Determinants of Public Health Behavior Based on the Health Belief Model: A Systematic Review

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ABSTRACT

Background: *Previous systematic reviews of the Health Belief Model have mainly been focused on specific diseases or behavioral intentions. This systematic review was aimed to synthesize the associations between Health Belief Model constructs and actual promotive and preventive health behaviors across public health contexts, and to translate the findings into operational recommendations for health policy and primary healthcare services.*
Method: *The PRISMA 2020 guidelines were followed by this systematic review. Scopus, PubMed, and Google Scholar were searched for English-language, peer-reviewed quantitative studies that were published between 2020 and 2025. Risk of bias was assessed using the Joanna Briggs Institute Critical Appraisal Checklist for Analytical Cross-Sectional Studies*
Result: *Of 742 records that were identified, 14 studies that involved 7,403 participants met the inclusion criteria. Across diverse public health behaviors, self-efficacy (10/14 studies, 71.4%) emerged as one of the most recurrent positive determinants, and cues to action were significant in 8 of 12 studies that operationalized the construct (66.7%). An inhibitory or unfavorable association with outcomes was shown by perceived barriers in 7 of 14 studies (50.0%). Perceived susceptibility was significantly associated with behavior or contributed to significant perceived-threat pathways in 9/14 studies (64.3%), while perceived severity was significant in 10/14 studies (71.4%). Positive associations were shown by perceived benefits in 8/14 studies (57.1%). Therefore, effective health policies should move beyond risk communication, so that timely behavioral cues, structural barrier reduction, and self-efficacy enhancement are integrated into primary healthcare services.*

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INTRODUCTION

Health behavior is shaped by interactions among individual cognition, social relationships, service environments, and policy conditions. Therefore, promotive and preventive programs depend not only on the availability of services, but also on whether a risk is perceived as relevant, an action is believed to be beneficial, barriers can be overcome, a timely trigger is received, and people feel capable of acting. These mechanisms are particularly important for behaviors such as screening, infection prevention, dietary change, self-care, reproductive and maternal health, and the use of preventive services.

The Health Belief Model (HBM) was developed so that why recommended health actions are adopted or avoided by individuals was explained. Its central constructs are perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy.(1) It was found by earlier meta-analyses that the predictive strength of individual constructs was modest and was varied substantially across behaviors, measures, and study designs.(2)(3) Consequently, the HBM is better treated as a context-sensitive framework by which modifiable determinants are identified than as a universal causal model.

The continuing but fragmented use of the HBM is illustrated by recent systematic reviews. General behavioral modeling has been examined by reviews,(4) COVID-19 vaccination intention,(5) and cervical-cancer screening.(6) Important evidence is provided by these reviews, but they are predominantly disease-specific, intention is frequently combined with behavior by them, or statistical prediction is emphasized without cross-context patterns being translated into service and policy instruments. The distinction between intention and actual behavior is important, because whether favorable beliefs are converted into practice is often determined by service access, administrative friction, social support, institutional trust, and action opportunities.

Attention to heterogeneity is also required by a policy-oriented synthesis. Cues to action may be

particularly important for services by which an appointment or provider contact is required, whereas self-efficacy may be more influential for repeated behaviors by which skill and persistence are required. In the same way, perceived barriers may reflect individual fear in one setting, but cost, distance, stigma, waiting time, or inconvenient service design in another. When these constructs are aggregated without the behavioral context being considered, the reason why findings differ can be obscured, and overly generic recommendations can be produced.

Therefore, this review differs from prior HBM reviews in three ways. First, it is focused primarily on actual promotive and preventive behaviors rather than intention-only outcomes; one mixed-outcome study was retained and interpreted separately, because weight-management intention and body mass index were jointly assessed by it. Second, evidence is compared across communicable-disease prevention, screening, reproductive and maternal health, lifestyle behavior, self-care, and service use. Third, the empirical pattern for each HBM construct is translated into operational policy options and measurable implementation indicators. The objective was that the determinants of public health behavior based on the HBM were synthesized and their implications for health-policy design were examined, particularly for primary and community health services.

METHOD

This systematic review was reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement.(7) The review question was structured using a Population–Exposure–Outcome framework, because associations between behavioral determinants and health behaviors, rather than the comparative effectiveness of a defined intervention, were examined by the review. The population comprised human participants in promotive, preventive, screening, self-care, or preventive-service settings. The exposure was the HBM, which was applied as the principal analytical framework and operationalized through at least five core constructs. The outcome comprised actual behavior, practice, adherence, screening history, preventive uptake, or health-service use. One mixed-outcome study, in which weight-management intention together with body mass index was assessed, was retained but interpreted cautiously. The review protocol was not prospectively registered; this is acknowledged as a limitation. Refinements to the eligibility criteria were documented before the final full-text selection.

Studies were eligible when all of the following criteria were met, human participants in a promotive, preventive, screening, self-care, or preventive-service context, the HBM was applied as the principal analytical framework and at least five core constructs were operationalized, the outcome was an actual behavior, practice, uptake, adherence, screening history, health-service use, or a mixed behavioral outcome that contained an objective or behavior-related indicator, the design was a primary quantitative analytical observational study, including cross-sectional, correlational, regression, or observational structural-equation-modeling designs, associations between HBM constructs and the behavioral outcome were examined by inferential analysis and the article was peer reviewed, published in English between January 2020 and December 2025, and the full text was retrievable. Qualitative studies, reviews, protocols, trials by which an intervention was primarily evaluated, editorials, conference papers, descriptive-only studies, and studies in which only intention, willingness, acceptance, knowledge, attitude, or perception was measured were excluded.

The literature search was conducted in Scopus, PubMed, and Google Scholar. Scopus and PubMed were used as the primary bibliographic databases, because broad coverage of health, behavioral science, nursing, and public-health research is provided by them. Google Scholar was used as a third search source for citation tracking and the retrieval of potentially eligible studies that were not identified through the primary databases. Backward citation searching was conducted by the screening of the reference lists of the included studies, while forward citation tracking was performed using Google Scholar. Publications from January 2020 through December 2025 were covered by the search.

The publication period from January 2020 to December 2025 was selected so that contemporary applications of the Health Belief Model in promotive and preventive health behavior were captured. Major developments in public health communication, digital health delivery, preventive-service organization, and behavioral responses during and after the COVID-19 pandemic are reflected by this period. The policy objective of the production of recommendations relevant to current public health and primary-care systems was also supported by the restriction of the review to this period.

