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The February 6th Earthquakes and Disaster Justice: An Examination of Social Vulnerability and Policy Gaps in the Case of Hatay

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Research Article

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Research article

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Declarations

Ethics approval and consent to participate

Ethical approval for the use of the data collection form was obtained from the Scientific Research and Publication Ethics Committee of Social Sciences and Humanities of Hatay Mustafa Kemal University (approval number: 53 approval date: April 3rd, 2026). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Informed consent to participate in the study was obtained from all participants.

Consent for publication

Not applicable. The manuscript presents aggregate survey results and does not include identifiable individual details, images or videos.

Availability of data and materials

The respondent-level survey data are not publicly available because they include sensitive household health and socioeconomic information, and unrestricted disclosure may compromise participant confidentiality. Any request for access must be assessed against applicable ethical, privacy and institutional requirements. Requests may be directed to the corresponding author; any access is conditional on the relevant ethical, privacy and institutional authorizations.

Competing interests

The author declares no competing interests.

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Authors' contributions

AUŞ prepared the original draft and reviewed and edited the manuscript. The author read and approved the final manuscript.

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Abstract

Background: Recovery after earthquakes involves access to material support, continuity of health and care services, and services responsive to different needs. This study examined these recovery experiences through a disaster justice perspective in Hatay, Türkiye, following the February 2023 earthquakes.

Methods: A cross-sectional non-probability survey combined face-to-face, computer-assisted and online administration. Of 454 records, 432 complete responses were analysed using descriptive statistics, permutation tests and regression models. Analyses distinguished cash-assistance application from applicants' reported outcomes and examined perceived service continuity, inclusion, governance and participation.

Results: Basic health-service continuity was rated positively by 42.1% of respondents, compared with 31.5% for chronic and older-person care and 33.6% for psychosocial support. Negative ratings concerned special dietary provision (49.3%), shelter accessibility (47.5%) and participation (58.8%). Among 297 cash-assistance applicants, 18.5% reported rejection, 43.8% partial benefit and 37.7% full benefit. Tenants had higher adjusted odds of applying than owners (OR 1.77, 95% CI 1.01–3.12), but lower odds of reporting a more favourable outcome among applicants (OR 0.47, 95% CI 0.28–0.80). Governance/participation evaluations were associated with belief in a safer and fairer future, and 72.5% selected a bundled consultation-and-inclusion reconstruction option.

Conclusions: Recovery monitoring should distinguish access to assistance from reported benefit and assess general service continuity alongside support for specific needs. These findings concern perceived recovery processes; they do not establish effects on health. Non-probability sampling, retrospective self-report and bundled questionnaire wording limit generalization and causal inference.

Keywords: disaster justice; earthquake recovery; social determinants of health; health service continuity; accessibility; cash assistance; public participation; Türkiye.

1. Background

Social vulnerability describes the social conditions that make some people less able to anticipate, withstand and recover from a hazardous event, including unequal access to resources and support [1]. Income, age, disability, housing circumstances and social networks matter because they shape the practical means available to protect health, secure shelter and rebuild everyday life [1]. Vulnerability therefore directs attention to the social organization of risk alongside the physical event that triggers a disaster [2].

The transition from social vulnerability to disaster justice concerns the responsibilities attached to these unequal capacities: whose exposure is accepted, whose losses receive support and whose priorities influence recovery [2]. A capabilities-based account makes this transition explicit by evaluating whether people can actually protect themselves and sustain lives they value, rather than whether they formally receive identical treatment [3]. From this perspective, recovery has a justice dimension when public action affects the opportunities of people already facing disadvantage [3]. Disaster justice concerns fairness in the allocation of risks, resources and rights throughout preparedness, response and recovery [2]. Its distributive dimension addresses the allocation of assistance and protection; recognition concerns whether different identities and needs are respected; and procedural justice concerns meaningful participation in decisions [4]. These dimensions are interconnected, since exclusion from decision making can coexist with the failure to recognize needs and unequal access to resources [4]. In this study, the distributive, recognition and procedural dimensions of disaster justice provide a framework for interpreting residents' reported experiences of assistance, services addressing specific needs and participation in recovery decisions.

The Sendai Framework gives this relationship an institutional expression through its priority of strengthening disaster risk governance [5]. Risk governance entails clear responsibilities, capable institutions, coordination across sectors and levels, and the participation of relevant stakeholders throughout disaster risk management [5]. Its principles also call for accessible participation,

attention to people disproportionately affected by disasters and the empowerment of local authorities and communities, while recovery should reduce future risk through Build Back Better [5]. Social protection research complements this framework by identifying programmes, information systems, financing and institutional arrangements as foundations of shock response [6]. Because registration, targeting, communication and payment arrangements can each influence delivery, application to assistance and the outcome after application need to be examined separately [7].

