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Online Supplementary Appendix

This Appendix contains supplementary information about data collection methods and supplementary tables.

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Data collection, additional details

Electronic municipal survey to collect data on ice cleat distribution programs

We designed an electronic survey sent to all municipalities in Sweden \( n = 290 \) on June 10\(^{th} \), 2019 (with up to four reminders sent on July 1\(^{st} \), 2019; August 16\(^{th} \), 2019; September 10\(^{th} \), 2019; and October 16\(^{th} \), 2019). The survey collected information about the ice cleat programs, e.g. if the municipalities ever had or have an ongoing ice cleat distribution program, the time span of the programs (when they were introduced and/or ended), the amount of distributed ice cleats, the costs of the programs, the targeted age group, etc. The municipal respondents were also given the opportunity to reply with supplementary information via e-mail. In total, 228
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municipalities participated in the survey. During the data retrieval process, the region of Jönköping informed us that they acted as the main distributor of ice cleats in their region (the Swedish municipalities are divided into 21 regions). This affected a total of 13 municipalities. Nine of them had already responded to the survey, which made us add additional four municipalities as exposed to a program. Our study focuses on municipalities that have introduced distribution programs targeting older adults. Therefore, five municipalities were excluded as they distributed ice cleats to all ages, making them ineligible for analysis. In summary, a total of 227 municipalities were included in the program data that we matched to respondents from Statistics Sweden’s surveys (see next section). Respondents from 223 of these municipalities were available in the survey data. The number of survey respondents per municipality is presented in Table S3. A corresponding list, containing only the 63 matched municipalities with programs, is available in Table S4.

**Statistics Sweden surveys to collect data on ice cleat use**

In recent decades, the Swedish Civil Contingencies Agency has repeatedly commissioned Statistics Sweden to investigate how the Swedish population perceives how safe their everyday lives are. To do this, Statistics Sweden designed nationwide surveys using a stratified random sampling design, targeting adults living in Sweden aged 18-79 (about 7 million people). The surveys were designed to investigate individuals’ self-reported perceptions of everyday threats and risks and their perceptions of safety and security. Also, Swedish municipalities were allowed to purchase a municipality-specific survey in addition to the national data collected by Statistics Sweden (600 survey samples per municipality, per year). Four nationwide survey waves were conducted in 2007, 2010, 2014, and 2018, with new random samples in each wave (i.e., the data does not contain repeated observations on the same individuals). Random samples stratified by age group, sex, place of birth (in the
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2007, 2010 waves) and age group and sex (in the 2014, 2018 waves) were drawn from a national sampling frame. Respondents within a stratum had the same probability of being included in the sample. Measures were applied to not double-count survey participation (the same participants who responded to the national survey could not participate in the municipal survey). Statistics Sweden also linked data on educational attainment (from the Swedish Education Register) to the respondents using personal identification numbers. In summary, 169,721 respondents were asked to participate in the surveys (see Table S1 for details), and a total of 88,676 respondents participated (i.e., a 52.2% response rate).

Measurement of ice cleat use per survey wave

In every survey conducted by Statistics Sweden, there were variations on questions relating to the use of personal safety equipment, and each survey included subquestions related to ice cleats (see Table S2 for details). However, there were differences in outcome responses in the four waves that needed to be handled to make them more homogeneous for analysis (the last two waves only included a yes or no question). In the first two waves (2007, 2010), the respondents were asked: “How often do you do the following for your own safety?” with subquestions “Use anti-slip protection when the roads are icy (e.g., ice cleats)” (in 2007) and “Use anti-slip protection on your shoes (e.g., ice cleats) when it is slippery or icy” (in 2010).

In the first survey (year 2007), the respondents were given six response options, using an ordinal scale with alternatives ranging from; (1) never, (2) seldom, (3) sometimes, (4) often, (5) always, and (6) don’t know (total participants n = 11,186). For our primary analysis, we dichotomized the self-reported outcomes defining alternatives 3-5 as ice cleat users (n = 2,595), while using 1, 2 and 6, the never (n = 7,112), seldom (n = 971) and don’t know-users
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(n = 508) as non-ice cleat users. To assess the implications of this interpretation, we also conducted a sensitivity analysis by recoding the *seldom*-users as ice cleat users.

The second survey (year 2010) reduced the number of self-rated alternatives to using ice cleats from six to five; (1) *never or very rarely*, (2) *sometimes*, (3) *often*, (4) *always or almost always*, (5) *don’t know* (total participants n = 18,546). Once again, we recoded and dichotomized the reported outcomes defining options 3 and 4 as ice cleat users (n = 3,082), using the remaining alternatives *never or very rarely*-users (n = 12,112), and *don’t know*-users (n = 1,173) as non-users. We also coded the *sometimes*-users (n = 1,872) as ice cleat users in a sensitivity analysis.

