

Storage of household firearms: an examination of the attitudes and beliefs of married women with children

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Abstract

Although safe firearm storage is a promising injury prevention strategy, many parents do not keep their firearms unloaded and locked up. Using the theory of planned behavior as a guiding conceptual framework, this study examines factors associated with safe storage among married women with children and who have firearms in their homes. Data come from a national telephone survey ($n = 185$). We examined beliefs about defensive firearm use, subjective norms, perceived behavioral control and firearm storage practices. A Wilcoxon–Mann–Whitney test was conducted to assess associations between psychosocial factors and firearm storage practices. Women were highly motivated to keep firearms stored safely. Those reporting safe storage practices had more favorable attitudes, more supportive subjective norms and higher perceptions of behavioral control than those without safe storage. One-fourth believed a firearm would prevent a family member from being hurt in case of a break-in, 58% believed

a firearm could scare off a burglar. Some 63% said they leave decisions about firearm storage to their husbands. Women were highly motivated to store firearms safely as evidenced by favorable attitudes, supportive subjective norms and high perceptions of behavioral control. This was especially true for those reporting safer storage practices.

Introduction

Firearm injuries are a serious public health problem among children and youth in the United States [1–6]. In 2004, 2038 young people (aged 1–18 years) died from firearm injuries [7]. More than one-third of the deaths were either from suicide (29%) or an unintentional injury (6%). It is estimated that there are about five serious non-fatal firearm injuries for every single firearm injury death [3, 4, 6].

Children and youth in the United States have considerable exposure to firearms in their homes and this contributes to firearm injuries. Firearms are present in about one-third of households with children and youth [8–10]. The home is the primary location where young people obtain firearms that are used to inflict injuries, especially suicide. It is also the principal setting for pediatric firearm injuries [3, 11–15].

An important injury prevention strategy is to limit young peoples' access to firearms by having parents store them unloaded and locked up in a safe, lock box or gun cabinet [16–18]. The American Academy of Pediatrics' policy statement on firearm injuries stresses the importance of restricting youth access to firearms through safe storage or removal of firearms from the home [19, 20]. However, many

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parents do not keep firearms stored safely. About 14–30% of parents who have firearms store them loaded, and 32–43% store them in an unlocked place [9, 10, 21–24]. Parents of teenagers are more likely to keep firearms stored unsafely than those with younger children [21, 24, 25].

Over the past decade, several programs encouraging parents to store firearms safely have been implemented [26–33]. Unfortunately, they have had limited success; one explanation for this is that they were not developed based on a comprehensive analysis of the psychosocial determinants of firearm storage. In this article, we identify how specific psychosocial factors are related to parents' household firearm storage practices. The information gained can then be used to enhance the effectiveness of interventions.

As a first step in understanding the psychosocial determinants of firearm storage, we focused on the experiences of married women with children. We chose this focus because many firearm safety programs are based in clinical settings, in which the majority of the participants are female. Learning more about psychosocial factors associated with the firearms in women's homes being stored safely has the potential to generate information that can be used to inform and improve clinic-based counseling. Moreover, because there are gender differences in knowledge, attitudes, beliefs and behavior relevant to firearm storage practices, studying women separately can help focus on the factors that would influence their receptivity to educational interventions.

We used the theory of planned behavior (TPB) as the guiding conceptual framework for this investigation. Briefly, the TPB posits that attitude (one's evaluation of a particular behavior), subjective norms (one's view of how important others feel about behavioral performance) and perceived behavioral control (the degree to which a person has command over the behavior) are the main determinants of behavioral intention, which is the primary determinant of behavior. The TPB also identifies that beliefs form the basis of attitudes [34–36]. The TPB has been used extensively in studies about health behaviors (e.g. condom use, physical activity, healthy eating and smoking) to outline determi-

nants of behavior and potential intervention strategies [37, 38]. However, it has been used infrequently to examine behaviors related to injury prevention or firearm safety [39].

The purpose of this study was to examine attitudes, subjective norms and perceptions of behavioral control regarding firearm storage practices among married women with children. The subjective norm construct focused on women's husbands because research suggests that they are the primary normative agents for firearm storage [40, 41]. We also sought to assess whether attitudes, subjective norms and perceptions of behavioral control were associated with firearm storage practices (i.e. keeping firearms stored unloaded or in a locked place).

