Supplemental Material for:

Holsteen KK, Hittle M, Barad M, Nelson LM. Development and Internal Validation of a Multivariable Prediction Model for Individual Episodic Migraine Attacks Based on Daily Trigger Exposures. Headache. 2020 Nov;60(10):2364-2379. doi: 10.1111/head.13960. Epub 2020 Oct 6. PMID: 33022773.

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Section S1. Screening Survey

This section displays the questions administered in the RedCap Screening Survey.

| Basic Questions | |
|--|---|
| Timestamp of survey start | |
| | |
| What is your date of birth? | |
| | (YYYY-MM-DD) |
| Age | |
| | (This is automatically calculated based on birth date.) |
| Over the past year, have you suffered from severe headaches? | ⊖ Yes ○ No |
| Do you use an iPhone as your primary mobile phone? | ⊖ Yes ⊖ No |
| Are you currently living in the United States? | ⊖ Yes ○ No |
| Where did you first hear about this study? | ResearchMatch Stanford - Email Stanford - Flyer Facebook group Twitter Nextdoor Other |
| Basic Criteria Eligible? | |
| | (Calculates whether basic eligibility criteria are met.) |
| | |
| Headache Symptoms | |
| During the last 3 months, did you have the following with y | your headaches: |
| You felt nauseated or sick to your stomach? | ⊖ Yes ⊖ No |
| Light bothered you (a lot more than when you didn't have headaches)? | ○ Yes ○ No |
| Your headaches limited your ability to work, study, or do what you needed to do for at least 1 day? | ○ Yes ○ No |
| Lleadacha Cummtama Elizible? | |

Headache Symptoms Eligible?

(Calculates whether headache symptoms criteria are met.)

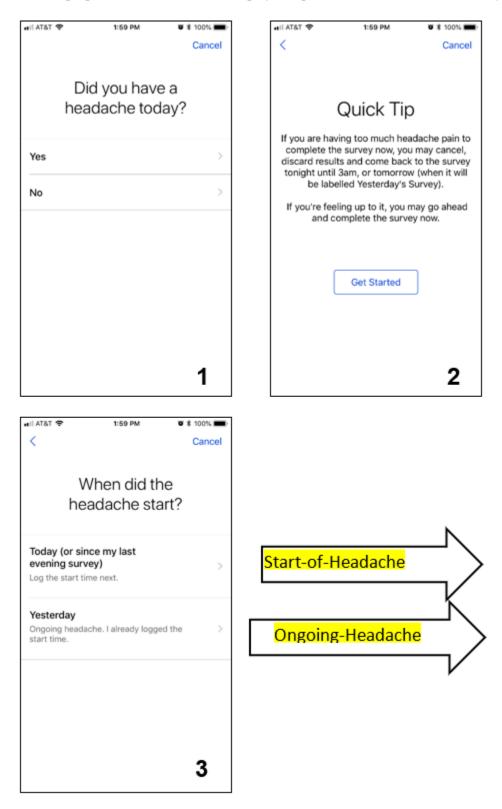
| Headache Frequency | |
|--|---|
| For how long have you experienced severe headaches? | Less than one year One year or more |
| During the last 3 months, did your headaches change noticeably (in frequency or severity)? | Yes, my headaches changed noticeably during the last 3 months. No, my headaches were consistent for the last 3 months. |
| During the last 3 months, did you have 1 or more headaches per month? | Yes, I had 1 or more headaches per month No, I had less than 1 headache per month |
| During the last 3 months, about how many headaches did you have per month? | (headaches per month) |
| Sometimes a headache may last longer than one day. During the last 3 months, how many days per month did you have a headache? | (days per month) |
| Headache Frequency Eligible? | |
| | (Calculates whether headache frequency criteria are met.) |
| iPhone Questions | |
| Are you willing to complete a 2-4 minute survey every evening for 90 days (3 months), within an app downloaded onto your iPhone? | ⊖ Yes ⊖ No |
| Which model number is your iPhone? | iPhone 3G, 3GS, 4, or 4S iPhone 5, 5C, 5S, or SE iPhone 6, 6 Plus, 6S, or 6S Plus iPhone 7 or 7 Plus iPhone 8 or 8 Plus iPhone X |
| Are you willing to update your iPhone to the latest version of iOS? | ⊖ Yes ⊖ No |
| Are you comfortable reading and writing on your iPhone in English? | ⊖ Yes ⊖ No |
| iPhone Eligible? | |
| | (Calculates whether iPhone-related eligibility criteria are met.) |
| | |

Finally Eligible?

(Calculates final decision on eligibility.)

Section S2. Daily Survey

The purpose of this section is to display the questions administered in the daily in-app survey.



Start-of-Headache

| •••••• ATAT # | 1:00 | AM | Cancel | ATAT # | 9:35 AM 9:35 Cano | _ | AT&T \$ 10 | 0 AM L V 8 93% Cancel | all ATAT 👁 | 1:50 PM | e t toots Cancel |
|--------------------------------------|---------|----------|---|-----------|-----------------------------------|---|---|---------------------------------------|---|----------------------|---------------------|
| What time did the headache start? | | | Did you experience visual or other sensory | | | Did you take any medications to treat this | | analgesics edrin, Midrin, Florinal | | | |
| Tue Jul 4 Wed Jul 6 | -4 6 | 07 58 | | before he | ces in the 1 hou adache onset? | | | ne today? that apply. | Triptans e.g. Imitrex, Relp Maxait, Zomig | xax, Frova, Amerge, | |
| Thu Jul 6 Today | 6 7 | 00 | | lights, r | umbness, tingling | No | medications | | Ergotamines | ranal, Ergomar, Cafe | ran? |
| Sat Jul 8 Sun Jul 9 Mon Jul 10 | 9 | 01 02 | PM | Yes | | | er-the-counter an AIDs | algesics or | | | iller. |
| | | | | No | | > 0.0. | Aspirin, Tylenol, Adv | il, Aleve | Alternative Th e.g. herbal supp acupuncture, ma | lement, | |
| | | | | | | | mbination analge Anacin, Excedrin, Mi | | Other type of | medication | |
| | Ne | xt | 4 | | 5 | e.g. | ptans Avert, Relpax, Frova rex, Zomig | , Amerge, Maxalt, | | Next | 6 |

Ongoing Headache questions

| | cancel | |
|-------------------------|---------------|-----------------|
| Did the headache finish | yet? | N |
| Yes | > | End-of-Headache |
| No | \rightarrow | K |
| I'm not sure | \rightarrow | Trigger Factors |
| | | V |
| | | |
| | _ | |
| | 7 | |

