

# Population Well-Being in Mashhad: Mental Health Distribution and Demographic Gradients

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## Abstract

**Objective:** Positive mental health is a distinct dimension of population health. Despite the validation of the Persian Mental Health Continuum–Short Form (MHC-SF), population-based estimates for adult municipal surveillance in Iran are limited. To describe MHC-SF score distributions, internal consistency, and demographic gradients among adults in Mashhad.

**Method:** A population-based cross-sectional survey (May 2024–March 2025) used stratified cluster sampling across five health districts (50 clusters; Kish-grid household selection). Adults aged  $\geq 18$  years completed the 14-item Persian MHC-SF indexing emotional well-being (EWB), social well-being (SWB), and psychological well-being (PWB).

**Results:** Among 2,066 adults (57.6% women), the overall mean (SD; median) MHC-SF score was 61.55 (13.21; 63), with domain scores of 28.99 (6.19; 30) for PWB, 19.01 (5.63; 19) for SWB, and 13.54 (4.11; 14) for EWB. Men scored slightly higher than women on the total scale, EWB, and PWB (all  $P < 0.001$ ; small effect sizes), while the SWB difference was not statistically significant ( $p = 0.075$ ). Age showed weak positive associations with total, EWB, and SWB scores ( $p = 0.060$ – $0.069$ ;  $P \leq 0.006$ ), but not PWB ( $p = 0.018$ ;  $P = 0.408$ ). Item-level contrasts suggested higher male endorsement of agency/meaning indicators and higher female endorsement of benevolence/collective optimism; both sexes reported high levels of warm, trusting relationships. In a multivariable linear regression adjusting for age and sex simultaneously, demographic predictors accounted for  $< 1\%$  of outcome variance, with male sex independently associated with higher total, EWB, and PWB scores, and age independently associated with slightly higher total, EWB, and SWB scores.

**Conclusion:** In this representative urban population-based study, positive mental health was moderately high; PWB ranked highest, while SWB lagged. Demographic gradients were small: men slightly exceeded women, and older adults reported marginally higher EWB and SWB. For surveillance, the MHC-SF total score appears suitable as a summary indicator, while the SWB profile may help identify community-level levers (e.g., social capital and trust) to strengthen social connectedness in Mashhad, Iran.

**Key words:** Cross-Sectional Studies; Iran; Mental Health; Psychological Well-Being; Mental Health Continuum–Short Form

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**P**ositive mental health is increasingly recognized as a core dimension of population health rather than merely the absence of mental disorders. In Keyes' two-continua model, mental health and mental illness are correlated but distinct, meaning that low well-being can occur without a diagnosable disorder and moderate-to-high well-being can coexist with symptoms (1). This distinction supports public-health surveillance that monitors well-being as a population asset alongside disorder-focused indicators, as flourishing is associated with better functioning beyond the absence of symptoms (1).

The Mental Health Continuum–Short Form (MHC-SF) operationalizes this framework (2-4). It assesses three complementary domains of positive mental health. Emotional well-being (EWB) reflects hedonic well-being and includes life satisfaction, happiness, and interest in life. Psychological well-being (PWB) reflects individual eudaimonic functioning, including self-acceptance, personal growth, purpose in life, environmental mastery, autonomy, and positive relations with others. Social well-being (SWB) captures functioning in the public sphere, including social integration, social contribution, social coherence, social actualization, and social acceptance (1). Because SWB includes societal appraisal and generalized trust, it is typically the most context-sensitive domain and is frequently the lowest rated MHC-SF domain in general-population studies (5, 6).

Demographic gradients in these domains can identify subgroups most likely to benefit from well-being promotion. Across settings, sex differences in overall positive mental health are usually small, but item-level profiles can reflect gendered roles and opportunities (7). Age gradients are often more visible for emotional aspects of well-being: many studies report maintained or increasing EWB into later life despite declining physical health, a phenomenon sometimes described as the well-being paradox (8). Socioemotional selectivity theory provides a mechanistic explanation by proposing that perceived time limitations increase the prioritization of emotionally meaningful goals and improve emotion regulation, which can support higher EWB and, in some contexts, stronger social acceptance with age (9).

In Iran, the Persian MHC-SF has undergone cultural and linguistic adaptation and has shown strong psychometric performance in adolescent and young-adult samples, including confirmatory support for the three-factor structure and evidence of convergent and discriminant validity (10, 11). Published work also reports good internal consistency and measurement invariance across gender, supporting meaningful sex comparisons (10). However, the strengths of prior Iranian research (psychometric rigor and specialized subgroup focus) are also weaknesses for municipal surveillance: most studies rely on convenience samples (e.g., students) or specific exposed groups, and thus they do not provide general-

adult reference distributions or city-level benchmarks (12). In parallel, very large registry datasets can be informative but may reflect selective catchments (e.g., marginalized areas) rather than the general urban population (13). These limitations leave cities without representative norms for interpreting MHC-SF scores and monitoring trends.

Despite a validated Persian MHC-SF, contemporary probability-sampled city-level estimates for adults remain limited in Iran. This gap matters because Iran's integrated primary healthcare network can support representative sampling and routine monitoring, making municipal surveillance of positive mental health feasible and actionable (14). The present study addresses this gap by providing Mashhad-wide distributions of total and domain MHC-SF scores, evaluating internal consistency under field conditions, and describing age and sex gradients at both the scale and item level to clarify which facets drive subgroup differences.