Electronic search strategies were developed according to the review objectives, the eligibility criteria, and the Population–Exposure–Outcome framework. Three conceptual domains were combined in the search strategy: (1) the Health Belief Model, (2) health-related behaviors

and preventive practices, and (3) behavioral determinants. In Scopus, searches were performed using the TITLE-ABS-KEY field, so that relevant studies were identified from article titles, abstracts, and author keywords. In PubMed, Medical Subject Headings and free-text terms were used and applied primarily to title and abstract fields.

Phrase searching using quotation marks was applied for multi-word concepts, such as "Health Belief Model," "health behavior," "preventive behavior," and "health service utilization," so that retrieval precision was improved. Truncation was applied so that variations of related terms were captured, including behavio* (behavior, behavioral, behaviours), prevent* (preventive, prevention), determinant* (determinant, determinants), and factor* (factor, factors). Boolean operators were used so that concepts were combined and both sensitivity and specificity of the search were optimized. The core search strategy consisted of the following concept combination: ("Health Belief Model" OR HBM OR "health belief") AND ("health behavio*" OR "preventive behavio*" OR "health practice*" OR screening OR uptake OR adherence OR "self-care" OR "health service utilization") AND (determinant* OR predictor* OR factor* OR association* OR correlate*). The syntax was adapted according to the indexing system and functionality of each database. Controlled vocabulary terms in PubMed were combined with free-text keywords, so that retrieval sensitivity was maximized. The complete database-specific search strategies should be retained in the supplementary material.

Database filters included publication year (2020–2025), human participants, English language, and peer-reviewed journal articles where available. Reviews, protocols, conference proceedings, editorials, and non-journal publications were excluded during screening. Policy-related terms were intentionally excluded from the search strategy, because the objective was that empirical studies by which behavioral determinants were examined using the HBM were identified, rather than studies that were explicitly focused on policy development or evaluation. Therefore, policy recommendations were derived inductively from the synthesized evidence on behavioral determinants and health-service contexts.

Records that were retrieved from all databases were exported to a single screening file and deduplicated before the title-and-abstract screening. Full-text articles were subsequently assessed against the predefined eligibility criteria, and one primary reason for exclusion was assigned to each excluded study. Data were extracted using a standardized form that was developed for this review. The extracted information included author, publication year, article title, country, study population, sample size, study design, behavioral outcome, HBM constructs assessed, statistical methods, direction and significance of associations, effect estimates, model-fit or explanatory statistics, and policy-relevant interpretations. Disagreements in study classification or interpretation were resolved through discussion among the review authors.

Methodological quality was evaluated using the Joanna Briggs Institute Critical Appraisal Checklist for Analytical Cross-Sectional Studies (8). Clarity of sample inclusion criteria, description of participants and settings, validity and reliability of exposure measurement, use of objective criteria for the condition or outcome, identification of confounding factors, strategies for the addressing of confounding, validity and reliability of outcome measurement, and appropriateness of statistical analysis were addressed by the eight domains. Consistent with JBI guidance, the score was not used as an automatic exclusion threshold, and the weighting and interpretation of findings were informed by item-level limitations. Ratings were recorded as Yes, No, Unclear, or Not applicable. A descriptive JBI score was calculated by the assignment of one point to each Yes response and zero points to No or Unclear responses; the score is presented only in the rightmost column of Table 1.

Data were synthesized using a structured narrative synthesis. Included studies were organized according to the six core constructs of the HBM and grouped by public-health behavioral context, so that consistent patterns of association across studies were identified. Evidence for each construct was synthesized by the consideration of the direction and statistical significance of its association with the behavioral outcome, the reported effect size or model contribution where available, and the methodological quality of the study. Mixed or context-specific findings were summarized separately, so that variation across populations and settings was preserved. Numerical consistency counts were used descriptively and were not treated as pooled effect estimates. A meta-analysis was not undertaken, because the studies differed substantially in populations, outcome definitions, HBM instruments, model specifications, and statistical effect measure.(9)

Table 1. JBI Critical appraisal of the 14 included analytical cross-sectional studies

Article	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Total (Yes)
Saghafi-Asl et al. (2020)	Y	Y	Y	Y	Y	Y	Y	Y	8/8
Fathian-Dastgerdi et al. (2021)	Y	Y	Y	Y	U	U	Y	Y	6/8
Jadil and Ouzir (2021)	Y	Y	Y	Y	U	U	Y	Y	6/8
Li et al. (2021)	Y	Y	Y	Y	U	U	Y	Y	6/8
Noghabi et al. (2021)	Y	Y	Y	Y	Y	Y	Y	Y	8/8
Mirakzadeh et al. (2021)	Y	Y	Y	Y	U	U	Y	Y	6/8
Mabotja et al. (2021)	Y	Y	Y	Y	Y	Y	Y	Y	8/8
Setyaningsih et al. (2022)	Y	Y	Y	Y	U	U	Y	Y	6/8
Triharini et al. (2023)	Y	Y	Y	Y	U	U	Y	Y	6/8
Rapheal et al. (2023)	Y	Y	Y	Y	Y	Y	Y	Y	8/8
Eryando et al. (2024)	Y	Y	Y	Y	U	U	U	Y	5/8
Moucheraud et al. (2025)	Y	Y	Y	Y	Y	Y	Y	Y	8/8
Habibi et al. (2025)	Y	Y	Y	Y	Y	Y	Y	Y	8/8

