ORIGINAL INVESTIGATION

Cigar, Cigarillo, and Little Cigar Use Among Current Cigarette-Smoking Adolescents

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ABSTRACT

Introduction: Cigar, cigarillo, and little cigar (CCLC) use is prevalent among adolescents, particularly among those who smoke cigarettes.

Methods: Using data from a longitudinal study of smoking patterns among adolescents, we examined differences between CCLC users (ever and past 30 days) and nonusers (never and not in the past 30 days) among adolescents who smoked a cigarette in the last month ($n = 486$).

Results: In our sample, 76.7% reported ever trying CCLC and 40.7% reported past month CCLC use. Bivariate analyses showed that CCLC users differed from nonusers in terms of demographics, other forms of tobacco use, other substance use, and mental health. Multivariate logistic regression analyses found that both ever and past 30-day CCLC use were strongly associated with being male and concurrent use of hookah. Ever CCLC use was also strongly associated with recent use of alcohol, and past 30-day CCLC use was strongly associated with antisocial behavior. After controlling for the number of days on which cigarettes were smoked in the past 30 days, past 30-day CCLC use was associated with most other forms of tobacco use, other substance use, and mental health, but not with number of cigarettes smoked in the past month and nicotine dependence.

Conclusions: Results suggest that CCLC use is high among adolescent cigarette users and is associated with a variety of negative correlates. Importantly, many of these relationships are not accounted for by the adolescent's level of cigarette use. Further characterizing CCLC use will be important for developing more targeted and tailored interventions.

INTRODUCTION

Cigars, cigarillos, and little cigars (CCLC) are the most widely consumed tobacco products second to cigarettes among adolescents aged 12–17. Surveys indicate that approximately 13.1% of all students in the United States report past month CCLC use, with use increasing over the course of high school (e.g., 9th grade: 9.0%; 12th grade: 17.3%; [Centers for Disease Control and Prevention \(CDC\), 2012](#)). Current surveillance reports may be an underestimation of CCLC prevalence rates given that many CCLC users, particularly those who also smoke cigarettes, incorrectly identify themselves as nonsmokers ([Nasim, Blank, Berry, & Eissenberg, 2012](#)). Notably, sales of cigar products in the United States have recently surged ([Kozlowski, Dollar, & Giovino, 2008](#)); annual sales of CCLC increased by up to 316% from 1995 to 2008 ([Maxwell, 2008](#)), which may be attributable to lower barriers to consumption including federal excise taxation rates that are 3.5 times higher for cigarettes than for cigars ([Delnevo, Foulds, & Hrywna, 2005](#); [Delnevo, Hrywna, Foulds, & Steinberg, 2004](#); [Ringel, Wasserman, & Andreyeva, 2005](#)), and the absence of prevention programs

focused explicitly on CCLC use ([Symm, Morgan, Blackshear, & Tinsley, 2005](#)).

CCLC use among American high school students is alarming given perceptions surrounding CCLC use and its associated negative outcomes. Marketing campaigns depict these products as more socially acceptable and fashionable than cigarettes and also as potential cessation aids. CCLC use is commonly perceived as a healthy alternative to and less addictive than smoking cigarettes ([Baker et al., 2000](#); [Iribarren, Tekawa, Sidney, & Friedman, 1999](#); [Jolly, 2008](#); [Malone, Yerger, & Pearson, 2001](#)). However, relative to cigarettes, CCLC include higher levels of carcinogens (i.e., nitrosamines), tar per gram of tobacco, and toxins ([Baker et al., 2000](#); [National Cancer Institute \[NCI\], 1998](#)). Furthermore, CCLC contain more tobacco (1–20 grams) and require longer smoking intervals than cigarettes, resulting in increased exposure to carbon monoxide, hydrocarbons, ammonium, and cadmium ([Baker et al., 2000](#); [Kozlowski et al., 2008](#); [NCI, 1998](#)). Given this, it is not surprising that use of these products is accompanied by a dose-dependent risk for significant deleterious health outcomes including chronic obstructive pulmonary disease and cancers of the mouth, lung,

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esophagus, and larynx (Baker et al., 2000; Boffetta et al., 1999; Dollar, Mix, & Kozlowski, 2008; Rodriguez et al., 2010; Shapiro, Jacobs, & Thun, 2000).