To address these needs, the present study applies the MHC-SF within a probability-sampled, population-based survey of adults in Mashhad, Iran's second-largest city, to (i) estimate the distribution of total well-being and its subscales (EWB, PWB, SWB); (ii) examine sex- and age-related patterns under a theoretically informed framework; and (iii) evaluate internal consistency as part of routine quality assurance for surveillance-oriented use in an urban Iranian context.

## Materials and Methods

### *Study Design and Setting*

We conducted a population-based, cross-sectional survey of adults living in Mashhad, Iran's second-largest city. Fieldwork took place between May 2024 and March 2025.

### *Study Population and Sampling*

The target population was all Mashhad residents aged  $\geq 18$  years. The sampling frame was derived from adult registrations within the municipal primary healthcare network, which spans the city's five administrative health districts and covers over 95% of residents, enabling representative sampling.

We used proportionally allocated, stratified cluster sampling. The five health districts served as strata. Within each stratum, ten comprehensive health centers were randomly selected from the official registry (computer-generated lists) and treated as primary sampling units.

For each selected center's catchment area, field teams randomly chose an index household from the electronic family database, canvassed all dwellings in the corresponding neighborhood block, and screened residents against preset eligibility criteria. When multiple eligible individuals were present, participant selection within the block used the Kish grid to avoid selection bias. If a block did not yield the required number of participants, teams proceeded systematically to adjacent blocks until the cluster quota was met.

**Recruitment and Follow-up**

Randomly selected individuals received hand-delivered invitations, followed by explanatory phone calls from trained staff. Consenting participants were scheduled for full assessments at nearby community health facilities or, if preferred, at home. Non-responders were telephoned up to three additional times at intervals of at least 48 hours. Those unreachable after these attempts, or who declined after the final contact, were replaced using the same random selection procedures within the cluster until each stratum reached its target size.

**Eligibility Criteria**

Inclusion required primary residence within Mashhad’s municipal boundaries for at least six months prior to the survey and an age of ≥ 18 years at the time of assessment. Exclusions encompassed conditions that would prevent completion of the mental health assessment, such as significant cognitive impairment limiting questionnaire comprehension, acute psychiatric emergencies needing immediate care, or withdrawal of consent at any stage.

**Sample Size Determination**

This Mental Health Continuum–Short Form (MHC-SF) analysis represents a pre-specified sub-study within a larger population-based survey conducted in Mashhad. The parent survey’s sample size was planned to ensure precise population estimates while accounting for the multistage cluster design. We used a single-proportion formula with adjustments for the design effect and anticipated nonresponse:

$$n_{\text{final}} = \frac{Z_{1-\alpha/2}^2 p (1 - p) \text{DEFF}}{d^2 R}$$

Here  $Z_{\alpha/2} = 1,96$  for a 95% confidence level,  $p = 0.105$ , informed by community surveys from Brazil (15), India/Cameroon (16), and the United States (17), and  $d = 0.020$  for ±2.0% absolute precision. A design effect (DEFF) of 2.2 was applied to account for the reduced statistical efficiency associated with interviewing 44 individuals per cluster and an intra-cluster correlation ( $\rho$ ) of 0.03, calculated as  $(\text{DEFF} = 1 + (m - 1) \rho)$ . Allowing for a 90% response rate, the required sample size was approximately 2,200.

$$n_{\text{final}} = \frac{(1,96)^2 \times 0,105 \times 0,895 \times 2,2}{(0,020)^2 \times 0,90} \approx 2200$$

This target was distributed proportionally across the city’s five administrative health zones and implemented as 50 clusters (10 comprehensive health facilities per zone). Each cluster enrolled 44 adults, aiming for a near-equal sex distribution (≈22 women and 22 men) using Kish-grid selection. This design yields 95% confidence that prevalence estimates for adults ≥ 18 years lie within ±2.0 percentage points of the true population values and provides adequate power for age- and sex-stratified analyses.

This sub-analysis draws on 2,066 adults with complete MHC-SF data from the broader multi-domain, population-based survey; accounting for clustering with a design effect of 2.2 yields an effective sample size of 939 (2,066/2.2). Using this effective  $n$  in the binomial variance under complex sampling, the 95% margin of error (MoE) for a prevalence  $p$  is  $\text{MoE} = 1.96\sqrt{p(1-p)/n_{\text{eff}}}$ , giving ±1.92% when  $p = 0.10$  and ±2.56–3.20% when  $p = 0.20$ –0.50 (worst case at 0.50). These precision levels meet common surveillance targets for city-level population studies and reflect standard design-effect adjustments for clustered samples. In context, our analytic  $n$  is squarely within—and often above—the range used in published population MHC-SF studies (e.g., 1,050 adults in South Africa (18); 1,300 in Argentina (19)).

