

## Impact of a No-Smoking Policy in Public Housing Apartments

*Pizacani BA, Maher JE, Rohde K, et al. Implementation of a smoke-free policy in subsidized multiunit housing: effects on smoking cessation and secondhand smoke exposure. Nicotine Tob Res 2012 Feb 27. Epub ahead of print.*

### Study Overview

**Objective.** To examine the effects of a comprehensive smoke-free policy on smoking cessation outcomes and secondhand smoke (SHS) exposure among tenants living in multiunit subsidized housing.

**Design.** A mixed methods study that consisted of a longitudinal survey of tenants and surveys and in-depth interviews of building managers.

**Setting and participants.** In January 2008, Guardian Management Limited Liability Company, the largest property management company in Portland, Oregon, implemented a comprehensive smoke-free policy that banned smoking in apartments and all indoor and outdoor common areas within 25 feet of their buildings. The authors partnered with Guardian Management to survey low-income tenants on the effects of policy implementation on policy acceptability and compliance, cessation rates, and SHS exposure. Participants were low-income tenants who had subsidies either through the U.S. Department of Housing and Urban Development (USD-HUD) Section 8 Program, or through the USD-HUD Low Income Housing Tax Credit Pro-

gram. Participants were surveyed at two time points after the implementation of the policy. Of the 839 eligible participants, 687 completed the questionnaire at “Time 1” (May 2008, 4 months after the policy change). The “Time 1” questionnaire also gathered information on the pre-policy period, labeled as “Time 0.” The “Time 2” questionnaire was administered a year later (May 2009) to all those who had completed the “Time 1” questionnaire and agreed to further participation ( $n = 564$ ). Of the 564 participants, 440 completed the “Time 2” questionnaire. Outcomes were analyzed only for the participants who completed both questionnaires ( $n = 440$ ). The authors also conducted in-depth interviews of 11 building managers 6 weeks after the implementation of the policy, and administered brief online questionnaires 7 times during the study period.

**Main outcome measures.** The Times 1 and 2 questionnaires queried tenants on knowledge of and compliance with the policy, smoking cessation, SHS exposure, demographics, and smoking-related chronic disease. Knowledge of the smoke-free policy was assessed by asking “Tell us if you think these things are allowed or not allowed under the ‘No Smoking’ policy that started

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in January 2008: Smoking inside your apartment; smoking in indoor shared areas, like hallways and entryways; smoking outdoors on porches, patios, or balconies; smoking in other outdoor areas of the property like the parking lot.” Compliance was measured by asking participants at Time 1 “Before the ‘No Smoking’ policy started in January, where did you smoke when you were at home?” At Time 2, participants were asked, “When you’re at home now, where do you smoke?” Smoking cessation outcomes were assessed using questions from the Behavioral Risk Factor Surveillance System (CDC, 2011). At each time point, participants were asked whether they were daily, non-daily, or former smokers. Former smokers were asked about their quit dates. The authors defined quitting to include participants who reported being a former smoker at Time 2, and those who reported quitting some time after the implementation of the policy (after January 2008). Quitters were asked whether they had called Oregon Tobacco Quit Line. Continuing smokers were asked whether they had changed their cigarette consumption at Times 1 and 2. For questions regarding SHS exposure, participants were asked whether they were exposed to SHS in the period before and after the policy change. Building managers ( $n = 11$ ) were interviewed on their views on the policy and if they had encountered any problems with enforcement (eg, tenant complaints, written and verbal warnings, and evictions). The authors compared knowledge, compliance, smoking status, and SHS exposure at the 3 time points: Time 0 (time of policy implementation, January 2008), Time 1 (4 months after policy implementation, May 2008), and Time 2 (1 year after policy implementation, May 2009). The authors computed annual quit rates by dividing all those who quit at a study time point by the total number of current smokers at the beginning of that period. Quit rates during the study were compared with the historical quit rate for the time period preceding the policy change to determine the difference in quitting as a result of policy implementation.