RESULT AND DISCUSSION

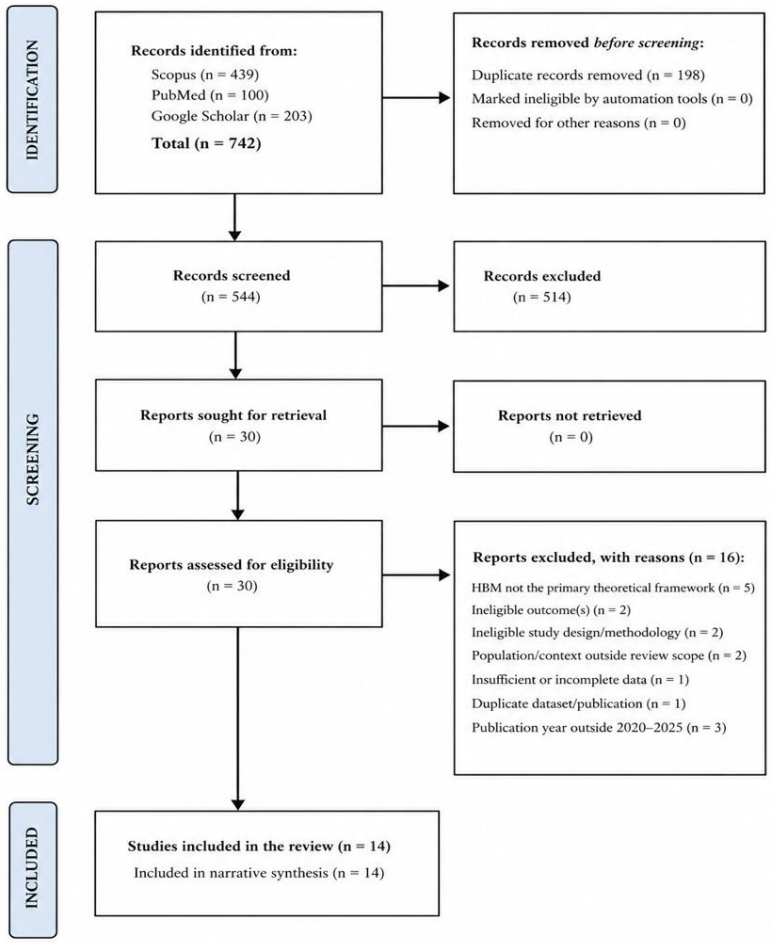

Figure 1. PRISMA 2020 study-selection flow diagram

The literature search across Scopus, PubMed, and Google Scholar identified 742 records. After 198 duplicates were removed, 544 records were screened, and 514 were excluded during title and abstract screening. Thirty full-text articles were assessed for eligibility, and all were successfully retrieved. Sixteen studies were excluded because the HBM was not analyzed as the primary analytical framework (n = 5), the outcome did not meet the eligibility criteria (n = 2), the study design or analytical method was ineligible (n = 2), the population or study context was outside the review scope (n = 2), data were incomplete (n = 1), a duplicate dataset was reported by the study (n = 1), or

publication occurred outside 2020–2025 (n = 3). Fourteen studies met the eligibility criteria and were included in the final narrative synthesis and methodological-quality assessment.

The 14 included studies were published between 2020 and 2025 and involved 7,403 participants. Study settings included Iran, Indonesia, China, South Africa, the United States, Morocco, India, Kenya, and Malawi. COVID-19 or other infectious-disease preventive behavior was examined by six studies; cervical screening or preventive-service decisions were addressed by three; reproductive or maternal health was examined by two; lifestyle or risk-prevention behavior was examined by two; and musculoskeletal-pain prevention among nursing-home residents was addressed by one. Analytical cross-sectional or observational survey data were used by all studies. The analytical approaches included hierarchical and multivariable regression, logistic regression, correlational analysis, structural equation modeling, partial least squares structural equation modeling, covariance-based structural equation modeling, and artificial neural network analysis. Reported behavior, practice, screening, uptake, or service use was assessed by thirteen studies. The study was retained as mixed-outcome evidence, because both weight-management intention and body mass index (BMI), rather than actual weight-management behavior alone, were examined by it.(10)

Table 2. Summary of study characteristics and key findings based on the Health Belief Model (HBM).

Article Title	Author	Country	Design and Analysis	HBM Constructs	Key Finding	Report Model Statistics
Factors influencing weight management behavior among college students: An application of the Health Belief Model	Saghafi-Asl, M.; Aliasgharzadeh, S.; Asghari-Jafarabadi, M.	Iran	Cross-sectional; quota sample (n = 336); SEM and hierarchical linear regression	Susceptibility, Severity, Benefits, Barriers, Cues to action, Dieting self-efficacy, Exercise self-efficacy	Perceived threat, perceived benefits, dieting self-efficacy, and exercise self-efficacy were positively associated with weight-management intention. Perceived barriers were not significantly associated with intention but were positively associated with BMI; perceived severity and dieting self-efficacy were inversely associated with BMI. The study was retained as mixed-outcome evidence.	SEM fit: CFI = .99; TLI = .95; RMSEA = .07; SRMR = .02. Adjusted R^2 = .40 for BMI in the final regression model.
The prevalence of preventive behaviors and associated factors during the early phase of the COVID-19 pandemic among Iranian people: Application of a Health Belief Model	Noghabi, A. D.; Mohammadzadeh, F.; Yoshany, N.; Javanbakht, S.	Iran	Cross-sectional survey (n = 1,020); simple and multivariable linear regression	Susceptibility, Severity, Benefits, Barriers, Cues to action, Self-efficacy	All six HBM constructs were significant. Self-efficacy and perceived benefits were the strongest positive predictors, while perceived barriers were negatively associated with preventive behavior.	R^2 not reported; multivariable coefficients included self-efficacy B = .26, benefits B = .25, and barriers B = -.12.
Analysis of preventive behaviors of rural tourism hosts in the face of COVID-19 pandemic: Application of Health Belief Model	Mirakzadeh, A. A.; Karamian, F.; Khosravi, E.; Parvin, F.	Iran	Cross-sectional census (n = 80); PLS-SEM (SmartPLS)	Susceptibility, Severity, Benefits, Barriers, Cues to action, Self-efficacy	Perceived susceptibility was the strongest determinant. Severity, benefits, self-efficacy, and cues to action were positively associated with preventive behavior; barriers were not significant.	R^2 preventive behavior = .56; SRMR = .09; NFI = .91.

Factors associated with preventive behaviors of COVID-19 among adolescents: Applying the Health Belief Model	Fathian-Dastgerdi, Z.; Khoshgoftar, M.; Tavakoli, B.; Jaleh, M.	Iran	Online cross-sectional survey (n = 797); hierarchical multiple regression	Susceptibility, Severity, Benefits, Barriers, Cues to action, Self-efficacy	Self-efficacy was the strongest positive predictor. Benefits and severity were positive; barriers and susceptibility were negative after adjustment.	Adjusted R^2 = .46; self-efficacy β = .59.
Exploring the predictors of health-protective behavior during the COVID-19 pandemic: A multi-country comparison	Jadil, Y.; Ouzir, M.	Morocco and India	Cross-sectional survey (Morocco n = 215; India n = 229); SEM and artificial neural network	Susceptibility, Severity, Benefits, Barriers, Cues to action, Self-efficacy	Benefits, self-efficacy, and severity were prominent in Morocco. In India, susceptibility was more influential than cues to action; both were retained as significant predictors for the ANN importance ranking, demonstrating country-specific HBM patterns.	Country-specific SEM/ANN importance rankings; R^2 not consistently reported.
Factors influencing the health behavior during public health emergency: A case study on norovirus outbreak in a university	Li, S.; Jiang, Q.; Zhang, P.	China	Cross-sectional survey (n = 386); SEM	Susceptibility, Severity, Benefits, Barriers, Self-efficacy, and health literacy	Severity and self-efficacy supported behavior change. Susceptibility operated conditionally through severity, and health beliefs mediated the relationship between health literacy and behavior.	Model fit reported as acceptable; explanatory R^2 not clearly reported.
Beliefs and perceptions regarding cervical cancer and screening associated with Pap smear uptake in Johannesburg: A cross-sectional study	Mabotja, M. C.; Levin, J.; Kawonga, M.	South Africa	Analytical cross-sectional; interviewer-administered survey (n = 280); robust logistic regression	Susceptibility, Severity, Benefits, Barriers, Cues to action, Self-efficacy, and knowledge	Pap-smear uptake was more likely among women reporting greater severity and fewer perceived barriers. Age and knowledge also contributed to uptake.	R^2 not reported; severity AOR = 1.30 and barriers AOR = .40 per five-point increase.
Perceived susceptibility, barriers, and cues to action as determinant factors of reproductive health behavior	Setyaningsih, W.; Yudianti, I.; Mansur, H.	Indonesia	Cross-sectional survey (n = 152); simple random sampling; logistic regression	Susceptibility, Severity, Benefits, Barriers, Cues to action, Self-efficacy	All six constructs were associated with reproductive-health behavior; susceptibility, barriers, and cues to action were identified as principal determinants.	Goodness-of-fit p = .917. The authors reported that 79.7% of reproductive-health behavior was associated with the six HBM variables; this value should not be interpreted as R^2 unless the original metric is explicitly defined.

