*Brief Report*

MDM Medical Decision Making

*Medical Decision Making*
2020, Vol. 40(4) 545–550

DOI: 10.1177/0272989X20927700
journals.sagepub.com/home/mdm
SAGE

# Eliciting Medical Maximizing-Minimizing Preferences with a Single Question: Development and Validation of the MM1

**Laura D. Scherer and Brian J. Zikmund-Fisher**

The 10-item validated Medical Maximizer-Minimizer Scale (MMS-10) assesses patients' preferences for aggressive v. more passive approaches to health care. However, because many research or clinical situations do not allow for use of a 10-item scale, we developed a single-item maximizer-minimizer elicitation question (the MM1) based on our experiences describing the construct to patient groups, clinical researchers, and the public. In 2 large samples of US adults ($N = 368$ and $N = 814$), the correlation between MMS-10 scores and the MM1 was .52 and .60, respectively. Both measures were robust predictors of medical preferences in a set of 12 hypothetical scenarios, and both had strong (and roughly equivalent) associations with 7 self-report measures of health care utilization. Our results demonstrate that the MM1 is a valid, brief elicitation of maximizing-minimizing preferences that can be used in clinical or research contexts where the 10-item scale is infeasible.

**Keywords**
healthcare utilization, medical maximizing and minimizing, patient preferences

Date received: November 13, 2019; accepted: April 26, 2020

The 10-item Medical Maximizer-Minimizer Scale (MMS-10) assesses patients' preferences for aggressive v. more passive approaches to health care.[1] Maximizers generally like to seek help from health care professionals and receive optional medical interventions, whereas minimizers prefer to not receive medical intervention unless they perceive it as being completely necessary.[2]

To date, medical maximizing-minimizing has been associated with preferences for prostate cancer screening,[3] treatment of incidental imagining findings,[4] use of imaging tests among thyroid cancer patients,[5] and avoidance of health care services.[6] Recent evidence suggests that maximizers are at risk of overusing health care that is of minimal benefit, whereas minimizers are at risk of underusing beneficial health care.[7] Relative to minimizers, maximizers report taking more medications, receive more medical tests, and visit the doctor more frequently and for relatively minor reasons.[1] Medical maximizing has only a weak association with health care access and health status and is distinct from hypochondriasis.[1,3]

Measuring medical maximizing-minimizing preferences could be highly valuable in both clinical and public health contexts. For example, the construct could be used to tailor health information for individuals at risk of over- or underutilization or as an approach for eliciting patient preferences as a part of shared decision making. However, the MMS-10 is too long for practical use in many circumstances. Clinicians cannot rely on a cumbersome 10-item questionnaire in a clinic visit, and research involving large surveys or vulnerable patient populations often has survey length limitations that make a 10-item measure prohibitive.

As a result of these considerations, we sought to develop and validate a single-item medical maximizer-minimizer elicitation question (the MM1). Before

**Corresponding Author**
Laura D. Scherer, Division of Cardiology, University of Colorado School of Medicine, CU Medicine Bldg, Aurora, CO 80203, USA (ldscherer@gmail.com; laura.scherer@cuanschutz.edu).

describing our process, we wish to emphasize that single-item measures have a number of psychometric disadvantages, including being relatively more susceptible to random errors of measurement and potentially being less sensitive to individual differences along a particular range of the construct continuum.[8] Nevertheless, these disadvantages can, in certain circumstances, be outweighed by practical considerations that necessitate the use of a shorter scale or a single-item assessment.