Understanding the correlates of CCLC use is particularly critical among cigarette users given that this population is more likely to use CCLC than noncigarette smokers (CDC, 1997; Delnevo et al., 2004; Soldz, Huyser, & Dorsey, 2003). Approximately 50% of current cigarette-using students in the United States also use other forms of tobacco (Bombard, Rock, Pederson, & Asman, 2008; Gilpin & Pierce, 2003; Tercyak & Audrain, 2002), with CCLC use representing the most common form of additional tobacco use (Bombard, Pederson, Koval, & O'Hegarty, 2009; Rigotti, Lee, & Wechsler, 2000). In a sample of young adults from a 10-year cohort study, 10% used only cigarettes compared with 26% who used both cigarettes and other forms of tobacco (Bombard et al., 2009); the most likely combination of tobacco use was cigarettes and CCLC (67%; Bombard et al., 2009). Taken together, use of both cigarettes and CCLC is alarmingly prevalent among American high school students, which necessitates a more nuanced profiling of this subpopulation of tobacco users.

Several studies have shown that polytobacco users exhibit different demographic and behavioral profiles than cigarette-only users (Smith-Simone, Curbow, & Stillman, 2008). Compared with those who exclusively use cigarettes, those who use cigarettes and any other form of tobacco are more likely to be less educated (Biener, McCausland, Curry, & Cullen, 2011), be of lower socioeconomic status (Borawski et al., 2010), use alcohol and other drugs (Coogan, Geller, & Adams, 2000; Everett, Giovino, Warren, Crossett, & Kann, 1998; Everett, Malarcher, Sharp, Husten, & Giovino, 2000; Gilpin & Pierce, 2003; Simon, Sussman, Dent, Burton, & Flay, 1993; Sterling & Mermelstein, 2011), and be truant and exhibit antisocial behaviors (Coogan et al., 2000; Simon et al., 1993). When specifically considering co-use of cigarettes and CCLC, evidence for a similar pattern of disparities has begun to emerge. Cigarette users who also use CCLC are more likely to be male, be of lower socioeconomic status, and perform more poorly in school (CDC, 2012; Cullen et al., 2011; Soldz et al., 2003). Co-occurring CCLC and cigarette use has also been linked with long-term tobacco use, daily cigarette use, fewer recent quit attempts, fewer negative perceptions toward cigarette use, and use of multiple forms of tobacco products (Borawski et al., 2010; Brooks, Gaier Larkin, Kishore, & Frank, 2008; Richardson, Xiao, & Vallone, 2012). These data together suggest that tobacco use is not phenomenologically unitary in nature. Instead, there are likely subpopulations of cigarette users, such as those who also use CCLC, who have an increased likelihood of having several comorbid conditions. Although some work has been done to identify the nature of these subpopulations, work in this arena is still in its nascent stage, and several variables (e.g., psychiatric comorbidities) have yet to be explored.

Taken together, use of CCLC is a prominent phenomenon among high school students in the United States, likely due to a confluence of factors including an overall decreased perception of harm, a lack of policy-level deterrents of use, and limited attention historically in this area of tobacco control. The goal of this study was to identify differences between CCLC users and nonusers among a sample of high school students who have smoked cigarettes in the past 30 days. To this end, we examined whether CCLC users and nonusers varied in terms of demographics, tobacco use history, other substance use, and mental health symptoms, the last of which has not yet been examined

in the context of CCLC use. Finally, in order to ascribe any observed effects more specifically to CCLC involvement compared with uneven rates of cigarette exposure, we conducted analyses that took into account the frequency of cigarette use. These descriptive analyses will help to understand whether CCLC and cigarette use, together, represent a tobacco profile that is fundamentally different than that of cigarette use alone.

