

## Towards a Contextualized Social Vulnerability Index: Defining Key Domains and Indicators for Iran's Health System

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### Abstract

**Background:** Social vulnerability is an inherently context-dependent concept that has recently gained increasing attention within the framework of the social determinants of health. This study aimed to define and conceptualize social vulnerability within the specific context of Iran.

**Methods:** A sequential mixed-methods design was employed. An initial pool of indicators was systematically developed through a literature review. The Delphi consensus technique was used to conceptualize social vulnerability in Iranian society by identifying context-sensitive and culturally relevant indicators. Over six months, 23 national experts in health and social welfare participated in three rounds of discussions. To assess the relevance and importance of these indicators, statistical indices, including the mean, standard deviation, and coefficient of variation, were applied. A directed qualitative content analysis was conducted to systematically categorize the indicators into distinct dimensions.

**Results:** Experts identified 65 relevant indicators of social vulnerability. Indicators with the strongest consensus included families living below the poverty line, the unemployment rate, the ratio of marginalized populations, the number of malnourished individuals, people lacking social insurance, the share of housing costs, the number of out-of-school children, the proportion of food expenses in total household spending, education levels below a diploma, and the under-five mortality rate. The ten identified dimensions of social vulnerability in Iran were: Populations at Risk; Family and Gender; Economic; Health Infrastructure and Public Health; Education; Housing and Built Environment; Transportation and Mobility; Crime and Social Security; Emergency Response and Disaster Preparedness; and Social Capital and Institutional Support.

**Conclusion:** In developing countries such as Iran, social vulnerability is strongly influenced by macroeconomic fragility, governance constraints, and cultural factors. Developing a robust, context-sensitive framework for conceptualizing social vulnerability provides a foundation for practical tools to assess and monitor vulnerability more effectively. Ultimately, this approach supports targeted interventions aimed at improving the social determinants of health and enhancing population well-being.

**Keywords:** Social vulnerability, Contextualization, Dimensions and Indicators, Mixed Method, Iran

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### ↑What is “already known” in this topic:

Social vulnerability is an interdisciplinary concept increasingly applied in health and medicine. It encompasses a range of social, economic, and environmental factors that influence a population's capacity to respond to health risks. Although widely studied in high-income countries, the concept remains context-sensitive, with its conceptualization and measurement varying across different social and cultural contexts. Existing indices have limited applicability in non-Western contexts due to contextual and structural differences.

### →What this article adds:

This study introduces contextual innovations to the field of social vulnerability research. Through a three-round Delphi process involving a multidisciplinary panel of Iranian experts, it develops a locally adapted framework and indicator set grounded in the Social Determinants of Health. The study not only tailors international concepts to Iran's sociocultural and economic realities but also provides a transparent methodological pathway for other developing countries seeking to localize global vulnerability frameworks. The resulting framework offers a practical foundation for integrating social vulnerability assessment into health planning and policy-making.

## Introduction

Social vulnerability (SV) is an interdisciplinary concept that has gained increasing importance and attention in recent years (1). Although it lacks a universally accepted definition, it is commonly understood as the capacity of a community to adapt to and recover from crises and disasters (2). This adaptive capacity is deeply embedded in the institutional structures and social organization of a society (3,4). Moreover, SV is often intensified by the intersection of social and demographic factors that collectively determine the extent to which communities can withstand and respond to adverse events (5).

Due to its complex and dynamic nature, conceptualizing SV remains a challenging and multifaceted task (1). One of the most common and practical approaches is to define it through the aggregation of multiple factors and variables that contribute to a community's susceptibility and resilience (1, 4). Using this approach, several SV indices have been developed (6–8). Among these, the Social Vulnerability Index (SoVI) proposed by Cutter and colleagues (8) is considered one of the pioneering frameworks in disaster management.

In recent years, growing attention has been directed toward applying the SV concept in the fields of health and medicine (1, 7). The Social Vulnerability Index (SVI) developed by the Centers for Disease Control and Prevention (CDC) represents a specialized adaptation of this concept for public health purposes (6). This index has been widely applied in numerous studies to examine the relationship between SV and various health outcomes (9–11). Furthermore, refined indices such as the Social Vulnerability Metric (SVM) have been developed to enhance the predictive capacity of SV measures in explaining health disparities and outcomes (7).