**Assessment Instruments**

*Mental Health Continuum-Short Form (MHC-SF)*

Positive mental health was assessed with the Persian MHC-SF, a 14-item scale derived from Keyes’ model that measures emotional well-being (EWB; 3 items), social well-being (SWB; 5 items), and psychological well-being (PWB; 6 items). EWB assesses hedonic aspects (happiness, interest in life, life satisfaction), whereas PWB captures eudaimonic functioning (e.g., self-acceptance, environmental mastery, warm relationships, autonomy, personal growth, and meaning). SWB assesses perceived functioning in society (e.g., community belonging, perceived contribution, social coherence, social acceptance, and optimism about societal progress) (1). Participants reported how often they experienced each feeling during the past month using a 6-point Likert scale ranging from 1 (never) to 6 (every day). For analysis, responses were recoded to a 0–5 scale (0 = never to 5 = every day), consistent with scoring conventions used in prior MHC-SF research. Item scores are summed to create domain scores and a total score, with higher scores indicating greater positive mental health.

*Validity and reliability of the MHC-SF Persian Version*

Confirmatory factor analyses in Iranian samples support the intended three-factor structure, and convergent and discriminant validity have been demonstrated via positive associations with other well-being constructs and negative associations with depression and general distress (10, 20, 21). Reported internal consistency in Persian validations is good for the total score (alpha about 0.87 to 0.91) and generally good for EWB and PWB, while SWB is often somewhat lower but typically acceptable (commonly in the range of about 0.74 to 0.82). Measurement invariance across gender (configural, metric, scalar) has also been supported, allowing meaningful mean comparisons between men and women (20, 21).

*Sociodemographic information*

1. Standardized questionnaires captured participant age, gender, and additional relevant background characteristics. Sociodemographic

variables available for the present analysis were limited to age and sex; socioeconomic position and cultural/religiosity measures were not collected in this specific survey instrument.

**Ethical Considerations**

The protocol was approved by the Research Ethics Committee of Mashhad University of Medical Sciences (IR.MUMS.REC.1400.039). All participants provided written informed consent after receiving detailed information on study objectives, procedures, risks, and voluntariness. Confidentiality was ensured through de-identification and secure data storage. Participants were informed of their unconditional right to withdraw without penalty or impact on healthcare access.

**Data Management and Quality Assurance**

Survey data were double-entered into a secure REDCap database, with programmed checks and manual reconciliation of discrepancies to maintain data integrity. Throughout data collection, staff completed a standardized two-day training focused on consistent MHC-SF administration and passed competency evaluations before field deployment.

**Statistical Analysis**

Analyses were conducted in IBM SPSS Statistics v26 and R. Two-sided tests used an  $\alpha$  of 0.05. Sample characteristics and MHC-SF scores were summarized descriptively. Shapiro–Wilk tests assessed the normality of continuous variables. Given departures from normality, we report means and standard deviations alongside medians and interquartile ranges; categorical

variables are presented as counts and percentages. Internal consistency was examined using Cronbach’s  $\alpha$  for the total scale and subscales. Associations between age and MHC-SF scores were assessed using Spearman’s rank correlation, and comparisons by gender used the Mann–Whitney U test. To evaluate demographic comparability between sexes, we compared age distributions between men and women using the Mann–Whitney U test and compared age-group distributions using a chi-square test. To quantify the independent contribution of demographic variables to MHC-SF outcomes while controlling for other demographic covariates, we fit multivariable linear regression models for the total MHC-SF score and each domain score with age (years; continuous) and sex as simultaneous predictors. We report unstandardized coefficients (B), standardized coefficients ( $\beta$ ), p-values, and model  $R^2$ /adjusted  $R^2$ . Multicollinearity was assessed using variance inflation factors (VIF).

**Results**

**Sample Characteristics**

The final analytic sample consisted of 2,066 adults (1,190 women, 57.6%; 876 men, 42.4%). The mean age was 58.9 years (SD = 7.6; median = 59, IQR = 11; range 20–82). Participants were predominantly aged 55–64 years (n = 925, 44.8%), followed by 45–54 years (n = 586, 28.4%) and  $\geq 65$  years (n = 505, 24.4%); relatively few were aged 18–44 years (n = 50, 2.4%) (Table 1).

**Table 1. Demographic Characteristics of Participants (N = 2,066) in This Study who Completed the Forms**

Characteristic	Category	Total (N = 2,066)	Female (n = 1,190)	Male (n = 876)
Sex, n (%)	Female	1,190 (57.6)		
	Male	876 (42.4)		
Age (years)	Mean (SD)	58.9 (7.6)	57.7 (7.1)	60.5 (7.9)
	Median (IQR)	59 (11)	57 (10)	61 (11)
	Min–Max	20–82	20–82	20–82
	18–44	50 (2.4)	32 (2.7)	18 (2.1)
Age group, n (%)	45–54	586 (28.4)	395 (33.2)	191 (21.8)
	55–64	925 (44.8)	553 (46.5)	372 (42.5)
	$\geq 65$	505 (24.4)	210 (17.6)	295 (33.7)

Age differed significantly by sex: men were older on average than women (mean 60.5 vs. 57.7 years). The Mann–Whitney U test indicated a statistically significant age difference between sexes ( $W = 403,729$ ;  $P < 0.001$ ). Age-group composition also differed by sex (chi-square = 78.76;  $df = 3$ ;  $P < 0.001$ ), with a higher proportion of men in the  $\geq 65$  group (33.7%) compared with women (17.6%) (Table 1). Accordingly, subsequent inferential analyses are complemented by multivariable models adjusting for age and sex.

