Some individuals in the sample (n=8) declined to provide their educational level, which may have contributed to the lack of significant effects, as they had to be excluded from the education analysis. Further, some individuals used alternative tobacco products, such as vapes, cigars, and dip; converting these products to estimations of numbers of cigarettes for the purpose of the analysis may have resulted in some inaccuracy.

Finally, there are other factors that may play a role in medication uptake. Currently, the CTQ®-RV database contains information about participants' age, ethnicity, race, employment status, age of regular smoking, and healthcare provider's smoking advice. Further analysis could be conducted to determine if any other factors play a role in medication uptake. Notably, these associations do not imply causality (e.g., lower education levels do not necessarily lead to lack of pharmacotherapy use). Additional data collection could also include qualitative data to identify and address common reasons for not using pharmacotherapy. Further research is necessary to better understand factors driving pharmacotherapy use, especially prescription medication, to increase uptake of these effective treatments.

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