Although these indices are inspired by the conceptual framework of the Social Determinants of Health (SDH), their alignment with it remains limited. The SDH framework views health outcomes as the result of dynamic and interactive relationships among contextual, structural, and individual (micro-level) factors (12). However, most existing SV indices capture only a narrow segment of this complexity—typically focusing on a limited set of socioeconomic and demographic indicators (1). Moreover, their adaptability to societies with different contextual and structural characteristics is problematic (13). A further limitation lies in the fact that the conceptual foundations of these indices were primarily developed in high-income, Global North countries—such as the United States—making their direct application to developing contexts with distinct social, cultural, and institutional configurations both theoretically and empirically challenging (14).

Developing countries in the Global South operate under conditions that differ substantially from those of high-income nations. They are often characterized by low or middle income levels, limited institutional capacity, and distinct structural configurations (15). Moreover, cultural values, social norms, and community practices play a crucial role in shaping vulnerability patterns within these contexts (16). Consequently, the conceptualization of SV

must reflect these contextual realities. The uncritical application of frameworks developed in Western settings risks producing inaccurate assessments and overlooking locally specific determinants of vulnerability, thereby diminishing their relevance and effectiveness for policy and practice (13, 14).

Iran exhibits demographic and structural characteristics shaped by its geographical and ethnic diversity (16). In addition, the structure of its welfare state, the informal economy, and the influence of religion (17) contribute to unique challenges that heighten its susceptibility to environmental disasters and health crises (15). A major social issue in contemporary Iranian society is uneven development and the center–periphery divide, which extends from urban centers to border regions marked by deprivation and disadvantage. These disparities in socioeconomic conditions and development have led to inadequate health infrastructure and inequities in access to healthcare services (18, 19).

In Iran, the application of the SVI has remained narrowly focused on natural disasters and environmental hazards (15, 20–23), reflecting a limited and compartmentalized understanding of vulnerability. Its potential relevance to health and medicine has received far less systematic attention. The few studies that have examined SVI in health-related contexts—primarily during the COVID-19 pandemic (16, 24–27)—have tended to use the index as an ad hoc tool rather than within a coherent analytical framework. These studies mainly concentrated on selecting context-specific indicators for pandemic response but were constrained by provincial-level analyses, small and fragmented variable sets, and the absence of a robust theoretical model anchoring SVI within the broader SDH paradigm. As a result, the existing evidence base remains fragmented and insufficient for guiding comprehensive, equity-oriented public health planning.

To address these gaps, the present study adopts the SDH as a guiding theoretical framework and integrates a Delphi consensus approach with directed qualitative content analysis. Developing a conceptual framework encompassing key domains and indicators of SV in health and medicine is essential. This framework must provide a comprehensive perspective that considers the full range of social factors shaping Iranian society and reflects its distinct conditions and circumstances. A context-sensitive and culturally tailored conceptualization of SV will enable the operationalization of this concept to generate accurate and valid information and evidence. A productive approach should incorporate local knowledge from national experts who possess deep insights into the structure and dynamics of Iranian society. The objectives of this study are to:

Identify and prioritize contextually relevant domains and indicators of SV applicable to Iran's health and medical sectors.

Develop a conceptually coherent and empirically validated framework for assessing SV, grounded in the SDH theory and informed by expert consensus.

This study contributes to the global discourse on SV by

bridging international frameworks with locally grounded knowledge, offering a model that enhances both the contextual relevance and cross-national comparability of SV assessment.

## Methods

### Design

This study employed a sequential mixed-methods design, integrating a Delphi consensus approach with a directed qualitative content analysis. In the first phase, the Delphi method was used to identify and prioritize potential SV indicators based on expert consensus. In the second phase, a Delphi-informed qualitative content analysis was conducted to organize the finalized indicators into conceptual dimensions and develop a context-sensitive framework for assessing SV in Iran's health and medical context. This integrative approach ensures both empirical validation and theoretical grounding of the resulting framework.