Shapiro–Wilk tests for normality revealed that all continuous variables had P-values  $< 0.001$ , indicating that all variables were non-normally distributed. Cronbach’s alpha coefficients indicated good to excellent internal consistency for most MHC-SF scales. The total MHC-SF scale demonstrated good reliability ( $\alpha = 0.859$ ). Among subscales, the emotional well-being subscale showed excellent reliability ( $\alpha = 0.899$ ), and the psychological well-being subscale demonstrated good

reliability ( $\alpha = 0.825$ ). The social well-being subscale showed questionable reliability ( $\alpha = 0.597$ ).

**Overall Mental Health Continuum Scores**

Descriptive statistics for the MHC-SF scales revealed that participants scored highest on the psychological well-being (PWB) subscale (M = 28.99, SD = 6.19, Mdn = 30), followed by the social well-being (SWB) subscale

(M = 19.01, SD = 5.63, Mdn = 19), and the emotional well-being (EWB) subscale (M = 13.54, SD = 4.11, Mdn = 14). The total MHC-SF score had a mean of 61.55 (SD = 13.21, Mdn = 63) out of a maximum possible score of 84. Complete descriptive statistics are presented in Table 2.

**Table 2. Overall Descriptive Statistics for Mental Health Continuum–Short Form**

Score	Mean	SD	Median	IQR
Total score	61.55	13.21	63	19
EWB score	13.53	4.10	14	7
SWB score	19.01	5.63	19	8
PWB score	28.99	6.18	30	9

**Sex Differences**

Examination of scores by sex revealed generally higher means for males compared to females across most measures. Males demonstrated higher mean scores on the total MHC-SF scale (M = 62.84) compared to females (M = 60.71). This pattern was consistent across subscales: males scored higher on emotional well-being (M = 14.00 vs. M = 13.19 for females), social well-being (M = 19.38 vs. M = 18.78 for females), and psychological well-being (M = 29.46 vs. M = 28.68 for

females). Detailed descriptive statistics by sex and age groups are presented in Table 3.

Mann-Whitney U tests revealed statistically significant sex differences for the total MHC-SF score (P < 0.001, r = 0.085), emotional well-being (P < 0.001, r = 0.090), and psychological well-being (P < 0.001, r = 0.089). The social well-being subscale showed a non-significant trend (P = 0.075, r = 0.039). Effect sizes for significant differences were small according to Cohen's conventions.

**Table 3. Descriptive Statistics of Mental Health Continuum–Short Form by Sex and Age Bins**

Sex	Age Bins	Score	N	Mean	SD	Median	IQR
Female	18-44	Total score	35	60.06	16.72	62.0	18.50
		EWB score	35	12.66	5.02	14.0	6.50
		SWB score	35	18.83	7.02	20.0	8.50
		PWB score	35	28.57	7.59	31.0	9.00
	45-54	Total score	440	60.27	13.06	61.0	18.00
		EWB score	440	13.16	4.00	14.0	6.25
		SWB score	440	18.45	5.63	18.0	8.00
		PWB score	440	28.66	6.03	30.0	9.00
	55-64	Total score	537	60.48	13.28	62.0	20.00
		EWB score	537	13.28	3.98	14.0	6.00
		SWB score	537	18.87	5.63	19.0	8.00
		PWB score	537	28.34	6.29	29.0	10.00
	65+	Total score	178	62.10	13.65	65.0	18.00
		EWB score	178	13.61	4.35	15.0	7.00
		SWB score	178	19.51	5.62	20.0	7.00
		PWB score	178	28.98	6.40	30.0	9.00
Male	18-44	Total score	20	59.90	12.13	58.0	11.50
		EWB score	20	13.50	4.85	14.5	7.00
		SWB score	20	17.25	5.38	17.0	6.50
		PWB score	20	29.15	6.16	30.0	8.00
	45-54	Total score	211	62.59	13.83	64.0	17.50
		EWB score	211	13.82	4.16	15.0	6.00
		SWB score	211	19.15	5.95	19.0	8.00
		PWB score	211	29.63	6.75	32.0	9.00
	55-64	Total score	376	62.39	12.42	63.0	17.00

Sex	Age Bins	Score	N	Mean	SD	Median	IQR
		EWB score	376	13.74	4.07	15.0	7.00
		SWB score	376	19.22	5.44	19.0	8.00
		PWB score	376	29.43	5.76	30.0	8.00
		Total score	269	63.76	12.90	66.0	18.00
	65+	EWB score	269	14.25	4.09	15.0	6.00
	65+	SWB score	269	19.68	5.42	20.0	8.00
	65+	PWB score	269	29.84	5.91	31.0	8.00

**Multivariable regression (demographic contributions).** In models including age and sex simultaneously as predictors, demographic variables explained a small proportion of the variance across outcomes ( $R^2 = 0.005-0.009$ ). Older age was independently associated with a slightly higher total MHC-SF score ( $B = 0.078$  per year,  $P = 0.045$ ), higher emotional well-being ( $B = 0.026$  per year,  $P = 0.034$ ), and higher Social Well-being ( $B = 0.041$  per year,  $P = 0.013$ ), but not psychological well-

being ( $P = 0.551$ ). Male sex (vs. female) was independently associated with a higher total score ( $B = 1.950$ ,  $P = 0.001$ ), higher emotional well-being ( $B = 0.573$ ,  $P = 0.002$ ), and higher psychological well-being ( $B = 1.005$ ,  $P < 0.001$ ), while the association with social well-being was not statistically significant ( $P = 0.144$ ). VIFs were 1.03 for both predictors, indicating no problematic multicollinearity. Standardized coefficients and model fit indices are shown in Table 4.