Secondarily, we examined beliefs about defensive firearm use because of their relevance to attitudes about firearm storage practices. A primary reason for having firearms in the home, and for keeping them stored loaded and unlocked, is the belief that they can be used defensively in the event of a home invasion [8, 9, 21, 42, 43]. The increased time required to load or unlock a firearm can be considered counterproductive to effective defensive use. We therefore examined whether beliefs about vulnerability to home invasion and the effectiveness of firearms for self-protection were related to attitudes about firearm storage practices.

Method

Sample

Eligible respondents for this cross-sectional study included English-speaking adult women (>18 years) in the continental United States who were married and living with their husbands, had at least one child aged 18 years or younger living with them and had at least one firearm in the home. The sample was generated by selecting individuals from two sampling frames. One was a listed household (LHH) frame targeted to households likely to contain children [44], and the other was a list-assisted random digit dial (RDD) frame [45–47]. LHH frames are based on telephone numbers from white

pages directories and are supplemented with information from multiple sources (e.g. driver's license and motor vehicle registration data) [48, 49].

The RDD sampling frame was based on lists of residential area code-exchange combinations obtained from telephone companies and included both published and unpublished numbers [45-47]. It was first drawn in 2002 as part of 'The State of Home Safety in America' study (SOHS), which was a national telephone survey that inquired about home safety practices [50, 51]. SOHS respondents who met or potentially met inclusion criteria and who consented to a callback were invited to participate in the present study. Telephone numbers from both frames were entered into the database and were randomly selected for calling.

Data collection

The data collection instrument had 72 items and inquired about the number of firearms in the home, demographic characteristics and psychosocial factors likely to be associated with storage practices. We used the colloquial term 'gun' rather than 'firearm' in posing questions. Because respondents with multiple firearms might have had different responses to items for each one, they were asked to identify one firearm to think about when answering questions about attitudes and beliefs. To select a referent firearm, we asked those without a firearm in the home for defensive purposes to think of the newest firearm to the home and those with a firearm in the home for defensive purposes to think of the newest firearm to the home that was owned for defense. We developed this protocol because firearms owned for defensive use are more likely to be stored unsafely [9, 21], and we were interested in examining attitudes about how firearms are stored, especially when they are not stored safely. We asked respondents how the referent firearm had been stored in the past 6 months, i.e., whether it had been locked up or unloaded. We also asked respondents whether any firearm in the home had been stored loaded, unlocked or both in the past 6 months.

Psychosocial factors were assessed by having respondents indicate how much they agreed with

an item statement on a five-point Likert scale ranging from strongly disagree (1), to strongly agree (5), with the mid-point being 'neither agree, nor disagree'. There were six item statements tapping attitudes about safe storage, three relevant to keeping firearms unloaded and three relevant to keeping firearms stored in a locked place. The statements inquired about whether the respondent thought the particular storage practice was 'a good idea', 'wisest', and 'important to her', e.g. 'It is a good idea to keep the gun stored unloaded'. Composite measures were developed for attitude toward each storage practice by averaging respondents' answers to the three items. A husband-specific subjective norm was measured by asking women to indicate whether their husbands viewed safe storage favorably, i.e. 'How much would your husband agree or disagree with the following statement: The gun should be stored unloaded?' (or in a locked place). The item statement for perceived behavioral control was 'If I wanted it to be, the gun would be stored unloaded' (or in a locked place).

The Survey Research Unit (SRU) at The University of North Carolina at Chapel Hill (UNC) generated the sample and collected the data. They conducted interviews in the spring of 2004. SRU used computer-assisted telephone interviewing technology to randomly select numbers to be called, to assign calls to interviewers and to schedule callbacks. They made up to 20 callbacks per number; callbacks were made on different days of the week and at different times of the day. Administration of the interview took an average of 9 minutes. Interviewers verbally obtained informed consent at the beginning of the interview. This study was originally approved by the Institutional Review Board at UNC School of Public Health, and continued data analysis was approved by the Human Subjects Committee at Harvard School of Public Health.