### Literature Review

The initial pool of indicators was systematically derived from core domains identified in the global literature, as well as from studies specific to the Iranian context that defined and conceptualized SV. A comprehensive literature search was conducted in December 2023 to identify relevant studies on SVIs within the domains of health and medicine. The search included both English and Persian publications and covered major academic databases, including PubMed, Scopus, Web of Science, Google Scholar, SID, and Magiran. The inclusion criteria were: (i) original research articles, and (ii) studies that developed or applied an SVI within health or medical contexts. Studies were excluded if they: (i) embedded the SVI as a subcomponent of a broader, (ii) non-health-focused index, or (ii) analyzed individual social factors without addressing the composite index structure. The search strategy combined key terms using Boolean operators, including “social vulnerability index”, “health”, “medicine”, and “public health”. Reference lists of included articles were also manually screened to identify additional sources.

All records were imported into EndNote X9 for citation management and duplicate removal. Studies meeting the predefined inclusion criteria were reviewed in full text, and relevant indicators were extracted for further analysis and synthesis.

### Delphi procedure

To contextualize and validate the relevance of the identified indicators within Iran's context, the Delphi technique was employed. This method was chosen for its capacity to systematically collect expert opinions and achieve consensus on complex, multidimensional issues (28). The Delphi process was conducted over three iterative rounds during a six-month period (December 2023–July 2024). A total of 23 experts participated in Round 1, of whom 17 completed all three rounds. The reduction in participation was primarily due to workload and scheduling conflicts rather than disagreement with the study con-

tent.

The survey was administered electronically via email to ensure anonymity. Experts were unaware of each other's identities, and only aggregated statistical results (mean, standard deviation, and coefficient of variation) were shared after each round to guide feedback and promote objective consensus. To minimize bias, detailed definitions and explanations of each indicator were included in the questionnaire, and clarification was provided upon request. The research team maintained strict neutrality throughout the process, avoiding leading statements or interpretive feedback. Responses were analyzed independently by two researchers to enhance accuracy, reliability, and transparency in data interpretation.

### Expert Panel Selection

Experts were purposefully selected to ensure diversity in disciplinary background and organizational affiliation. The inclusion and exclusion criteria were defined as follows:

#### Inclusion criteria

A minimum of a Master's degree in public health, social sciences, health policy, disaster management, or related fields. At least five years of professional or research experience related to social determinants of health, SV, or community resilience.

Current or past affiliation with relevant institutions such as universities, research centers, governmental health organizations, or NGOs.

Willingness to participate in all Delphi rounds and provide informed consent.

#### Exclusion criteria

Fewer than three years of relevant professional or academic experience.

Lack of direct expertise in SV or related domains.

Withdrawal of consent at any stage of the study.

A total of 32 experts from diverse fields were initially identified and invited to participate through formal introductory letters outlining the study's purpose and expectations. Of these, 23 experts consented to join the Delphi panel. The final group comprised 14 male (60%) and 9 female (40%) participants, representing a balanced gender distribution. Detailed demographic and professional characteristics of the Delphi participants are presented in Table 1.

### Phase 1: Indicator Completion and Expansion

In the first round, a preliminary framework of indicators was distributed to all Delphi panel members. The primary objective was to refine and expand the list by incorporating expert feedback. Panel members were asked to thoroughly review the initial list and propose additional indicators that might have been omitted. Based on the feedback received, the indicator framework was revised and updated to reflect the collective input of the experts.

Table 1. Summary of Delphi members' profile

Expertise	Total Number	Gender	
		Male	Female
Health and Social Welfare	3	3	-
Sociology	3	3	-
Social Determinants of Health in Disasters and Social Policy	3	2	1
Occupational Health and Public Health	2	1	1
Social Medicine	1	-	1
Psychiatry	1	-	1
Epidemiology	1	1	-
Rehabilitation Management	1	-	1
Social Work	2	1	1
Psychology	1	-	1
Economics	1	1	-
Gerontology	1	-	1
Total	23	14	9

### Phase 2: Suitability Assessment

In the second round, the revised list of indicators deemed relevant for assessing SV in Iran's health and medical sectors was redistributed to the Delphi panel. Panelists evaluated the appropriateness of each indicator using a 5-point Likert scale, where 4 indicated completely suitable, 3 suitable, 2 somewhat suitable, 1 unsuitable, and 0 completely unsuitable. In this phase, responses were obtained from 21 participants. The mean, standard deviation (SD), and coefficient of variation (CV) were then calculated for each indicator to assess the overall level of agreement.