End-of Headache questions

| al A167 🗢 1 | 59 PM | | # 8 100% m | wil AT&T 🗢 | 1:59 PM | # \$ 100% mil | ani Atat 🗢 | 1:59 PM | # 8 100% m |
|--|--------|----------|------------|----------------|--------------------------|---------------|------------|--------------------------|------------|
| < | | | Cancel | < | | Cancel | < | | Cancel |
| What tir heada | | | | Wher | re did it hurt | today? | | ur peak pa neadache t | |
| | guess. | | | One side o | f head | > | | | |
| If you went to slee and woke up relieved | | e repo | | Both sides | of head | > | Mild | | > |
| | | | | | | | Moderate | | > |
| Mon Aug 27 Tue Aug 28 | | 66 57 | | | | | Severe | | > |
| Wed Aug 29 | 12 | 58 | AM | | | | | | |
| Today | 1 | 59 | PM | | | | | | |
| Fri Aug 31 | 2 | 00 | | | | | | | |
| Sat Sep 1 Sun Sep 2 | 03 r | 01 oz | | | | | | | |
| _ | | _ | | | | | | | |
| | Vext | | 8 | | | 9 | | | 10 |
| | 25 AM | | Cancel | < | 9:25 AM | Cancel | | 1.01 AM | Cancel |
| What kind o | of pa | in w | as it? | addit | u experien ional symp | toms | | e pain agg 1e physica | |
| Pulsating or throbb | ing | | > | | g the heada | | | | |
| | | | | 3 | Select all that apply | n. | e.g. v | valking or climbin | A prose |
| Another kind of pai e.g. stabbing, dull, or p | | | > | Nausea or vo | omiting | | Yes | | > |
| | | | | Sensitivity to | o light | | No | | > |
| | | | | Sensitivity to | o noise | | | | |
| | | | | None of the | above | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Trigger Factors

| •••••• AT&T 🗢 | 4:08 PM | ■ 64% ■ D |
|---------------|--------------------|------------------|
| < | | Cancel |
| | | |
| What | kind of day | / was |
| | today? | |
| | , | |
| | | |
| Work / Scho | ol Day | > |
| Weekend / D | Day off / Half Day | > |
| recencina ; c | oy on , name of | - |
| Holiday / Va | cation | > |
| | | |
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| | | |
| | | |
| | | |
| | | 14 |
| | | |

Sleep Questions

| Carrier 🎔 | 11:54 AM | | - | ali Atat 🗢 | 3:43 PM | -7 0 8 100% | | Carrier 🕈 | | 11:54 AN | | - | Carrier 🕈 | 11:54 AM | - |
|---------------------------------|----------|----|--------|--------------|-----------|---------------------------|----|---------------|---|----------|------------------|--------|-----------|--------------------------------|----------|
| < | | | Cancel | < | | Cano | el | < | | | | Cancel | < | | Cancel |
| What time lights ou sleep | t to tr | | | | | did it take last night | | What t for | | | ou wal today? | | | ase rate you juality last n | |
| | | | | | | | | | 3 | 60 61 | | | Very Goo | đ | × |
| - 7 | 51 | | | Less than 18 | 5 minutes | | | | 4 | 52 | | | | | |
| 8 | 52 | AM | | 16-30 minut | | | | | 5 | 53 | AM | | Good | | <u>х</u> |
| 9 | 53 | PM | | 10-30 minu | 105 | | _ | | 6 | 54 55 | PM | | Fair | | × |
| 10 | 54 | | | 31-60 minut | tes | | | | | | | | | | |
| *21 | | | | | | | | | | | | | Poor | | × |
| | | | | More than 6 | 0 minutes | | 1 | | | | | | | | |
| | | | | | | | | | | | | | Very Poor | | λ. |
| | Next | | 15 | | Next | 16 | | | | Next | | 17 | | | 18 |



Stress Questions



Dietary Triggers

| ell ATAT 🗢 | 2:00 PM | # \$ 100% m | Carrier 🕈 | 11:57 AM | - |
|---------------|---|-------------|------------------------------|--|----------|
| < | | Cancel | < | Ca | ncel |
| | many cup ed bevera | | | n times did you dr inated beverages | |
| you | have toda | ay? | | today? | |
| (Pepsi, Coke, | e, tea (black or Mountain Dew) (Red Bull, Mon | and energy | (Pepsi, Col drinks (Red B | ffee, tea (black or green), so ke, Mountain Dew) and energ Bull, Monster). Please select to the times at which you di | y the |
| | 0 | | | | |
| 0 | | 10 | 12am | | |
| 0 cups | | 10 cups | | | - |
| | | | 1am | | |
| | | | 2am | | |
| _ | | _ | 3am | | |
| | Next | 24 | 4am | 2 | 5 |

| HI ATAT 🗢 | 2:00 PM | Ø 8 100% | Carrier 🌩 | 11:57 AM | - |
|-----------|--|-----------|-----------|--|--------|
| < | | Cancel | < | | Cancel |
| wine dia | any drinks d you have drink = 5 oz. glas | today? | re | h times did y ed wine today t the hours closest to which you drank. | ? |
| o + | 1 | 10 | 12am | | |
| 0 drinks | | 10 drinks | 1am | | |
| | | | 2am | | |
| | | | 3am | | |
| | | | 4am | | |
| C | Next | 26 | 5am | | 27 |

| HI ATAT 🗢 2:00 PM | Ø 8 100% 🔳 | Carrier 🕈 | 15:58 AM | - |
|--|--------------------------------|-----------|---|--------|
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| How many drinks of alcoholic beveragy you have toda 1 drink = 502, glass of wine, beer or 1 shot of ligh | Jes did AY? 12oz. can of | other a | times did yo lcoholic beve today? the hours closest to which you drank. | erages |
| 0 | | 12am | | |
| 0 Odrinks | 10 drinks | 1am | | |
| | | 2am | | |
| | | 3am | | |
| | 20 | 4am | | - |
| Next | 28 | 5am | | 29 |

Other questions

| ail ATAT 🗢 | 3:45 PM | | al ATAT 🗢 | 3:45 PM | | •••• ATAT * | 9:27 AM | ¥ 045 m | ++000 ATAT * | 6:07 PM | Ø 70% |
|---------------------------|--|-------------------------------------|--|-----------------------------------|--|-------------|--------------------------|---------|------------------|---|--------|
| < | | Cancel | < | | Cancel | < | | Cancel | < | | Cancel |
| head med | changes t dache prev dications to de medications t aking to treat a he | ventive oday? hat you already | Please enter t medication stopped taking | that you adde g. If you stoppe | ange #1 ew dosage of any d, changed, or d taking it, please nt and doses per | , | u have mer eding toda | | you t | ly do you ti o experienc the in the n hours? | ce a |
| Missed a pr | reventive med | | Medication N | lame | | No | | > | Almost certai | n (>95% chance) |) > |
| Took an ext | tra preventive m | ed | Dosage | | | | | | Very likely (75 | 5-94% chance) | > |
| Made a long preventive | g-term change t meds | o my | Units | e.g. ml, | mg, pills, puffs | | | | Fairly likely (5 | i0-74% chance) | > |
| No changes | s today | | Doses per Da | ay perday | | | | | Quite unlikely | (25-49% chance | e) > |
| | | | Other notes | | | | | | Very unlikely | (<25% chance) | > |
| | Next | 30 | DO YOU HAVE | ANOTHER CHANG | ие то пера | | | 32 | | | 33 |