**Table 4. Multivariable linear Regression Models Estimating Demographic Contributions to Mental Health Continuum–Short Form Outcomes (N = 2,066) in Participants**

Outcome	Age B (SE)	$\beta$ Age	p	Sex (Male) B (SE)	$\beta$ Sex	P	R <sup>2</sup>	Adj. R <sup>2</sup>
Total MHC-SF score	0.078 (0.039)	0.05	0.045	1.950 (0.596)	0.07	0.001	0.009	0.008
Emotional well-being	0.026 (0.012)	0.05	0.034	0.573 (0.185)	0.07	0.002	0.008	0.007
Social well-being	0.041 (0.017)	0.06	0.013	0.372 (0.255)	0.03	0.144	0.005	0.004
Psychological well-being	0.011 (0.018)	0.01	0.551	1.005 (0.279)	0.08	< 0.001	0.007	0.006

B = unstandardized coefficient; SE = standard error;  $\beta$  = standardized coefficient. VIFs were 1.03 for both predictors, indicating no problematic multicollinearity.

**Age Group Patterns**

Analysis across age groups showed relatively consistent patterns within sex groups. Among females, the 65+ age group demonstrated the highest mean total score ( $M = 62.10$ ), while the 45-54 age group showed the lowest ( $M = 60.27$ ). Among males, the 65+ age group also showed the highest mean total score ( $M = 63.76$ ), with the 18-44 age group showing the lowest ( $M = 59.90$ ).

Spearman rank correlations between age and MHC-SF scores revealed small but statistically significant positive correlations for the total score ( $\rho = 0.060$ ,  $P = 0.006$ ), emotional well-being ( $\rho = 0.069$ ,  $P = 0.002$ ), and Social Well-being ( $\rho = 0.062$ ,  $P = 0.005$ ). The Psychological Well-being subscale showed no significant correlation with age ( $\rho = 0.018$ ,  $P = 0.408$ ).

**Sex Differences at the Item Level**

Item-level analysis revealed notable sex differences across specific well-being indicators. Males reported

higher mean scores compared to females on most items, with the largest differences observed for "confident to think or express your own ideas and opinions" ( $M = 4.96$  for males vs.  $M = 4.52$  for females), "that your life has a sense of direction or meaning to it" ( $M = 4.88$  vs.  $M = 4.63$ ), and "that you had something important to contribute to society" ( $M = 4.32$  vs.  $M = 3.98$ ).

Conversely, females showed higher mean scores on "that people are basically good" ( $M = 4.05$  vs.  $M = 3.72$  for males) and "that our society is a good place, or is becoming a better place, for all people" ( $M = 3.13$  vs.  $M = 2.97$  for males). Both sexes showed similarly high scores on relationship-oriented items, with "that you had warm and trusting relationships with others" receiving the highest mean ratings across both groups ( $M = 5.07$  for females,  $M = 5.13$  for males). Complete item-level statistics by sex are presented in Table 5.

**Table 5. Item-Level Statistics by Sex for Mental Health Continuum–Short Form**

Item	Sex	Mean	SD	Median	IQR
Happy	Female	4.07	1.57	4	3
	Male	4.34	1.55	5	3
Interested In Life	Female	4.59	1.48	5	2

Item	Sex	Mean	SD	Median	IQR
Satisfied With Life	Male	4.80	1.44	5	2
	Female	4.60	1.46	5	2
That You Had Something Important to Contribute to Society	Male	4.76	1.48	5	2
	Female	3.98	1.76	4	3
That You Belonged to A Community (Like A Social Group, Or Your Neighborhood)	Male	4.32	1.78	5	3
	Female	4.39	1.74	5	3
That Our Society Is a Good Place, Or Is Becoming a Better Place, For All People	Female	3.13	1.88	3	4
	Male	2.97	1.94	3	4
That People Are Basically Good	Female	4.05	1.71	4	3
	Male	3.72	1.84	4	4
That The Way Our Society Works Makes Sense to You	Female	3.26	1.85	3	4
	Male	3.78	1.92	4	4
That You Liked Most Parts of Your Personality	Female	4.81	1.38	5	2
	Male	5.06	1.26	6	2
Good At Managing the Responsibilities of Your Daily Life	Female	4.99	1.33	6	2
	Male	5.00	1.32	6	2
That You Had Warm and Trusting Relationships with Others	Female	5.07	1.24	6	2
	Male	5.13	1.24	6	1
That You Had Experiences That Challenged You to Grow and Become a Better Person	Female	4.54	1.52	5	2
	Male	4.56	1.58	5	2
Confident To Think or Express Your Own Ideas and Opinions	Female	4.52	1.55	5	2
	Male	4.96	1.38	6	2
That Your Life Has a Sense of Direction or Meaning to It	Female	4.63	1.54	5	2
	Male	4.88	1.46	6	2