METHODS

Participants

Participants were recruited for a large natural history study of the social-emotional contexts of adolescent smoking in a multistage process from 16 Chicago area high schools. The cohort was over-sampled for students who had ever smoked at least once, even a puff, in their life. All 9th and 10th graders ($N = 12,970$) completed a screening survey of smoking behavior and were eligible if they fell into one of four levels of smoking experience: (a) never smokers; (b) former experimenters (smoked > one cigarette in the past, have not smoked in the last 90 days, and <100 cigarettes in their lifetime); (c) current experimenters (smoked in the past 90 days, but smoked <100 cigarettes in their lifetime); and (d) current smokers (smoked in the past 30 days and have smoked >100 cigarettes in their lifetime). Recruitment packets were mailed to 3,654 eligible students and their parents to participate in the multicomponent program project. Participants and their parents had to agree to participate in all possible components of the larger study, including multiple longitudinal questionnaire assessments, a family observation study, an ecological momentary assessment study, and a psychophysiological laboratory-based study. A total of 1,344 students agreed to participate (36.8%), and 1,263 (94.0%) students completed the baseline measurement wave (March 2005 through May 2006). The mean age of the baseline sample was 15.6 years (range 13.9–17.5 years), and 56.5% were female. Their racial/ethnic distribution was 56.5% white, 17.2% Hispanic, 16.9% black, 4.0% Asian, and 5.5% "other." Parental consent and student assent were obtained and all procedures were approved by the University of Illinois at Chicago Institutional Review Board.

Data for the current study come from the 24-month assessment wave (data collection from February 2007–September 2008) and comprise only the subset of participants who reported at least one occasion of cigarette use in the past month ($n = 486$; 42.4% of the 24-month sample). This analytic sample was about half female (54.7%) with an average of 17.6 years of age ($SD = 0.62$). The racial/ethnic distribution was 62.4% White, 18.1% Hispanic, 9.9% Black, 3.9% Asian, and 5.7% "other." Over half of the sample (52.5%) reported smoking a cigarette on 10 or more of the past 30 days (median = 2, interquartile range = 1–4). The majority of the sample had smoked cigarettes on a daily basis (i.e., at least 30 days when they smoked every day or nearly every day; 63.5%) and had smoked more than 100 lifetime cigarettes (63.5%).

Measures

Sociodemographic Characteristics

Participants self-reported their age, gender, and race/ethnicity. Grade point average (GPA) was based on self-reported

average grade in school on a 1–5 scale. Additionally, adolescents reported the highest level of mother and father's education.

Assessment of Tobacco Use

We assessed CCLC use with two items inquiring about whether the participant had ever used CCLC (yes or no) and the number of days of use in the past 30 days (0 days, 1–2 days, 3–5 days, 6–9 days, 10–19 days, 20–29 days, all 30 days). We assessed cigarette-smoking use with two items pertaining to the number of days of use in the past 30 days (1–2 days, 3–5 days, 6–9 days, 10–19 days, 20–29 days, all 30 days) and number of cigarettes smoked on smoking days in the past month (≤ 1 cigarette, 2–5 cigarettes, 6–10 cigarettes, > 11 cigarettes). Additionally, we assessed whether participants had used other forms of tobacco (smokeless tobacco, bidis, kreteks, and hookah) in the 30 days prior to their assessment (yes or no).

We measured nicotine dependence using a seven-item adolescent version of the Fagerstrom Tolerance Questionnaire (mFTQ; Prokhorov et al., 2000; Prokhorov, Pallonen, Fava, Ding, & Niaura, 1996). A total score was created by averaging all seven items ($\alpha = 0.69$), and higher scores represented more nicotine dependence.

We also assessed nicotine dependence using the Nicotine Dependence Syndrome Scale (NDSS; Shiffman, Waters, & Hickcox, 2004), modified for use with adolescents based on input from the Tobacco Etiology Research Network (Nichter, Thompson, Shiffman, & Moscicki, 2002; Sterling et al., 2009). The NDSS assesses an array of dependence symptomatology, including smoking to avoid withdrawal symptoms, craving, and increasing smoking to achieve similar effects (tolerance). Items in the current study were answered on a four-point Likert-type scale, ranging from 1 (not at all true) to 4 (very true). Scale scores were obtained by averaging responses to all items, with higher scores representing more nicotine dependence ($\alpha = 0.93$).

Assessment of Other Substance Use

Ever use of alcohol, marijuana, and other substances were queried (yes or no). Participants were also asked about the frequency of their use of alcohol and marijuana over the past 3 months (0 times, $\leq$ once a month, $>$ once a month but $<$ once a week, $>$ once a week but not every day, everyday), using a modified version of the Adolescent Alcohol and Drug Involvement Scale (Moberg, 2000; Moberg & Hahn, 1991).