Existing recovery research illustrates why these distinctions matter in Hatay. Comparative earthquake research identified a tension between rapid reconstruction and deliberation, with the Van case combining fast housing delivery and limited consultation [8]. A recent document-based and spatial study of Hatay found that participation was prominent in planning discourse but had limited operational influence [9]. Interviews with 16 Hatay earthquake survivors connected information access and trust with solidarity and the fulfilment of basic needs [10]. Disability-stakeholder research in Türkiye identified exclusion, unmet requirements and accessibility barriers [11]. International shelter research likewise emphasized the role of physical, social and attitudinal environments [12]. Early healthcare literature documented specialized treatment, rehabilitation and psychosocial needs after the 2023 earthquakes [13]. Together, these studies motivate an examination of how aid access, service experiences and participation are distributed within a respondent group, while retaining the distinction between reported experience and verified policy performance.

The social determinants of health framework links socioeconomic position with material and psychosocial circumstances and access to health systems [14]. It also identifies intersectoral action and social participation as directions for addressing health inequities [14]. In the present study, this framework is used to interpret reported assistance, shelter accessibility, service continuity and participation as interconnected aspects of recovery conditions. This interpretation connects the

disaster justice concerns of distribution, recognition and procedure with public health questions about access to resources and services.

This study examines residents' reported recovery experiences in Hatay, connecting disaster justice with conditions relevant to public health, including assistance, service continuity, accessibility and participation. Its contribution is to distinguish entry into cash assistance from applicants' reported benefit while examining these stages alongside evaluations of services and recovery governance. It asks: (1) how respondents evaluated early response, assistance, health and care services, coordination, participation and a safer and fairer future; (2) how social indicators related to cash-aid application and applicants' reported outcomes; (3) whether process scores differed across groups; (4) how reported current housing related to pre-earthquake characteristics; and (5) how process evaluations related to future belief and a reconstruction priority choice.

2. Methods

2.1. Design and participants

This cross-sectional study used a non-probability survey of adults aged 18 years or older who experienced the February 2023 earthquakes in Hatay, Türkiye. Convenience and snowball recruitment were used. Data collection combined face-to-face, computer-assisted and online questionnaire administration. Responses from these modes were pooled for analysis. The anonymous workbook does not contain survey-mode labels, a recruitment denominator or timestamps; mode-specific participation counts, a population response rate and the precise collection interval cannot be recovered from that file.

The unchanged raw workbook contains 454 responses and 22 question fields. For a common complete-case sample, 18 records with at least one missing required response and four records selecting both options on a single-choice item were excluded without overlap. The analytic sample is 432. No missing responses were imputed. Item-level descriptive summaries were also calculated using all non-missing responses to each item in the raw dataset to assess sensitivity to complete-case exclusion.

2.2. Structure of the questionnaire

The study-specific structured questionnaire contained four substantive sections: demographic and vulnerability indicators; access to assistance and distributive justice; service satisfaction and psychosocial support; and governance and participation. The analysis used demographic and household characteristics, individual recovery items and summaries of related process ratings. These measures did not constitute a validated Social Vulnerability Index or a direct assessment of institutional justice.

Questions 1–9 covered age, sex, education, employment immediately before the earthquake, pre-earthquake tenure and income, household members with specified support needs, residential insurance and a self-described emergency support network. The needs item allowed multiple selections. Public employment and registered private-sector employment were combined in some models, while self-employment, unregistered work and not working remained outside that binary category. This binary is not a measure of all formal employment.

Questions 10–13 assessed perceived timeliness of emergency services, fairness of basic aid, attention to special diets and accessibility of temporary shelter. Questions 16–18 assessed continuity of health and care services and access to psychosocial support. Questions 19–20 assessed perceived coordination between central and local institutions and residents' participation in decisions. Nine five-point agreement items (1, strongly disagree; 5, strongly agree) were averaged to form early response/inclusion (Q10–13), service continuity (Q16–18) and governance/participation (Q19–20) scores. A nine-item overall process score was used only as a descriptive sensitivity measure. These conceptual scores are correlated; the two-item governance score mixes coordination and participation rather than measuring participation independently.

The social determinants of health perspective is used to interpret the reported recovery experiences, rather than as a causal model tested by these analyses. Service ratings describe respondents' perceptions; they do not establish personal service use, clinically assessed unmet need, treatment interruption or individual health outcomes.