**Age-Related Patterns at the Item Level**

Across age groups, older participants (65+) generally showed higher mean scores on most items compared to younger participants. The most pronounced age-related increases were observed for the items "satisfied with life" (M = 4.86 for 65+ vs. M = 4.36 for 18-44), "confident to think or express your own ideas and opinions" (M = 4.90 vs. M = 4.44), and "good at

managing the responsibilities of your daily life" (M = 5.11 vs. M = 5.04).

Social well-being items showed more modest age-related differences, with "that the way our society works makes sense to you" demonstrating the largest increase across age groups (M = 3.79 for 65+ vs. M = 3.07 for 18-44). Complete item-level statistics by age group are presented in Table 6.

**Table 6. Item-Level Statistics by Age Bins for Mental Health Continuum–Short Form**

Item	Age Bins	N	SD	Median	IQR	Mean
Happy	18-44	55	4.00	1.80	4	3.0
	45-54	651	4.15	1.52	4	3.0
	55-64	913	4.15	1.55	4	3.0
	65+	447	4.35	1.64	5	3.0
Interested In Life	18-44	55	4.47	1.86	5	2.0
	45-54	651	4.63	1.45	5	2.0
	55-64	913	4.67	1.45	5	2.0
	65+	447	4.78	1.49	5	2.0
Satisfied With Life	65+	447	4.78	1.49	5	2
	18-44	55	4.36	1.71	5	2.5

**Population Mental Health Distribution**

<b>Item</b>	<b>Age Bins</b>	<b>N</b>	<b>SD</b>	<b>Median</b>	<b>IQR</b>	<b>Mean</b>
That You Had Something Important to Contribute to Society	45-54	651	4.59	1.46	5	2
	55-64	913	4.65	1.46	5	2
	18-44	55	4.04	1.91	5	4
	45-54	651	4.06	1.82	4	3
	55-64	913	4.16	1.72	4	3
	65+	447	4.15	1.8	4	3
That You Belonged to A Community (Like A Social Group, Or Your Neighborhood)	18-44	55	4.47	1.86	5	2
	45-54	651	4.47	1.73	5	3
	55-64	913	4.4	1.74	5	3
	65+	447	4.49	1.76	5	3
That Our Society Is a Good Place, Or Is Becoming a Better Place, For All People	18-44	55	2.95	1.93	3	4
	45-54	651	2.94	1.93	3	4
	55-64	913	3.09	1.9	3	4
	65+	447	3.19	1.89	3	4
That People Are Basically Good	18-44	55	3.73	1.9	4	4
	45-54	651	3.85	1.82	4	4
	55-64	913	3.92	1.74	4	2
	65+	447	3.99	1.77	4	3
That The Way Our Society Works Makes Sense to You	18-44	55	3.07	1.93	3	4
	45-54	651	3.35	1.89	3	4
	55-64	913	3.44	1.89	4	4
	65+	447	3.79	1.9	4	4
That You Liked Most Parts of Your Personality	18-44	55	4.82	1.48	5	2
	45-54	651	4.93	1.35	5	2
	55-64	913	4.86	1.33	5	2
	65+	447	5.04	1.3	6	2
Good At Managing the Responsibilities of Your Daily Life	18-44	55	5.04	1.4	6	1
	45-54	651	4.95	1.38	5	2
	55-64	913	4.97	1.31	5	2
	65+	447	5.11	1.26	6	1
That You Had Warm and Trusting Relationships with Others	18-44	55	4.98	1.57	6	1.5
	45-54	651	5.15	1.21	6	1
	55-64	913	5.02	1.25	6	2
	65+	447	5.17	1.21	6	1
That You Had Experiences That Challenged You to Grow and Become a Better Person	18-44	55	4.82	1.68	6	1
	45-54	651	4.63	1.54	5	2
	55-64	913	4.52	1.5	5	2
	65+	447	4.44	1.61	5	3
Confident To Think or Express Your Own Ideas and Opinions	18-44	55	4.44	1.78	5	2
	45-54	651	4.6	1.55	5	2
	55-64	913	4.71	1.46	5	2
	65+	447	4.9	1.41	5	2
That Your Life Has a Sense of Direction or Meaning to It	18-44	55	4.69	1.67	5	2
	45-54	651	4.72	1.52	5	2
	55-64	913	4.71	1.5	5	2

Item	Age Bins	N	SD	Median	IQR	Mean
	65+	447	4.83	1.5	5	2

**Discussion**

**Principal findings**

This probability-sampled city survey provides municipal reference distributions of MHC-SF scores for Mashhad and indicates generally robust positive mental health, with stronger endorsement of eudaimonic functioning (PWB) than society-facing well-being (SWB). The comparatively weaker SWB profile, together with its low internal consistency, suggests that societal appraisal and trust represent both an intervention opportunity (more headroom than PWB) and a measurement domain that should be interpreted cautiously. Sex and age gradients were statistically detectable but small, indicating that demographic differences account for only a limited proportion of population variance. However, item-level profiles were informative, showing that the small male advantage was concentrated in agency and contribution indicators, whereas women endorsed benevolence and collective optimism more strongly.