Sample

In a review of 58 health behavior studies using the TPB, the mean correlation coefficients R of behavioral intentions with attitude, subjective norm and perceived behavioral control were 0.46, 0.34 and 0.46, respectively. Based on this information, we

set a minimum sample size of 140 so that a multi-variable linear regression test of $R = 0$ ($\alpha = 0.05$) for six normally distributed covariates would have 80% power to detect an R of 0.30 [52, 53]. Although we generated a sampling frame database of 3230 telephone numbers, we exceeded the target sample size by the time 1586 numbers had been put into active calling.

Call dispositions were classified in accordance with the guidelines from the American Association for Public Opinion Research (AAPOR), including complete, non-response (includes refusals), ineligible and unknown eligibility [54]. Although 186 interviews were completed, one respondent was excluded from the analysis because she answered 'don't know' to more than one-quarter of the items ($n = 185$). There were 39 non-responses; only 2% of all final dispositions were refusals. Some 720 individuals were deemed ineligible. An ineligible disposition was made when a telephone number had been changed or was not in service, if the number reached a place that was not a private residence or if no one in the household met inclusion criteria. Eligibility could not be ascertained for 40% (641) of the telephone numbers in active calling even after the maximum number of call attempts had been made; these numbers were disposed as unknown eligibility [54]. We used AAPOR's Formula 3 to compute a response rate [54]. Under the assumption that those with unknown eligibility had the same eligibility rate as those with known eligibility (i.e. $\sim 24\%$), the response rate was 49.2%.

Data analysis

Descriptive characteristics were generated as appropriate. The next series of analyses examined the degree to which beliefs about defensive firearm use were associated with attitudes toward safe firearm storage. The final series examined whether those with safe firearm storage practices were more likely to have favorable attitudes, supportive subjective norms, and perceptions of high behavioral control over firearm storage.

Due to the ordinal nature of the data, we could not make rigid assumptions about the underlying distri-

bution [55]. Thus, we used non-parametric statistical techniques to assess the statistical significance of associations. We used a Spearman's rank correlation coefficient to quantify the association between two ordinally scaled variables, a chi-square test for two dichotomous variables and a Wilcoxon–Mann–Whitney test to quantify the association of a dichotomous variable with an ordinally scaled variable. As a non-parametric analog to the t -test, the Wilcoxon–Mann–Whitney test assesses the statistical significance of differences in median scores by group. The normal approximation Z value and the corresponding P -value serve as the test statistics. Analyses were conducted using SAS, version 9.1.2 [56, 57].

Results

The sample included respondents from 41 states and all four Census regions (i.e. West, Midwest, South and Northeast). The mean age for respondents was 39.4 years ($SD = 6.6$) and for respondents' husbands was 41.6 years ($SD = 7.1$). The vast majority were White and non-Hispanic (98.4%). The modal number of children per household was two (48.9%). Eighty-one percent had children younger than 13 years (Table I).

Patterns of firearm ownership and storage

Respondents reported an average of 4.4 firearms in their homes (range 1–20, $SD = 3.7$). Recreation was cited as the leading reason for having firearms, with 88.7% indicating that the firearms were for hunting and/or target shooting. Although 33.7% said the firearms were for protection, just 8.1% cited protection as the *only* reason for having firearms. Only 9.2% of the respondents said they personally owned the referent firearm; the vast majority of individuals said their husband owned it.

More than one-half (59.2%) said that the referent firearm had been stored in a locked place over the past 6 months, 93.0% said it had been stored unloaded. Compared with those whose children were all aged 13–17 years, respondents with children younger than 13 were not significantly more likely to say the firearm was unloaded

Table I. Description of sample, $n = 185$

Characteristic	<i>n</i>	%
Race/ethnicity ^a		
White	182	98.4
Hispanic	2	1.1
American Indian	1	0.5
Level of educational attainment		
High school diploma or less	24	13.0
Some higher education, does not have a 4-year college degree	80	43.2
Attained 4-year college degree	81	43.8
Region of residence		
Northeast	21	11.4
Midwest	74	40.0
South	55	29.7
West	35	18.9
Presence of children by age		
Any child younger than 5 years	61	33.2
Any child aged 5–12 years	128	69.6
Any teenager aged 13–18 years	80	43.2

^aThere were no respondents in the Black/African-American, Asian or Native Hawaiian/Pacific Islander racial groups in the sample. Both respondents reporting Hispanic ethnicity also described themselves as White in terms of race.