**Main results.** Of the 440 participants who completed both questionnaires, 68.7% were women, 88.5% were white, 25.2% had 4 or more chronic conditions, and 30.8% had impaired mobility (eg, used a cane or a walker). The mean age of the sample was 60.8 years. Those lost to follow-up were younger and had fewer chronic medical conditions. Of the 104 current smokers at the

time of policy implementation (Time 0), 23 smokers reported quitting by Time 2, for a quit rate of 22.1% (over 18 months). The annual quit rate after the policy implementation was 14.7% (95% confidence interval [CI] 7.9%–21.6%). In contrast, the quit rate for participants in the 5 years preceding the policy implementation was 2.6% (95% CI 0.6%–4.5%). Of the 23 smokers who quit smoking during the study time period, 27% reported that the policy change was the main reason for quitting. Of the participants who reported smoking at Time 1, 48.9% reported smoking less. Of those who smoked less, 29% reported that the policy was the main reason for smoking less. At Time 1, 84.7% of smokers were aware that smoking was not permitted inside the apartment, 68.1% were aware that smoking was not permitted outdoors on patios, porches and balconies, and 60.6% were aware that smoking was not permitted outdoors in parking lots. At Time 2, policy knowledge was similar to Time 1, except that 83.6% were aware that smoking was not permitted in outdoor areas including patios, porches and balconies ( $P = 0.034$ ). Before policy implementation, 59% smoked indoors and outdoors compared to 17% after policy implementation. Participants with mobility impairments were more likely to be noncompliant with indoor and outdoor smoking policies during both time periods. Among non-smokers, indoor SHS exposure decreased from 41% pre-policy to 17% post-policy and outdoor SHS decreased from 42% to 20%. The majority of building managers (91%) noted difficulty with enforcing the policy, particularly among tenants who continued to smoke inside their apartments. They issued 11 evictions related to non-compliance with the smoke-free policy during the study time period. Three-fourths of the managers (73%) were in favor of the smoke-free policy. The building managers noted few tenant complaints over the 18 months of data collection.

**Conclusion.** The implementation of a comprehensive smoke-free policy was associated with increases in quit rates and decreases in SHS exposure among tenants living in multiunit subsidized housing.

### Commentary

Although tobacco use has declined in the general population, smoking rates and exposure to SHS remains high among low-income populations [1]. Studies have examined the effects of work place and home smoking bans

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psychoactive substances. Tolerance is a state of adaptation in which exposure to a drug induces changes that result in diminution of one or more of the drug effects over time. Tolerance may occur to both desired and undesired effects of drugs and may develop at different rates for different effects. Addiction is a primary, chronic, neurobiological disease with genetic, psychosocial, and environmental factors influencing its development and manifestations. It is characterized by behaviors that include one or more of the following: impaired control over drug use, compulsive use, continued use despite harm, and craving. Drug addiction is a treatable disease, using a multidisciplinary approach, but relapse is common. Studies of abuse potential in former drug abusers found that the effects of single doses of 40 mg of oral zolpidem tartrate were similar, but not identical, to diazepam 20 mg, while 10 mg of oral zolpidem tartrate was difficult to distinguish from placebo. Because persons with a history of addiction to or abuse of drugs or alcohol are at increased risk for misuse, abuse and addiction of zolpidem, they should be monitored carefully when receiving Intermezzo.

**9.3 Dependence:** Physical dependence is a state of adaptation that is manifested by a specific withdrawal syndrome that can be produced by abrupt cessation, rapid dose reduction, decreasing blood level of the drug, and/or administration of an antagonist. Sedative-hypnotics have produced withdrawal signs and symptoms following abrupt discontinuation. These reported symptoms range from mild dysphoria and insomnia to a withdrawal syndrome that may include abdominal and muscle cramps, vomiting, sweating, tremors, and convulsions. The following adverse events which are considered to meet the DSM-III-R criteria for uncomplicated sedative-hypnotic withdrawal were reported during U.S. clinical trials with other oral zolpidem formulations following placebo substitution occurring within 48 hours following the last zolpidem treatment: fatigue, nausea, flushing, lightheadedness, uncontrolled crying, emesis, stomach cramps, panic attack, nervousness, and abdominal discomfort. These reported adverse events occurred at an incidence of 1% or less. However, available data cannot provide a reliable estimate of the incidence, if any, of dependence during treatment at recommended doses. Post-marketing reports of abuse, dependence, and withdrawal resulting from use of oral zolpidem tartrate have been received.