**Why psychological well-being exceeded social well-being in Mashhad**

The dominance of PWB over SWB is theoretically coherent because many PWB items (for example, managing daily responsibilities, self-acceptance, and warm relationships) are appraised primarily within the personal and family sphere, which can remain relatively stable even under broader economic or institutional strain. In contrast, SWB items explicitly require evaluating society’s coherence and trajectory, which are more directly influenced by macro-level conditions and can therefore remain low even when private functioning is strong (1). This pattern suggests that Mashhad residents may be “doing well” in immediate life management and close relationships while simultaneously being more reserved about societal trust and optimism.

**Comparison with prior literature**

Cross-study comparisons of MHC-SF scores require attention to design and measurement differences. In Iran, much of the MHC-SF literature is based on convenience samples (often students) or specific subgroups, which is valuable for psychometric testing but limited for producing city-representative benchmarks (12). Internationally, stronger benchmark studies typically use probability samples or population panels. Survey mode and sample composition also matter: interviewer-assisted administration and older age structures can yield higher reported well-being than anonymous self-administered surveys and younger samples, partly through social desirability and known age gradients in emotional well-being (8, 22). For this reason, our most defensible comparisons emphasize relative patterns (domain ranking and effect sizes) rather than raw mean differences.

Within these constraints, the Mashhad domain ranking is consistent with general-population findings showing SWB as the lowest and often the most psychometrically fragile domain. In Dutch adult panel data and other population studies, societal appraisal items tend to lag behind EWB and PWB, supporting the interpretation that SWB is particularly sensitive to context and less homogeneous as a construct (5, 6). This aligns with the broader evidence that SWB items combine distinct facets (belonging and contribution versus social coherence and optimism), which can reduce inter-item correlations and lower internal consistency (23, 24).

Sex differences in positive mental health in Mashhad were small, consistent with international evidence that gender gaps in well-being are typically modest compared with gender gaps in many disorder indicators (7). Our item-level pattern suggests that the small male advantage is driven mainly by higher endorsement of autonomy, self-expression, meaning, and societal contribution indicators, whereas women’s higher endorsement of benevolence and collective optimism suggests a stronger communal and trust-oriented orientation. A plausible mechanism is gendered opportunity structures and role expectations that influence access to public roles and perceived social recognition, which can shape endorsement of contribution and agency items (25). Importantly, evidence for scalar gender invariance of the Persian MHC-SF reduces concern that these differences are measurement artifacts (10).

Age showed weak positive associations with total well-being, EWB, and SWB, while PWB was flat. This aligns with lifespan evidence on the well-being paradox, where emotional well-being is often maintained or improves into older adulthood, even as physical health declines (8). A coherent mechanism is increasing psychological maturity: older adults tend to use more effective emotion regulation strategies and acceptance-based coping, and they increasingly prioritize emotionally meaningful goals and relationships, consistent with socioemotional selectivity theory (SST) (9). These processes can elevate life satisfaction and relationship quality, explaining slightly higher EWB and, in some contexts, greater social acceptance with age. We note that cross-sectional age differences may also partly reflect cohort effects, particularly in societies undergoing rapid social change that can influence societal trust and coherence (8).

The multivariable findings further underscore that age and sex operate as relatively distal correlates of positive mental health in population samples. In our data, age and sex together explained < 1% of the variance across MHC-SF outcomes, which is consistent with contemporary well-being modeling showing that sociodemographic indicators often contribute only modest explanatory power once other domains are considered. Large adult cohort analyses that

simultaneously evaluate sociodemographics alongside psychosocial, behavioral, cognitive, and life-event factors typically find that variance in well-being is more strongly captured by modifiable characteristics such as personality/emotion-regulation processes, health behaviors, and recent life experiences— than by age/sex alone. (26). Similarly, broader “competency” constructs and psychological resources tend to outperform symptom-only or demographic-only explanations when predicting multiple well-being dimensions (27). From a mechanistic standpoint, self-determination evidence indicates that basic psychological need satisfaction remains robustly associated with well-being across adulthood even when accounting for demographic heterogeneity, suggesting a plausible pathway for within-age-group variation that is not captured by age/sex coefficients (28). Finally, the absence of an adjusted sex association with SWB in our study is compatible with evidence that societal trust and social-capital processes, which are central to Keyes’ social well-being content, are consequential drivers of well-being over time and show meaningful context sensitivity; meta-analytic work links trust most strongly with social well-being specifically (29, 30). Taken together, these results support interpreting demographic gradients as statistically detectable but substantively small, and they motivate future surveillance rounds to incorporate modifiable social and psychosocial determinants (e.g., trust, social capital, and need satisfaction) to better explain and target variability in SWB and overall flourishing.