Q14 recorded current housing; “living in my own home” indicates the selected response, not proven return to the pre-earthquake dwelling or absence of displacement. Q15 asked whether respondents had regularly benefited from state cash assistance and offered “did not apply”, “told I was not eligible despite applying”, “partly benefited” and “benefited from all my entitlements without difficulty” responses. The non-eligibility option explicitly mentioned being a tenant as an example, and the partial-benefit option mentioned slow or complex bureaucracy. These prompts may shape reported group differences; Q15 does not identify a programme, eligibility criteria, payment amount, timing or a verified decision. Q21 asked whether respondents believed ongoing reconstruction would make Hatay “safer and fairer” against future disasters; its combined wording does not separately identify safety and justice. Q22 required one choice between rapid reconstruction that deprioritized neighbourhood culture and aesthetics and a package of consultation, disability/older-person access and historic fabric even if slower. Its 72.5% consultation-and-inclusion share must be read in light of this bundled, potentially socially desirable contrast.

2.3. Analysis

Counts, percentages, means and standard deviations were calculated for the 432 complete records; responses 1–2, 3 and 4–5 were grouped as negative, neutral and positive for description. Cronbach alpha with 2,000 nonparametric bootstrap resamples summarized score consistency. Ordinal alpha was calculated from polychoric item correlations as an ordinal-response reliability sensitivity measure [15].

The three observed domain-score correlations were examined. The scores were treated as observed summaries rather than separate latent constructs. An additional binary logistic model examined the current “living in my own home” response among all 432 respondents, adjusting for the same social covariates as the cash-assistance models. This was treated as a descriptive housing check rather than a measure of displacement.

For multiple exploratory comparisons, false-discovery-rate adjusted q-values were computed within explicitly defined reporting families using the Benjamini–Hochberg procedure [16].

Four-level aid responses were compared across nine social indicators using Pearson χ^2, 100,000 label permutations for Monte Carlo p-values and bias-corrected Cramér's V. The nine p-values formed one q-value family. A binary logistic model of application included all 432 respondents; a proportional-odds ordinal logistic model compared the rejection, partial-benefit and full-benefit responses among the 297 applicants. Both adjusted for age (three groups), sex, education, the specified public/registered employment binary, pre-earthquake tenure, income, household needs, insurance and social network. Odds ratios (ORs) are accompanied by 95% Wald confidence intervals (CIs). An approximate joint proportional-odds diagnostic used respondent-clustered covariance across two cumulative logistic fits; a nonsignificant result does not establish the assumption.

Three complete-sample linear models of process scores used the original five employment categories and heteroskedasticity-robust HC3 standard errors. Two-sided p-values and 95% confidence intervals used Student's t reference distributions with residual degrees of freedom of 410 for the three primary models and 408 for the household-needs subtype models. Benjamini–Hochberg adjustment was applied to separate families of 63 and nine non-intercept coefficients, respectively; the subtype family was exploratory. The future-belief item was grouped into the same negative, neutral and positive categories used for descriptive reporting, because the adjusted five-category multinomial model had a zero-response cell in one education stratum and unstable estimates. A multinomial model for these three levels adjusted for the social covariates and the three process scores; likelihood-ratio tests assessed each process score. Adjusted probabilities standardized over the sample covariates were calculated at governance scores of 2 and 4, with delta-method 95% CIs. Five-category models containing only the three process scores were a sensitivity check, not equivalent adjusted estimates. Finally, a logistic model related the Q22

priority choice to Q20, with social covariates. Tests are exploratory and two-sided; $p<0.05$ and $q<0.05$ are described separately.

2.4. Ethics

The study protocol specified adult participation, provision of a participant information and voluntary participation form, protection of personal information, and explicit conditions for joining and withdrawing. Ethics approval and consent information are provided in the Declarations. Data collection took place between May and August 2026.

2.5. Use of artificial intelligence

During manuscript preparation, the author used ChatGPT to assist with English-language refinement, manuscript drafting and revision, organization, formatting and preparation of submission documents, and DeepL for translation support. The author reviewed and edited the content as needed and takes full responsibility for the content of the published article.

3. Results

3.1. Respondents and item evaluations

Table 1 describes the sample. Of the 432 respondents, 240 (55.6%) owned their pre-earthquake dwelling, 112 (25.9%) were tenants and 80 (18.5%) reported another tenure; 72 (16.7%) reported at least one household member with the listed support needs. Categories for disability (28), older age/care (30) and chronic illness (28) overlap and cannot be added to obtain distinct households. The “not working” response (n=188) pooled groups such as unemployed people, students, homemakers and retirees, without identifying their separate proportions.

