



## Suicide-related behavior and firearm access among perpetrators of domestic violence subject to domestic violence protection orders

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### ABSTRACT

Perpetrators of domestic violence (DV) may be a population at elevated risk of suicide. Domestic violence protection orders (DVPOs) can include the removal of firearms from the individual subjected to the order (i.e., the respondent) to protect the victim-survivor. While removal of firearms in a DVPO is designed to protect the victim-survivor; it may also prevent suicide of the respondent by reducing access to lethal means. Therefore, we examined the association of respondent suicide-related behaviors with firearm possession and weapon use in DV among a sample of granted DVPO petitions in King County, Washington (WA), United States from 2014 to 2020 (n = 2,537). We compared prevalence ratios (PR) of respondent firearm possession and use of firearms or weapons to threaten or harm by suicide-related behavior. Overall, respondent suicide-related behavior was commonly reported by petitioners (46 %). Approximately 30 % of respondents possessed firearms. This was similar between respondents with and without a history of suicide-related behavior (PR: 1.03; 95 % CI: 0.91–1.17). Respondents with a history of suicide-related behavior were 1.33 times more likely to have used firearms or weapons to threaten/harm in DV compared to those without a history of suicide-related behavior (44.1 % vs. 33.8 %; 95 % CI: 1.20–1.47). In conclusion, both firearm possession and suicide-related behaviors were common among DVPO respondents. History of suicide-related behavior may be a marker for firearm-related harm to the victim-survivor. Evaluations of DVPO firearm dispossession should consider both firearm-related injury of the victim-survivor and suicide of the respondent.

### 1. Introduction

Suicide and domestic violence (DV) are major public health and public safety concerns. DV affects an estimated 43 million adults in the United States (Peterson et al., 2018). Suicide is the 11th leading cause of death for all ages in the United States, the second leading cause of death for ages 10–34, and the fifth leading cause for ages 35–44 (Facts About Suicide | Suicide | CDC, 2023). Several risk factors for perpetration of DV overlap with suicide risk factors including alcohol and substance use, previous suicide attempts, and family history of child abuse (Webb et al., 2011). Prior research has shown high rates of suicide death among

people with a history of DV perpetration (Stawar, 1996; Conner et al., 2000; Starr and Fawcett, 2006). Therefore, perpetrators of DV may be a population at elevated risk for suicide-related behaviors and suicide death.

A domestic violence protection order petition (DVPO) is a court document completed by the petitioner (usually the victim-survivor) seeking a protection order from the court against the abuser, referred to as the respondent. As DVPOs are designed to protect the victim-survivor, suicide prevention is rarely considered as part of the rationale for DV-related firearm prohibitions. However, one study found almost half of DVPO respondents had a history of communicating

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suicidal ideation, and of those, one-quarter had attempted suicide (Conner et al., 2002). Suicidal behaviors among DV perpetrators may be an emotional response or coping strategy to crises (Sesar et al., 2018; Dewar et al., 2021). Perpetrators of DV may also threaten suicide as a form of coercive control over the person against whom they use violence (Stark, 2009). The abuser's demands are connected to credible threats (e.g., suicide) if the victim-survivor does not comply (Hamberger et al., 2017). The person threatening suicide may be experiencing both a desire to die and a desire for control over another person (Fitzpatrick et al., 2022).

Abuser threats of suicide signal elevated risk of violence to victim-survivors and are considered a risk factor for lethal DV, including intimate partner homicide-suicide (Campbell et al., 2003; Campbell et al., 2009). Another risk factor in lethality assessment is access to firearms. Abuse using firearms impacts a victim-survivor's feeling of safety and has the potential to quickly escalate the lethality of abuse (Adhia et al., 2021; Sorenson, 2017). Firearms are used in half of intimate partner homicides (Zeoli et al., 2020) and over 80 % of intimate partner homicide-suicides (Logan et al., 2019). Abusers who threaten or assault their victim with a firearm or other weapon are 20 times more likely to subsequently murder them (Campbell et al., 2003). When a firearm is in the home, an abuser is six times more likely to kill their DV victim (Campbell et al., 2003). Therefore, examining firearm use in DV and suicide-related behavior is also informative for understanding risk to the victim-survivor.

Firearm dispossession is one avenue to reduce intimate partner homicides (Lyons et al., 2021) and to prevent suicide through reducing access to lethal means (Barber and Miller, 2014). Prior research has compared firearm access and risk factors for suicide including mental health and past suicidal ideation and attempt among general populations, adolescents, older adults, and veterans (Morgan et al., 2018; Simonetti et al., 2015; Morgan et al., 2019; Swanson et al., 2020; Bossarte et al., 2021). Information specific to populations perpetrating DV would inform current policies and practice to both prevent suicide and protect victim-survivors of DV as removal of firearms can occur in the civil legal system through DVPOs. In Washington (WA) in 2014, an order to surrender firearms was made mandatory for DVPOs in intimate partner relationships (e.g., current or former spouses, relationships with a child in common, intimate partners who resided together; Wash. Rev. Code Ann. § 9.41.040(2)(a)). Therefore, DVPOs and specifically, orders to surrender firearms, may provide an actionable intervention point to reduce firearm-related injury, including suicide and homicide.