## Methods

### *Participants*

We recruited 2 online samples of US adults from Amazon's Mechanical Turk (Mturk; $N = 445$ and 894). Participants in sample 1 were ineligible for the second survey. Current evidence indicates that Mturk samples produce results that are very similar to nationally representative samples,[9,10] especially when studies (like this one) avoid employing overused measures, behavioral interventions, or other criteria that might motivate inaccurate responses.[11]

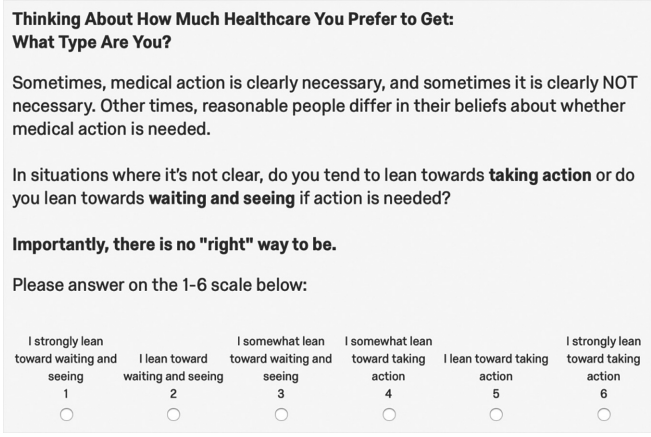
### *Study Design*

Drawing on our experience describing the construct to patient groups, clinical researchers, and the public, we developed several candidate descriptions of the maximizing-minimizing construct. Based on preliminary comparative testing, we focused our validation studies on a very brief description (Box 1). Our anecdotal experience and pretesting found that it was important to include a preamble designed to situate the MM1 question within a generic preference-sensitive context. In addition, to prevent concerns that there is a right answer, the question states "Importantly, there is no 'right' way to be" prior to eliciting the preference on a 6-point scale.

For sample 1, scale endpoints were labeled "I lean toward waiting and seeing" and "I lean toward taking action," and the order in which the maximizer and minimizer preference was described was counterbalanced across subjects. For sample 2, we randomized across subjects whether the responses scale was labeled only at the endpoints (as in sample 1) v. a response scale in which every endpoint was labeled (Box 1), which we thought would be more ideal for administering the MM1 verbally.

**Box 1.** MM1 Question with Scale Points Labeled

For sample 1, scale




### *Outcomes*

To test the convergent validity of the MM1 question, all participants completed the standard MMS-10. To establish predictive validity, participants also reported their medical preferences in response to 12 brief medical scenarios that previous research has shown are correlated with the MMS-10.[7] Six scenarios involved high-benefit, recommended medical tests and interventions (flu vaccine, colonoscopy, blood test to identify cause of tiredness, medicating type 2 diabetes, getting cholesterol tested at age 65, testing a baby for developmental delay), and 6 involved low-benefit medical tests and interventions (magnetic resonance imaging [MRI] for nonacute low back pain, full-body computed tomography [CT] scan, CT scan for minor head injury, opioids for knee pain, colorectal cancer screening at age 80, taking a 3-year-old to the emergency department for vomiting).[7] In addition, participants reported 8 utilization outcomes used in the original MMS validation work: use of prescription medications, number of lifetime surgeries, hospitalizations in the past 10 years, doctor visit in the past year for reasons other than an annual checkup, blood draws in the past year, lifetime medical scans (e.g., x-ray, MRI), aspirin use, and frequency of annual exams. To assess incremental validity, we also assessed standard demographics (age, sex, race, education), participants'

Division of Cardiology, University of Colorado School of Medicine, Aurora, CO, USA (LDS); VA Denver Center for Innovation (COIN), Denver, CO, USA (LDS); Department of Health Behavior and Health Education, University of Michigan, Ann Arbor, MI, USA (BJZ-F); Department of Internal Medicine, University of Michigan, Ann Arbor, MI, USA (BJZ-F); and Center for Bioethics and Social Sciences in Medicine, University of Michigan, Ann Arbor, MI, USA (BJZ-F).

general health status, whether they worked in a medical field, and whether they had health insurance.

We included an attention check question after the medical preference scenarios to assess data quality. Although this question was ostensibly about cancer screening attitudes, the last sentence told participants to provide a particular response "to show that you are reading this question."