The other two survey samples, the years 2014 (n = 17,916) & 2018 (n = 15,362), Statistics Sweden asked this question differently; “*Do you use any of the following safety equipment?*” with five sub-questions and we addressed the ice cleat-question specifically; “*Do you use anti-slip protection on your shoes (e.g., ice cleats) when it is slippery or icy outside?*”. The answer options were binary coded: (1) yes, (2) no, and (3) don’t know. The respondents who stated that they use ice cleats (1) are used for the primary analyses (year 2014 n = 6,425 & year 2018 n = 6,536), and non-users (2) and don’t know users (3) were coded as non-users (year 2014 n = 11,491 & year 2018 n = 8,826).
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Supplementary tables

Table S1. Sample size and response rate of surveys conducted by Statistics Sweden on behalf of the Swedish Civil Contingencies Agency.

| Survey year | Sample size | Response rate (%) |
|-------------|-------------|-------------------|
|             | National sample | Municipality samples | Total |
|            | 2007  | 2010  | 2014  | 2018  | 2007  | 2010  | 2014  | 2018  |
|             | 12 000 | 10 000 | 10 000 | 10 000 | 21 600 | 37 800 | 34 800 | 33 521 |
|             | 33 600 | 47 800 | 44 800 | 43 521 |         |         |         |         |
| Response rate (%) | 20.881 | 26.161 | 23.168 | 18.466 |
|         | (62.1%) | (54.7%) | (51.7%) | (42.4%) |
| Municipality* | 55-70% | 44-62% | 44.5-62.2% | 38-46% |

a Shows the interval for the response rate for the municipality-specific survey. The number of municipalities that purchased survey participation varies each survey year.
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Table S2. Questions and response categories relating to ice cleat use in each wave (in Swedish and with our translation to English), and coding rules for the main outcome measure and sensitivity outcome measure.

| Wave | Question (in Swedish) | Response categories | Question (English translation) | Response categories | Main analysis | Sensitivity analysis |
|------|-----------------------|---------------------|---------------------------------|---------------------|--------------|---------------------|
| 2007 | "Hur ofta gör du nedanstående saker för din egen säkerhets skull?" (Main question) + "Använder halkskydd vid halt väglag (t.ex. broddar)" | Aldrig (1); Sällan (2); Ibland (3); Ofta (4); Alltid (5); Ej aktuellt (6). | "How often do you do the following for your own safety?" (Main question) + "Use anti-slip protection when the roads are icy (e.g., ice cleats)" | Never (1); Seldom (2); Sometimes (3); Often (4); Always (5); Not relevant (6). | ICE CLEAT USER = YES IF 4 OR 5, ELSE NO (MISSING AS NO). | ICE CLEAT USER = YES IF 3 OR 4 OR 5, ELSE NO (MISSING AS NO). |
| 2010 | "Hur ofta gör du följande för din egen säkerhets skull?" (Main question) + "Använder halkskydd på skorna (t.ex. broddar) när det är halt eller isigt ut?" (Subquestion) | Aldrig eller mycket sällan (1); Ibland (2); Ofta (3); Alltid eller nästan alltid (4); Vet inte/ej aktuellt (5). | "How often do you do the following for your own safety?" (Main question) + "Use anti-slip protection on your shoes (e.g., ice cleats) when it is slippery or icy" (Subquestion) | Never or very rarely (1); Sometimes (2); Often (3), Always or almost always (4); Don’t know/not relevant (5). | ICE CLEAT USER = YES IF 3 OR 4, ELSE NO (MISSING AS NO). | ICE CLEAT USER = YES IF 2 OR 3 OR 4, ELSE NO (MISSING AS NO). |
| 2014 | "Använder du någon av följande säkerhetsutrustning?" (Main question) + "Använder du halkskydd på skorna (t.ex. broddar) när det är halt eller isigt ute?" (Subquestion) | Ja (1); Nej (2); Vet ej (3). | "Do you use any of the following safety equipment?" (Main question) + "Do you use anti-slip protection on your shoes (e.g., ice cleats) when it is slippery or icy outside?" | Yes (1); No (2); Don’t know (3). | ICE CLEAT USER = YES IF 1, ELSE NO (MISSING AS NO). | SAME AS MAIN. |
| 2018 | "Använder du någon av följande säkerhetsutrustning?" (Main question) + "Använder du halkskydd på skorna (t.ex. broddar) när det är halt eller isigt ute?" (Subquestion) | Ja (1); Nej (2); Vet ej (3). | "Do you use any of the following safety equipment?" (Main question) + "Do you use anti-slip protection on your shoes (e.g., ice cleats) when it is slippery or icy outside?" | Yes (1); No (2); Don’t know (3). | ICE CLEAT USER = YES IF 1, ELSE NO (MISSING AS NO). | SAME AS MAIN. |
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Table S3. Municipalities that participated in the electronic survey that could be matched to the national surveys on ice cleat use (n=223), and the number of survey participants per municipality, age 18-79 (n=63,234)