#### **Reliability Check**

The total MHC-SF and its EWB and PWB subscales showed good internal consistency in our field conditions, comparable to prior Persian validation studies reporting strong reliability for the total score and generally strong reliability for EWB and PWB (10, 20, 21). In contrast, SWB reliability in Mashhad was low and lies at the lower end of the range reported internationally. This pattern is widely attributed to SWB’s conceptual breadth and to the sociopolitical sensitivity of items assessing social coherence and social actualization, which can reduce inter-item coherence in unstable or strained contexts (23, 24). Low reliability can attenuate associations and may partly explain the absence of a sex difference in SWB in our sample. For municipal surveillance, this supports using the total score as the primary indicator. This emphasis is consistent with bifactor evidence across countries showing that a dominant general well-being factor explains much of the common variance in MHC-SF responses (31).

#### **Interpreting the “social well-being deficit”**

Lower SWB should be interpreted differently from lower EWB or PWB because SWB items assess societal appraisal, generalized trust, and perceived intelligibility of the social order, which are strongly shaped by macro-level conditions rather than individual resources alone (1). Cross-national evidence links these components to

institutional trust, perceived fairness, and economic security, suggesting that reduced SWB can reflect realistic evaluations of social conditions rather than a deficit in personal functioning (32, 33). In the current Iranian context, sustained economic strain and social tensions may plausibly depress societal optimism and coherence, even when close relationships and day-to-day functioning remain strong.

Practically, this implies two surveillance recommendations. First, the MHC-SF total score is the most dependable summary indicator for monitoring overall positive mental health in Mashhad. Second, SWB should be treated as a set of context-sensitive indicators. Interpreting SWB at the item level and alongside external social indicators (for example, neighborhood trust, civic participation, and perceived fairness) can make the SWB profile more actionable for municipal planning (34).

#### **Implications for policy and practice**

Findings support the dual-continua perspective that promoting positive mental health is a distinct public-health aim, complementary to treating mental illness. The clearest leverage point in Mashhad is SWB: structural and community-level strategies that build social capital—safe public spaces, civic participation, volunteering infrastructure, and fairness/trust initiatives—are most likely to shift the population distribution where headroom is greatest (1, 34). Given the negligible sex effects, universal promotion should be the backbone; targeted supports may still be warranted for subgroups facing compounded constraints (e.g., women with heavy caregiving burdens or limited labor-market access) in line with Iranian evidence on gendered resource inequities and well-being (35).

#### **Limitation**

A key strength of this study, relative to much of the Iranian MHC-SF literature, is its probability-sampled design. Most prior Iranian studies have focused on students or specific subgroups, which supports psychometric testing but limits generalizability for municipal benchmarking (12). In contrast, our sampling leveraged the primary healthcare registry with broad city coverage, used stratified cluster sampling across all five health districts, and applied within-household Kish selection. This design increases representativeness, supports district-wide municipal interpretation, and yields local reference distributions for future surveillance cycles. Additional strengths include the large sample size, standardized field staff training, and item-level reporting, which clarifies which facets drive subgroup differences and supports more targeted interpretation than subscale means alone.

Limitations include sample imbalances (female overrepresentation and an older age distribution), which may influence overall mean levels given known age gradients in emotional well-being. In addition, the achieved age distribution differed by sex (men were

older), which could confound unadjusted sex comparisons; therefore, we report adjusted estimates from multivariable regression models. The cross-sectional design also prevents separation of aging effects from cohort effects, which is particularly relevant for SWB because societal appraisal may differ by generation in rapidly changing contexts (8). In addition, interviewer-assisted administration can increase social desirability and should be considered when comparing our raw means with studies using anonymous self-administered modes (22). Finally, the low SWB internal consistency underscores the value of future confirmatory work in Persian adult samples to test whether SWB is better represented by two facets (belonging and contribution versus societal appraisal) and to examine invariance across adult age bands (24). Socioeconomic and cultural determinants (including beliefs and religiosity) were not measured in this survey; therefore, we could not assess or adjust for their potential confounding or effect-modifying roles in observed well-being patterns.

### Conclusion

In a representative urban Iranian cohort, positive mental health was generally robust, especially in eudaimonic domains (PWB), while social well-being lagged and was psychometrically fragile. Sex differences favored men but were negligibly small; older adults reported slightly higher EWB and SWB. These patterns are theoretically coherent (SST; dual-continua), methodologically consistent with known properties of the MHC-SF, and substantively interpretable in light of current Iranian socioeconomic conditions. For surveillance and policy, the MHC-SF total score is a dependable indicator, and the SWB profile highlights community-level levers to strengthen social connectedness and societal trust in Mashhad, Iran.

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### Conflict of Interest

None.

### Author's Contributions

SJ contributed to concept, design, data gathering, writing and revising the manuscript, approving the final version,

and agree to all aspects of the manuscript. AZ contributed to design, data analyzing and interpretation, writing and revising the manuscript, approving the final version and agree to all aspects of the manuscript

MK contributed to design, technical support, data analyzing and interpretation, writing and revising the manuscript, approving the final version and agree to all aspects of the manuscript

MG contributed to design, management, data interpretation, writing and revising the manuscript, approving the final version and agree to all aspects of the manuscript

Manuscript has been read and approved by all the authors, that the requirements for authorship. Each author believes that the manuscript represents honest work, if that information is not provided in another form.

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