### Analyses

Participants who failed the attention check were dropped from analyses. In sample 1, we tested whether the order in which the maximizer and minimizer preference was described would influence responses, using a linear regression model that included order, the MMS-10, and the interaction as predictors of the MM1. In sample 2, we tested whether the type of response scale (labeled v. unlabeled) would influence MM1 responses using an analogous linear regression that included scale type, the MMS-10, and the interaction as predictors. After finding no significant effects involving order or scale type, we collapsed across these factors in subsequent analyses.

Our primary analysis compared the predictive and incremental validity of the MMS-10 v. the MM1. We computed a mean score for the 10 original MMS items. Reliability among the 12 scenario preference judgments was good in both samples (sample 1: Cronbach's $\alpha$ = .82; sample 2: $\alpha$ = .78), so we created a mean score. (Interested readers can find analyses for these scenarios individually in our previous work.[7]) We conducted hierarchical linear regressions predicting average scenario preferences and self-reported utilization outcomes. In each regression, step 1 entered all covariates—age, sex (1 = male/identify as male, 0 = female/identify as female), race (1 = white, 0 = nonwhite), education (treated as continuous 1–10 score), work in a medical field (0 = no, 1 = yes), insurance status (0 = no, 1 = yes), and health status (1–5, 1 = excellent, 5 = poor), and step 2 added the MM1 (or MMS-10). We report the significance of change in $R^2$ when adding the MM1/MMS-10 in step 2.

## Results

Sample characteristics for sample 1/sample 2 are as follows: 42%/45% female, 55%/54% male, 3%/1% transgender/other, 79%/76% white, 9%/11% African American, 6%/6% Asian or Asian American, and 11%/13% Hispanic. Mean (SD) age was 37/36 (11/10), 79%/79% had health insurance, and 5%/10% worked in a medical field.

### Distributions of MM1 and MMS-10 Values

In sample 1, a total of 445 participants began the survey. Of those, 373 passed the attention check and 368 answered the MM1 question. Mean (SD) MM1 was 2.88 (1.46) on the 1 to 6 scale (with 1 = minimizing and 6 = maximizing), with a median and mode of 2. Mean (SD) MMS-10 score was 3.62 (1.20) on a range of 1 to 7 (median = 3.60; mode = 3.40; 1 = minimizing and 7 = maximizing). The correlation between the MMS-10 and MM1 (collapsing across order) was $r$ = .52, $P < 0.001$. For comparison, correlations among the MMS-10 items ranged from $r$ = .77 to $r$ = .23.

In sample 2, a total of 894 participants began the survey, and 70 participants failed the attention check, leaving an analytic sample of 814. MM1 mean (SD) was 3.15 (1.55; median = 3, mode = 2), while mean (SD) MMS-10 score was 3.87 (1.28; median = 3.90; mode = 4). The correlation between the MMS and MM1 collapsing across the 2 scale labels was $r$ = .60, $P < 0.001$. Correlations among the MMS-10 items ranged from $r$ = .80 to $r$ = .15.

Distributions of MMS-10 scores and MM1 responses can be found in the online appendix. Interestingly, the MM1 showed a more bimodal distribution of scores than the MMS-10 in both samples, which may have been a function of the 6-point scale used for the MM1 (v. the 7-point scale with midpoint indicating neither agree nor disagree for the MMS-10).

### Predictive and Incremental Validity

Table 1 presents results of regressions using the MMS-10 and the MM1 to predict scenario judgments, including covariates for both sample 1 and sample 2. Results were highly similar across the 2 samples. Variance inflation factors were $<2$ for all variables, alleviating concerns about multicollinearity of predictors. In both samples, the MMS-10 and MM1 each strongly and uniquely predicted all scenario preferences and all utilization outcomes except for aspirin use. The MM1 and MMS-10 both explained a significant amount of additional variance in the outcomes (except for aspirin use), after accounting for variance explained by the control variables.