### Phase 3: Reevaluation and Consensus Measurement

In the final round, the updated questionnaire—including each indicator along with its computed mean, SD, and CV from the previous round—was circulated to the experts. Panel members were asked to reconsider and reevaluate the appropriateness of all indicators, taking into account the summarized group feedback. In this phase, 17 participants submitted responses. New mean, SD, and CV values were then calculated for each indicator to determine the level of consensus.

### Data analysis

The coefficient of variation (CV) was employed to rank and classify the indicators by incorporating both the mean and standard deviation. Initially, the indicators were arranged in ascending order based on their CV values and subsequently divided into two groups. In the Delphi technique, a CV threshold between 30% and 50% is commonly used to categorize indicators. A CV below 30% indicates a high level of consensus and agreement among experts, signifying acceptance and validity of the indicator. A CV between 30% and 50% denotes moderate consensus and agreement, while a CV exceeding 50% reflects substantial variability and disagreement, suggesting that the indicator should be excluded (28). All data analyses were performed using SPSS Version 26 software.

The formula for the CV is:

$$CV = \left( \frac{\text{Standard Deviation}}{\text{Mean}} \right) \times 100$$

### Categorizing Dimensions of SV

A directed qualitative content analysis was conducted within the framework of the SDH. Two researchers independently coded the transcripts according to predefined categories derived from this framework. Indicators that did not align with existing codes were inductively added as new subcategories, and conceptually similar indicators were iteratively grouped through successive rounds of coding.

The coding framework was continuously refined through comparative analysis and the consolidation of overlapping codes to enhance clarity and consistency. To ensure rigor and reliability, explicit coding guidelines were developed, analytical memos were maintained, and discrepancies were resolved through collaborative discussions until consensus was achieved. This systematic and transparent process facilitated the development of valid and robust categorical dimensions of SV.

Qualitative data analysis was conducted using MAXQDA (2018), and the results were visualized with a bar chart created in Microsoft Word (2017).

### Results

Through three rounds of the Delphi process, expert consensus was achieved on the appropriateness and priority of each indicator for capturing SV in the context of health within Iran. The initial framework, developed through a comprehensive literature review, contained 182 indicators. Panel members proposed the addition of eleven new indicators: population aged 75 years and older, percentage of households covered by supportive institutions, percentage of households without homeownership, child marriage, percentage of sexually transmitted diseases (STDs), debt-to-income ratio, budget credibility in times of crisis, share of infrastructure investment relative to total investments, number of non-governmental organizations and foundations, percentage of fraud, bribery, and corruption, and percentage of ethnic and religious minorities.

The final framework included 193 indicators. Of these, 128 indicators with a CV of 50% or higher were excluded from further consideration. The remaining 65 indicators, each with a CV below 50%, were identified as suitable for conceptualizing SV in Iran's health and medical sectors. Among these, 33 indicators with a CV below 30% were classified as having a high level of agreement, while 32 indicators with a CV between 30% and 50% were classified as having a moderate level of agreement. Tables 2 & 3 presents the indicators that received respectively high and moderate agreement among Iranian health specialists.

Drawing on a directed qualitative content analysis that integrated insights from the literature on SV frameworks and the 65 indicators refined through the three-round Delphi process, the indicators were organized into ten distinct dimensions consistent with established theoretical models