Determinant factors of anemia in pregnancy based on Health Belief Model: A correlational study	Triharini, M.; Mar'ah Has, E. M.; Nofita, G.	Indonesia	Correlational cross-sectional study (n = 104); purposive sampling; bivariate correlation	Susceptibility, Severity, Benefits, Barriers, Cues to action, Self-efficacy	Susceptibility and cues to action were significantly associated with anemia-prevention behavior. Severity, benefits, barriers, and self-efficacy were not significant.	R^2 not reported; susceptibility r = .223 and cues to action r = .204.
Using the Health Belief Model to predict pre-travel health decisions among U.S.-based travelers	Rapheal, E.; Prithviraj, R.; Campbell, S.; Stoddard, S. T.; Paz-Soldan, V. A.	United States	Cross-sectional survey (n = 604); outcome-specific logistic regression	Susceptibility, Severity, Benefits, Barriers, Cues to action, Self-efficacy	Models containing susceptibility and benefits most consistently predicted information seeking, provider visits, and receipt of pre-travel vaccination.	Outcome-specific adjusted models; R^2 not reported. Reported outcomes: 55% sought information, 41% visited a provider, and 27% received vaccination.
Community preventive behaviour and perception on the severity of COVID-19 disease in Indonesia, 2021–2022: Structural equation modelling	Eryando, T.; Sipahutar, T.; Poddar, S.	Indonesia	Online cross-sectional survey (n = 1,802); SEM	Susceptibility, Severity, Benefits, Barriers, Self-efficacy	Perceived barriers and self-efficacy were statistically significant. Because the behavioral indicators were coded as frequencies of risk-related activities, coefficient directions require cautious interpretation. The proposed structural model showed inadequate overall fit, limiting confidence in the pathway interpretation.	Inadequate model fit; explanatory power should not be interpreted as robust.
Determinants of smoking prevention behavior of senior high school students: A short report	Muthmainnah, M.; Kurnia, G. M.; Nugrahani, A.	Indonesia	Pilot cross-sectional survey (n = 90); convenience sampling; chi-square and Fisher's exact tests	Susceptibility, Severity, Benefits, Barriers, Cues to action, Self-efficacy	Susceptibility, severity, benefits, self-efficacy, and cues to action were associated with smoking-prevention behavior; perceived barriers were not significant.	R^2 not reported; strongest bivariate association was susceptibility (contingency coefficient = .470).
Factors associated with cervical cancer screening: Results from cross-sectional surveys in Kenya and Malawi	Moucheraud, C.; Chibaka, S.; Golub, G.; Kalande, P.; Makwaya, A.; Ochieng, E.; Ogutu, V.; Phiri, K.; Phiri, S.; Hoffman, R. M.	Kenya and Malawi	Cross-sectional surveys (Kenya n = 736; Malawi n = 261); adjusted risk-ratio models	Susceptibility, Severity, Benefits, Barriers, Cues to action, Self-efficacy	Provider discussion was the strongest cue to action. Social experience of cervical cancer or death and self-efficacy were also associated with screening uptake.	R^2 not reported; provider discussion aRR = 1.88 in Kenya and 1.89 in Malawi.

Investigating effective factors on musculoskeletal pain prevention behaviors in the elderly population living in nursing homes, based on the Health Belief Model: Structural equation modeling approach	Habibi, S.; Tavafian, Iran S. S.; Maghbouli, R.; Montazeri, A.	Cross-sectional; random sample (n = 311); PLS-SEM (SmartPLS) and CB-SEM (AMOS)	Susceptibility, Severity, Benefits, Barriers, Cues to action, Self-efficacy, and knowledge	Knowledge strongly influenced perceived benefits and self-efficacy. Perceived barriers negatively influenced preventive behavior, and cues to action were a key predictor of musculoskeletal-pain prevention practices.	R^2 for the endogenous cues-to-action construct = .426; R^2 for the behavioral outcome was not clearly reported.

Table 3. Quantitative consistency and interpretation of HBM constructs across the 14 studies

Construct	Studies assessing (n)	Studies reporting a significan association or pathway	Cross-study interpretation
Perceived susceptibility	14	9/14 (64.3%): predominantly positive, with one negative association; one additional conditional pathway	Strongly context-dependent. Salience increased for infectious, travel-related, reproductive, or personally relevant risks; negative findings may reflect optimism bias, risk normalization, or model suppression.
Perceived severity	14	10/14 (71.4%) positive or incorporated in a significant threat pathway	More consistent when consequences were tangible, socially experienced, or linked to acute threats; weaker for routine behavior when severity was already widely recognized.
Perceived benefits	14	8/14 (57.1%) positive	Supported rational evaluation of action, but benefits alone did not reliably overcome access problems, low capability, or service friction.
Perceived barriers	14	7/14 (50.0%) inhibitory or unfavorable associations; several studies explicitly reported non-significant effects	The most directionally consistent inhibitory construct. Barriers represented psychological concerns, time, access, convenience, stigma, uncertainty, and service complexity.
Cues to action	12	8/12 (66.7%) positive	Particularly relevant for service-dependent actions and behaviors triggered by provider recommendations, reminders, family influence, education, or media.
Self-efficacy	14	10/14 (71.4%) positive	Especially influential for repeated, skill-dependent, and self-managed behavior requiring persistence and self-regulation.