### Differential Classification

Table 2 shows differential classifications of individuals as maximizers v. minimizers on the MMS-10 v. MM1. Of individuals classified as minimizers on the MM1, 74%/71% (in samples 1/2, respectively) were also minimizers on the MMS-10. Of individuals classified as maximizers on the MM1, 66%/73% were also maximizers on the

**Table 1** Standardized Beta Coefficients from Regressions Using Either the 10-Item Medical Maximizer-Minimizer Scale (MMS-10) or MM1 and Covariates to Predict Medical Preferences and Self-Reported Utilization Outcomes in Sample 1 (S1) and Sample 2 (S2)[a]

| | MMS-10 or MM1 | Age | Sex | Race | Education | Medical Field | Insurance | Health Status | $R^2$ Covariates | Change in $R^2$ Adding MMS-10 or MM1 |
|---|---|---|---|---|---|---|---|---|---|---|
| Medical scenario preferences (average of 10 responses) | | | | | | | | | | |
| S1: MMS-10 | .56*** | −.03 | −.01 | .00 | .10** | .14** | .10* | .07 | .08 | .29*** |
| S1: MM1 | .50*** | −.04 | .03 | −.08 | .02 | .11** | .11** | .06 | .08 | .24*** |
| S2: MMS-10 | .65*** | −.01 | −.03 | .00 | .03 | .03 | .07** | .03 | .07 | .38*** |
| S2: MM1 | .55*** | −.05 | −.02 | −.05 | −.01 | .05 | .07** | .00 | .07 | .28*** |
| Prescription medications (daily) | | | | | | | | | | |
| S1: MMS-10 | .22*** | .16** | .04 | .01 | .16** | .18*** | .01 | .31*** | .14 | .04*** |
| S1: MM1 | .24*** | .16** | .04 | −.01 | .13** | .16*** | .02 | .31*** | .15 | .06*** |
| S2: MMS-10 | .26*** | .14*** | .03 | −.04 | .08* | .25*** | .04 | .11** | .13 | .06*** |
| S2: MM1 | .29*** | .13*** | .03 | −.05 | .06 | .25*** | .03 | .10** | .13 | .08*** |
| Surgery in lifetime | | | | | | | | | | |
| S1: MMS-10 | .15** | .18** | .04 | .00 | .14** | .13** | .01 | .19*** | .09 | .02** |
| S1: MM1 | .25*** | .19*** | .05 | −.02 | .11* | .12* | .01 | .19*** | .09 | .06*** |
| S2: MMS-10 | .17*** | .12*** | .00 | .00 | .07* | .29*** | .05 | .10** | .13 | .03*** |
| S2: MM1 | .20*** | .12*** | .00 | −.01 | .05 | .29*** | .05 | .09** | .13 | .04*** |
| Hospitalizations (in past 10 years) | | | | | | | | | | |
| S1: MMS-10 | .28*** | .07 | .09 | −.03 | .09* | .32*** | −.04 | .14** | .14 | .07*** |
| S1: MM1 | .26*** | .07 | .09* | −.08 | .05 | .30*** | −.03 | .14** | .14 | .07*** |
| S2: MMS-10 | .27*** | .06* | .07* | −.06* | .07* | .29*** | .01 | .10** | .15 | .07*** |
| S2: MM1 | .29*** | .05 | .07* | −.08** | .04 | .29*** | .01 | .09** | .15 | .08*** |
| Visits to doctor (for reasons other than well visit) | | | | | | | | | | |
| S1: MMS-10 | .27*** | −.03 | −.01 | .06 | .15** | .14** | .05 | .25*** | .09 | .07*** |
| S1: MM1 | .30*** | −.03 | −.01 | .02 | .11* | .13** | .05 | .25*** | .09 | .09*** |
| S2: MMS-10 | .28*** | .02 | −.04 | −.01 | .10** | .21*** | .13*** | .19*** | .13 | .08*** |
| S2: MM1 | .24*** | .00 | −.04 | −.04 | .08* | .22*** | .14*** | .18*** | .13 | .06*** |
| Blood draws (in past 12 months) | | | | | | | | | | |
| S1: MMS-10 | .25*** | .03 | −.01 | .05 | .14** | .07 | .12* | .17** | .06 | .06*** |
| S1: MM1 | .29*** | .04 | .00 | .01 | .10* | .06 | .12** | .17** | .06 | .09*** |
| S2: MMS-10 | .31*** | .11*** | .02 | −.04 | .08* | .24*** | .11*** | .17*** | .15 | .08*** |
| S2: MM1 | .29*** | .10** | .02 | −.07* | .06 | .24*** | .11*** | .16*** | .15 | .08*** |
| Medical scans (in past 10 years) | | | | | | | | | | |
| S1: MMS-10 | .23*** | .11* | .00 | .03 | .02 | .14** | .01 | .18*** | .06 | .04*** |
| S1: MM1 | .20*** | .11* | .01 | .00 | .00 | .13* | .02 | .18** | .06 | .04*** |
| S2: MMS-10 | .20*** | .06* | −.01 | −.04 | −.01 | .23*** | .12*** | .21*** | .12 | .04*** |
| S2: MM1 | .16*** | .05 | −.01 | −.05 | −.03 | .24*** | .12*** | .20*** | .12 | .03*** |
| Aspirin use | | | | | | | | | | |
| S1: MMS-10 | −.06 | .01 | −.07 | .11* | −.04 | .09 | −.02 | .17** | .07 | .01 |
| S1: MM1 | .02 | .02 | −.07 | .12* | −.04 | .09 | −.02 | .17** | .07 | .00 |
| S2: MMS-10 | .04 | .05 | −.07* | .07* | −.02 | .10** | −.01 | .18*** | .06 | .00 |
| S2: MM1 | .04 | .05 | −.07* | .07* | −.03 | .10** | −.01 | .18*** | .06 | .00 |
| Annual exam | | | | | | | | | | |
| S1: MMS-10 | .26*** | .14** | −.08 | .06 | .11* | .06 | .22*** | .00 | .11 | .06*** |
| S1: MM1 | .30*** | .15** | −.08 | .03 | .06 | .05 | .23*** | .00 | .11 | .08*** |
| S2: MMS-10 | .22*** | .17*** | −.05 | .00 | .05 | .12*** | .31*** | .06 | .18 | .04*** |
| S2: MM1 | .25*** | .16*** | −.05 | .00 | .03 | .12*** | .30*** | .05 | .18 | .06*** |