Premonitory Symptoms

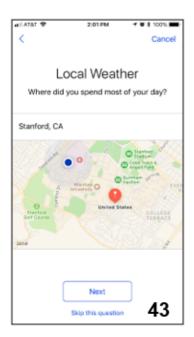
| uil AT&T ♥ 12:05 | PM # 78% Cancel | wii AT&T ♥ 12:05 | PM Ø # 78% Cancel | nell ATAT ♥ 12:0 | SPM # 78% |
|----------------------------------|-------------------------|----------------------------------|-------------------------|------------------|--------------------------------------|
| Overall today, you fe | | Overall today, h did you | | neck pain/stif | y, how much ifness did you el? |
| None | > | None | > | None | > |
| Mild | > | Mild | > | Mild | > |
| Moderate | > | Moderate | > | | |
| Severe | > | Severe | > | Moderate | > |
| | | | | Severe | > |
| ## ATST की 12:05 | 34 PM * * 74% Cancel | #EAT&T ♥ 12:05 | 35 PM * # 785 Cancel | ••I AT&T ♥ 12:0 | 36 SPM • \$ 765. Cancel |
| Overall today, ł to light did | | Overall today, to loud noises | | | how sensitive d you feel? |
| None | > | None | > | None | > |
| Mild | > | Mild | > | Mild | > |
| Moderate | > | Moderate | > | Moderate | > |
| Severe | > | Severe | > | Severe | > |
| | 37 | | 38 | | 39 |

| HI ATAT 🗢 | 12:05 PM | 0 \$ 78% |
|-----------|---------------------------|-----------------|
| < | | Cancel |
| | day, how e lid you fee | |
| None | | > |
| Mild | | > |
| Moderate | | > |
| Severe | | > |
| | | |
| | | 40 |

| Overall today, how mu difficulty with concentra did you have? | |
|---|---|
| | |
| Mild | > |
| | > |
| Moderate | > |
| Severe | > |

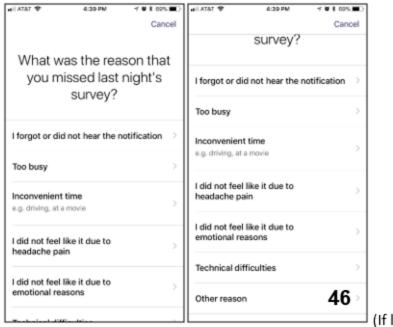
| oday, hov with spe ou have? | ech did |
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| with spe | ech did |
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| | 42 |
| | |

Local weather (if not sharing location with app ALWAYS)



| #I ATAT 😤 | 2:02 PM | -7 @ \$ 100% mm- |
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| Would v | ou like to | save this |
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(If last night's survey missed)

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| | l you like to ng else abo day? | |
| Tap to write | | |
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| | Next | |
| | Skip this question | 47 |

Section S3. Predictor Susceptibility to Measurement Error

The purpose of this supplemental section is to acknowledge the degree of measurement error that may have been present in the predictors that were almost exclusively collected through a very basic iPhone survey, and that these errors may have reduced the prediction model accuracy.

Sleep: High susceptibility to measurement error. Participants were asked to report last evening's bedtime, wake time, sleep latency, and nighttime awake duration on the next evening's survey. These might be difficult to remember with accuracy, even immediately upon waking.

Stress: Moderate to high susceptibility to measurement error. Participants provided a subjective onedimensional summary every evening which may have been subject to recall bias over the day and/or systematic bias due to recording at the same time every day. Participants may not have accurately perceived their own level of stress.

Consumption: Medium susceptibility to measurement error. Participants reported caffeine and alcohol consumption in units of cups or drinks. Participants may have biased recall about the number of cups or drinks they consumed, and different beverages have different amounts of caffeine and alcohol which may contribute additional error.

Weather: Low susceptibility to measurement error. We expect a low risk of error for weather data which was passively collected from a separate API. The source of error here is participant travel, at which time they would not have actually been exposed to their home weather conditions.

Menstruation: Low susceptibility to measurement error. We expect a low likelihood of error in reporting of menstruation, but some participants appeared to have irregular or unpredictable cycles which may cloud the interpretation of the derived indicator variable for days -2 to 2.

Workday vs. Non-Workday: Low susceptibility to measurement error.

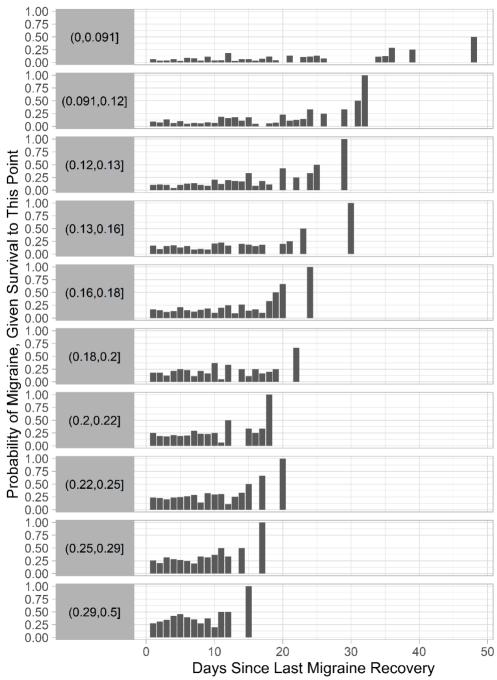
In future work, measuring sleep, stress, and consumption in ways that are less susceptible to measurement error may improve predictions.

Section S4. Discrete Hazard of Migraine Events

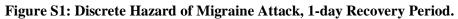
The purpose of this supplementary section is to further describe the observed discrete hazard of migraine and explain why we elected not to include predictors based on lagged migraines or time since the last migraine.

Episodic migraine may be a cyclical disorder, in which the threshold for trigger sensitivity gradually declines over an interictal period.^{57,58} Under this model, the risk of new migraine onset varies depending on the time since the last migraine. When a patient is exposed to one or more trigger factors during a susceptible period, that can bring him/her over the "migraine threshold" and initiate an attack.^{4,15,59,60} The baseline hazard of migraine may depend upon the time since the last migraine. If so, then it would be essential to incorporate a time-varying baseline hazard into the prediction model.⁶¹

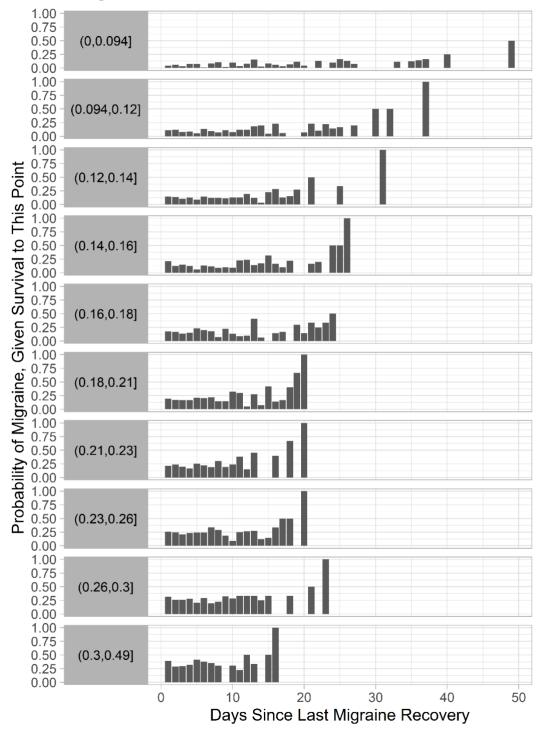
Using our empirical data, we examined how the discrete hazard of migraine changed over the time since recovery from previous migraine. We first grouped participants by decile of migraine risk (number of new migraines divided by number of at-risk days). Within each decile we calculated the discrete hazard of new migraine (the number of new migraines occurring at a given time since last migraine, divided by the total number of at-risk days with that same time since last migraine). We did this for the migraines identified using a one-day recovery period (the primary method in this paper) as well as no recovery period. The results are plotted in Error! Reference source not found. and Error! Reference source not found.. The results showed a roughly constant hazard (not counting the last couple of days in each stratum, which have very few exposures). This suggests that the time since recovery from the last migraine does not give much information about the risk of the next migraine. For this reason, we elected not to include predictors based on lagged migraines or time since the last migraine.