The item-level JBI appraisal indicated generally clear inclusion criteria, participant descriptions, HBM measurements, behavioral outcomes, and statistical methods. A descriptive score of 8/8 was achieved by six studies.(10–15) Seven studies scored 6/8, primarily because potential confounding factors were incompletely identified or no clear strategy for the management of confounding was reported. One study scored 5/8, because the identification and management of confounding factors and the validity or reliability of outcome measurement were insufficiently clear.(16) In addition, confidence in the interpretation of its pathways was limited by the inadequate fit of the proposed structural model.(16) Other interpretive concerns included a small sample size,(17) reliance on bivariate analysis,(18)(19) the use of self-reported behavioral measures, and the inability of cross-sectional designs to establish temporal or causal relationships. The appraisal scores were used descriptively rather than as mechanical criteria for the exclusion of evidence.

Self-efficacy was positively associated with behavior or the mixed behavioral outcome in 10 of 14 studies (71.4%). Its role was strongest in behaviors by which repeated performance, skill, or self-regulation was required, including adolescent COVID-19 protective behavior, population-level infection prevention, rural-tourism preventive practice, cross-country health-protective behavior, weight-management behavior, smoking prevention, and cervical-screening uptak.(10)(11)(14)(17)(19–21) Behavior change during a norovirus public-health emergency was contributed to by self-efficacy, and it was operated within a broader pathway that involved health literacy and health beliefs.(22) A

distinction between the knowing that an action is beneficial and the believing that it can be performed consistently is supported by this pattern. Therefore, awareness may be improved by information-only interventions without sustained behavior being produced when practical competence, perceived control, and opportunities for rehearsal are still limited.

Cues to action were significant in 8 of the 12 studies that operationalized them (66.7%). Cervical-screening history in both Kenya and Malawi was strongly associated with provider discussion (14), while musculoskeletal-pain prevention among older adults was supported by reminders and structured education (15). Cues were also relevant to anemia prevention, reproductive-health behavior, smoking prevention, population-level COVID-19 prevention, rural-tourism preventive practices, and cross-country protective behavior.(11)(17–19)(21)(23) Across these contexts, a bridge between favorable beliefs and a concrete opportunity to act was functioned as by cues. Their effect was especially visible when the behavior depended on service contact, scheduling, trusted recommendations, or a timely reminder. The policy implication is that passive dissemination of information is unlikely to be sufficient when several steps are required to be initiated by individuals without a structured trigger.

A statistically significant inhibitory or unfavorable association with behavior or the mixed outcome was shown by perceived barriers in 7 of 14 studies (50.0%). Although the frequency was lower than for self-efficacy, the substantive direction of significant findings was highly consistent after outcome coding was accounted for. Practical constraints, inconvenience, uncertainty, cost, stigma, psychological concerns, and difficulties in the sustaining of recommended practices were represented by barriers. In Johannesburg, Pap-smear uptake was strongly associated with lower barrier scores.(12) Barriers were also important for adolescent COVID-19 protection, population preventive behavior, reproductive-health behavior, the mixed weight-management outcome, community prevention in Indonesia, and musculoskeletal-pain prevention.(10)(11)(15)(16)(20)(23) In the mixed weight-management study, higher BMI was associated with greater perceived barriers, which represented an unfavorable relationship despite the positive statistical coefficient. By contrast, barriers were non-significant in the rural-tourism study, the anemia-prevention study, and the smoking-prevention pilot.(17–19) These differences may reflect narrow measurement of barriers, limited statistical power, outcome coding, or behavioral contexts in which other determinants were more salient. It is indicated by the heterogeneity that the local content of barriers should be identified by policy, rather than the construct being treated as a single psychological variable.

This distinction is important for policy interpretation. An individual belief may be represented by a high perceived-barrier score, but it may also be an accurate perception of transport costs, inconvenient operating hours, lack of privacy, fragmented referrals, fear of judgment, or previous negative interactions with health services. In those circumstances, behavior is unlikely to be changed by additional counseling alone. Effective intervention requires that the service environment is modified, followed by communication by which the improved opportunity is made visible and credible.

Perceived susceptibility was significant or formed part of a significant perceived-threat pathway in 9 of 14 studies (64.3%), but its direction and strength were more context-dependent than those of self-efficacy and barriers. Susceptibility was prominent among rural-tourism hosts who faced COVID-19, in pre-travel health decisions, reproductive-health behavior, anemia prevention, smoking prevention, and population-level infection prevention.(11)(13)(17–19)(23) It was negatively associated with adolescent protective behavior in one adjusted model,(20) and a conditional relationship through perceived severity was also identified.(22) These apparently inconsistent results may reflect optimism bias, reverse interpretation of risk items, habituation to prolonged threats, or statistical suppression when correlated constructs are entered in the same model. Why susceptibility should not be interpreted independently from severity, efficacy, and access to an actionable response is also demonstrated by them.

Perceived severity was significant in 10 of 14 studies (71.4%) and was more consistent when disease consequences were concrete, visible, or socially experienced. Pap-smear uptake, cervical-cancer screening, behavior change during a norovirus emergency, several COVID-19 preventive behaviors, reproductive-health behavior, smoking prevention, and the mixed weight-management outcome were supported by severity.(10–12)(14)(17)(19–22) However, severity was not universally influential. When awareness of seriousness was already high, or when the recommended action was difficult to access, little behavioral gain may have been produced by additional emphasis on adverse consequences. It is cautioned against uniform fear-based communication by these findings. Threat information is more useful when it is credible, personally relevant, proportionate, and paired with a feasible and effective action.

Perceived benefits were positively associated with outcomes in 8 of 14 studies (57.1%). Benefits were

prominent in COVID-19 prevention, cross-country protective behavior, rural-tourism practices, pre-travel decisions, reproductive-health behavior, smoking prevention, and the mixed weight-management study.(10)(11)(13)(17)(19–21)(23) Nevertheless, benefits were not consistently translated into action when structural barriers, low self-efficacy, or absence of cues were still present. Therefore, the greatest practical value is had by benefit communication when immediate, concrete, and personally meaningful advantages are specified by it and it is linked to an accessible opportunity to act.

The pattern of results was materially affected by differences among diseases and behaviors. For service-dependent behaviors such as cervical screening and pre-travel consultation, cues to action and access-related barriers were particularly influential, because contact with a health system, provider recommendation, scheduling, or referral completion was required for action.(12–14) For repeated self-managed behaviors, such as infection prevention, weight management, smoking prevention, and musculoskeletal self-care, self-efficacy was more central, because practices needed to be sustained over time by individuals and difficulties needed to be managed outside direct clinical supervision.(10)(11)(15)(19)(20) Threat perceptions were stronger for acute infectious risks and diseases with recognizable severe outcomes. Why no single HBM construct was universally dominant is explained by this contextual variation, and it is the principal reason that a pooled meta-analysis was not appropriate.