Given the link between suicide and DV perpetration and the importance of firearms in both suicide and DV, including intimate partner homicide-suicides, we sought to examine the association of suicide-related behaviors with firearm possession and use of firearms or weapons to threaten or harm the petitioner among DVPO respondents in King County, WA, United States. To add to our knowledge on the continuum of suicide-related behavior among this population, we examined suicide-related behaviors overall and, as an exploratory analysis, examined subtypes of suicide-related behavior, including suicidal communication, suicidal communication expressed as a threat, and history of suicide attempts.

## 2. Methods

This cross-sectional study used data from a sample of civil legal system-involved perpetrators of DV. In King County, WA, a population-based cohort of DVPOs was established from January 1, 2014-December 31, 2020 to evaluate implementation of WA's DV-related firearm prohibitions (RCW9.41.800) by the courts and the Regional Domestic Violence Firearms Enforcement Unit (RDVFEU) (Ellyson et al., 2023). A random sample of 55 % of all granted DVPO petitions was collected (n = 3,543) for all years from 2014 to 2020 except for 2017. The RDVFEU officially began on January 1, 2018 with a pilot program beginning in mid-2017. Thus, 2017 was not collected for the evaluation project. As

the evaluation study did not collect information from 2017, this year was not available in the current study. Petitioner narratives and data were abstracted from the records about the respondent, including age, sex, relationship to petitioner, substance use, and history of firearm use. Firearm possession status was not reported or coded as unknown for 28.4 % of cases resulting in a sample size of n = 2,537 petitions for the analysis (Appendix Table 1). This study was approved by the University of Washington Institutional Review Board.

### 2.1. Measures

#### 2.1.1. Suicide-related behaviors

Suicide-related behaviors were abstracted from a question on the petition that asks petitioners to "Describe threats of suicide or suicidal behavior by respondent". A summary of all responses was abstracted for this study. First, a binary variable was coded as 1 if the petitioner described any suicide-related behavior by the respondent, and 0 if they did not describe suicide-related behavior.

#### 2.1.2. Subtypes of suicide-related behaviors

For the exploratory analysis, we classified subtypes of suicide-related behavior by the respondent as described in the petition. Suicidal communication included narratives that described the respondent expressing passive thoughts about wanting to be dead or imagining being dead or active thoughts considering ways to die or forming a plan (Silverman et al., 2007). As the petitioner reported this behavior, the respondent would have had to communicate this ideation to the petitioner themselves or the petitioner would have been informed by someone else.

Suicidal communication expressed as a threat was coded as present for narratives where communication about suicide included an intent to coerce or control the victim-survivor (Silverman et al., 2007). For example, suicidal communication in which the respondent expressed a desire or a plan to kill themselves if the petitioner leaves the relationship or blamed the petitioner if the respondent were to kill themselves was coded as a threat. Equally, if the suicidal communication also included threats of homicide to the petitioner or others, the statement was coded as a threat. History of suicide attempt was coded as present when the petitioner described the respondent having had a history of suicide attempts or initiating an attempt (i.e., taking steps to engage in lethal action, such as putting a firearm to their head but not pulling the trigger).

To determine whether suicidal communication was expressed as a threat and/or if there was a history of suicide attempts, a rules-based system was used to perform text classification from the unstructured text. Natural Language Processing (NLP) uses computer science to understand human language and has been used in prior research examining suicide and suicide risk factors in clinical notes in Electronic Health Records (EHR) (Fernandes et al., 2018). Text classification is the process of organizing unstructured text into predefined categories to reduce the burden of manual review and coding which can require significant time, training, and expertise. Key phrases from these narratives were used as the inputs for rules-based text classification system. A 30 % random sample (n = 455) stratified by the relationship type was manually reviewed and compared to the rules-based text classification system. For suicidal communication expressed as a threat, the sensitivity was 87.2 % and the specificity was 93.7 %, and for history of suicide attempt, the sensitivity was 80.2 % and the specificity was 95.7 %. For more details on suicide-related behavior definitions, coding instructions, and example text see Appendix-Supplemental Codebook.

We then created a nominal variable with five categories: 1) No suicide-related behavior; 2) Suicidal communication (not expressed as a threat and no history of suicide attempt); 3) Suicidal communication expressed as a threat; 4) History of suicide attempt; and 5) Suicidal communication expressed as a threat and a history of suicide attempt.

**Table 1**

Granted Domestic Violence Protection Order (DVPO) case and respondent characteristics by reported history of suicide-related behavior in King County, WA, 2014–2020.