Table 1 about here

Table 2 shows that 42.1% of respondents rated basic health-service continuity positively, compared with 31.5% for chronic and older-person care and 33.6% for psychosocial support. Negative evaluations were reported by 49.3% for attention to special dietary needs and 47.5% for the physical accessibility of temporary shelters. Participation was the lowest-rated item (mean

2.35/5; 254/432, 58.8%, negative). The timeliness of emergency services in the first 72 hours and the fairness of basic aid received negative ratings from 51.6% and 50.9%, respectively. For the combined “safer and fairer” future item, 162 (37.5%) were negative, 88 (20.4%) neutral and 182 (42.1%) positive. Current housing was own home for 241 (55.8%), new rental in Hatay for 87 (20.1%), container accommodation for 43 (10.0%), outside Hatay for 40 (9.3%) and with relatives for 21 (4.9%). These categories describe a current situation without identifying earthquake-attributable movement.

Table 2 about here

The alpha estimates for early response/inclusion, service continuity and governance/participation were 0.867 (95% bootstrap CI 0.841–0.889), 0.816 (0.778–0.848) and 0.790 (0.744–0.831). Ordinal alpha estimates were 0.900, 0.855 and 0.854. Observed correlations across scores ranged from 0.693 to 0.778, consistent with considerable overlap rather than strong evidence that the scores measure independent constructs. Available-case descriptive summaries used 450–454 responses per item. Negative participation ratings were 59.3% among all 454 responses to Q20, compared with 58.8% in the primary sample of 432. The consultation-and-inclusion option was selected by 327 of 450 respondents with valid Q22 responses (72.7%), compared with 313 of 432 (72.5%) in the primary sample.

3.2. Cash-assistance stages

Among all respondents, 135 (31.2%) selected the non-application response for the state cash assistance described in Q15. Among the 297 applicants, 55 (18.5%) selected the rejection response, 130 (43.8%) partial benefit and 112 (37.7%) full benefit. Non-applicants were not classified as rejected. In nine χ^2 comparisons, the four-category aid response was associated after false-discovery-rate adjustment with pre-earthquake tenure (permutation p=0.0010, q=0.0090; corrected V=0.139) and income (p=0.0047, q=0.0212; V=0.107). No other social indicator reached $q<0.05$ in this nine-test comparison. These small effect sizes and exploratory comparisons should be considered alongside the adjusted models.

In the application model, respondents in public or registered private-sector work had higher odds of applying than the comparison group (OR 2.04, 95% CI 1.17–3.55; p=0.012), as did tenants relative to owners (OR 1.77, 1.01–3.12; p=0.047). A group-wise likelihood-ratio test for tenure gave p=0.035. These are odds, not risk ratios or administrative application rates. Among applicants, tenants had lower adjusted odds of a more favourable reported aid category than owners (OR 0.47, 0.28–0.80; p=0.006). The 1.5–2-times-minimum-wage group had higher odds than the below-minimum-wage group (OR 3.40, 1.54–7.47; p=0.002); the pattern was not strictly monotonic across all income groups. Both "strong network" (OR 2.11, 1.23–3.64) and "alone" (OR 2.10, 1.03–4.26) differed from "close family only" after adjustment. Table 3 gives stage-specific contrasts.

Table 3 about here

In standardized model predictions for applicants, owner versus tenant profiles had estimated rejection-response probabilities of 14.0% versus 24.8% and full-benefit probabilities of 44.3% versus 28.6%. For incomes below the minimum wage versus 1.5–2 times that wage, the corresponding estimates were 33.3% versus 13.7% selecting rejection and 20.8% versus 44.7% selecting full benefit. The joint proportional-odds diagnostic was $\chi^2(18)=22.91$, p=0.194. These associations do not reveal eligibility rules, the reasons for rejection, or who made a decision.

3.3. Group comparisons, housing and preferences

None of the 63 individual group contrasts in the three primary process-score models reached $q<0.05$ using the stated Student's t reference (minimum q=0.0546). Adjusted R^2 was 0.062, 0.075 and 0.073 for early response/inclusion, service continuity and governance/participation, respectively. A normal-reference sensitivity calculation yielded a minimum q of 0.0499, showing that the result closest to the threshold was sensitive to the reference choice. In the separate nine-comparison analysis of household-needs subtypes, chronic illness was associated with a 0.604-point lower governance/participation score (95% CI −1.029 to −0.178; q=0.0497). None of the

other subtype comparisons reached $q<0.05$. The chronic-illness subgroup included 28 respondents, so this borderline finding remains exploratory.

In the current own-home model, pre-earthquake tenants had lower adjusted odds than owners of selecting "living in my own home" (OR 0.08, 95% CI 0.05–0.15; $p<0.001$). Given the outcome's ownership-related wording, this association should not be interpreted as evidence of displacement, return to the same dwelling or a housing-policy effect. On Q22, 313/432 (72.5%) chose the bundled consultation-and-inclusion option. A higher Q20 participation rating was associated with lower adjusted odds of this choice (OR 0.75 per scale point, 95% CI 0.64–0.88; $p<0.001$). The survey cannot identify which component of either option drove the selection.