(94.0% versus 88.6%, $P = 0.26$) or locked (58.8% versus 60.0%, $P = 0.90$). Respondents from states with a Child Access Prevention law (i.e. a statute mandating that adults store their firearms so as to be inaccessible to children and youth) [58] were no more likely than those in states without such a law to have the referent firearm stored unloaded (91.0% versus 94.1%, $P = 0.44$) or in a locked place (60.6% versus 58.5%, $P = 0.78$).

Application of the TPB

Overall, a majority of women had favorable attitudes toward safe storage of firearms (Fig. 1). Notably, a greater percentage of respondents held strongly favorable attitudes toward keeping firearms stored unloaded than toward keeping them stored in a locked place. Nearly all respondents (94.6%) agreed with each of the three-item statements assessing attitudes toward keeping firearms stored unloaded, whereas 75.7% agreed with all three-item statements assessing attitudes toward keeping firearms stored locked. The mean scale score for atti-

tude toward keeping firearms stored locked was 4.31 (SD = 0.95) and for keeping firearms stored unloaded was 4.74 (SD = 0.62). Both attitude scales demonstrated high internal consistency, each having Cronbach's alpha coefficients of 0.95.

About two-thirds (32.4%) of the respondents said they were concerned about the possibility of a break-in. Twenty-six percent agreed with the statement that 'a gun would prevent a family member from being hurt in case of a break-in'. Twice as many (57.7%) agreed that 'a gun could scare off someone who tried to break into the home'. Using Spearman's rank correlation coefficients, we found a modest but statistically significant association between beliefs about defensive firearm use and attitude toward keeping firearms stored in a locked place (Table II). Those who believed that a firearm could scare off a burglar or keep someone in the family from being hurt were less likely to have a favorable attitude toward keeping the firearm locked up.

Women's reports indicated supportive subjective norms and perceptions of high behavioral control regarding keeping firearms stored safely. Most respondents indicated that their husbands favored storing the firearm unloaded (90.8%) and in a locked place (72.4%). Similarly, 95.1% of the respondents agreed that the referent firearm would be unloaded 'if I wanted it to be', and 88.1% agreed that it would be stored locked up if that were her preference. Despite high perceptions of behavioral control, 63.2% reported that they 'mostly leave it up to their husbands to decide how to store the gun'.

Women who reported that the referent firearm was stored safely had more favorable attitudes, more supportive subjective norms and higher perceptions of behavioral control as compared with those who said the firearm was not stored safely (Table III). These findings were strong and statistically significant, particularly for attitude and subjective norms.

Discussion

Many firearm injuries, especially suicides and unintentional injuries, could be prevented if parents stored firearms so as to make them inaccessible to