Case and respondent characteristics	Overall (N = 2537) N (%)	No suicide-related behavior (N = 1369) N (%)	Any reported history of suicide-related behavior (N = 1168) N (%)	Type of Reported History of Suicide-related behavior (N = 1168)			
				<i>Suicidal communication</i> (N = 474) N (%)	<i>Suicidal communication expressed as a threat</i> (N = 510) N (%)	<i>History of suicide attempt</i> (N = 107) N (%)	<i>Suicidal communication expressed as a threat and a history of suicide attempt</i> (N = 77) N (%)
<b>Year</b>							
2014	468 (18.4)	259 (18.9)	209 (17.9)	89 (18.8)	94 (18.4)	20 (18.7)	6 (7.8)
2015	411 (16.2)	221 (16.1)	190 (16.3)	85 (17.9)	81 (15.9)	15 (14.0)	9 (11.7)
2016	435 (17.1)	236 (17.2)	199 (17.0)	81 (17.1)	85 (16.7)	18 (16.8)	15 (19.5)
2018	452 (17.8)	226 (16.5)	226 (19.3)	94 (19.8)	95 (18.6)	22 (20.6)	15 (19.5)
2019	425 (16.8)	228 (16.7)	197 (16.9)	77 (16.2)	86 (16.9)	16 (15.0)	18 (23.4)
2020	346 (13.6)	199 (14.5)	147 (12.6)	48 (10.1)	69 (13.5)	16 (15.0)	14 (18.2)
<b>Age of respondent</b>							
17 or under	27 (1.1)	16 (1.2)	11 (0.9)	1 (0.2)	8 (1.6)	1 (0.9)	1 (1.3)
18–24	272 (10.7)	134 (9.8)	138 (11.8)	47 (9.9)	65 (12.7)	14 (13.1)	12 (15.6)
25–34	818 (32.2)	413 (30.2)	405 (34.7)	176 (37.1)	164 (32.2)	40 (37.4)	25 (32.5)
35–44	720 (28.4)	375 (27.4)	345 (29.5)	127 (26.8)	161 (31.6)	27 (25.2)	30 (39.0)
45–54	418 (16.5)	240 (17.5)	178 (15.2)	78 (16.5)	76 (14.9)	17 (15.9)	7 (9.1)
55–64	166 (6.5)	107 (7.8)	59 (5.1)	25 (5.3)	27 (5.3)	6 (5.6)	1 (1.3)
Over 65	35 (1.4)	24 (1.8)	11 (0.9)	4 (0.8)	6 (1.2)	1 (0.9)	0 (0)
Missing	81 (3.2)	60 (4.4)	21 (1.8)	16 (3.4)	3 (0.6)	1 (0.9)	1 (1.3)
<b>Respondent gender</b>							
Male	2210 (87.1)	1195 (87.3)	1015 (86.9)	411 (86.7)	456 (89.4)	83 (77.6)	65 (84.4)
Female	314 (12.4)	168 (12.3)	146 (12.5)	60 (12.7)	51 (10.0)	24 (22.4)	11 (14.3)
Missing	13 (0.5)	6 (0.4)	7 (0.6)	3 (0.6)	3 (0.6)	0 (0)	1 (1.3)
<b>Domestic violence type</b>							
Intimate partner violence	2065 (81.4)	1052 (76.8)	1013 (86.7)	399 (84.2)	452 (88.6)	93 (86.9)	69 (89.6)
Family or household member violence	472 (18.6)	317 (23.2)	155 (13.3)	75 (15.8)	58 (11.4)	14 (13.1)	8 (10.4)
<b>Incidents of stalking or similar behavior</b>	1747 (68.9)	848 (61.9)	899 (77.0)	352 (74.3)	402 (78.8)	82 (76.6)	63 (81.8)
<b>Substance use*</b>							
Alcohol	1240 (48.9)	626 (45.7)	614 (52.6)	260 (54.9)	252 (49.4)	58 (54.2)	44 (57.1)
Drugs	1080 (42.6)	492 (35.9)	588 (50.3)	231 (48.7)	251 (49.2)	58 (54.2)	48 (62.3)
Other	112 (4.4)	52 (3.8)	60 (5.1)	26 (5.5)	24 (4.7)	7 (6.5)	3 (3.9)
None	908 (35.8)	562 (41.1)	346 (29.6)	139 (29.3)	160 (31.4)	29 (27.1)	18 (23.4)

\*Could select multiple.

**2.1.3. Firearm possession**

Firearm possession status was measured by the following question in the petition, “Does the respondent own or possess firearms?” The response options include “Yes” and “No”. If neither option was selected the question was coded as “Unknown” by the research team.

**2.1.4. Weapon use**

Petitioners were also asked the following open-ended question: “Does the respondent use firearms, weapons or objects to threaten or harm you? Please describe.” These petitioner responses were coded as “Yes” if a petitioner explicitly mentioned the use of a weapon in

incidents of DV or “No” if a petitioner did not explicitly mention the use of a weapon in incidents of DV.

**2.1.5. Covariates**

Covariates included age of the respondent (i.e., 17 or under; 18–24; 25–34; 35–44; 45–54; 55–64, and Over 65), respondent gender (i.e., Male, Female), and case year (i.e., 2014, 2015, 2016, 2018, 2019, 2020). Age was calculated by subtracting the age of the respondent using the respondent’s date of birth from the date the order was granted. Respondent gender was entered on the granted order by a judicial officer, an attorney, or an advocate working with the petitioner.

**Table 2**

Prevalence of firearm possession and weapon use by suicide-related behavior among granted Domestic Violence Protection Orders (DVPOs) in King County, WA, 2014–2020.