Overall Migraine Risk Decile



Discrete hazards were calculated based on the number of days since recovery from the last migraine, where recovery was defined as the completion of a migraine-free day. The plot is stratified by decile of participant-specific migraine risk observed in the study (lowest at the top).



Overall Migraine Risk Decile

Figure S2: Discrete Hazard of Migraine Attack, 0-day Recovery Period.

Discrete hazards were calculated based on the number of days since recovery from the last migraine, where recovery was defined as the completion of the day on which a migraine ended (with no extra migraine-free day). The plot is stratified by decile of participant-specific migraine risk observed in the study (lowest at the top).

Section S5. Timing of Data Collection

This section summarizes the timing of data collection used in the current predictive model, with respect to the intended timing of risk estimation (**Figure S3**). Participants were expected to complete their evening surveys before 3 am, at which point a new 24-hour risk period for the migraine event would begin. In practice, a daily migraine prediction app would take into account the data available up until 3am, apply the predictive model, and output a probability for the coming day. Such predictions would not have access to any data collected after 3am on the target day. All day-level factors except for menstruation and workday status are collected before 3am on the target day. Menstruation, workday status, and within-person means of all factors rely on same-day and/or future data to construct the predictors.

| | | | | e of Estimation on Day 0 | | |
|------|-----|-----|-----|--|---|--|
| Day | -4 | -3 | -2 | -1 | 0 (Target for Prediction) | +1 & future |
| Time | 3am | 3am | 3am | 3am | 3am | 3am |
| Data | * | * | * | (*): [- Stress level - Sleep timing/ duration/quality last night - Consumption of Caffeine/Alcohol - Menstrual cycle today] - Headache Self- Prediction - Workday or Off day | Migraine today (outcome) Workday or Off day Menstrual cycle today | - Menstrual cycle look-ahead (2 days) - Within-person means of predictors (all days) |

Figure S3: Timing of Data Collection and Intended Risk Estimation.

Section S6. Distribution of Predictors.

This section gives the distribution of predictors over all person-days (**Table S1**), for within-person means (**Table S2**), and within-person standard deviations (**Table S3**). These descriptive statistics help to interpret the current findings and to estimate the expected predictor variation for future studies.

| | | Percentile of Overall Distribution | | | | | | | |
|-------------------------------|-----------------|------------------------------------|--------|--------|--------|--------|--------|--------|------|
| Predictor | Units | 5th | 10th | 25th | 50th | 75th | 90th | 95th | SD |
| Bedtime, Diff from 12am | hours | -3.0 | -2.5 | -2.0 | -1.0 | 0.0 | 1.0 | 2.0 | 1.6 |
| Sleep Duration | hours | 4.7 | 5.5 | 6.6 | 7.5 | 8.4 | 9.4 | 10.0 | 1.6 |
| Sleep Quality (PC1) | unitless | -1.6 | -0.9 | -0.8 | -0.2 | 0.5 | 1.6 | 2.5 | 1.3 |
| Change in Sleep Hours | hours | -3.0 | -2.2 | -1.0 | 0.0 | 0.9 | 2.1 | 3.0 | 1.9 |
| Change in Bed Time | hours | -2.0 | -1.3 | -0.5 | 0.0 | 0.5 | 1.3 | 2.0 | 1.3 |
| Change in Sleep Quality (PC1) | unitless | -2.1 | -1.3 | -0.6 | 0.0 | 0.7 | 1.5 | 2.3 | 1.5 |
| Stress Rating | 0-10 scale | 0.0 | 1.0 | 2.0 | 4.0 | 5.0 | 7.0 | 8.0 | 2.3 |
| Change in Stress Rating | -10 to 10 | -3.0 | -2.0 | -1.0 | 0.0 | 1.0 | 3.0 | 4.0 | 2.1 |
| Temp. Max | degrees F | 27.8 | 32.7 | 42.6 | 55.5 | 67.2 | 77.4 | 82.0 | 17.0 |
| Pressure Min | millibars | 1000.4 | 1003.6 | 1008.8 | 1014.2 | 1019.2 | 1023.7 | 1026.2 | 7.9 |
| Wind Gust Speed | miles per hr | 5.7 | 6.8 | 9.2 | 13.5 | 19.2 | 24.9 | 28.7 | 7.2 |
| Precipitation/Humidity (PC1) | unitless | -1.5 | -1.3 | -0.9 | -0.6 | 0.7 | 2.0 | 3.0 | 1.6 |
| Change in Temp. Max | degrees F | -14.0 | -9.9 | -4.3 | 0.4 | 4.7 | 9.7 | 12.9 | 8.0 |
| Change in Pressure Min | millibars | -12.2 | -8.5 | -4.1 | -0.1 | 3.8 | 9.0 | 12.7 | 7.4 |
| Change in Wind Gust Speed | miles per hr | -12.4 | -9.0 | -4.2 | 0.0 | 4.1 | 9.4 | 13.1 | 7.6 |
| Caffeinated Bev | cups | 0.0 | 0.0 | 0.0 | 1.0 | 2.0 | 3.0 | 4.0 | 1.4 |
| Change in Caffeinated Bev | cups | -1.3 | -1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.9 |
| Alcohol | drinks | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 2.0 | 1.0 |
| Change in Alcohol | drinks | -2.0 | -1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 2.0 | 1.0 |
| Headache Self-Prediction | 0-4 scale | 0.0 | 0.0 | 0.0 | 1.0 | 2.0 | 2.0 | 2.0 | 0.8 |

Table S1: Distribution of Predictors (Overall).