**10 OVERDOSAGE: 10.1 Signs and Symptoms:** In post-marketing experience of overdose with oral zolpidem tartrate alone, or in combination with CNS-depressant agents, impairment of consciousness ranging from somnolence to

coma, cardiovascular and/or respiratory compromise, and fatal outcomes have been reported.

**10.2 Recommended Treatment:** General symptomatic and supportive measures should be used along with immediate gastric lavage where appropriate. Intravenous fluids should be administered as needed. Zolpidem's sedative-hypnotic effect was shown to be reduced by flumazenil and therefore flumazenil may be useful; however, flumazenil administration may contribute to the appearance of neurological symptoms (convulsions). As in all cases of drug overdose, respiration, pulse, blood pressure, and other appropriate signs should be monitored and general supportive measures employed. Hypotension and CNS depression should be treated by appropriate medical intervention. Sedating drugs should be withheld following zolpidem overdose, even if excitation occurs. The value of dialysis in the treatment of overdose has not been determined, although hemodialysis studies in patients with renal failure receiving therapeutic doses have demonstrated that zolpidem is not dialyzable. As with management of all overdose, the possibility of multiple drug ingestion should be considered. The healthcare provider may wish to consider contacting a poison control center for up-to-date information on the management of hypnotic drug overdose.

**14.2 Special Safety Studies: Driving Study:** A randomized, double-blind, placebo-controlled, active-control, single-center, four-period, crossover study in 40 healthy subjects was conducted to evaluate the effects of middle-of-the-night administration of Intermezzo on next-morning driving performance. The four randomized treatments included Intermezzo 3.5 mg four hours before driving, Intermezzo 3.5 mg three hours before driving, placebo, and a positive control (an unapproved sedative-hypnotic) given nine hours before driving. The primary outcome measure was the change in the standard deviation of lateral position (SDLP), a measure of driving impairment. The results were analyzed using a symmetry analysis, which determined the proportion of subjects whose change from their own SDLP in the placebo condition was statistically significantly above a threshold thought to reflect clinically meaningful driving impairment. When driving began 3 hours after taking Intermezzo, testing had to be terminated for one subject (a 23-year old woman) due to somnolence. Overall, the symmetry analysis showed a statistically significant impairing effect at 3 hours. When driving began 4 hours after taking Intermezzo, statistically significant impairment was not found, but numerically Intermezzo was worse than placebo. Zolpidem

blood levels were not measured in the driving study, and the study was not designed to correlate specific blood level with degree of impairment. However, the estimated blood level of zolpidem in patients whose SDLP worsened according to the symmetry analysis is considered to present a risk for driving impairment. In some women, the 3.5 mg dose of Intermezzo results in zolpidem blood levels that remain at or sometimes considerably above this level 4 or more hours after dosing. Therefore, the recommended dose for women is 1.75 mg. A small negative effect on SDLP may remain in some patients 4 hours after the 1.75 mg dose in women, and after the 3.5 mg dose in men, such that a potential negative effect on driving cannot be completely excluded.

**Rebound effects:** In studies performed with other zolpidem formulations (5 mg to 10 mg oral zolpidem tartrate) given at bedtime, there was no objective (polysomnographic) evidence of rebound insomnia at recommended doses seen in studies evaluating sleep on the nights following discontinuation. There was subjective evidence of impaired sleep in the elderly on the first post-treatment night at doses above the recommended elderly dose of 5 mg oral zolpidem tartrate.

**Memory impairment in controlled studies:** Controlled studies in adults utilizing objective measures of memory yielded no consistent evidence of next-day memory impairment following the administration at bedtime of 5 mg to 10 mg oral zolpidem tartrate. However, in one study involving zolpidem tartrate doses of 10 mg and 20 mg, there was a significant decrease in next-morning recall of information presented to subjects during peak drug effect (90 minutes post-dose), i.e., these subjects experienced anterograde amnesia. There was also subjective evidence from adverse event data for anterograde amnesia occurring in association with the administration of oral zolpidem tartrate, predominantly at doses above 10 mg. Healthcare professionals can telephone Purdue Pharma's Medical Services Department (1-888-726-7535) for information on this product.