| Municipality | Survey responses | Municipality | Survey responses | Municipality | Survey responses |
|--------------|------------------|--------------|------------------|--------------|------------------|
| Alvesta      | 386              | Karlstad     | 867              | Stenungsund  | 394              |
| Aneby        | 19               | Kil          | 344              | Storfors     | 8                |
| Arjeplog     | 4                | Klippan      | 34               | Storuman     | 17               |
| Arvidsjaur   | 14               | Kristinehamn | 343              | Strängnäs    | 79               |
| Arvika       | 711              | Krokom       | 32               | Strömstad    | 43               |
| Askersund    | 319              | Kumla        | 15               | Strömsund    | 23               |
| Avesta       | 25               | Kungälv      | 762              | Sundbyberg   | 79               |
| Bengtsfors   | 324              | Kungälv      | 762              | Sunne        | 31               |
| Berg         | 16               | Kivlinge     | 404              | Surahammar   | 29               |
| Bjurholm     | 308              | Köping       | 56               | Svedala      | 38               |
| Bjuv         | 39               | Laholm       | 393              | Svenljunga   | 18               |
| Bollbygd     | 21               | Laxå          | 651              | Säffle       | 605              |
| Bollnäs      | 47               | Lekeberg     | 8                | Säter        | 12               |
| Borgholm     | 370              | Leksand      | 391              | Sävsjö       | 26               |
| Borlänge     | 56               | Lessebo      | 173              | Södertälje   | 67               |
| Borås        | 643              | Lidingö      | 385              | Tanum        | 32               |
| Botkyrka     | 483              | Lidköping    | 54               | Tidaholm     | 9                |
| Bräcke       | 20               | Lillå Edet   | 338              | Tierp        | 342              |
| Burlöv       | 47               | Linköping    | 1,218            | Timrå        | 91               |
| Båstad       | 38               | Ljungby      | 66               | Tjörn        | 375              |
| Dals-Ed      | 7                | Ljusdal      | 21               | Tomelilla    | 39               |
| Danderyd     | 378              | Ljusnarsberg | 5                | Torsby       | 26               |
| Dorotea      | 1                | Lomma        | 422              | Torsås       | 383              |
| Eda          | 574              | Ludvika      | 28               | Tranås       | 697              |
| Ekerö        | 352              | Luleå        | 1,181            | Trelleborg   | 395              |
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| Place          | Population |
|----------------|------------|
| Eksjö          | 406        |
| Emmaboda       | 19         |
| Enköping       | 251        |
| Eskilstuna     | 44         |
| Eslov          | 550        |
| Fagersta       | 63         |
| Falkenberg     | 1,069      |
| Falkoping      | 564        |
| Filipstad      | 719        |
| Finspång       | 434        |
| Flen           | 332        |
| Färgelanda     | 14         |
| Gislaved       | 79         |
| Gnosjö         | 12         |
| Gotland        | 11         |
| Grums          | 14         |
| Grästorp       | 312        |
| Gullspång      | 8          |
| Gällivare      | 314        |
| Gävle          | 340        |
| Göteborg       | 4,374      |
| Habo           | 1,515      |
| Hagfors        | 23         |
| Hallsberg      | 11         |
| Halmstad       | 1,25       |
| Hammarö        | 375        |
| Haninge        | 123        |
| Trollhättan    | 461        |
| Trosa          | 251        |
| Tyresö         | 209        |
| Töreboda       | 337        |
| Ulricehamn     | 811        |
| Ulricehamn     | 8          |
| Ulricehamn     | 35         |
| Umeå           | 401        |
| Uppsala        | 450        |
| Uppsala        | 22         |
| Västervik      | 400        |
| Västerås       | 719        |
| Västerås       | 9          |
| Varberg        | 1,572      |
| Vaxholm        | 75         |
| Vetlanda       | 38         |
| Vimmerby       | 409        |
| Vittsjö        | 4         |
| Vänersborg     | 420        |
| Vänersborg     | 12         |
| Värräs         | 9          |
| Värräs         | 30         |
| Vänersborg     | 19         |
| Vänersborg     | 5         |
| Vänersborg     | 539        |
| Vänersborg     | 10         |
| Vänersborg     | 9          |
| Vänersborg     | 4         |
| Vänersborg     | 31         |
| Vänersborg     | 455        |
| Vänersborg     | 5         |
| Vänersborg     | 184        |
| Vänersborg     | 7         |
| Vänersborg     | 7         |
| Vänersborg     | 12        |
| Vänersborg     | 13        |
| Vänersborg     | 339        |
| Vänersborg     | 575        |
| Vänersborg     | 6         |
| Vänersborg     | 3         |
| Vänersborg     | 1         |
| Vänersborg     | 564        |
| Vänersborg     | 19        |
| Vänersborg     | 31        |
| Vänersborg     | 14        |
| Vänersborg     | 55        |
| Vänersborg     | 774        |
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| Location       | No. | Location      | No. | Location     | No. |
|----------------|-----|---------------|-----|--------------|-----|
| Haparanda      | 29  | Ovanåker      | 13  | Ystad        | 64  |
| Hedemora       | 16  | Oxelösund     | 25  | Ålmhult      | 413 |
| Helsingborg    | 686 | Pajala        | 3   | Älvdalby     | 38  |
| Herrljunga     | 17  | Pitå          | 774 | Älvsvyn      | 18  |
| Hjo            | 18  | Ronneby       | 165 | Ångelholm    | 78  |
| Hofors         | 35  | Sala          | 1,087| Åmål        | 356 |
| Hultsfred      | 33  | Salem         | 28  | Änge         | 22  |
| Hylte          | 18  | Sandvikien    | 115 | Åre          | 27  |
| Härlefors      | 6   | Sigtuna       | 601 | Årjäng       | 18  |
| Härjedalen     | 33  | Simrishamn    | 51  | Ästorps     | 31  |
| Härjedal       | 455 | Sjöbo         | 46  | Åtvidaberg   | 11  |
| Hässleholm     | 100 | Skara         | 23  | Öckerö       | 719 |
| Häbo           | 17  | Skellefteå    | 1,045| Örebro      | 640 |
| Högsby         | 12  | Skinskatteberg| 10  | Örkelljunga  | 22  |
| Hörby          | 27  | Skurup        | 43  | Örnsköldsvik| 1,559|
| Jokkmokk       | 17  | Skövde        | 95  | Östersund    | 560 |
| Järfälla       | 100 | Smedjebacken  | 15  | Österåker    | 77  |
| Jönköping      | 1,739| Sollefteå    | 41  | Östhammar    | 2   |
| Kalmar         | 548 | Sollentuna    | 428 | Östergöinge | 30  |
| Karlsborg      | 4   | Solna         | 164 | Övertorneå   | 15  |
| Karlskoga      | 21  | Sorsele       | 4   |              |     |
| Karlskrona     | 673 | Sotenäs       | 25  |              |     |
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Table S4. The municipalities that implemented ice cleat distribution programs for older adults (n=63) and the number of survey participants per municipality, ages 65-79 and exposed to ice cleat distribution (n=2,507).