| | | Percentile of Within-Person Means | | | | | | | | |
|---------------------------------|-----------------|-----------------------------------|--------|--------|--------|--------|--------|--------|------|--|
| Predictor | Units | 5th | 10th | 25th | 50th | 75th | 90th | 95th | SD | |
| Bedtime, Diff from 12am | hours | -2.4 | -2.2 | -1.6 | -1.1 | -0.5 | 0.4 | 0.8 | 1.1 | |
| Sleep Duration | hours | 6.1 | 6.5 | 6.9 | 7.5 | 8.1 | 8.4 | 8.9 | 0.9 | |
| Sleep Quality (PC1) | unitless | -0.8 | -0.6 | -0.4 | -0.1 | 0.4 | 0.9 | 1.5 | 0.7 | |
| Change in Sleep Hours | hours | -0.2 | -0.2 | -0.1 | 0.0 | 0.0 | 0.1 | 0.2 | 0.1 | |
| Change in Bed Time | hours | -0.1 | -0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | |
| Change in Sleep Quality (PC1) | unitless | -0.1 | -0.1 | 0.0 | 0.0 | 0.1 | 0.1 | 0.2 | 0.1 | |
| Stress Rating | 0-10 scale | 1.3 | 1.8 | 2.7 | 4.2 | 5.1 | 5.7 | 6.2 | 1.5 | |
| Change in Stress Rating | -10 to 10 | -0.2 | -0.1 | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.2 | |
| Temp. Max | degrees F | 32.3 | 37.7 | 44.5 | 56.4 | 64.6 | 70.6 | 77.7 | 13.4 | |
| Pressure Min | millibars | 1010.2 | 1011.1 | 1012.1 | 1014.2 | 1015.5 | 1016.5 | 1016.9 | 2.4 | |
| Wind Gust Speed | miles per hr | 10.1 | 10.9 | 12.3 | 14.3 | 17.0 | 19.9 | 22.1 | 3.7 | |
| Precipitation/Humidity (PC1) | unitless | -0.8 | -0.6 | -0.3 | 0.0 | 0.3 | 0.6 | 0.7 | 0.5 | |
| Change in Temp. Max | degrees F | -0.8 | -0.6 | -0.3 | 0.1 | 0.5 | 0.8 | 1.0 | 0.6 | |
| Change in Pressure Min | millibars | -0.8 | -0.6 | -0.3 | 0.0 | 0.3 | 0.7 | 1.0 | 0.6 | |
| Change in Wind Gust Speed | miles per hr | -0.7 | -0.4 | -0.2 | 0.1 | 0.3 | 0.6 | 0.8 | 0.5 | |
| Caffeinated Bev | cups | 0.0 | 0.2 | 0.6 | 1.5 | 2.1 | 3.1 | 4.0 | 1.3 | |
| Change in Caffeinated Bev | cups | -0.1 | -0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | |
| Alcohol | drinks | 0.0 | 0.0 | 0.0 | 0.1 | 0.5 | 1.1 | 1.5 | 0.6 | |
| Change in Alcohol | drinks | -0.1 | -0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | |
| Headache Self-Prediction | 0-4 scale | 0.2 | 0.3 | 0.6 | 1.1 | 1.4 | 1.8 | 2.0 | 0.6 | |

Table S2: Distribution of Predictors (Within-Person Means).

| | | Percentile of Within-Person Standard Deviations | | | | | | | |
|---------------------------------|-----------------|---|------|------|------|------|------|------|-----|
| Predictor | Units | 5th | 10th | 25th | 50th | 75th | 90th | 95th | SD |
| Bedtime, Diff from 12am | hours | 0.5 | 0.6 | 0.7 | 0.9 | 1.2 | 1.4 | 1.5 | 0.5 |
| Sleep Duration | hours | 0.8 | 0.9 | 1.0 | 1.3 | 1.6 | 2.0 | 2.3 | 0.5 |
| Sleep Quality (PC1) | unitless | 0.5 | 0.6 | 0.7 | 1.0 | 1.2 | 1.6 | 1.9 | 0.4 |
| Change in Sleep Hours | hours | 1.0 | 1.1 | 1.3 | 1.7 | 2.1 | 2.6 | 3.1 | 0.6 |
| Change in Bed Time | hours | 0.6 | 0.7 | 0.9 | 1.1 | 1.5 | 1.8 | 2.0 | 0.5 |
| Change in Sleep Quality (PC1) | unitless | 0.7 | 0.8 | 1.0 | 1.3 | 1.6 | 2.0 | 2.5 | 0.6 |
| Stress Rating | 0-10 scale | 0.7 | 1.0 | 1.3 | 1.7 | 2.1 | 2.6 | 2.9 | 0.7 |
| Change in Stress Rating | -10 to 10 | 0.9 | 1.1 | 1.5 | 2.0 | 2.4 | 3.0 | 3.2 | 0.7 |
| Temp. Max | degrees F | 5.2 | 7.0 | 8.4 | 10.3 | 12.0 | 13.3 | 14.1 | 2.7 |
| Pressure Min | millibars | 4.0 | 4.7 | 6.3 | 7.5 | 8.9 | 9.7 | 9.8 | 1.9 |
| Wind Gust Speed | miles per hr | 3.9 | 4.5 | 5.4 | 6.3 | 7.0 | 7.7 | 8.4 | 1.4 |
| Precipitation/Humidity (PC1) | unitless | 0.6 | 0.8 | 1.0 | 1.3 | 1.7 | 2.0 | 2.3 | 0.5 |
| Change in Temp. Max | degrees F | 3.5 | 4.2 | 6.5 | 8.4 | 9.4 | 10.1 | 10.3 | 2.1 |
| Change in Pressure Min | millibars | 3.2 | 4.0 | 5.6 | 7.6 | 8.5 | 9.9 | 10.3 | 2.2 |
| Change in Wind Gust Speed | miles per hr | 4.6 | 5.1 | 6.2 | 7.3 | 8.7 | 9.6 | 10.4 | 1.8 |
| Caffeinated Bev | cups | 0.1 | 0.3 | 0.5 | 0.6 | 0.8 | 1.1 | 1.2 | 0.3 |
| Change in Caffeinated Bev | cups | 0.2 | 0.5 | 0.7 | 0.8 | 1.0 | 1.4 | 1.5 | 0.4 |
| Alcohol | drinks | 0.0 | 0.0 | 0.1 | 0.5 | 0.9 | 1.3 | 1.6 | 0.5 |
| Change in Alcohol | drinks | 0.0 | 0.0 | 0.2 | 0.7 | 1.2 | 1.6 | 2.0 | 0.6 |
| Headache Self-Prediction | 0-4 scale | 0.3 | 0.3 | 0.5 | 0.6 | 0.7 | 0.9 | 0.9 | 0.2 |

Section S7. Estimated Odds Ratios from Best Category Models

This section shows the estimated odds ratios of the best category-specific models that were selected based on the AIC (**Figure S4**). Each model was also adjusted for the three baseline features: self-reported headaches per month, headache days per month, and presence of a change in headache frequency or severity within the past 3 months. The predictors from these best category models were included in the primary predictive model.

Day-Level Person-Level

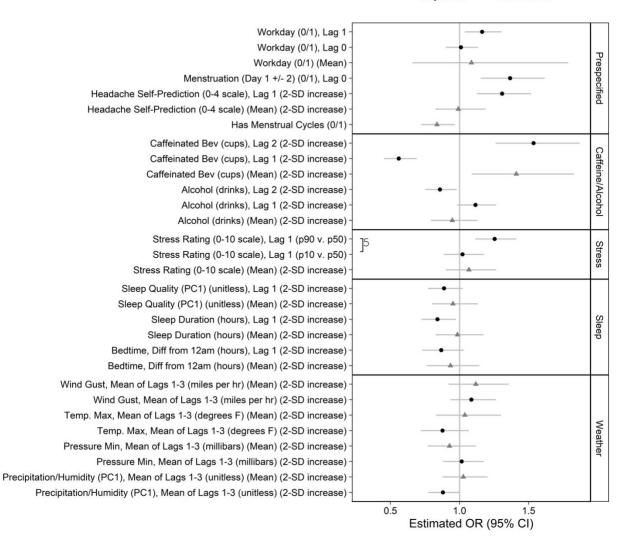


Figure S4: Estimated Odds Ratios from the Best Category-Specific Models.