	Overall (N = 2537) N (%)	No suicide-related behavior (N = 1369) N (%)	Any reported history of suicide-related behavior (N = 1168) N (%)	Type of Reported History of Suicide-related Behavior (N = 1168)			
				Suicidal communication (N = 474) N (%)	Suicidal communication expressed as a threat (N = 510) N (%)	History of suicide attempt (N = 107) N (%)	Suicidal communication expressed as a threat and a history of suicide attempt (N = 77) N (%)
<b>Owns or possess firearms</b>							
No	1780 (70.2)	962 (70.3)	818 (70.0)	332 (70.0)	353 (69.2)	77 (72.0)	56 (72.7)
Yes	757 (29.8)	407 (29.7)	350 (30.0)	142 (30.0)	157 (30.8)	30 (28.0)	21 (27.3)
<b>Used firearms, weapons, or objects to threaten or harm</b>							
No	1550 (61.1)	901 (65.8)	649 (55.6)	278 (58.6)	269 (52.7)	66 (61.7)	36 (46.8)
Yes	973 (38.4)	460 (33.6)	513 (43.9)	192 (40.5)	239 (46.9)	41 (38.3)	41 (53.2)
Missing	14 (0.6)	8 (0.6)	6 (0.5)	4 (0.8)	2 (0.4)	0 (0)	0 (0)

**Table 3**

Association of history of suicide-related behavior with firearm possession status and weapon use among granted Domestic Violence Protection Orders (DVPOs) in King County, WA, 2014–2020.

	Owns or possess firearms				Used firearms, weapons, or objects to threaten or harm			
	Crude		Adjusted*		Crude		Adjusted*	
	PR	95 % CI	PR	95 % CI	PR	95 % CI	PR	95 % CI
<b>Model 1: No/Any suicide-related behavior</b>								
No reported history of suicide-related behavior	<i>Reference</i>				<i>Reference</i>			
Any reported history of suicide-related behavior	1.01	(0.89–1.14)	1.03	(0.91–1.17)	1.31	(1.18–1.44)	1.33	(1.20–1.47)
<b>Model 2: Type of suicide-related behavior</b>								
No suicide related behavior	<i>Reference</i>				<i>Reference</i>			
Suicidal communication	1.01	(0.86–1.18)	1.02	(0.86–1.20)	1.21	(1.06–1.38)	1.24	(1.08–1.41)
Suicidal communication expressed as a threat	1.04	(0.89–1.21)	1.07	(0.91–1.24)	1.39	(1.23–1.57)	1.42	(1.25–1.60)
History of suicide attempt	0.94	(0.68–1.27)	1.01	(0.72–1.37)	1.13	(0.87–1.44)	1.16	(0.89–1.47)
Suicidal communication expressed as a threat and a history of suicide attempt	0.92	(0.62–1.30)	0.95	(0.63–1.35)	1.58	(1.21–2.01)	1.55	(1.19–1.99)

\*Adjusted for case year, respondent age, respondent gender.

Therefore, this measure was not self-reported by the respondent and does not include other gender identities. Case year (e.g., 2014, 2015) was the year the petition was filed with the court. These covariates were selected to account for firearm ownership patterns and yearly trends in suicide-related behavior, firearm ownership, or documentation of these behaviors in DVPO petitions over time. Situational factors included relationship type (i.e., intimate partner or family/household member), stalking or similar behavior by the respondent, and respondent substance use (i.e., none vs. any reported substance use, including alcohol and drugs).

2.2. Statistical analysis

First, we calculated descriptive statistics including counts and proportions of demographic and situational factors comparing DVPO respondents with a reported history of any suicide-related behavior to DVPO respondents without a history of suicide-related behavior.

Prevalence of firearm possession and prevalence of weapon use to threaten or harm was compared by respondents with a history of suicidal-related behavior to respondents that did not have a history of suicide-related behavior using modified Poisson regression models to estimate prevalence ratios (Zou, 2004). Additionally, we considered subtypes of suicide-related behavior as an exploratory form of our exposure (Silverman et al., 2007). Models adjusted for age of the respondent, respondent gender, and case year. A sensitivity analysis was conducted adjusting for situational factors as use of a firearm is more common among perpetrators of DV with a history of substance use

(Sorenson, 2017) and stalking (Logan and Lynch, 2018). For analyses examining subtypes of suicide-related behaviors, we additionally performed a sensitivity analysis with non-mutually exclusive categorizations comparing the presence and absence of suicidal communication expressed as a threat and history of suicide attempt, separately. Analyses were conducted using R version 4.2.2 and R package tidytext version 0.4.1 (R Foundation for Statistical Computing, Vienna, Austria).

3. Results

Overall, 46.0 % (n = 1168) of DVPO respondents had a history of suicide-related behavior (For prevalence among respondents with unknown firearm possession status, see Appendix Table 2). Compared to respondents without a history of suicide-related behavior, DVPO respondents with a history of suicide-related behavior were more likely to be a current or former intimate partner rather than being a family member or cohabitant (86.7 % vs. 76.8 %), more likely involved in stalking or similar behavior (77.0 % vs. 61.9 %), and more likely to have alcohol, drug or other substance use (70.4 % vs. 58.9 %) (Table 1).

Firearm possession was similar between respondents with (30.0 %) and without (29.7 %) a history of suicide-related behavior (Table 2). We did not find a statistically significant difference in the prevalence of firearm possession (PR: 1.01; 95 % CI: 0.89–1.14) between those two groups (Table 3). This finding did not materially change after adjustment for case year, respondent age, and respondent gender (PR: 1.03; 95 % CI: 0.91–1.17; Appendix Table 3).

Overall, 43.9 % of respondents with a history of suicide-related

**Appendix Table 1**

Granted Domestic Violence Protection Order (DVPO) case and respondent characteristics by firearm possession status in King County, WA, 2014–2020.