3.4. Future belief

The adjusted three-category future-belief model converged without a response-category empty cell in the education cross-tabulation. Conditional on social covariates and the other process scores, the governance/participation score was associated with the overall future-belief outcome (likelihood-ratio $\chi^2(2)=47.13$, $p<0.001$), as was early response/inclusion ($\chi^2(2)=17.66$, $p<0.001$); service continuity was not ($\chi^2(2)=1.51$, $p=0.469$). The McFadden pseudo-R^2 was 0.353, which must not be interpreted as the proportion of variance explained. Table 4 presents standardized predicted probabilities: at governance score 2, a positive future response was estimated at 26.9% (95% CI 19.9–33.8), versus 69.6% (59.7–79.6) at score 4. This is an adjusted comparison holding the observed distribution of other variables fixed; it is neither an intervention effect nor a population forecast. Correlated scores can also make such standardized contrasts sensitive to the empirical joint distribution.

Table 4 about here

In a sensitivity model using all five future-belief categories and only the three process scores, early response/inclusion (likelihood-ratio $p=0.0013$), governance/participation ($p<0.001$) and service continuity ($p=0.0447$) were associated with future belief. This model omitted social covariates and

used different outcome categories from the primary model, so its results are not directly equivalent to the adjusted three-category estimates.

4. Discussion

The findings raise a public health question about whether recovery services respond to different needs, beyond the restoration of general provision. Positive ratings of basic health-service continuity were more common than positive ratings of chronic and older-person care or psychosocial support, while negative evaluations of dietary provision and shelter accessibility pointed to additional concerns. A scoping review of early evidence after the Türkiye–Syria earthquakes identified interruptions to oncology and dialysis services and needs for rehabilitation and mental health support [13]. Our survey extends this discussion to residents' retrospective evaluations of service continuity and accessibility during recovery, while its non-probability design and general items prevent population estimates or verification of particular care pathways. These ratings do not measure the prevalence of clinically unmet need or health outcomes. Accordingly, the absence of an independent association between the service-continuity score and future belief should not be read as evidence that continuity of care was unimportant.

The findings place residents' voice alongside material provision as a central concern in the surveyed recovery experiences. Participation received the most negative ratings, and nearly three-quarters selected the consultation-and-inclusion reconstruction package. This pattern converges with the recent Hatay analysis in which participation appeared frequently in policy texts but translated into limited influence over spatial decisions [9]. The agreement across a resident survey and document-based spatial research strengthens the interpretation of participation as a substantive recovery concern, although these designs examine different evidence and cannot validate one another's numerical estimates. The survey does not show which administrative decisions excluded respondents or whether all residents experienced the same constraint.

The reconstruction priority result also relates to the speed–deliberation dilemma identified across Japan, Türkiye and Chile, including the rapid provision of housing without public consultation in

Van [8]. In the questionnaire, 72.5% of respondents selected an option combining public consultation, accessibility and preservation of historic fabric, even if reconstruction took longer. The alternative prioritized speed at the expense of neighbourhood culture and aesthetics. This result shows support for the combined option; it does not reveal which feature motivated the choice or measure preferences about construction speed separately. After adjustment for social characteristics, respondents who felt less involved in current decisions were more likely to select the inclusive option. This pattern is consistent with unmet demand for participation, although it does not establish that exclusion caused the preference. The survey also did not test whether rapid reconstruction and meaningful participation could be achieved together.

Governance/participation and early response evaluations were associated with belief in a safer and fairer future, whereas service continuity had no independent association after adjustment. Interviews with Hatay survivors similarly situated access to reliable information and trust within accounts of basic needs and social recovery [10]. The conceptual convergence lies in residents interpreting recovery through institutional processes as well as delivered services. Our measures, however, did not directly assess trust or legitimacy: the governance score combined coordination and participation, and the future item combined safety and fairness. Shared optimism or dissatisfaction could partly account for the associations. Thus, the findings concern linked evaluations of recovery and its prospects; they do not demonstrate that improving one process would produce the modelled change in future belief.

The cash-aid findings add a stage-specific account of distribution. Tenants had higher adjusted odds of applying than owners but lower odds of reporting a more favourable outcome among applicants. This distinction is consistent with shock-responsive social protection research showing that identifying people for support, maintaining suitable registries and delivering transfers involve different operational decisions [7]. Adaptive social protection likewise treats programme design, information and institutional coordination as connected components rather than equating assistance with a single delivery count [6]. Our results identify where a reported disparity becomes

visible, but not why it arises. Programme eligibility, damage, documentation and timing could differ between tenure groups, and the response option's reference to renting may itself strengthen the observed association. A less favourable reported category consequently cannot be read as verified discriminatory treatment.