Separate multivariable logistic regression models were estimated for each category of predictors (indicated by separate boxes on the plot). Each model was also adjusted for the three baseline features: self-reported headaches per month, headache days per month, and presence of a change in headache frequency or severity within the past 3 months. Lag 0 denotes the day for which migraine risk is predicted; lag 1 denotes the day before, and lag 2 denotes two days prior. Predictors modeled by 3-knot natural cubic splines were represented in the model by two separate linear terms and are shown in this plot by two separate estimates to summarize the nonlinear relationship: odds ratio for the 90th vs. 50th, and 10th vs. 50th percentiles of the overall distribution of the predictor. On this plot, these pairs of terms are always connected by a "]" with an integer denoting the number of imputations (of 5) in which the pair of linear terms was jointly statistically significant. For the predictors modeled linearly, odds ratios compare the risk associated with a 2-SD difference in the (continuous) predictor value, or with a change from 0 to 1 in a dichotomous predictor.

Section S8. Estimated Odds Ratios from Primary Model.

The purpose of this section is to publish the full estimated odds ratios and 95% confidence intervals from the primary predictive model (**Table S4**), to supplement the estimates plotted in Error! Reference source not found.. As discussed in the methods section, this model was composed of the best models from each category selected based on AIC, and in total it included 34 predictors including the intercept.

| Category | tegory Variable | | Estimated OR (95% CI) | |
|------------------|--|---|--------------------------|--|
| Baseline | Headaches per Month (Logit) (logit ha/mo/30) (2-SD increase) | 1 | 1.29 (1.10, 1.53) | |
| Baseline | Headache Days per Month (Logit) (logit d/mo/30) (2-SD increase) | 1 | 1.24 (1.06, 1.45) | |
| Baseline | Headaches Changed in Past 3 Months (0/1) | 1 | 0.77 (0.62, 0.96) | |
| Caffeine/Alcohol | Caffeinated Bev (cups) (Mean) (2-SD increase) | 1 | 1.28 (0.98, 1.67) | |
| Caffeine/Alcohol | Caffeinated Bev (cups), Lag 2 (2-SD increase) | 0 | 1.53 (1.26, 1.87) | |
| Caffeine/Alcohol | Caffeinated Bev (cups), Lag 1 (2-SD increase) | 0 | 0.54 (0.44, 0.67) | |
| Caffeine/Alcohol | Alcohol (drinks) (Mean) (2-SD increase) | 1 | 0.95 (0.80, 1.14) | |
| Caffeine/Alcohol | Alcohol (drinks), Lag 2 (2-SD increase) | 0 | 0.90 (0.79, 1.03) | |
| Caffeine/Alcohol | Alcohol (drinks), Lag 1 (2-SD increase) | 0 | 1.13 (0.99, 1.29) | |
| Prespecified | Headache Self-Prediction (0-4 scale) (Mean) (2-SD increase) | 1 | 1.00 (0.83, 1.20) | |
| Prespecified | Headache Self-Prediction (0-4 scale), Lag 1 (2-SD increase) | 0 | 1.27 (1.09, 1.48) | |
| Prespecified | Has Menstrual Cycles (0/1) | 1 | 0.84 (0.73, 0.97) | |
| Prespecified | Menstruation (Day 1 +/- 2) (0/1), Lag 0 | 0 | 1.38 (1.16, 1.63) | |
| Prespecified | Workday (0/1) (Mean) | 1 | 0.93 (0.56, 1.54) | |
| Prespecified | Workday (0/1), Lag 1 | 0 | 1.12 (0.98, 1.27) | |
| Prespecified | Workday (0/1), Lag 0 | 0 | 1.01 (0.90, 1.14) | |
| Sleep | Bedtime, Diff from 12am (hours) (Mean) (2-SD increase) | 1 | 0.92 (0.74, 1.13) | |
| Sleep | Bedtime, Diff from 12am (hours), Lag 1 (2-SD increase) | 0 | 0.93 (0.77, 1.12) | |
| Sleep | Sleep Quality (PC1) (unitless) (Mean) (2-SD increase) | 1 | 0.95 (0.80, 1.13) | |
| Sleep | Sleep Quality (PC1) (unitless), Lag 1 (2-SD increase) | 0 | 0.88 (0.76, 1.02) | |
| Sleep | Sleep Duration (hours) (Mean) (2-SD increase) | 1 | 1.07 (0.89, 1.28) | |
| Sleep | Sleep Duration (hours), Lag 1 (2-SD increase) | 0 | 0.90 (0.77, 1.06) | |
| Stress | Stress Rating (0-10 scale) (Mean) (2-SD increase) | 1 | 1.15 (0.97, 1.37) | |
| Stress | Stress Rating (0-10 scale), Lag 1 (p10 v. p50) | 0 | 1.10 (0.94, 1.28) | |
| Stress | Stress Rating (0-10 scale), Lag 1 (p90 v. p50) | 0 | 1.21 (1.07, 1.37) | |
| Weather | Wind Gust, Mean of Lags 1-3 (miles per hr) (Mean) (2-SD increase) | 1 | 1.15 (0.95, 1.39) | |
| Weather | Wind Gust, Mean of Lags 1-3 (miles per hr) (2-SD increase) | 0 | 1.07 (0.92, 1.24) | |
| Weather | Precipitation/Humidity (PC1), Mean of Lags 1-3 (unitless) (Mean) (2-SD increase) | 1 | 1.01 (0.87, 1.18) | |
| Weather | Precipitation/Humidity (PC1), Mean of Lags 1-3 (unitless) (2-SD increase) | 0 | 0.89 (0.78, 1.02) | |
| Weather | Temp. Max, Mean of Lags 1-3 (degrees F) (Mean) (2-SD increase) | 1 | 1.00 (0.80, 1.25) | |
| Weather | Temp. Max, Mean of Lags 1-3 (degrees F) (2-SD increase) | 0 | 0.87 (0.71, 1.06) | |
| Weather | Pressure Min, Mean of Lags 1-3 (millibars) (Mean) (2-SD increase) | 1 | 0.99 (0.82, 1.18) | |
| Weather | Pressure Min, Mean of Lags 1-3 (millibars) (2-SD increase) | 0 | 1.01 (0.88, 1.17) | |
| | Intercept | | 0.19 (0.15, 0.26) | |

Table S4: Estimated Odds Ratios from Primary Model.

Predictors were measured at the day level (varying across persons and across days within persons) or the person level (varying across persons, but constant across days within persons). Lag 0 denotes the day for which migraine risk is predicted; lag 1 denotes the day before, and lag 2 denotes two days prior. Predictors modeled by 3-knot natural cubic splines were represented in the model by two separate linear terms and are shown in this plot by two separate estimates to summarize the nonlinear relationship: odds ratios for the 90th vs. 50th, and 50th vs. 10th percentiles of the overall distribution of the predictor. These estimates and confidence intervals are plotted in Error! Reference source not found..

Section S9. Estimated Odds Ratios from Penalized Model.