Case and respondent characteristics	Overall	Firearm Possession Status: Yes	Firearm Possession Status: No	Firearm Possession Status: Unknown
	(N = 3543) N (%)	(N = 757) N (%)	(N = 1780) N (%)	(N = 1006) N (%)
<b>Year</b>				
2014	640 (18.1)	127 (16.8)	341 (19.2)	172 (17.1)
2015	558 (15.7)	127 (16.8)	284 (16.0)	147 (14.6)
2016	588 (16.6)	123 (16.2)	312 (17.5)	153 (15.2)
2018	631 (17.8)	133 (17.6)	319 (17.9)	179 (17.8)
2019	621 (17.5)	133 (17.6)	292 (16.4)	196 (19.5)
2020	505 (14.3)	114 (15.1)	232 (13.0)	159 (15.8)
<b>Age of respondent</b>				
17 or under	39 (1.1)	8 (1.1)	19 (1.1)	12 (1.2)
18–24	384 (10.8)	59 (7.8)	213 (12.0)	112 (11.1)
25–34	1098 (31.0)	215 (28.4)	603 (33.9)	280 (27.8)
35–44	1016 (28.7)	236 (31.2)	484 (27.2)	296 (29.4)
45–54	598 (16.9)	132 (17.4)	286 (16.1)	180 (17.9)
55–64	229 (6.5)	58 (7.7)	108 (6.1)	63 (6.3)
Over 65	49 (1.4)	18 (2.4)	17 (1.0)	14 (1.4)
Missing	130 (3.7)	31 (4.1)	50 (2.8)	49 (4.9)
<b>Respondent gender</b>				
Male	3084 (87.0)	702 (92.7)	1508 (84.7)	874 (86.9)
Female	440 (12.4)	51 (6.7)	263 (14.8)	126 (12.5)
Missing	19 (0.5)	4 (0.5)	9 (0.5)	6 (0.6)
<b>Domestic violence type</b>				
Intimate partner violence	2800 (79.0)	639 (84.4)	1426 (80.1)	735 (73.1)
Family or household member violence	743 (21.0)	118 (15.6)	354 (19.9)	271 (26.9)
<b>Incidents of stalking or similar behavior</b>	2412 (68.1)	574 (75.8)	1173 (65.9)	665 (66.1)
<b>Substance use*</b>				
Alcohol	1647 (46.5)	415 (54.8)	825 (46.3)	407 (40.5)
Drugs	1494 (42.2)	339 (44.8)	741 (41.6)	414 (41.2)
Other	142 (4.0)	40 (5.3)	72 (4.0)	30 (3.0)
None	1358 (38.3)	240 (31.7)	668 (37.5)	450 (44.7)

\*Could select multiple.

behavior had petitioner reported use of firearms, weapons, or objects to threaten or harm compared to 33.6 % of respondents without a history of suicide-related behavior. Respondents with a history of suicide-related behavior were 1.31 (95 % CI: 1.18–1.44) times as likely to have reported use of firearms, weapons, or objects to threaten or harm than respondents without a history of suicide-related behavior (Table 3).

**Appendix Table 2**

Granted Domestic Violence Protection Order (DVPO) reported respondent history of suicide-related behavior by firearm possession status in King County, WA, 2014–2020.

Case and respondent characteristics	Overall	Firearm Possession Status: Yes	Firearm Possession Status: No	Firearm Possession Status: Unknown
	(N = 3543) N (%)	(N = 757) N (%)	(N = 1780) N (%)	(N = 1006) N (%)
<b>Suicide-related behavior</b>				
No	2018 (57.0)	407 (53.8)	962 (54.0)	649 (64.5)
Yes	1525 (43.0)	350 (46.2)	818 (46.0)	357 (35.5)
<b>Suicide-related behavior subtypes</b>				
No suicide related behavior	2018 (57.0)	407 (53.8)	962 (54.0)	649 (64.5)
Suicidal communication	616 (17.4)	142 (18.8)	332 (18.7)	142 (14.1)
Suicidal communication expressed as a threat	675 (19.1)	157 (20.7)	353 (19.8)	165 (16.4)
History of suicide attempt	135 (3.8)	30 (4.0)	77 (4.3)	28 (2.8)
Suicidal communication expressed as a threat and a history of suicide attempt	99 (2.8)	21 (2.8)	56 (3.1)	22 (2.2)

This finding did not materially change after adjustment for case year, respondent age, and respondent gender (PR: 1.33; 95 % CI: 1.20–1.47; Appendix Table 3).

Of the DVPO respondents with a history of suicide-related behavior, 43.7 % of petitions described suicidal communication expressed as a threat (n = 510); 9.2 % had a history of suicide attempt (n = 107); 6.6 % had both suicidal communication expressed as a threat and a history of suicide attempt (n = 77); and 40.6 % (n = 474) had suicidal communication that did not include threats nor a history of suicide attempt.