[a]Medfield = participant works in a medical field (yes/no). Asterisks in right-most column indicate significance of change in $R^2$ when adding the MMS-10/MM1 to the regression model. *$p < .05$, **$p < .01$, ***$p < .001$.

**Table 2** Number of Participants Classified as Minimizers and Maximizers on the MM1 and 10-Item Medical Maximizer-Minimizer Scale (MMS-10), Respectively[a]

| | MM1 = 1–3 (Minimizer) | MM1 = 4–6 (Maximizer) |
|---|---|---|
| Sample 1 | | |
| MMS-10 <4 (minimizer), *n* | 185 | 32 |
| MMS-10 = 4 (neutral), *n* | 7 | 8 |
| MMS-10 >4 (maximizer), *n* | 56 | 79 |
| Percent correctly classified | 74 | 66 |
| Sample 2 | | |
| MMS-10 <4 (minimizer), *n* | 356 | 65 |
| MMS-10 = 4 (neutral), *n* | 21 | 18 |
| MMS-10 >4 (maximizer), *n* | 119 | 235 |
| Percent correctly classified | 71 | 73 |

[a]The MMS-10 has a natural neutral point of 4, so the small number of participants with a mean MMS-10 score of 4 was classified as "neutral."

MMS-10. Furthermore, most misclassified individuals had an MMS-10 score very close to the midpoint of 4: 51% (89/175) of MMS-10 maximizers misclassified as minimizers on the MM1 had MMS-10 scores between 4.1 and 4.6, and 64% (62/97) of MMS-10 minimizers misclassified as maximizers on the MM1 had an MMS-10 score between 3.4 and 3.9.