| Municipality | Survey responses | Municipality | Survey responses | Municipality | Survey responses |
|--------------|------------------|--------------|------------------|--------------|------------------|
| Aneby        | 2                | Jönköping    | 133              | Sundbyberg    | 5                |
| Askersund    | 2                | Kalmar       | 10               | Svenljunga    | 1                |
| Bengtfsors   | 1                | Karlshkrona   | 130              | Säffle        | 132              |
| Borgholm     | 4                | Krokom       | 1                | Säter         | 4                |
| Borås        | 7                | Kungsör      | 2                | Sävsjö        | 6                |
| Dorotea      | 1                | Laholm       | 6                | Tranås        | 118              |
| Eksjö        | 3                | Laxå         | 154              | Trollhättan   | 16               |
| Emmaboda     | 1                | Lidingö      | 5                | Töreboda      | 3                |
| Fagersta     | 101              | Lidköping    | 13               | Uddevalla     | 95               |
| Gislaved     | 2                | Ljusdal      | 4                | Uppsala       | 130              |
| Gnösjo       | 1                | Lund         | 37               | Vaggeryd      | 122              |
| Grästorp     | 1                | Mark         | 137              | Valdemarsvik  | 3                |
| Gällivare    | 3                | Mellerud     | 1                | Vettland      | 153              |
| Göteborg     | 128              | Mulsjö       | 1                | Värnamo       | 131              |
| Habo         | 130              | Mönsterås    | 3                | Västervik     | 6                |
| Halmstad     | 19               | Norrköping   | 136              | Ålmhult       | 1                |
| Hanning      | 23               | Nässjö       | 106              | Åmål          | 136              |
| Haparanda    | 4                | Oskarshamn   | 5                | Öckerö        | 2                |
| Härryda      | 97               | Skövede      | 5                | Örkelljunga   | 1                |
| Hörby        | 3                | Smedjebacken | 1                | Österåker     | 7                |
| Järfälla     | 5                | Strängnäs    | 5                | Övertorneå    | 2                |