Table 2. Indicators with a high level of expert agreement

Row	Consensual indicators	Mean	SD	CV%
1	Percentage of families below the poverty line	4	0	0
2	Unemployment rate	4	0	0
3	Marginal population ratio	3.67	0.46	12
4	Percentage of children malnourished	3.67	0.46	12
5	Percentage of people without social insurance	3.5	0.52	15
6	Share of housing costs from household budgets	3.53	0.53	15
7	Out-of-school children's percentage	3.43	0.60	17
8	Share of food in total household expenses	3.30	0.58	17
9	Population 18 years and older with education under diploma	3.07	0.54	17
10	Under 5-year mortality rate	3.47	0.64	18
11	Out-of-pocket payment of patients for health expenses	3.47	0.64	18
12	Percentage of female headed households	3.43	0.64	19
13	Illiteracy rate of population 6 years and above	3.43	0.64	19
14	The proportion of child labor in the population	3.42	0.64	19
15	Percentage of people without health insurance	3.36	0.64	19
16	Gini coefficient	3.65	0.74	20
17	Housing density	2.94	0.60	21
18	Households covered by supportive institutions	3.4	0.75	22
19	Percentage non-ownership of a house	3.16	0.73	23
20	Prison population rate	3.08	0.71	23
21	Shortage of hospital beds per 1000 people	3.21	0.75	23
22	The proportion of drug users	3.14	0.75	24
23	Homeless percentage of population	3.34	0.83	25
24	Percentage of child headed Households	3.67	0.92	25
25	Shortage of physicians per 10000 persons	3.07	0.77	25
26	Lack of internet access	2.93	0.75	25
27	Lack of rehabilitation centers per residents	2.75	0.71	26
28	Divorce rate	3.07	0.80	26
29	Lack of access to public transportation	2.72	0.71	26
30	Maternal mortality rate	3.23	0.87	27
31	Lack of access to health care	3.15	0.85	27
32	Lack of emergency centers	3.14	0.85	27
33	Percentage of marriages under 18 years of age	3.07	0.84	27

Table 3. The indicators with medium level of agreement

Row	Consensual indicators	Mean	SD	CV%
34	Percentage of victims of domestic violence	3.14	0.97	31
35	Rate of thefts	3	0.92	31
36	Percentage of population who are immigrants	3	0.93	31
37	The degree of earthquake-prone areas	2.85	0.89	31
38	Percentage of single-parent households	3.08	0.97	31
39	Murder/homicide rate	3.27	1.04	32
40	Number of households living per housing unit	2.85	0.92	32
41	Percentage of people with disabilities	3	0.97	32
42	Percentage of households with no available vehicles	2.58	0.84	32
43	Share of infrastructure investment from total investments	2.72	0.92	34
44	Budget credibility in times of crisis	2.47	0.84	34
45	The number of relief forces	2.65	0.91	34
46	Suicide mortality rate	3.08	1.06	34
47	Population aged 75 years and over	2.93	1.02	35
48	Lower green spaces per capita	2.62	0.92	35
49	Violent crime rate	3.07	1.10	36
50	Fire stations distribution <i>per square kilometer</i>	2.77	1.01	36
51	Percentage of fraud, bribery and corruption	2.94	1.10	37
52	Percentage of old house	2.74	1.04	38
53	Prevalence of chronic diseases	2.58	1	39
54	The percentage of STDs	2.54	1.02	40
55	Debt-to-income ratio	2.86	1.15	40
56	Prevalence of mental disorders	2.79	1.15	41
57	Number of Non-governmental organizations and foundations	2.65	1.12	42
58	Ratio of widows	2.47	1.07	43
59	Percentage of children under five years old	2.87	1.30	45
60	Number of relief and rescue stations	2.67	1.19	44
61	Means of essential transport during a crisis	2.34	1.10	47
62	Percentage of people have a fire extinguisher	2.34	1.13	48
63	Percent employed in high-risk jobs	2.54	1.23	48
64	Low airline capacity	2.20	1.07	49
65	Percentage of ethnic and religious minorities	2	1	50

in SV research. Each dimension comprises a set of conceptually coherent and semantically aligned indicators, identified through iterative inductive coding and compara-

tive analysis. This framework provides a context-sensitive yet theoretically grounded structure for assessing SV in the Iranian setting.