The meaning of the same construct was also influenced by context. A provider recommendation, family encouragement, media exposure, school education, digital reminders, or personal experience of illness could be referred to by a cue to action. In the same way, confidence in the performance of a daily preventive routine, the arrangement of a screening visit, communication with a provider, or the maintenance of behavior despite competing demands could be reflected by self-efficacy. Therefore, interpretation at the level of behavioral mechanism is required by cross-study synthesis, rather than the assumption that fully equivalent exposures are represented by identically named questionnaire scales.

A policy architecture by which each HBM construct is linked to a distinct policy function is supported by the review. Communication design is primarily informed by threat and benefit perceptions; service and administrative reform is pointed to by barriers; active delivery systems are required by cues to action; and capability-building is required by self-efficacy. By the resulting framework, generic health education is moved beyond, because behavioral communication is combined with service design and implementation accountability.

For Indonesia, this framework is directly relevant to the continuing transformation and integration of primary health care. Promotive and preventive services, life-course screening, stronger Puskesmas–Posyandu networks, community outreach, and digital health are emphasized by national policy.(24) These priorities can be strengthened by HBM-informed implementation through the embedding of provider-initiated recommendations, digital recall systems, tailored risk communication, barrier monitoring, and skills-based counseling into routine service standards. Therefore, the policy value of the HBM is not that health-system or social-determinant frameworks are replaced by it, but that the behavioral mechanisms through which service and communication policies are experienced by users are identified by it.

The individualizing of structural failure should also be avoided by policy design. Transport costs, inconvenient hours, fragmented referral pathways, lack of privacy, limited disability access, or previous negative encounters with services may be accurately reflected by a high perceived barrier. In such cases, behavior is unlikely to be changed by counseling alone. The appropriate policy response is that the service environment is redesigned and then communication and cues to action are used, so that the improved opportunity is made visible, trusted, and credible.

Implementation indicators should be selected according to the proposed behavioral mechanism. Calibrated risk and benefit comprehension, rather than message exposure alone, should be measured by communication interventions. Waiting time, referral completion, direct and indirect costs, missed appointments, and equity gaps should be measured by barrier-reduction strategies. Reminder reach and its conversion into completed action should be measured by cue-to-action systems. Demonstrated skill, adherence, and maintenance over time should be measured by self-efficacy programs. This alignment between mechanism and indicator is needed, so that programs are not judged only by outputs by which behavioral change is not represented.

It was found by this review that self-efficacy and cues to action were recurrent and actionable facilitators of actual or closely behavior-related health outcomes, whereas the most directionally consistent inhibitory factor was represented by perceived barriers. It is indicated by the findings that health beliefs are not operated as isolated cognitive predictors, but as interacting mechanisms by which it is determined whether perceived risk and benefit can be translated into observable action by individuals.

Table 4. Operational HBM-to-policy translation matrix

HBM construct	Evidence pattern	Policy function	Operational examples	Implementation indicators
Perceived susceptibility	Effects varied by disease and audience; risk was more influential when personally relevant.	Use segmented risk communication based on local epidemiology, life-stage risk, and individual assessment; avoid generalized fear appeals.	Puskesmas risk stratification, tailored counseling, school or community risk profiles, travel-risk assessment.	Change in calibrated risk perception; uptake among high-risk groups; reach of targeted communication.
Perceived severity	Severity mattered when consequences were concrete, visible, or socially experienced.	Combine credible complication information with a clear, feasible, and proportionate recommended action.	Peer testimony in screening programs; complication counseling during antenatal, adolescent, chronic-care, or older-person services.	Message comprehension; referral completion; screening or preventive-service uptake.
Perceived benefits	Benefits supported behavior but did not overcome structural friction alone.	Frame immediate, concrete, and family-relevant benefits and pair the message with accessible services or practical support.	Benefit-framed invitations, family-protection messages, symptom-prevention framing, explicit explanation of time or cost saved.	Benefit recall; intention-to-action conversion; service utilization; maintenance of practice.
Perceived barriers	Significant findings consistently reflected an inhibitory or unfavorable relationship and included psychological and structural obstacles.	Apply user-centered service redesign to reduce cost, waiting time, travel, administrative steps, stigma, uncertainty, and inconvenience.	Extended service hours, one-stop services, transport support, privacy safeguards, simplified referrals, transparent communication.	Waiting time; missed appointments; reported barriers; completion of referrals; equity gaps.
Cues to action	Provider communication, reminders, education, and social triggers frequently initiated action.	Institutionalize timely prompts within routine services rather than relying on passive information.	SMS or WhatsApp recall, electronic prompts, provider-initiated offers, home-visit reminders, school and community follow-up.	Reminder reach; response rate; appointment completion; repeat uptake; referral conversion.
Self-efficacy	Self-efficacy was prominent for repeated and skill-dependent behavior.	Shift health promotion from information delivery to skills, rehearsal, coaching, supported action planning, and social support.	Demonstration sessions, peer coaching, goal setting, problem solving, role play, supervised practice, and follow-up.	Self-efficacy score; observed skill performance; adherence; maintenance at 3–6 months.

Self-efficacy appeared to be particularly influential, because the capability component of behavior enactment is represented by it: the importance of preventive action may be recognized by individuals, yet sustained practice depends on confidence, skills, perceived control, and the ability to overcome practical difficulties. A complementary function was performed by cues to action, in that the temporal or social trigger by which favorable beliefs were connected to a concrete action opportunity was provided. The principal novelty of this review is the integration of cross-domain HBM evidence into an operational policy matrix by which communication strategies, service-access reform, action-triggering systems, and capability-building interventions are differentiated. Earlier HBM syntheses have often been concentrated on whether an outcome is predicted by a construct. That approach is extended by the present review, in which what function is performed by the construct in implementation is asked. The perceived rationale for action is primarily shaped by susceptibility, severity, and benefits. Whether action is permitted by the environment is indicated by barriers. Motivation is connected to a specific time, place, provider, or service by cues to action. The performance and maintenance of behavior after action has been initiated is supported by self-efficacy. This functional interpretation is particularly important for public-health policy, because limited effects may be had by identical educational messages when the principal constraint is service access, administrative complexity, or lack of behavioral capability.

By the primary focus on enacted behaviors, uptake, screening, and service use, the distinction between motivational readiness and implementation is also clarified

by the review. This distinction is not removed by the inclusion of one mixed-outcome study; instead, the need for intention and behavior to be interpreted separately is demonstrated by it. It may be indicated by intention that the rationale for action is accepted by individuals, while resources, opportunity, social support, and a viable delivery pathway are additionally required by actual behavior. Therefore, the policy question is not only how favorable beliefs are strengthened, but how conditions in which those beliefs can be translated into equitable and sustained practice are created.