Alcohol-related problems were indexed using a measure modeled after the DSM-IV diagnostic criteria for substance use disorders (Colder & Chassin, 1999). Participants were asked to respond to whether any of six negative consequences had happened to them within the past year (yes or no; e.g., “had problem with, or complaints from, your family or friends” and “been in trouble at school or work”). Items were summed, with higher values suggestive of higher levels of alcohol-related problems ($\alpha = 0.70$).

Assessment of Mental Health Correlates

The Center for Epidemiological Studies Depression inventory (CES-D; Radloff, 1977) was used to assess the frequency of past-week depressive symptoms, from 0 (rarely or none of the time) to 3 (most or all of the time). Item scores were summed, and higher scores represent higher levels of depressive symptoms, with suggested adolescent clinical cutoffs of 22 for boys and 24 for girls ($\alpha = 0.89$; Lewinsohn, Rohde, & Seeley, 1998).

Current anxiety symptoms were assessed with the Mood and Anxiety Symptom Questionnaire (Clark & Watson, 1991;

Watson et al., 1995). Adolescents rated the extent to which they had experienced each symptom in the past week, from 1 (not at all) to 5 (extremely). Items were summed with higher scores representing higher levels of anxiety ($\alpha = 0.81$).

Adolescent antisocial behavior was assessed using a 22-item scale based on the Antisocial Behavior Checklist (Zucker, 1999; Zucker & Fitzgerald, 1992), with added items from a longitudinal study on adolescent problem behaviors (Windle, 1992), together reflecting the core domains of DSM-IV Conduct Disorder (American Psychiatric Association, 1994). The scale addresses 6 domains of behaviors: (a) aggression, (b) deceit, (c) police contact, (d) rule violation, (e) theft, and (f) vandalism. Participants responded to the following choices: “never”, “rarely: once or twice”, “sometimes: 3–9 times”, and “often: > 10 times.” Sum scores were calculated, with higher numbers indicating more antisocial tendencies ($\alpha = 0.87$).

RESULTS

General Statistical Approach

JMP 9.0 (SAS, Carey, NC) was used to conduct all analyses. Analyses compared participant demographics, tobacco use, other substance use, and mental health variables between those who (a) reported ever using CCLC compared with those who had never used CCLC at 24 months and (b) reported using CCLC in the past 30 days compared with those who had not used in the past 30 days at 24 months. Both comparison groups were considered because patterns of CCLC are sporadic in adolescent populations, and we wanted to maximize the likelihood of capturing the full range of the phenomenon. Additionally, use of both comparison groups allowed us to explore whether any unique patterns emerged when considering ever versus never CCLC users compared with past 30-day- versus no 30-day CCLC use.

Between-Group Differences: CCLC Users Compared with Nonusers

Of the 486 adolescents who reported having smoked at least one cigarette in the 30 days prior to the 24-month assessment wave, 76.7% ($n = 373$) reported ever trying CCLC and 40.7% ($n = 198$) reported using CCLC in the past 30 days. [Supplementary Table 1](#) shows the prevalence of ever CCLC use and past 30-day CCLC use by several demographic, tobacco use, other substance use, and mental health variables of interest.

Demographics

Few between-group demographic differences emerged. There was a higher percent of males among both groups of CCLC users compared with both nonusing subsamples. Additionally, past 30-day CCLC users had a lower GPA at 24 months than individuals who had not used CCLC in the past 30 days (see [Supplementary Table 1](#)).

Tobacco Use

Compared with individuals who did not use, ever users and past 30-day CCLC users had elevated reports on several parameters of tobacco use at 24 months. Ever users and past 30-day users reported more frequent past month cigarette smoking, a greater amount of daily cigarette smoking in the past month, a higher likelihood of being a concurrent user of all other forms

Table 1. Model Fit at Final Stage of Backward Elimination for Predicting Ever and Past 30-Day Cigars, Cigarillos, and Little Cigars (CCLC) Use