The purpose of this section is to display the results of the grouped-lasso penalized logistic regression model (**Table S5**). This table gives the full list of candidate predictors included in the grouped-lasso procedure, ranked by their absolute mean estimated log-OR. The means are taken over all five imputations, whether or not the predictor was selected for a nonzero effect. The number of imputations in which each predictor was assigned a positive, negative, or zero coefficient are shown in the corresponding columns. The grouped lasso procedure does not produce standard errors for the estimates, so this table does not include confidence intervals.

| Category | Variable | Person Level? | N Positive | N Zero | N Negative | Estima ted OR |
|------------------|--|------------------|---------------|-----------|---------------|------------------|
| | Intercept | | 0 | 0 | 5 | 0.19 |
| Prespecified | Menstruation (Day 1 +/- 2) (0/1), Lag 0 | 0 | 5 | 0 | 0 | 1.28 |
| Baseline | Headaches per Month (Logit) (logit ha/mo/30) (2- SD increase) | 1 | 5 | 0 | 0 | 1.25 |
| Prespecified | Headache Self-Prediction (0-4 scale), Lag 1 (2-SD increase) | 0 | 5 | 0 | 0 | 1.22 |
| Caffeine/Alcohol | Change in Caffeinated Bev (cups), Lag 1 (p10 v. p50) | 0 | 5 | 0 | 0 | 1.21 |
| Baseline | Headache Days per Month (Logit) (logit d/mo/30) (2-SD increase) | 1 | 5 | 0 | 0 | 1.17 |
| Sleep | Change in Sleep Quality (PC1) (unitless) (Mean) (2-SD increase) | 1 | 0 | 0 | 5 | 0.86 |
| Weather | Wind Gust Speed (miles per hr) (Mean) (2-SD increase) | 1 | 5 | 0 | 0 | 1.16 |
| Baseline | Headaches Changed in Past 3 Months (0/1) | 1 | 0 | 0 | 5 | 0.87 |
| Stress | Stress Rating (0-10 scale), Lag 1 (p90 v. p50) | 0 | 5 | 0 | 0 | 1.15 |
| Prespecified | Has Menstrual Cycles (0/1) | 1 | 0 | 0 | 5 | 0.89 |
| Prespecified | Workday (0/1), Lag 1 | 0 | 5 | 0 | 0 | 1.10 |
| Caffeine/Alcohol | Change in Caffeinated Bev (cups), Lag 1 (p90 v. p50) | 0 | 0 | 0 | 5 | 0.92 |
| Caffeine/Alcohol | Change in Alcohol (drinks), Lag 1 (2-SD increase) | 0 | 5 | 0 | 0 | 1.08 |
| Sleep | Bedtime, Diff from 12am (hours) (Mean) (2-SD increase) | 1 | 0 | 0 | 5 | 0.93 |
| Caffeine/Alcohol | Caffeinated Bev (cups) (Mean) (2-SD increase) | 1 | 5 | 0 | 0 | 1.06 |
| Stress | Stress Rating (0-10 scale) (Mean) (2-SD increase) | 1 | 5 | 0 | 0 | 1.06 |
| Weather | Temp. Max (degrees F), Lag 2 (2-SD increase) | 0 | 0 | 0 | 5 | 0.94 |
| Weather | Precipitation/Humidity (PC1) (unitless), Lag 2 (2- SD increase) | 0 | 0 | 0 | 5 | 0.94 |
| Sleep | Bedtime, Diff from 12am (hours), Lag 2 (2-SD increase) | 0 | 0 | 0 | 5 | 0.96 |
| Stress | Stress Rating (0-10 scale), Lag 1 (p10 v. p50) | 0 | 5 | 0 | 0 | 1.04 |
| Weather | Change in Pressure Min (millibars), Lag 1 (p90 v. p50) | 0 | 5 | 0 | 0 | 1.04 |
| Weather | Wind Gust Speed (miles per hr), Lag 3 (2-SD increase) | 0 | 5 | 0 | 0 | 1.03 |
| Sleep | Change in Sleep Quality (PC1) (unitless), Lag 1 (p90 v. p50) | 0 | 0 | 0 | 5 | 0.98 |
| Caffeine/Alcohol | Alcohol (drinks), Lag 3 (2-SD increase) | 0 | 0 | 0 | 5 | 0.98 |
| Stress | Change in Stress Rating (from -10 to 10), Lag 1 (p90 v. p50) | 0 | 5 | 0 | 0 | 1.02 |
| Sleep | Sleep Quality (PC1) (unitless), Lag 1 (p90 v. p50) | 0 | 0 | 0 | 5 | 0.98 |
| Sleep | Change in Sleep Quality (PC1) (unitless), Lag 1 (p10 v. p50) | 0 | 0 | 0 | 5 | 0.99 |
| Sleep | Sleep Quality (PC1) (unitless) (Mean) (2-SD increase) | 1 | 0 | 0 | 5 | 0.99 |
| Weather | Pressure Min (millibars), Lag 1 (p90 v. p50) | 0 | 5 | 0 | 0 | 1.01 |
| Weather | Change in Temp. Max (degrees F), Lag 1 (p90 v. p50) | 0 | 0 | 0 | 5 | 0.99 |
| Sleep | Sleep Quality (PC1) (unitless), Lag 1 (p10 v. p50) | 0 | 0 | 0 | 5 | 0.99 |
| Weather | Change in Wind Gust Speed (miles per hr) (Mean) (2-SD increase) | 1 | 0 | 0 | 5 | 0.99 |
| Weather | Precipitation/Humidity (PC1) (unitless), Lag 1 (p90 v. p50) | 0 | 0 | 0 | 5 | 0.99 |
| Weather | Change in Temp. Max (degrees F), Lag 1 (p10 v. p50) | 0 | 0 | 0 | 5 | 0.99 |

Table S5: Estimated Odds Ratios from Penalized Model.