The findings are consistent with previous meta-analytic evidence, by which it is demonstrated that heterogeneous and context-dependent associations with health behavior are generally shown by HBM constructs.(2)(3) However, previous work is extended by this review, in that the analytical focus is shifted from general prediction and intention toward observable health practices and implementation mechanisms. This distinction is theoretically important, because motivational readiness is reflected by intention, whereas actual behavior is shaped by the interaction between personal beliefs, behavioral capability, environmental opportunity, and health-service accessibility. It is shown by the present findings that motivation may be supported by threat and benefit perceptions, but the conversion of motivation into action is more likely when cues, self-efficacy, and manageable service conditions are simultaneously present.

Health behavior is rarely explained by a single theoretical variable, as demonstrated by a systematic review of behavioral modeling.(4) This conclusion is supported by the current synthesis, and it is further shown that the relative importance of HBM constructs is changed across behavioral contexts. Self-efficacy was particularly relevant for repeated or skill-dependent behavior, while cues to action were salient for service-dependent actions. This contextual differentiation is more useful for intervention planning than a universal ranking of HBM constructs, because which mechanism should be targeted for a particular behavior and delivery setting is indicated by it.

Susceptibility, severity, benefits, barriers, cues to action, and self-efficacy were identified as relevant factors by which willingness or intention was influenced in the review of COVID-19 vaccination intention.(5) It is suggested by the present review that the same constructs are not necessarily performed identically when the outcome is actual practice or service use. For example, intention may be sufficiently increased by favorable benefit perceptions, but actual screening or preventive-service use may still depend on provider recommendation, appointment availability, transport, privacy, and administrative simplicity. Why high uptake is not always produced by high awareness or expressed willingness is helped to be explained by the distinction.

Barriers, perceived severity, self-efficacy, and cues to action were identified as important factors by the included screening studies, consistent with findings from a previous cervical-screening review.(6) Nevertheless, a service-design interpretation is added by the present synthesis. Provider discussion in Kenya and Malawi was functioned as more than information provision; an institutional cue by which screening was legitimized and women were linked to an actionable service pathway was acted as by it.(14) In Johannesburg, Pap-smear uptake was associated with lower perceived barriers, which emphasizes that risk and severity messages are unlikely to be sufficient when practical or psychosocial difficulties are anticipated by women.(12) Therefore, tailored risk and benefit communication should be combined with provider-initiated recommendations, accessible appointment systems, privacy safeguards, simplified referrals, and practical support for the overcoming of financial, geographic, and psychosocial barriers by screening policy.

The numerical counts that are reported in this review should not be interpreted as pooled effect sizes. Different instruments, significance thresholds, model structures, sample sizes, and outcome definitions were used by the studies. A construct may be absent from a final model because of collinearity, mediation, model-selection procedures, or insufficient statistical power, rather than a true lack of relevance. Conversely, it is not established by significance in a large cross-sectional sample that behavior change will be caused by the changing of the construct. Therefore, the consistency counts are descriptive indicators by which pattern recognition is supported, but effect-size synthesis or experimental evidence cannot be replaced by them.

Causal effects are also not demonstrated by the evidence. Cross-sectional observational data were used by all included studies, and most HBM constructs and behavioral outcomes were self-reported. Reverse causation is plausible, because higher benefits, lower barriers, greater self-efficacy, or stronger perceived risk may be subsequently reported by individuals who already perform a behavior. Associations may be further inflated by common-method bias when the exposure and outcome are measured within the same questionnaire. The need for the findings to be framed as associations and policy hypotheses rather than definitive causal mechanisms is reinforced by these limitations.

Individual perceptions are primarily represented by the HBM, and social norms, institutional trust, material

resources, commercial determinants, gender relations, or policy constraints are not fully captured by it. These conditions are partly reflected by perceived barriers, but whether the appropriate response is counseling, financial protection, service redesign, community engagement, or regulatory action cannot be specified by a single questionnaire score. Therefore, HBM insights should be combined with socioecological, equity, and health-system analyses in policy formulation. The model is most useful when it is used so that modifiable behavioral mechanisms within a broader implementation context are diagnosed, not when it is used so that low uptake is attributed solely to individual beliefs.

Weight-management intention and BMI were jointly examined by one included study (10). Useful evidence on HBM pathways and an objective anthropometric indicator is provided by its inclusion, but intention should not be treated as equivalent to enacted weight-management practice. Therefore, the findings were interpreted as mixed-outcome evidence and were given less weight in claims that specifically concern actual behavior.(10) In the same way, independent predictors after adjustment for confounding cannot be established by bivariate findings.(18)(19) In addition, confidence in the interpretation of structural pathways is limited by inadequate model fit.(16)

The strengths of this review include an updated three-database search, supplementary citation tracking, an explicitly narrated Population–Exposure–Outcome framework, the prioritization of actual behavior and service uptake, the use of a design-specific JBI appraisal tool, item-level and descriptive score reporting, a quantitative description of construct consistency, and cross-context policy translation. By the inclusion of studies from multiple countries and behavioral domains, comparison between service-dependent and self-managed actions was enabled. Each construct is also linked to operational strategies and implementation indicators by the policy matrix, so that the synthesis is extended beyond the identification of statistical predictors.

Several limitations are still present. First, studies that were indexed only in regional, nursing, psychology, education, or social-science databases may have been missed by the search of Scopus, PubMed, and Google Scholar. Second, a risk of language and publication bias is created by the restriction to English-language peer-reviewed articles. Third, all included studies were observational and predominantly cross-sectional, so temporal ordering and causality cannot be established. Fourth, most outcomes and HBM constructs were self-reported and measured with non-equivalent instruments. Fifth, meta-analysis was precluded by heterogeneity, and sample size, precision, model complexity, or effect magnitude are not accounted for by the descriptive significance counts. Sixth, the protocol was not prospectively registered. Seventh, limited conceptual heterogeneity is introduced by the inclusion of one mixed-outcome study. Finally, generalizability may be affected by the concentration of COVID-19 prevention studies, although screening, reproductive and maternal health, lifestyle and risk prevention, self-care, and preventive-service use were also covered by the evidence.

In future research, prospective cohort, repeated-measures, quasi-experimental, or experimental designs should be used, so that whether changes in behavior are preceded and produced by changes in HBM constructs is established. Comparison across studies would be improved by standardized and validated HBM measures, while common-method bias would be reduced by objective or routinely recorded outcomes—such as screening completion, appointment attendance, medication refill, vaccination records, or digitally recorded practice. The content of perceived barriers and cues to action should also be specified by studies, rather than only global scale scores being relied on.