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on smoking behaviors and SHS exposure [2–4]; however little evidence exists for smoke-free policies in multiunit subsidized housing. This study found that a comprehensive smoke-free policy in multiunit subsidized housing was associated with decreases in consumption and increases in cessation among smokers, as well as decreases in exposure to SHS among non-smokers. This study fills an important gap in the literature by demonstrating that smoke-free policies in multiunit subsidized housing are an effective strategy to reduce the burden of tobacco use among low-income populations.

Persons of low socioeconomic status, elderly and disabled persons comprise the majority of tenants who live in public housing. As demonstrated in this study, public housing tenants have a high burden of chronic disease and are susceptible to the harmful effects of SHS exposure, particularly as the prevalence of smoking is higher among low-income populations. Children living in public housing are at an increased risk for long-term exposure to SHS. Growing awareness of the harms of SHS exposure and requests by non-smoking tenants to live in smoke-free environments led the USD-HUD to release a memorandum in 2009 that “strongly

encouraged” all Public Housing Authorities (PHAs) to implement smoke-free policies on their properties [5]. In 2010, USD-HUD issued another memorandum to multifamily housing assistance rental programs including Section 8 housing and other voucher-based rental programs (represented in this study) to implement optional smoke-free policies [6]. Despite these policy recommendations, uptake has been slow. By the end of 2011, only 9% of all PHA housing had implemented smoke-free policies [7]. Results from this study on the improved quit rates and decreases in consumption as well as SHS exposure after a smoke-free policy provide further impetus for housing providers across the nation to promote smoke-free living environments in subsidized multiunit housing.

Few studies have examined compliance and acceptability of smoke-free policies among smokers. In this study more than 80% of smokers complied with the indoor smoking restrictions; however, they were less likely to comply with outdoor smoking restrictions. Decreased compliance with the outdoor smoking policy was associated with decreased knowledge of those policies. The authors suggested that improving signage around

the property and increasing advertising to promote the policy could minimize noncompliance. The study found the individuals who had impaired mobility were more likely to be non-compliant with an indoor and outdoor smoking policy, suggesting a need for strategies to help these individuals to reduce consumption or quit smoking under a smoke-free policy change. Building managers issued 11 evictions related to smoke-free policy violations during the study time period. Given that individuals living in public housing have limited housing options, non-punitive strategies are needed to help individuals comply with a smoke-free policy in order to minimize risk of housing loss. Although all tenants were informed about the availability of the Oregon Tobacco Quit Line, only 2 of the 23 smokers used the telephone quit line to quit smoking. Because implementation of smoke-free policies is generally accompanied by an increase in interest in quitting [2], the results of this study suggest that housing providers should provide tenants with resources for smoking cessation as they consider smoke-free policy changes on their properties.

This study has several limitations. All the responses to the questions on policy knowledge and compliance, smoking cessation outcomes and SHS exposure were based on self-report, introducing a potential for social desirability bias. By comparing the quit rates between individuals who quit during the study (over 18 months) and those who quit for a longer period of time (historical quit, 2002–2006), the authors could have overestimated the difference in quit rates as a result of the policy change. The study is limited in generalizability because it was performed only among rental assistance housing programs in one state. The majority of the sample was elderly and white, limiting the generalizability to public housing tenants who are young and belong to racial/ethnic minorities.

### Applications for Clinical Practice

From a public health perspective, this study offers evidence of another strategy to reduce the burden of tobacco use among low-income populations. From a clinical perspective, health care providers can educate and encourage their non-smoking patients who live in public housing to voice their opinions to their property managers about interest in living in smoke-free environments in order to trigger a policy change. Within the context of a brief counseling intervention for patients who smoke, health care providers can educate and advise patients to adopt home smoking restriction to encourage smoking reduction or cessation and reduce exposure to SHS for tenants living in public housing.

—*Maya Vijayaraghavan, MD*

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