In analyses that examined by subtype of suicide-related behavior, firearm possession was similar between the groups; there was no association observed between subtype of suicide-related behaviors and firearm possession status (Table 3; Appendix Table 3). Respondents with suicidal communication expressed as a threat were 1.42 (95 % CI: 1.25–1.60) times as likely to have reported use of firearms, weapons, or objects to threaten or harm than respondents without a history of any suicide-related behavior after adjustment (Table 3; Appendix Table 4). Respondents with suicidal communication expressed as a threat and a history of suicide attempt were 1.55 (95 % CI: 1.19–1.99) times as likely to use firearms, weapons, or objects to threaten or harm than respondents without a history of suicide-related behavior after adjustment. Respondents with suicidal communication (not expressed as a threat and no history of suicide attempt) were 1.24 (95 % CI: 1.08–1.41) times as likely to use firearms, weapons, or objects to threaten or harm than respondents without a history of suicide-related behavior after adjustment. Respondents with a history of suicide attempt were 1.16 (95 % CI: 0.89–1.47) times as likely to use firearms, weapons, or objects to threaten or harm than respondents without a history of suicide-related behavior after adjustment, though this finding was not statistically significant.

In sensitivity analyses adjusting for case year, respondent age, respondent gender as well as situational factors (i.e., IPV relationship type, stalking, and any substance use) our results were similar (Appendix Table 5). Findings were also consistent when examining suicide

**Appendix Table 3**

Association of history of suicide-related behavior with firearm possession status and weapon use among granted Domestic Violence Protection Orders (DVPOs) in King County, WA, 2014–2020.

	Owns or possess firearms				Used firearms, weapons, or objects to threaten or harm			
	Crude		Adjusted*		Crude		Adjusted*	
	PR	95 % CI	PR	95 % CI	PR	95 % CI	PR	95 % CI
<b>No/Any suicide-related behavior</b>								
No reported history of suicide-related behavior	<i>Reference</i>				<i>Reference</i>			
Any reported history of suicide-related behavior	1.01	(0.89–1.14)	1.03	(0.91–1.17)	1.31	(1.18–1.44)	1.33	(1.20–1.47)
<b>Year</b>								
2014	<i>Reference</i>				<i>Reference</i>			
2015			1.16	(0.94–1.44)			1.02	(0.86–1.21)
2016			1.03	(0.83–1.27)			0.96	(0.81–1.14)
2018			1.07	(0.86–1.32)			1.08	(0.92–1.28)
2019			1.12	(0.91–1.39)			1.03	(0.87–1.22)
2020			1.23	(0.99–1.53)			1.04	(0.87–1.25)
<b>Age</b>								
17 or under	<i>Reference</i>				<i>Reference</i>			
18–24			0.78	(0.44–1.54)			0.52	(0.35–0.83)
25–34			0.89	(0.51–1.71)			0.65	(0.44–1.00)
35–44			1.11	(0.64–2.13)			0.69	(0.47–1.07)
45–54			1.08	(0.62–2.10)			0.67	(0.45–1.04)
55–64			1.19	(0.66–2.34)			0.64	(0.42–1.02)
Over 65			1.66	(0.84–3.49)			0.65	(0.36–1.17)
<b>Male Gender</b>			2.01	(1.57–2.61)			1.00	(0.86–1.17)

\*Adjusted for case year, respondent age, respondent gender.

**Appendix Table 4**

Association of subtype of history of suicide-related behavior with firearm possession status and weapon use among granted Domestic Violence Protection Orders (DVPOs) in King County, WA, 2014–2020.

	Owns or possess firearms				Used firearms, weapons, or objects to threaten or harm			
	Crude		Adjusted*		Crude		Adjusted*	
	PR	95 % CI	PR	95 % CI	PR	95 % CI	PR	95 % CI
<b>Suicide-related behavior subtypes</b>								
No suicide related behavior	<i>Reference</i>				<i>Reference</i>			
Suicidal communication	1.01	(0.86–1.18)	1.02	(0.86–1.20)	1.21	(1.06–1.38)	1.24	(1.08–1.41)
Suicidal communication expressed as a threat	1.04	(0.89–1.21)	1.07	(0.91–1.24)	1.39	(1.23–1.57)	1.41	(1.24–1.60)
History of suicide attempt	0.94	(0.68–1.27)	1.01	(0.72–1.37)	1.13	(0.87–1.44)	1.16	(0.89–1.48)
Suicidal communication expressed as a threat and a history of suicide attempt	0.92	(0.62–1.30)	0.95	(0.63–1.35)	1.58	(1.21–2.01)	1.55	(1.19–1.99)
<b>Year</b>								
2014	<i>Reference</i>				<i>Reference</i>			
2015			1.16	(0.94–1.44)			1.02	(0.86–1.21)
2016			1.03	(0.83–1.27)			0.96	(0.80–1.14)
2018			1.07	(0.87–1.32)			1.08	(0.92–1.28)
2019			1.12	(0.91–1.39)			1.03	(0.87–1.22)
2020			1.23	(0.99–1.54)			1.03	(0.86–1.24)
<b>Age</b>								
17 or under	<i>Reference</i>				<i>Reference</i>			
18–24			0.78	(0.44–1.54)			0.53	(0.35–0.84)
25–34			0.89	(0.51–1.71)			0.66	(0.45–1.03)
35–44			1.11	(0.64–2.13)			0.70	(0.48–1.09)
45–54			1.08	(0.62–2.10)			0.69	(0.46–1.07)
55–64			1.19	(0.66–2.34)			0.66	(0.43–1.05)
Over 65			1.66	(0.84–3.49)			0.67	(0.37–1.20)
<b>Male Gender</b>			2.00	(1.57–2.61)			0.99	(0.85–1.16)

\*Adjusted for case year, respondent age, respondent gender.

communication expressed as a threat and history of suicide attempt as present and absent (See Appendix Table 5).