	Chi square	Odds ratio (95% confidence interval)	<i>p</i> value
Ever CCLC use			
Model	72.19	—	<.0001
Sex (male)	21.37	3.38 (2.04–5.76)	<.0001
Nicotine dependence (Fagerstrom Tolerance Questionnaire)	5.19	1.22 (1.03–1.16)	.02
Current hookah use	9.75	2.22 (1.36–3.69)	.002
Ever use of marijuana	8.84	2.62 (1.38–4.95)	.003
Ever use of prescription medication	6.57	2.08 (1.20–3.71)	.01
Use of alcohol in the past 90 days	4.57	2.13 (1.05–4.25)	.03
Past 30-day CCLC use			
Model	54.46	—	<.0001
Sex (male)	8.60	1.79 (1.21–2.65)	.003
Current hookah use	15.19	2.15 (1.46–3.16)	<.0001
Antisocial behavior	17.89	1.06 (1.03–1.09)	<.0001

of tobacco products, and higher levels of nicotine dependence compared with non-CCLC users (see [Supplementary Table 1](#)).

Other Substance Use

CCLC users endorsed more frequent use of alcohol and marijuana in the past 90 days as well as more alcohol-associated problems than nonusers. Ever users were more likely to have tried marijuana, cocaine, hallucinogens, and prescription medications than those who had never tried a CCLC, whereas past 30-day CCLC use was not related to the likelihood that an individual had ever tried other substances of abuse (see [Supplementary Table 1](#)).

Mental Health

Ever users and past 30-day users reported higher levels of anxiety and antisocial behavior than nonusers. Past 30-day users also self-reported higher levels of depression than those who had not used CCLC in the past 30 days (see [Supplementary Table 1](#)).

Predicting Ever and Past 30-Day CCLC Use

We then conducted a multivariate binary logistic regression following a manual backward stepwise approach in order to determine the most parsimonious main effects model. We started by placing all effects that were significant bivariate predictors in the model for initial consideration. Stepwise elimination of nonsignificant effects occurred by sequentially removing variables in order of largest *p* value. After each effect was removed, the model was refit with the remaining items. This process continued until a final model consisting only of variables that explained significant partial variability in CCLC use ($p < .05$) was ascertained. Only the final models with significant predictors are reported ([Table 1](#)). The significant predictors of ever CCLC use while controlling for the others in the model included being male, greater nicotine dependence (FTQ), use of hookah in the last month, ever use marijuana, ever use of prescription medications, and use of alcohol in the last 90 days. From the array of variables included in the second multivariate model, being male, use of hookah in the last 30 days, and higher antisocial tendencies all were associated with an increased likelihood of being a past 30-day CCLC user.

Controlling for Frequency of Past Month Cigarette Use

Finally, multivariate linear regressions were conducted to determine whether 30-day CCLC use was related to our correlates of interest after adjusting for frequency of past 30-day cigarette use. We separately regressed past 30-day CCLC use (independent variable) on each tobacco use, substance use, and mental health variable (separate dependent variables), controlling for frequency of past 30-day cigarette use. Additionally, we also controlled for gender and GPA given that bivariate analyses showed that 30-day CCLC users and nonusers were different along these background demographic dimensions. Results reveal that having smoked CCLC in the past month and frequency of past month cigarette use both accounted for unique variance in predicting concurrent use of bidis, kreteks, and hookah, frequency of past 90-day alcohol and marijuana use, and alcohol problems (p 's $< .03$). Only being a past 30-day CCLC user was uniquely associated with concurrent use of smokeless tobacco, depression, anxiety, and antisocial behavior (p 's for cigarette use $> .17$; p 's for CCLC use $< .04$). Past 30-day CCLC use was not uniquely associated with number of cigarettes smoked on smoking days in the past month, and both indices of nicotine dependence (p 's $> .10$). However, frequency of cigarette use was uniquely associated with these cigarette-specific variables (p 's $< .0001$).

DISCUSSION

Results from the current investigation suggest that CCLC use is common among American high school students who currently smoke cigarettes, and that this co-use may represent an important public health phenomenon. We observed rates that were much higher than rates in the general adolescent population ([CDC, 2012](#)), which is not surprising as we restricted our sample to current cigarette users.

Demographic between-group differences were largely consistent with previous reports ([CDC, 2012](#); [Cullen et al., 2011](#)); males in our sample had a higher likelihood than females of being a CCLC ever and past 30-day user and also comprised a higher proportion of both CCLC using groups than nonusing groups. Yet, females still represented a significant proportion of the CCLC use in this sample. Additionally, similar to other investigations ([CDC, 2012](#)), our analyses did not reveal

any differences in use across other demographic distinctions (including race/ethnicity), with the exception of lower levels of academic achievement among past 30-day CCLC users compared with nonusers.