| Weather | Change in Pressure Min (millibars), Lag 1 (p10 v. p50) | 0 | 1 | 0 | 4 | 1.00 |
|------------------|--|---|---|---|---|------|
| Weather | Precipitation/Humidity (PC1) (unitless), Lag 1 (p10 v. p50) | 0 | 5 | 0 | 0 | 1.00 |
| Stress | Change in Stress Rating (from -10 to 10), Lag 1 (p10 v. p50) | 0 | 5 | 0 | 0 | 1.00 |
| Weather | Pressure Min (millibars), Lag 1 (p10 v. p50) | 0 | 0 | 0 | 5 | 1.00 |
| Caffeine/Alcohol | Alcohol (drinks), Lag 2 (2-SD increase) | 0 | 0 | 4 | 1 | 1.00 |
| Weather | Change in Wind Gust Speed (miles per hr), Lag 1 | 0 | 2 | 3 | 0 | 1.00 |
| Stress | (p10 v. p50) Change in Stress Rating (from -10 to 10) (Mean) | 1 | 0 | 4 | 1 | 1.00 |
| Weather | (2-SD increase) Wind Gust Speed (miles per hr), Lag 2 (2-SD | 0 | 1 | 4 | 0 | 1.00 |
| Weather | increase) Change in Wind Gust Speed (miles per hr), Lag 1 | 0 | 2 | 3 | 0 | 1.00 |
| Caffeine/Alcohol | (p90 v. p50) Caffeinated Bev (cups), Lag 1 (p10 v. p50) | 0 | 1 | 4 | 0 | 1.00 |
| | Sleep Quality (PC1) (unitless), Lag 3 (2-SD | | | | | |
| Sleep | increase) | 0 | 0 | 4 | 1 | 1.00 |
| Caffeine/Alcohol | Caffeinated Bev (cups), Lag 1 (p90 v. p50) | 0 | 1 | 4 | 0 | 1.00 |
| Caffeine/Alcohol | Change in Caffeinated Bev (cups) (Mean) (2-SD increase) | 1 | 0 | 5 | 0 | 1.00 |
| Caffeine/Alcohol | Change in Caffeinated Bev (cups), Lag 2 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Caffeine/Alcohol | Caffeinated Bev (cups), Lag 3 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Caffeine/Alcohol | Caffeinated Bev (cups), Lag 2 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Caffeine/Alcohol | Change in Alcohol (drinks) (Mean) (2-SD increase) | 1 | 0 | 5 | 0 | 1.00 |
| Caffeine/Alcohol | Change in Alcohol (drinks), Lag 2 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Caffeine/Alcohol | Alcohol (drinks) (Mean) (2-SD increase) | 1 | 0 | 5 | 0 | 1.00 |
| Caffeine/Alcohol | Alcohol (drinks), Lag 1 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Prespecified | Headache Self-Prediction (0-4 scale) (Mean) (2- SD increase) | 1 | 0 | 5 | 0 | 1.00 |
| Prespecified | Workday (0/1) (Mean) | 1 | 0 | 5 | 0 | 1.00 |
| Prespecified | Workday (0/1), Lag 2 | 0 | 0 | 5 | 0 | 1.00 |
| Prespecified | Workday (0/1), Lag 0 | 0 | 0 | 5 | 0 | 1.00 |
| Sleep | Change in Bed Time (hours) (Mean) (2-SD increase) | 1 | 0 | 5 | 0 | 1.00 |
| Sleep | Change in Bed Time (hours), Lag 2 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Sleep | Change in Bed Time (hours), Lag 1 (p10 v. p50) | 0 | 0 | 5 | 0 | 1.00 |
| Sleep | Change in Bed Time (hours), Lag 1 (p90 v. p50) | 0 | 0 | 5 | 0 | 1.00 |
| Sleep | Bedtime, Diff from 12am (hours), Lag 3 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Sleep | Bedtime, Diff from 12am (hours), Lag 1 (p10 v. p50) | 0 | 0 | 5 | 0 | 1.00 |
| Sleep | Bedtime, Diff from 12am (hours), Lag 1 (p90 v. p50) | 0 | 0 | 5 | 0 | 1.00 |
| Sleep | Change in Sleep Quality (PC1) (unitless), Lag 2 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Sleep | Sleep Quality (PC1) (unitless), Lag 2 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Sleep | Change in Sleep Hours (hours) (Mean) (2-SD increase) | 1 | 0 | 5 | 0 | 1.00 |
| Sleep | Change in Sleep Hours (hours), Lag 2 (2-SD | 0 | 0 | 5 | 0 | 1.00 |
| Sleep | increase) Change in Sleep Hours (hours), Lag 1 (p10 v. p50) | 0 | 0 | 5 | 0 | 1.00 |
| Sleep | Change in Sleep Hours (hours), Lag 1 (p10 v. p50) | 0 | 0 | 5 | 0 | 1.00 |
| Sleep | Sleep Duration (hours) (Mean) (2-SD increase) | 1 | 0 | 5 | 0 | 1.00 |
| Sleep | Sleep Duration (hours), Lag 3 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Sleep | Sleep Duration (hours), Lag 2 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| | | | | | | |

| Sleep | Sleep Duration (hours), Lag 1 (p10 v. p50) | 0 | 0 | 5 | 0 | 1.00 |
|------------------|---|---|---|---|---|------|
| Sleep | Sleep Duration (hours), Lag 1 (p90 v. p50) | 0 | 0 | 5 | 0 | 1.00 |
| Stress | Change in Stress Rating (from -10 to 10), Lag 2 (2- SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Stress | Stress Rating (0-10 scale), Lag 3 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Stress | Stress Rating (0-10 scale), Lag 2 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Weather | Change in Wind Gust Speed (miles per hr), Lag 2 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Weather | Wind Gust Speed (miles per hr), Lag 1 (p10 v. p50) | 0 | 0 | 5 | 0 | 1.00 |
| Weather | Wind Gust Speed (miles per hr), Lag 1 (p90 v. p50) | 0 | 0 | 5 | 0 | 1.00 |
| Weather | Precipitation/Humidity (PC1) (unitless) (Mean) (2- SD increase) | 1 | 0 | 5 | 0 | 1.00 |
| Weather | Precipitation/Humidity (PC1) (unitless), Lag 3 (2- SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Weather | Change in Temp. Max (degrees F) (Mean) (2-SD increase) | 1 | 0 | 5 | 0 | 1.00 |
| Weather | Change in Temp. Max (degrees F), Lag 2 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Weather | Temp. Max (degrees F) (Mean) (2-SD increase) | 1 | 0 | 5 | 0 | 1.00 |
| Weather | Temp. Max (degrees F), Lag 3 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Weather | Temp. Max (degrees F), Lag 1 (p10 v. p50) | 0 | 0 | 5 | 0 | 1.00 |
| Weather | Temp. Max (degrees F), Lag 1 (p90 v. p50) | 0 | 0 | 5 | 0 | 1.00 |
| Weather | Change in Pressure Min (millibars) (Mean) (2-SD increase) | 1 | 0 | 5 | 0 | 1.00 |
| Weather | Change in Pressure Min (millibars), Lag 2 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Weather | Pressure Min (millibars) (Mean) (2-SD increase) | 1 | 0 | 5 | 0 | 1.00 |
| Weather | Pressure Min (millibars), Lag 3 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Weather | Pressure Min (millibars), Lag 2 (2-SD increase) | 0 | 0 | 5 | 0 | 1.00 |
| Prespecified | Menstruation (Day 1 +/- 2) (0/1), Lag 0 | 0 | 5 | 0 | 0 | 1.28 |
| Baseline | Headaches per Month (Logit) (logit ha/mo/30) (2- SD increase) | 1 | 5 | 0 | 0 | 1.25 |
| Prespecified | Headache Self-Prediction (0-4 scale), Lag 1 (2-SD increase) | 0 | 5 | 0 | 0 | 1.22 |
| Caffeine/Alcohol | Change in Caffeinated Bev (cups), Lag 1 (p10 v. p50) | 0 | 5 | 0 | 0 | 1.21 |
| Baseline | Headache Days per Month (Logit) (logit d/mo/30) (2-SD increase) | 1 | 5 | 0 | 0 | 1.17 |

The estimated ORs were calculated by exponentiating the mean estimated coefficient over all of the imputations including zero and non-zero estimates. The number of imputations in which each predictor was assigned a positive, negative, or zero coefficient are shown in the corresponding columns. Lag 0 denotes the day for which migraine risk is predicted; lag 1 denotes the day before, and lag 2 denotes two days prior. Predictors modeled by 3-knot natural cubic splines were represented in the model by two separate linear terms and are shown in this plot by two separate estimates to summarize the nonlinear relationship: odds ratios for the 90th vs. 50th, and 10th vs. 50th percentiles of the overall distribution of the predictor.