**4. Discussion**

We found that almost half of DVPO respondents in King County, WA had a history of suicide-related behavior (including communication, communication expressed as threats, and history of suicide attempts) and 30 % of these respondents also had access to firearms. Firearm possession was just as likely among respondents with a history of suicide-related behavior as those without a history of suicide-related

behavior. Though respondents with a history of suicide-related behavior were just as likely to own or possess firearms, these respondents were more likely to use firearms or other weapons to threaten or harm compared to respondents without a history of suicide-related behavior. In exploratory analyses examining by subtype of suicide-related behavior, this finding was most pronounced for respondents with a history of suicide-related communication expressed as threats.

Firearm access and abuse using firearms are important risk factors for lethal domestic violence (Campbell et al., 2003; Campbell et al., 2009). Abusers can also use firearms in non-lethal violence by shooting or hitting the victim-survivor with the firearm (e.g., pistol-whipping),

**Appendix Table 5**

Association of history of suicide-related behavior with firearm possession status and weapon use adjusting for additional situational factors in King County, WA, 2014–2020.

	Owns or possess firearms						Used firearms, weapons, or objects to threaten or harm					
	Crude		Adjusted*		Adjusted**		Crude		Adjusted*		Adjusted**	
	PR	95 % CI	PR	95 % CI	PR	95 % CI	PR	95 % CI	PR	95 % CI	PR	95 % CI
<b>Model 1: No/Any suicide-related behavior</b>												
No reported history of suicide-related behavior	<i>Reference</i>						<i>Reference</i>					
Any reported history of suicide-related behavior	1.01	(0.89–1.14)	1.03	(0.91–1.17)	0.97	(0.85–1.10)	1.31	(1.18–1.44)	1.33	(1.20–1.47)	1.26	(1.13–1.39)
<b>Model 2: Type of suicide-related behavior</b>												
No suicide related behavior	<i>Reference</i>						<i>Reference</i>					
Suicidal communication	1.01	(0.86–1.18)	1.02	(0.86–1.20)	0.96	(0.81–1.13)	1.21	(1.06–1.38)	1.24	(1.08–1.41)	1.18	(1.03–1.35)
Suicidal communication expressed as a threat	1.04	(0.89–1.21)	1.07	(0.91–1.24)	0.99	(0.85–1.16)	1.39	(1.23–1.57)	1.42	(1.25–1.60)	1.34	(1.18–1.52)
History of suicide attempt	0.94	(0.68–1.27)	1.01	(0.72–1.37)	0.94	(0.67–1.27)	1.13	(0.87–1.44)	1.16	(0.89–1.47)	1.09	(0.84–1.39)
Suicidal communication expressed as a threat and a history of suicide attempt	0.92	(0.62–1.30)	0.95	(0.63–1.35)	0.86	(0.58–1.24)	1.58	(1.21–2.01)	1.55	(1.19–1.99)	1.44	(1.10–1.85)

\*Adjusted for case year, respondent age, respondent gender.

\*\*Adjusted for case year, respondent age, respondent gender, IPV relationship type, stalking, any substance use.

**Appendix Table 6**

Association of history of suicide-related behavior expressed as threats and history of suicide attempt with firearm possession status and weapon use in King County, WA, 2014–2020.

	Owns or possess firearms				Used firearms, weapons, or objects to threaten or harm			
	Crude		Adjusted*		Crude		Adjusted*	
	PR	95 % CI	PR	95 % CI	PR	95 % CI	PR	95 % CI
<b>Model 1: No/Any suicidal communication expressed as a threat</b>								
No history of suicide-related behaviors	<i>Reference</i>				<i>Reference</i>			
Suicide-related behavior not including threats	1.00	(0.86–1.15)	1.01	(0.87–1.18)	1.19	(1.05–1.35)	1.22	(1.07–1.38)
Suicidal communication expressed as threat	1.02	(0.89–1.18)	1.05	(0.90–1.22)	1.42	(1.26–1.59)	1.43	(1.27–1.61)
<b>Model 2: No/Any history of suicide attempt</b>								
No history of suicide-related behaviors	<i>Reference</i>				<i>Reference</i>			
Suicide-related behavior not including history of suicide attempt	1.02	(0.90–1.16)	1.04	(0.92–1.18)	1.30	(1.18–1.45)	1.33	(1.20–1.48)
History of suicide attempt	0.93	(0.72–1.18)	0.98	(0.76–1.25)	1.32	(1.09–1.58)	1.32	(1.09–1.59)

\*Adjusted for case year, respondent age, respondent gender.

brandishing the firearm, and threatening the victim-survivor or other family members (Sorenson and Schut, 2018; Kafka et al., 2021). Victim-survivors who experience firearm abuse are more likely to experience other forms of abuse including physical abuse, sexual abuse, financial abuse, and controlling behaviors (Adhia et al., 2021). Our study suggests suicide-related behaviors, especially communication expressed as threats, may be a marker for DV using firearms. Research should evaluate if reducing access to firearms among DVPO respondents with a history of suicide-related behavior reduces firearm-related injury to both the victim-survivor and the respondent. Though there are legislative mechanisms in place for orders to surrender firearms in DVPO cases, implementation varies by jurisdiction and improvements in enforcement would be needed to realize potential reductions in harm (Kafka et al., 2022; Webster et al., 2010).