Table 4. Dimensions and indicators of social vulnerability in Iran

Domains and Items	
Populations at Risk (8 indicators, 12.30%)	Educational Vulnerability (3 indicators, 4.61%)
Percentage of children under five years old	Out-of-school children's percentage
Population aged 75 years and over	Population with education under diploma
Percentage of population who are immigrants	Illiteracy rate of population 6 years and above
Percentage of ethnic and religious minorities	
Homeless percentage of population	Housing and Built Environment Vulnerability (10 indicators, 15.38%)
Percentage of people with disabilities	Housing density
Percent employed in high-risk jobs	Percentage of old houses
The proportion of child labor in the population	Lower green spaces per capita
	Percentage non-ownership of houses
Family and Gender Vulnerability (7 indicators, 10.77%)	marginal population ratio
Percentage of Female headed households	Number of households living per housing unit
Percentage of child headed Households	Transportation and Mobility Vulnerability (4 indicators, 6.2%)
Child marriage rates	Lack of access to public transportation
Divorce rate	Percentage of households with no available vehicles
Ratio of widows	Low airline capacity
Percentage of single-parent households	
Victims of domestic violence	Crime and Social Security Vulnerability (7 indicators, 10.77%)
	Murder/homicide rate
Economic Vulnerability (9 indicators, 13.70%)	Violent crime rate
Percentage of families below poverty line	Prison population rate
Unemployment rate	Suicide mortality rate
Gini coefficient	Percentage of fraud, bribery, and corruption
Debt-to-Income ratio	The proportion of drug users
Share of food costs in total expenditures	Rate of thefts
Share of housing costs from household budgets	
Share of infrastructure investment from total investments	Emergency Response and Disaster Preparedness Vulnerability (8 indicators, 12.31%)
percentage of people without social insurance	Number of relief forces
the Out-of-pocket payment of patients for health expenses	Fire stations distribution per square kilometer
	Budget credibility in times of crisis
Health Infrastructure and Public Health Vulnerability (12 indicators, 18.46%)	Earthquake-prone areas
Lack of hospital beds per 1000 people	Percentage of people with fire extinguishers
Shortage of physicians per 10,000 persons	Lack of Internet Access
Prevalence of chronic diseases	Number of Relief and Rescue Bases
Maternal mortality rate	Means of essential transport during a crisis
Percentage without health insurance	
The percentage of sexually transmitted disease	Social Capital and Institutional Support Vulnerability (2 indicators, 3.07%)
Prevalence of mental disorders	Percentage of households covered by supportive institutions
Under 5-year mortality rate	Number of non-governmental organizations and foundations
Rehabilitation centers per residents	
Lack of access to health care	
the number of emergency centers	
Percentage of malnourished population	

The dimensions of SV in Iran are as follows:  
 Populations at Risk (8 indicators, 12.30%)  
 Family and Gender Vulnerability (7 indicators, 10.77%)  
 Economic Vulnerability (9 indicators, 13.70%)  
 Health Infrastructure and Public Health Vulnerability (12 indicators, 18.46%)  
 Educational Vulnerability (3 indicators, 4.61%)  
 Housing and Built Environment Vulnerability (10 indicators, 15.38%)  
 Transportation and Mobility Vulnerability (4 indicators, 6.20%)  
 Crime and Social Security Vulnerability (7 indicators, 10.77%)  
 Emergency Response and Disaster Preparedness Vulnerability (8 indicators, 12.31%)  
 Social Capital and Institutional Support Vulnerability (2 indicators, 3.07%).

A comprehensive summary of these dimensions and their corresponding indicators is presented in Table 4.

The Figure 1 illustrates the dimensions of SV in Iran, along with the frequency of indicators identified within

each dimension.

## Discussion

This study developed a conceptual framework for SV in Iran that is applicable to the fields of health and medicine. The proposed framework comprises 10 domains and 65 indicators. Based on evaluations from Delphi experts, 33 of these indicators were identified as the most important and relevant. At first glance, the framework appears comprehensive, encompassing a broad range of domains and indicators that reflect multiple dimensions of community life.

The breadth and diversity of the domains and indicators in this framework, compared with existing models and indices (6, 7), underscore the necessity of contextually grounded conceptualizations of constructs such as SV. Developing such concepts from within the specific social, cultural, and economic contexts of each society is both essential and critical—particularly since most existing frameworks have been developed in high-income, Western industrialized nations (13, 14).