In policy and implementation research, whether uptake is improved equitably by HBM-informed service redesign, not only whether beliefs are changed by it, should be tested. Comparative studies are needed, so that which cue-to-action systems are effective across population groups, whether inequity is widened or reduced by digital reminders, and which self-efficacy strategies sustain behavior after initial adoption are determined. Interactions between psychological and structural barriers should be examined by the analyses, and whether effects differ by age, gender, socioeconomic position, disability, geography, and service accessibility should be reported. The transition from theoretical prediction to accountable public-health implementation would be strengthened by such research.

CONCLUSION

Across 14 studies that involved 7,403 participants, self-efficacy was significantly associated with outcomes in 10 studies (71.4%), and cues to action were significant in 8 of the 12 studies that assessed the construct (66.7%). Inhibitory or unfavorable associations were shown by perceived barriers in 7 studies (50.0%), and it was the most directionally consistent inhibitor after outcome coding was accounted for. Susceptibility was significant or contributed to a significant threat pathway in 9 studies (64.3%), severity was significant in 10 studies (71.4%), and benefits were positive in 8 studies (57.1%); however, these threat and

benefit constructs were varied according to disease salience, personal relevance, population characteristics, and the availability of an actionable response. It is indicated by these findings that risk communication alone should not be relied on by effective health policy. The most actionable approach is that timely prompts, accessible and user-centered services, transparent reduction of psychological and structural barriers, and skills-based support are combined. In primary and community health systems, the conversion of health beliefs into sustained promotive and preventive action can be improved by HBM-informed policy when it is integrated with broader equity, social-determinant, and health-system reforms.

REFERENCES

1. Janz NK, Becker MH, Rosenstock IM, Harrison JA, Mullen PD, Green LW. Historical origins of the Health Belief Model. Health Educ Monogr. 1974 Dec 1;2(1):328–35.
2. Carpenter CJ. A meta-analysis of the effectiveness of Health Belief Model variables in predicting behavior. Health Commun; 2010 Nov 30;25(8):661–9.
3. Harrison JA, Mullen PD, Green LW. A meta-analysis of studies of the Health Belief Model with adults. Health Educ Res. 1992;7(1):107–16.
4. Leman MA, Claramita M, Rahayu GR. Predicting factors on modeling health behavior: a systematic review. Am J Health Behav .2021;45(2):268–78.
5. Limbu YB, Gautam RK, Pham L. The Health Belief Model applied to COVID-19 vaccine hesitancy: a systematic review. Vaccines .2022 Jun 18;10(6):973.
6. Al-Ani A, Hammouri M, Sultan H, Al-Huneidy L, Mansour A, Al-Hussaini M. Factors affecting cervical screening using the Health Belief Model during the last decade: a systematic review and meta-analysis. Psychooncology. 2024 Jan 28;33(1):e6275.
7. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021 Mar 29;372:n71.
8. Joanna Briggs Institute. Joanna Briggs Institute critical appraisal tools. Adelaide: Joanna Briggs Institute; 2020.
9. McKenzie JE, Brennan SE, Ryan RE, Thomson HJ, Johnston RV, Thomas J. Defining the criteria for including studies and how they will be grouped for the synthesis. In: Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, et al., editors. Cochrane handbook for systematic reviews of interventions. Version 6. London: Cochrane; 2024.
10. Saghafi-Asl M, Aliasgharzadeh S, Asghari-Jafarabadi M. Factors influencing weight management behavior among college students: an application of the Health Belief Model. PLoS One. 2020 Feb 7;15(2):e0228058.
11. Noghabi AD, Mohammadzadeh F, Yoshany N, Javanbakht S. The prevalence of preventive behaviors and associated factors during the early phase of the COVID-19 pandemic among Iranian people: application of a Health Belief Model. J Prev Med Hyg. 2021;62(1):E60–6.
12. Mabotja MC, Levin J, Kawonga M. Beliefs and perceptions regarding cervical cancer and screening associated with Pap smear uptake in Johannesburg: a cross-sectional study. PLoS One. 2021;16(2):e0246574.
13. Rapheal E, Prithviraj R, Campbell S, Stoddard ST, Paz-Soldan VA. Using the Health Belief Model to predict pre-travel health decisions among U.S.-based travelers. Am J Trop Med Hyg. 2023;109(4):937–44.
14. Moucheraud C, Chibaka S, Golub G, Kalande P, Makwaya A, Ochieng E, et al. Factors associated with cervical cancer screening: results from cross-sectional surveys in Kenya and Malawi. BMC Public Health. 2025 May 27;25(1):1956.
15. Habibi S, Tavafian SS, Maghbouli R, Montazeri A. Investigating effective factors on musculoskeletal pain prevention behaviors in the elderly population living in nursing homes, based on the Health Belief Model: structural equation modeling approach. BMC Geriatr. 2025 Sep 3;25(1):685.
16. Eryando T, Sipahutar T, Poddar S. Community preventive behaviour and perception on the severity of COVID-19 disease in Indonesia, 2021-2022: structural equation modelling. F1000Research. 2024 Oct 3;12:966.
17. Mirakzadeh AA, Karamian F, Khosravi E, Parvin F. Analysis of preventive behaviors of rural tourism hosts in the face of COVID-19 pandemic: application of Health Belief Model. Front Public Health. 2021;9:793173.
18. Triharini M, Has EMM, Gita N. Determinant factors of anemia in pregnancy based on Health Belief Model: a correlational study. J Ners. 2023 Apr 1;18(1):40–6.
19. Muthmainnah M, Kurnia GM, Nugrahani A. Determinants of smoking prevention behavior of senior high school students: a short report. Tob Induc Dis. 2025;23:37.
20. Fathian-Dastgerdi Z, Khoshgoftar M, Tavakoli B, Jaleh M. Factors associated with preventive behaviors of COVID-19 among adolescents: applying the Health Belief Model. Res Social Adm Pharm. 2021 Oct;17(10):1786–90.
21. Jadil Y, Ouzir M. Exploring the predictors of health-protective behavior during the COVID-19 pandemic: a multi-country comparison. Environ Res.2021 Aug;199:111376
22. Li S, Jiang Q, Zhang P. Factors influencing the health behavior during public health emergency: a

case study on norovirus outbreak in a university. Data Inf Manag. 2021 Jan;5(1):27–39.
23. Setyaningsih W, Yudianti I, Mansur H. Perceived susceptibility, barriers, and cues to action as determinant factors of reproductive health behavior. Int J Public Health Sci. 2022;11(3):884–92.
24. Kementerian Kesehatan Republik Indonesia. Transformasi layanan primer Kemenkes fokus pada pencegahan di Puskesmas dan Posyandu. Jakarta: Kementerian Kesehatan Republik Indonesia; 2025.