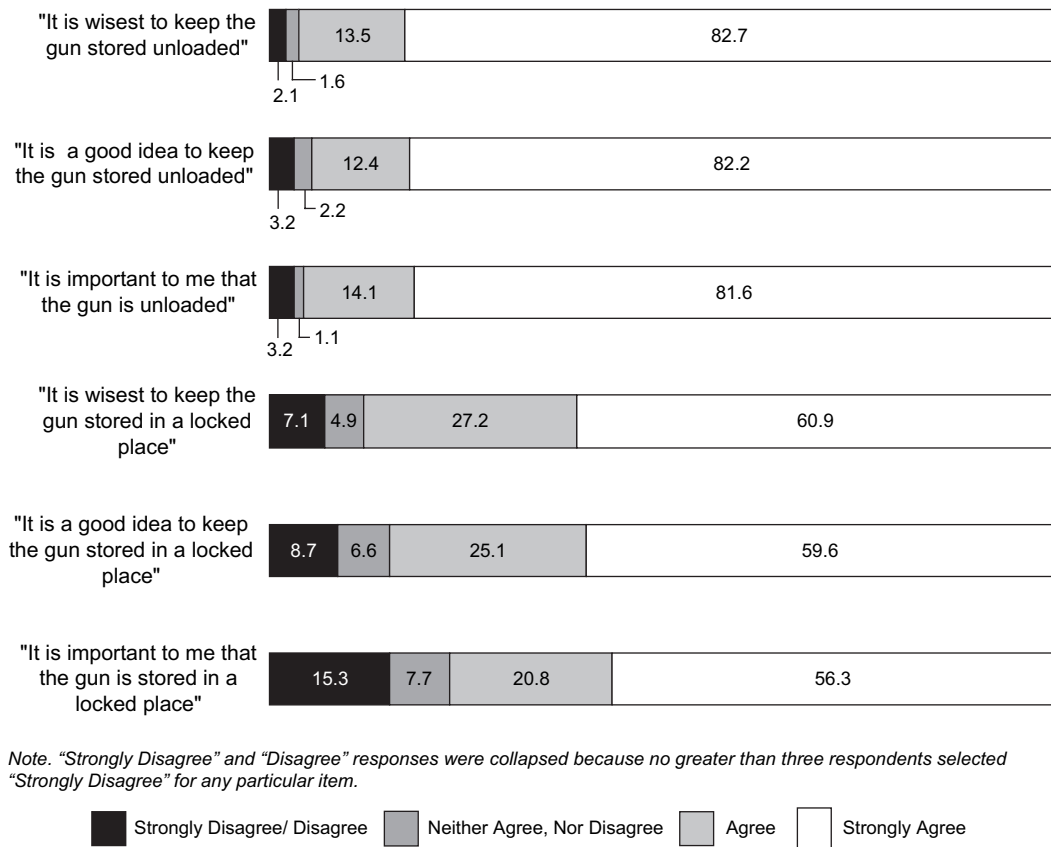


Fig. 1. Women's attitudes toward keeping firearms stored unloaded and locked up.

youth [3, 11–14, 27, 30, 59–64]. Learning about the psychosocial determinants of firearm storage practices has the potential to uncover information that can be used to effectively promote safe storage. The purpose of this study was to examine the extent to which beliefs, attitudes, subjective norms and perceptions of behavioral control were consistent with safe storage, and how strongly they were related to household firearm storage practices, among a sample of married women with children.

The findings provide initial support for the TPB as a useful conceptual framework for understanding the determinants of firearm storage practices. Women were highly motivated to store firearms safely as evidenced by favorable attitudes, support-

ive subjective norms and high perceptions of behavioral control. This was especially true for those reporting safer storage practices.

As previous research would suggest [40, 65, 66], we found that most women had favorable attitudes toward safe storage. Notably, women were more supportive of keeping firearms stored unloaded, than of keeping them locked up. About 95% of the respondents favored keeping the firearms in their homes stored unloaded, and 76% favored storing firearms locked up. Although consistent with what has been reported in the literature, these findings represent new information because the focus of prior research has been on beliefs about storage generally or opinions about how safe or dangerous

Table II. Spearman's rank correlation coefficients between women's attitudes toward safe firearm storage practices and their beliefs about safety and security, $n = 185$

Item statements ^a	Median score	Correlation with attitude toward keeping firearms stored:	
		In a locked place	Unloaded
I am concerned about the possibility that someone will break into our home	3	-0.062 ($P = 0.41$)	-0.095 ($P = 0.20$)
The gun would prevent someone in my family from getting hurt in case of a break-in	2	-0.252 ($P < 0.01$)	-0.091 ($P = 0.22$)
The gun could scare off someone who tried to break into our home	4	-0.148 ($P < 0.05$)	-0.080 ($P = 0.29$)

Note. Attitude scores come from attitude scales, both Cronbach's alpha coefficients were equal to 0.95.

^aThe response set for the items ranges from 1 (strongly disagree) to 5 (strongly agree).

Table III. Differences in psychosocial factors by household firearm storage practices, $n = 185$

Construct ^a	Referent firearm stored in a locked place			Referent firearm stored unloaded		
	Yes, $n = 109$, median score	No, $n = 75$, median score	Z, Pr < Z	Yes, $n = 172$, median score	No, $n = 13$, median score	Z, Pr < Z
Attitude ^b	5.0	3.7	-9.63, $P < 0.001$	5.0	3.0	-6.97, $P < 0.001$
Subjective norm	5.0	3.0	-9.72, $P < 0.001$	5.0	2.0	-6.59, $P < 0.001$
Perceived behavioral control	5.0	4.0	-7.10, $P < 0.001$	5.0	4.0	-3.80, $P < 0.001$

Comparisons were conducted with a Wilcoxon–Mann–Whitney test for equivalence of medians.