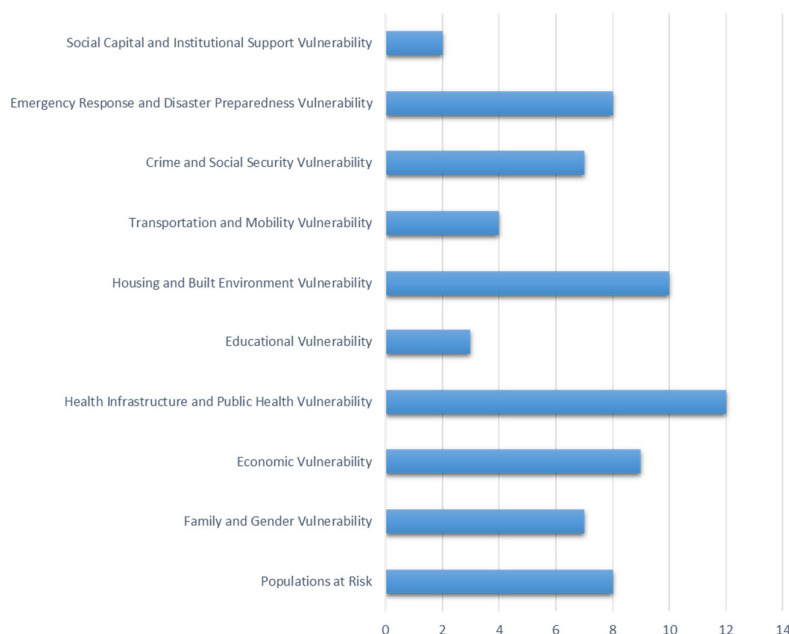


Figure 1. Dimensions of SV and the frequency of indicators

Countries such as Iran—which differ significantly in developmental conditions and possess distinct social structures and institutions, similar to many low- and middle-income countries—often face substantial governance challenges and gaps in state capacity (29, 30). These limitations can hinder governmental ability to fulfill social responsibilities. For example, in the proposed framework, the incomplete coverage of social security emerges as a key indicator of state underperformance. Large segments of the population remain without adequate social protection, reflecting a critical shortfall in efforts to achieve comprehensive and inclusive social welfare (31).

In general, economic fragility and underdevelopment in many Middle Eastern countries expose their societies to recurrent and multifaceted crises (15). In Iran, these challenges have become increasingly pronounced and wide-ranging. Prolonged international sanctions (32) and persistent inflation have further eroded the country's economic structures and institutions, limiting their capacity to meet population needs (17). Within this study, economic vulnerability encompasses the largest number of indicators and, according to expert evaluations, represents the highest-priority and most critical domain.

However, the challenges facing the country are not limited to economic instability and governance deficiencies; cultural and social norms also play a significant role in intensifying SV (15). One salient example is child marriage, which Delphi panel members identified as a context-specific issue deeply rooted in local realities—one that lacks a direct counterpart in most Western models or frameworks. Gender-based restrictions represent another critical factor shaping SV in Middle Eastern societies, as they constrain women's economic and social participation (33). These constraints become even more consequential

when women serve as heads of households, further exacerbating and deepening their vulnerability.

These intermediate and structural determinants of SV create a distinct, hybrid vulnerability profile characterized by structural fragility (e.g., economic sanctions and inflation), institutional weaknesses (such as fragmented welfare systems), and cultural constraints. The identified domains are interconnected through multiple causal mechanisms operating within dynamic social contexts. Some determinants exert direct causal effects, while others have more indirect or mediated influences. For instance, education—another key domain—acts as a cross-cutting determinant of vulnerability and is strongly emphasized in this study for its broad and long-term impact (24). This conceptualization aligns with the SDH framework, reinforcing its relevance and applicability for understanding and conceptualizing SV.

These findings demonstrate that a hybrid approach can effectively localize international SV frameworks without compromising their theoretical integrity. When compared with international conceptualizations such as the CDC's SVI or SVM—both developed for health and medical contexts and recognized for their validity and reliability (6,7)—the proposed framework maintains a comparable level of conceptual rigor.

Although the framework retains the universal structure found in global models, encompassing socioeconomic, demographic, and housing-related dimensions (34), it also diverges in meaningful ways by incorporating additional domains and indicators tailored to the Iranian context. Specifically, it introduces Crime and Social Security Vulnerability and Social Capital and Institutional Support Vulnerability as context-specific domains. Moreover, the relative importance of each domain varies according to

localized social, cultural, and economic conditions, underscoring the importance of contextually grounded assessments in settings such as Iran.

Unlike the SVM or CDC-SVI, which primarily assess structural exposure, or others Framework, which emphasizes adaptive capacity (7,34), the present framework integrates both structural and contextual determinants of vulnerability. In contrast to high-income countries—where SV is often shaped by factors such as social isolation or population aging (35)—vulnerability in Iran is deeply rooted in macroeconomic fragility and governance limitations, reflecting broader shortcomings in the state's capacity to fulfill essential responsibilities.