Our main analysis sought to understand the overall prevalence of firearm possession and use and threats of use with a weapon by history of suicide-related behaviors. We found that respondents with a history of suicide-related behavior were more often a current or former intimate partner, involved in stalking or similar behavior, and engaged in substance use. Prior work has found the use of a firearm to be more common among perpetrators of DV with a history of substance use (Sorenson, 2017) and stalking (Logan and Lynch, 2018). Even after adjusting for these factors in sensitivity analyses, our findings remained similar. Future research could further explore these risk factors and their

association with suicide-related behavior and firearm possession/use.

Prior research in a DV intervention court found that 45.5 % of respondents were reported by petitioners to have ever told someone they were going to die by suicide and 12.9 % had a history of suicide attempt (Conner et al., 2002). Though our study relied on the petitioner responses from the DVPO petitions, our findings were similar. Other studies using DVPO petition data have found a range of prevalence for reported threats of suicide, from 41.5 % in North Carolina (Kafka et al., 2021) to a much lower 6 % in Arizona (Wallin and Durfee, 2020). This may be due to differences in how suicide-related behavior is documented such as whether DVPO petitions explicitly ask about respondent suicide-related behaviors or whether legal advocates are trained to ask DVPO petitioners to describe these behaviors. Jurisdictions should consider including questions of suicide-related behaviors of the respondent on the DVPO petition form to assess this risk of violence to the respondent and the victim-survivor. Similar to prior research on firearm possession and other risk factors for suicide among WA residents (Morgan et al., 2018), adolescents (Simonetti et al., 2015), and older adults (Morgan et al., 2019), we found no differences in firearm possession by history of suicide-related behaviors among DVPO respondents.

#### 4.1. Limitations

We used a unique source of data to measure the association between suicide-related behaviors, firearm ownership, and weapon use in DV. This unstructured data from granted DVPO petitions has both advantages and limitations. Problems with recall or selection bias may occur, although every petitioner was asked to describe threats of suicide or suicidal behavior by the respondent which may help recall and reduce selection bias. Petitioners are often current or former intimate partners and therefore may have great knowledge of the respondent. Respondents who may not disclose suicidal ideation in a research or clinical setting may have communicated their thoughts to the petitioner during the relationship. On the other hand, the use of proxies may have limitations as suicidal ideation may be underreported compared to behaviors such as threats or suicide attempts because it is unobservable unless communicated. Victim-survivors may also underreport to protect the respondent (Heckert and Gondolf, 2000). The direction of bias is unknown and self-reported information from the respondent would also be impacted by similar disclosure biases (Conner et al., 2002). Petitioners may be more likely to disclose both suicide-related behaviors and weapon use/threats if they have the support of a DV advocate, legal counsel, or other knowledge that these are dangerous indicators and disclosure may help the petitioner obtain a DVPO.

Subtypes of suicide-related behavior were assessed through a rule-based text classification system. This allowed for efficient classification of the narratives. However, nuances in petitioner descriptions of respondent suicidal behavior may be missed resulting in misclassification. In our study, 80 % of narratives describing suicide attempt and 87 % of narratives describing suicidal communication expressed as threat were correctly identified by the rules-based system. In addition to NLP limitations, a petitioner's description of respondent suicide-related behavior may be influenced by their own perceptions and beliefs regarding suicide (Pouliot and De Leo, 2006). Future research should further this inquiry of examining a continuum of suicide-related behaviors and the use of NLP in identifying suicide-related behavior in administrative records, specifically when proxy-reported.

This study was cross-sectional. We cannot determine if suicide-related behaviors occurred before or after weapon use/threats, or if these behaviors co-occurred. Firearm possession information was missing for 28.4 % of petitions and thus, excluded from the current study. Petitioners may be unaware if the respondent owns a firearm or be reluctant to disclose firearm possession for fear of retaliation. We were not able to isolate the use of firearms specifically to threaten or harm as the question on the petition includes other weapons or objects. However, understanding weapon use is important for considering prohibiting future firearm purchases or access as firearms increase the risk of lethality.

#### 5. Conclusion

Using data from granted DVPO petitions in King County, WA, we found that 3 in 10 DVPO respondents with a history of suicide-related behavior possessed firearms according to the petitioner. Firearm possession was just as likely among respondents with a history of suicide-related behavior as those without a history of suicide-related behavior. Respondents with a history of suicide-related behavior were more likely to have petitions that reported use of firearms or other weapons to threaten or harm the petitioner, especially if the suicide-related behavior was communication expressed as threats. When evaluating effects of firearm dispossession through DVPOs, both firearm-related injury to the victim-survivor and the respondent should be considered.

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#### CRedit authorship contribution statement

**Kimberly Dalve:** Conceptualization, Methodology, Formal analysis, Writing – original draft. **Alice M. Ellyson:** Conceptualization, Data curation, Resources, Writing – review & editing. **Deirdre Bowen:** Conceptualization, Writing – review & editing. **Julie Kafka:** Writing – review & editing. **Isaac C. Rhew:** Conceptualization, Writing – review & editing. **Frederick Rivara:** Conceptualization, Writing – review & editing. **Ali Rowhani-Rahbar:** Conceptualization, Funding acquisition, Resources, Supervision, Writing – review & editing.

#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

#### Data availability

The authors do not have permission to share data.

#### Appendix

##### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2023.102560>.

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