Income and network results further qualify a simple vulnerability gradient. Applicants in the 1.5–2 times minimum wage category reported more favourable outcomes than those below the minimum wage, but the pattern was not monotonic across income groups. Both a strong network and reporting being alone were associated with more favourable outcomes than relying on close family alone. This complicates any straightforward claim that stronger social connections consistently improve aid outcomes. Interviews with Hatay survivors highlighted how local solidarity helped people share information and meet basic needs [10]. Our analysis examined applicants' reported outcomes of state cash assistance. The two studies therefore address different forms of support, and our findings should not be interpreted as contradicting the importance of local solidarity. Restricting the outcome analysis to applicants, together with unmeasured assistance needs and small categories, may also influence the pattern; the study cannot establish a protective effect of isolation.

Recognition concerns were visible in negative evaluations of special diet provision and accessible temporary shelter. These observations align with disability-stakeholder accounts of unmet requirements, exclusion and accessibility problems in Türkiye [11]. They also accord with an integrative review in which emergency shelter experiences depended on physical, social and attitudinal environments [12]. However, none of the individual group differences estimated in the three main process-score models remained statistically significant after correction for multiple comparisons. The separate chronic-illness result was borderline and based on 28 respondents. This weaker subgroup evidence does not invalidate the qualitative findings: our household-level indicators pooled heterogeneous needs, overlapped across categories and did not directly interview

people with disabilities about their own access. Differences in sampling, measurement and multiplicity control provide plausible reasons for the contrast in the strength of evidence.

Taken together, the findings connect disaster justice with public health questions about access to recovery resources, continuity of essential services and the recognition of different needs. The contribution is to distinguish reported application from reported benefit while examining these stages alongside service and participation evaluations. This approach offers questions for recovery monitoring beyond Hatay: whether access barriers arise before or after application, whether general service ratings obscure concerns about specific support, and whose priorities enter recovery decisions. These questions require assessment in other settings with programme-specific records and direct measures of service use and health; the present findings do not establish transferable effect sizes or causal mechanisms.

5. Limitations

Convenience and snowball recruitment limit representativeness. Combining face-to-face, computer-assisted and online administration provided several routes to participation, but did not remove selection through networks, digital access or the ability to be reached in person. Residents displaced from Hatay or facing severe access barriers may remain underrepresented. Administration modes can also differ in privacy, assistance with comprehension and the presence of an interviewer, potentially influencing disclosure and socially desirable answers [17]. Because mode labels and recruitment counts were not retained in the analytic workbook, these differences cannot be assessed or adjusted, and no response rate can be estimated. Complete-case exclusion may introduce further selection if incomplete responses differ systematically from retained records.

Self-reported, retrospective evaluations are susceptible to recall and shared response tendencies, and the cross-sectional design cannot establish temporal or causal direction. Cash-aid responses pool unspecified programmes and lack verified eligibility, decisions, amounts and payment dates. Examples referring to renting and bureaucracy may shape answer selection. The questionnaire

455 does not identify migration status, housing damage, pre-earthquake address, reasons for moving
456 or return to the same dwelling. The future item combines safety and fairness; the reconstruction
457 choice combines several desirable features; and governance/participation combines coordination
458 with voice. Correlated scores are not independent validated justice constructs. Small, overlapping
459 needs subgroups and multiple exploratory comparisons limit precision, and the borderline chronic-
460 illness association requires replication. The health-related items did not distinguish service users
461 from non-users or verify individual clinical need and treatment histories. Negative ratings
462 therefore cannot be interpreted as the prevalence of unmet healthcare need, and the study cannot
463 determine whether reported assistance or participation translated into better health.

464 **6. Conclusions**

465 In this non-probability Hatay sample, respondents' evaluations raised concerns about both access
466 to recovery assistance and services addressing specific needs. Basic health-service continuity
467 received more positive ratings than chronic and older-person care or psychosocial support, while
468 dietary provision and shelter accessibility attracted substantial negative evaluations. Separating
469 cash-assistance application from applicants' reported outcomes revealed opposite tenure
470 associations, and participation was the lowest-rated recovery item. Governance/participation and
471 early response evaluations were associated with belief in a safer and fairer future. The findings
472 support public health monitoring that considers assistance stages, service continuity and
473 accessibility together. The following recommendations address these reported concerns; their
474 effectiveness and effects on health were not tested.

475 First, health and care providers, social services and shelter managers should agree responsibility
476 for continuing treatment, medication supply, home care, accessible facilities, special diets and
477 psychosocial referrals during displacement. Needs assessments should record functional
478 requirements rather than rely only on a broad vulnerability label, and an identified service contact
479 should follow up unresolved referrals. Monitoring should include treatment interruptions,
480 unresolved access requests and waiting times, alongside the number of people receiving services.