Although several regional studies on SV have been conducted within Iran (23–25), none have provided a comprehensive, context-sensitive framework applicable across all provinces. The proposed framework therefore fills a critical gap by offering a holistic and nationally relevant structure for assessing SV.

This study presents a contextually adapted yet theoretically grounded framework that remains aligned with international models. It demonstrates that global SV frameworks can be meaningfully localized without compromising their theoretical foundations. The hybrid approach used here—integrating structural fragility, institutional weaknesses, and cultural constraints—differentiates Iran's SV profile from both international and regional counterparts. Consequently, the application of a one-size-fits-all framework risks misrepresenting local realities.

The Iranian framework extends existing models by incorporating sociocultural determinants consistent with SDH theory, while maintaining methodological comparability with global indices such as the SVI and SVM. This structure enhances conceptual clarity and provides a practical foundation for developing measurable indices tailored to national health planning and policy evaluation.

Nevertheless, this study's reliance on expert consensus through the Delphi method introduces potential subjectivity and selection bias, despite deliberate efforts to include a diverse range of expertise. Future research should therefore aim to empirically validate and refine the identified indicators and domains through quantitative studies across diverse Iranian populations and other developing-country contexts. Longitudinal and intervention-based research could further evaluate the framework's predictive capacity for health outcomes and its utility in informing evidence-based policy decisions.

Moreover, expanding interdisciplinary collaboration and integrating community-based participatory research may enhance the framework's contextual sensitivity and adaptability. The qualitative content analysis did not employ formal inter-coder reliability metrics, which may affect the consistency of indicator classification. Finally, some indicators may be context-specific, potentially limiting their direct applicability to other countries without appropriate contextual adaptation.

Policymakers and health authorities should adopt the proposed context-sensitive SV framework as a foundational tool for identifying and prioritizing at-risk populations, particularly in developing countries. Integrating

these indicators into national and local health surveillance systems can facilitate targeted resource allocation and the design of tailored interventions for economically insecure and housing-deprived populations. Executive agencies are encouraged to collaborate closely with local experts across provinces and regions to incorporate region-specific knowledge, ensuring that interventions are both culturally appropriate and contextually relevant.

Furthermore, SV assessments should inform multisectoral policies addressing the underlying social determinants of health (SDH)—including poverty reduction, access to education, housing improvement, and healthcare coverage. Effective coordination among the health, social welfare, urban planning, and disaster management sectors is essential to strengthen community resilience and reduce vulnerability. Continuous monitoring and evaluation mechanisms should also be established to assess the impact of implemented policies and programs, enabling timely adjustments and improvements in addressing SV.

## Conclusion

This study identified ten key domains and a set of measurable indicators that contextualize SV within Iran's health system. Grounded in the Social Determinants of Health framework, the findings highlight the importance of addressing upstream social factors that shape population health, particularly in settings where healthcare systems remain predominantly treatment-oriented. The proposed framework offers a contextually adapted tool to guide preventive and equity-oriented health planning. Strengthening intersectoral collaboration—among the health, social welfare, education, and urban development sectors—is essential for the practical application of these indicators. Integrating the proposed framework into national and regional health surveillance and planning systems could enhance the evidence base for reducing SV and promoting health equity across diverse regions of Iran.

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## Conflict of Interests

The authors declare that they have no competing interests.

## Authors' Contributions

Hajeer Mahmoudi Panah: manuscript writing, data collection; Seyed Hossein Mohaqeqi Kamal: study design, data analysis; Mehdi Basakha: data analysis, visualization; Homeira Sajjadi: data interpretation; and Farhad Nosrati Nejad: conceptualization.

## Ethical Considerations

This study received approval from the Research Ethics Committee of the University of Social Welfare and Rehabilitation Sciences, Tehran, Iran (IR.USWR.REC.1402.142). In the consultation with experts, the participation was voluntary and anonymous.

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**Data availability**

The data that support the findings of this study are available from the corresponding author upon reasonable request.

**AI Use Statement**

The authors declare that artificial intelligence tools were used solely for language editing.

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