Individuals who used both CCLC and cigarettes tended to exhibit more remarkable tobacco and other substance use profiles than non-CCLC users. Importantly, many of these relationships persisted even after accounting for frequency of cigarette use. CCLC users in our sample reported a higher rate of concurrent use of other tobacco products including smokeless tobacco, bidis, kreteks, and hookah than nonusers. Interestingly, our finding that concurrent use of hookah continued to be associated with CCLC use even after accounting for all other variables closely mirrors other work done with this sample; Sterling and Mermelstein (2011) found that CCLC use, and not use of other tobacco forms, was predictive of past 30-day hookah use in a multivariate logistic regression model. Additionally, data from the current investigation replicated findings by Cullen et al. (2011), showing that CCLC users were more likely than nonusers to have smoked marijuana. Finally, our data indicated that CCLC use was related to increased rates of experimentation with several other illicit drugs of abuse, higher rates of recent alcohol use, and elevated levels of alcohol-associated problems. Although our results cannot clarify the temporal ordering of behaviors, these data do show that cigarette smokers who have some history of CCLC use are vulnerable to a wide constellation of substance use behaviors.

Data from the current investigation also point to mental health variables as robust correlates of CCLC use, which until this point has not yet been examined. Over and above the influence of frequency of past 30-day cigarette use, CCLC users showed higher levels of depression, anxiety, and antisocial behavior than nonusers. Antisocial behavior appears to be a particularly relevant correlate, which is consistent with a burgeoning area of research linking personality disorders to increased risk for tobacco use. Several studies have found that antisocial personality disorder is significantly associated with overall smoking status and current and lifetime nicotine dependence (Dickerson, O'Malley, Canive, Thuras, & Westermeyer, 2009; El Mhamdi, Wolfcarius-Khiari, Mhalla, Ben Salem, & Soltani, 2011; Hasin et al., 2011; Zvolensky, Jenkins, Johnson, & Goodwin, 2011). Future studies are needed to determine the causal role of mental health disturbance in the development and maintenance of CCLC use. Additionally, given that there are special considerations in traditional prevention and reduction interventions when targeting individuals with mood and personality disorders, it should be evaluated how existing treatment protocols can be modified for CCLC users who are more likely than nonusers to present with comorbid psychopathology.

Our results suggest that rates of CCLC use are high among current cigarette-using American high school students, and its use is associated with a variety of deleterious tobacco, substance use, and mental health variables. Importantly, between-group differences cannot be explained solely by heavier levels of cigarette use. Of additional importance, with very few exceptions, the pattern between CCLC use and our examined correlates was equivalent for ever CCLC use and past 30-day CCLC use. This indicates that simply knowing whether a current cigarette user has ever used CCLC may be sufficient in determining his/her likelihood of other related problems. Together, these findings point to the importance of assessing for multiple forms of tobacco involvement, as adolescents who use more

than just cigarettes may be more vulnerable to deleterious outcomes compared with cigarette-only users. Future research is needed to understand the temporal ordering between CCLC use, cigarette use, and the other correlates of interest, as well as to identify the possible explanatory mechanisms involved in these relationships. Indeed, there are a number of possible explanations for these associations including overlapping social contexts in which these behaviors occur and/or a common liability for a constellation of multiple problem behaviors. Additionally, follow-up studies may wish to examine whether unique patterns emerge with a more fine-grained definition of CCLC use (e.g., inclusion of blunt smoking—cigars with tobacco fillers removed and replaced with marijuana and residual tobacco). Finally, as our sample, as well as the samples of most studies cited in this manuscript, included only individuals from the United States, further research is warranted to better understand the cross-cultural generalizability of findings. Continued work aimed at characterizing the profile of CCLC users and understanding the unique risks associated with use of such products will be important in developing more targeted and tailored tobacco control and treatment efforts.

SUPPLEMENTARY MATERIAL

Supplementary Table 1 can be found online at www.ntr.oxfordjournals.org

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DECLARATION OF INTERESTS

The authors have no conflicts of interest to report.

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