These proposals respond to the survey's accessibility concerns and provisional chronic-illness finding, and are consistent with the specific continuity needs documented after the earthquakes [13].

Second, cash-assistance administrators should record each stage of access separately for each programme: contact or referral, application, eligibility assessment, decision, payment and appeal. A common case identifier should connect these stages, with reasons for refusal or partial support recorded in plain language. Aggregate monitoring should distinguish tenure and income groups while accounting for programme rules, housing damage and application timing. Assisted in-person access should accompany digital channels, and applicants should receive a decision explanation and an accessible review route. This proposal responds to the divergence between application and reported benefit and makes the suspected access barriers testable. It follows the broader emphasis on reliable information and functioning delivery arrangements in shock-responsive social protection [7].

Third, provincial and local recovery authorities should embed consultation before housing locations, neighbourhood layouts and service arrangements become fixed. Neighbourhood forums should include tenants, displaced residents, people with disabilities, older residents and caregivers, with accessible venues and remote participation options. Authorities should publish the options discussed, the principal concerns raised and a reasoned account of how these influenced the decision. Published consultation deadlines can be coordinated with delivery milestones, so that participation has a defined place in reconstruction rather than being deferred until implementation. An independent complaint and review channel should allow residents to challenge exclusion from these processes. These proposed arrangements give operational content to Sendai's principles of inclusive participation, local empowerment and clear stakeholder responsibilities [5].

Finally, these measures should be evaluated through programme-specific records and repeated, inclusive resident surveys that retain administration-mode and collection-date information. Reporting should make non-application, unresolved needs and unanswered consultation requests

visible, as well as completed delivery. The aim is to enable scrutiny of whose needs were met and whose input shaped recovery. Such evaluation would provide stronger evidence for improving disaster justice without treating the associations observed here as established policy effects.

List of abbreviations

CI: confidence interval; DASK: compulsory earthquake insurance in Türkiye; HC3: heteroskedasticity-consistent covariance estimator, type 3; OR: odds ratio; Q: questionnaire item; SD: standard deviation.

Declarations

Ethics approval and consent to participate

Ethical approval for the use of the data collection form was obtained from the Scientific Research and Publication Ethics Committee of Social Sciences and Humanities of Hatay Mustafa Kemal University (approval number: 53 approval date: April 3rd, 2026).

Consent for publication

Not applicable. The manuscript presents aggregate survey results and does not include identifiable individual details, images or videos.

Availability of data and materials

The respondent-level survey data are not publicly available because they include sensitive household health and socioeconomic information, and unrestricted disclosure may compromise participant confidentiality. Any request for access must be assessed against applicable ethical, privacy and institutional requirements. Requests may be directed to the corresponding author; any access is conditional on the relevant ethical, privacy and institutional authorizations.

Competing interests

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Authors' contributions

AUŞ prepared the original draft and reviewed and edited the manuscript. The author read and approved the final manuscript.

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Table 1. Participant characteristics

Characteristic	Category	n (%)
Age (years)	18–34	210 (48.6%)
Age (years)	35–54	192 (44.4%)
Age (years)	55+	30 (6.9%)
Sex	Female	204 (47.2%)
Sex	Male	228 (52.8%)
Education	Primary	35 (8.1%)
Education	Lower secondary	49 (11.3%)
Education	Upper secondary	157 (36.3%)
Education	University	145 (33.6%)
Education	Postgraduate	46 (10.6%)
Employment before the earthquake	Not working	188 (43.5%)
Employment before the earthquake	Public	88 (20.4%)
Employment before the earthquake	Registered private	95 (22.0%)
Employment before the earthquake	Self-employed	52 (12.0%)
Employment before the earthquake	Unregistered/daily	9 (2.1%)

Pre-earthquake tenure	Owner	240 (55.6%)
Pre-earthquake tenure	Tenant	112 (25.9%)
Pre-earthquake tenure	Other	80 (18.5%)
Pre-earthquake household income	Below minimum wage	56 (13.0%)
Pre-earthquake household income	About minimum wage	139 (32.2%)
Pre-earthquake household income	1.5–2 times minimum wage	157 (36.3%)
Pre-earthquake household income	3+ times minimum wage	80 (18.5%)
Household member with listed support need	Yes	72 (16.7%)
Residential insurance	None	285 (66.0%)
Residential insurance	DASK only	115 (26.6%)
Residential insurance	DASK and private	32 (7.4%)
Emergency support network	Close family only	252 (58.3%)
Emergency support network	Strong network	117 (27.1%)
Emergency support network	Alone	63 (14.6%)

Note. N=432. Public (88) and registered private-sector (95) employment are separate survey responses. The "not working" category contains several statuses that cannot be disaggregated. Listed support-need types overlap: disability 28, older-person care 30, chronic illness 28; there are 72 distinct respondents reporting at least one. DASK denotes compulsory earthquake insurance in Türkiye.