^aThe response set for the items ranges from 1 (strongly disagree) to 5 (strongly agree).

^bAttitude scores come from the three-item attitude scales, both Cronbach's alpha coefficients were equal to 0.95.

firearms in the home are. Our items asked about safe storage in the specific context of the woman's home.

Women's subjective norms and perceptions of behavioral control highlight the complexity of their role in making decisions about firearm storage. Most believed that their husbands were supportive of storing firearms safely; >90% said their husband thought the firearm should be stored unloaded, and 72% said their husband thought it should be stored in a locked place. Those reporting safe firearm storage were significantly more likely to have supportive husband-specific subjective norms. Despite the fact that most respondents perceived themselves to have control over how firearms are stored, most said they leave the decision making to their husbands (63%), and almost all said their husbands owned the firearm (90%). These results suggest that

husbands' preferences may strongly influence how firearms in the home will be stored.

Although only one-fourth of the respondents believed that the firearm in the home would prevent a family member from being hurt in case of a break-in, ~58% thought the firearm could scare off someone who tried to break into their home. These findings confirm prior research, which shows that many believe firearms can keep them safe [40, 42]. Those who believed that a firearm could scare off a burglar or keep someone in the family from being hurt were less likely to have a favorable attitude toward keeping the firearm locked up.

Storage practices

When considering all firearms in the home, i.e. not just the referent firearm, respondents' reported

storage practices were somewhat different than estimates from other national studies of households with firearms and with children. Forty-three percent reported an unlocked firearm in the home (national estimates ranged from 43 to 62%) [9, 43, 67], 7% reported having a loaded firearm (national estimates ranged from 14 to 30%) [21–23, 67] and 5% reported having a firearm that was stored both unlocked and loaded (national estimates ranged from 6 to 17%) [9, 21, 22, 67, 68]. Reported storage practices in this study were consistent with other research in the sense that individuals were less likely to keep firearms stored loaded than unlocked [10, 67]. Reports of unsafe storage practices from women in this sample may have been underestimated because of inaccurate recall, social desirability or because they simply did not know how the firearms were actually stored [10, 21, 65, 69, 70]. However, the fact that almost one-half of the women in this sample reported having a firearm in the home stored unsafely is concerning and underscores the importance of continued efforts to promote safe firearm storage to parents.

Generalizability

As this study had a relatively homogenous and small sample and a moderate response rate, caution should be taken in generalizing the results to the population at large. Although the response rate (49%) was low relative to traditional survey research standards [71–73], it is comparable to other studies about firearm ownership and storage [21, 65, 74]. Nonetheless, the question remains of whether study findings would have been altered if the response rate had been higher.

The fact that there were no African Americans in the sample precludes generalizing to that population, which experiences a high burden of firearm injury, especially homicide [7]. Several factors may have contributed to the absence of African Americans in the sample. First, telephone coverage is lower for African American households (90%) compared with the United States as a whole (94%) [75, 76]. Additionally, African American women are less likely to live with a spouse as com-

pared with white women (53.6% versus 29.2%) [77, 78], and African American households are less likely to contain firearms than white households [10, 21, 66], both of which decrease the universe of African American women eligible for this study. Other studies about household firearms have also underrepresented African Americans [21, 67], highlighting the need to oversample such households in future research.

Future directions

The TPB is a model of intrapersonal decision making and does not address behaviors that require cooperation with others [38, 79]. Though the influence of husbands was incorporated in this research via the subjective norm construct, specification was limited to women's perceptions of their partners' beliefs. Despite limited generalizability, results clearly suggest that women's behavior to keep firearms stored safely involves interaction with their husbands. Therefore, research using theoretical frameworks that are able to capture the complex nature of how partners make decisions and influence each other's attitudes and beliefs, such as attitude alignment, is needed [80].

To date, anticipatory guidance about firearm safety has focused on presenting information about the hazardous nature of firearms, so as to motivate behavior change by changing attitudes. This study shows that most women have favorable attitudes toward safe firearm storage, even those who do not have firearms stored safely. It may therefore be important to target other psychosocial determinants of firearm storage—such as beliefs about defensive firearm use, subjective norms or participation in decision making—to effectively change storage practices.

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Conflict of interest

None declared.

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