## Discussion

We developed a single-item maximizing-minimizer elicitation question—the MM1—and tested its convergence with the original MMS-10. The MM1 was strongly associated with the original MMS-10, and this finding was robust to our order and scale label manipulations. Both measures were robust predictors of medical preferences and self-reported utilization. Across both samples, the MMS-10 and MM1 also converged on what they did *not* predict, namely, aspirin use. The MM1 reliably classified individuals with strong maximizing or minimizing preferences, with most misclassifications potentially explainable by weak underlying preferences.

Limitations of this work include our use of online convenience samples and the lack of cognitive interviewing in developing the MM1 (although our question was based on extensive experience and feedback describing the construct to patients and the general public). We also acknowledge the need for future work to assess test-retest reliability (although this has been shown for the MMS, with an intraclass correlation coefficient of .89) and to further validate both the MM1 and MMS-10 in more diverse patient populations. Also, certain aspects of the maximizing-minimizing construct may not be captured by the MM1 question, such as doing everything regardless of survival or quality of life.

Nonetheless, in our view, these results indicate that the MM1 is a valid, brief elicitation of maximizing-minimizing preferences for the general population that can be used in contexts where the 10-item scale is infeasible. This question could be useful for eliciting patients' preferences in clinic settings, for facilitating shared decision making, or for targeting interventions designed to improve patient decision making. We reiterate, however, that the 10-item MMS is preferred when a longer measure can be used due to the psychometric disadvantages of all single-item measures. We also remind users of either the MM1 or the MMS-10 that even individuals with strong medical maximizing or minimizing preferences may value the opportunity to exercise choice among medical options. Hence, MM1/MMS-10 scores should never be used to presumptively determine whether a medical action is discussed or offered.

### ORCID iDs

Laura D. Scherer https://orcid.org/0000-0002-8660-7115
Brian J. Zikmund-Fisher https://orcid.org/0000-0002-1637-4176

### Supplemental Material

Supplementary material for this article is available on the *Medical Decision Making* Web site at http://journals.sagepub.com/home/mdm.

### References

1. Scherer LD, Caverly TJ, Burke J, et al. Development of the Medical Maximizer-Minimizer Scale. *Health Psychol.* 2016;35(11):1276–87.
2. Groopman J, Hartzband P. *Your Medical Mind: How to Decide What Is Right for You.* New York: Penguin; 2011.

3. Scherer LD, Kullgren JT, Caverly TJ, Scherer AM, Shaffer VA, Fagerlin A. Medical maximizing-minimizing preferences predict responses to information about prostate specific antigen screening. *Med Decis Making*. In press.
4. Kang SK, Scherer LD, Megibow AJ, et al. A randomized study of patient risk perception for incidental renal findings on diagnostic imaging tests. *Am J Roentgenol*. 2018; 210(2):369–375.
5. Evron JM, Reyes-Gastelum D, Banerjee M, et al. Role of patient maximizing-minimizing preferences in thyroid cancer surveillance. *J Clin Oncol*. 2019;37:3042–9.
6. Smith KT, Monti D, Mir N, Peters E, Tipirneni R, Politi MC. Access is necessary but not sufficient: factors influencing delay and avoidance of health care services. *MDM Policy Pract*. 2018;3(1):238146831876029.
7. Scherer LD, Shaffer VA, Caverly TJ, DeWitt J, Zikmund-Fisher B. Medical maximizing-minimizing predicts patient preferences for both high-benefit and low-benefit care. *Med Decis Making*. In press.
8. Nunnally JC. *Psychometric Theory*. New York: McGraw-Hill; 1967.
9. Mullinix KJ, Leeper TJ, Druckman JN, Freese J. The generalizability of survey experiments. *J Exp Polit Sci*. 2015; 2(2):109–38.
10. Coppock A. Generalizing from survey experiments conducted on Mechanical Turk: a replication approach. *Polit Sci Res Methods*. 2019;7(3):613–28.
11. Buhrmester M, Kwang T, Gosling SD. Amazon's Mechanical Turk a new source of inexpensive, yet high-quality, data? *Perspect Psychol Sci*. 2011;6(1):3–5.