Source: Author's survey and analysis.

Table 2. Evaluations of response and recovery

Item and condensed wording	Mean (SD)	Negative 1–2	Neutral 3	Positive 4–5
Q10 Emergency services reached the area within 72 hours	2.56 (1.45)	223 (51.6%)	84 (19.4%)	125 (28.9%)
Q11 Fair distribution of basic humanitarian aid	2.59 (1.48)	220 (50.9%)	84 (19.4%)	128 (29.6%)
Q12 Special dietary needs were considered	2.56 (1.36)	213 (49.3%)	114 (26.4%)	105 (24.3%)
Q13 Temporary shelters were physically accessible	2.66 (1.42)	205 (47.5%)	100 (23.1%)	127 (29.4%)
Q16 Continuity of basic health services	3.18 (1.36)	135 (31.2%)	115 (26.6%)	182 (42.1%)
Q17 Continuity of chronic and older-person care	2.90 (1.31)	144 (33.3%)	152 (35.2%)	136 (31.5%)
Q18 Accessibility of psychosocial support	2.92 (1.32)	158 (36.6%)	129 (29.9%)	145 (33.6%)
Q19 Coordination between central and local authorities	2.97 (1.47)	179 (41.4%)	73 (16.9%)	180 (41.7%)
Q20 Residents consulted and involved in major decisions	2.35 (1.39)	254 (58.8%)	81 (18.8%)	97 (22.5%)
Q21 Hatay will become safer and fairer against future disasters	3.05 (1.49)	162 (37.5%)	88 (20.4%)	182 (42.1%)

Note. Complete-case N=432; each agreement response ranged from 1 (strongly disagree) to 5 (strongly agree). Condensed English descriptions retain the source item's meaning; Q21 combines safer and fairer in a single question. Full questionnaire wording can be checked against the Turkish raw workbook.

Source: Author's survey and analysis.

Table 3. Cash-assistance application and applicant outcomes

Stage	Contrast	Adjusted OR (95% CI)	p
Application (n=432)	Public / registered private work vs other statuses	2.04 (1.17–3.55)	0.012
Application (n=432)	Tenant vs owner	1.77 (1.01–3.12)	0.047
Outcome among applicants (n=297)	Tenant vs owner	0.47 (0.28–0.80)	0.006
Outcome among applicants (n=297)	Income 1.5–2× minimum wage vs below minimum wage	3.40 (1.54–7.47)	0.002
Outcome among applicants (n=297)	Income 3+× minimum wage vs below minimum wage	2.63 (1.05–6.58)	0.039
Outcome among applicants (n=297)	Strong network vs close family only	2.11 (1.23–3.64)	0.007
Outcome among applicants (n=297)	Alone vs close family only	2.10 (1.03–4.26)	0.040

Note. Every contrast is adjusted for age, sex, education, the specified employment binary, tenure, income, household needs, insurance and social network. The reference category for sex is female in both models. An OR>1 in the ordinal applicant model refers to a more favourable self-reported aid category (told ineligible < partly benefited < fully benefited). The outcome is not an independently verified eligibility or payment decision. For tenure the respective model group likelihood-ratio p-values are 0.035 and 0.012. The three applicant responses were selected by 55, 130 and 112 of 297 applicants; 135 non-applicants are outside the second-stage model. The first response option gave renting as an example of ineligibility and may prime the tenure association.

Source: Author’s survey and analysis.

Table 4. Future belief and standardized model probabilities

Governance / participation score	Negative (95% CI)	Neutral (95% CI)	Positive (95% CI)
2	42.1% (36.9–47.3)	31.1% (24.0–38.1)	26.9% (19.9–33.8)
4	14.9% (6.6–23.2)	15.5% (9.0–22.1)	69.6% (59.7–79.6)

Note. Outcome: whether reconstruction will make Hatay safer and fairer (negative Q21=1–2; neutral=3; positive=4–5). N=432. Estimates average predictions over all observed covariates while setting the two-item governance/participation score to 2 or 4; 95% CIs use the delta method conditional on the observed sample. These are observational contrasts, not intervention effects. Domain likelihood-ratio $\chi^2(2)$: early response/inclusion 17.66 ($p<0.001$), service continuity 1.51 ($p=0.469$), governance/participation 47.13 ($p<0.001$).

Source: Author's survey and analysis.