STROBE Statement — Checklist for cohort studies

Manuscript: Evolving burden of falls and fall-related fractures in China, 1990-2023, with projections to 2035: GBD 2023 estimates and the individual-level cascade to disability in CHARLS

Item wording follows the STROBE cohort checklist (von Elm E, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement. Lancet 2007;370:1453-1457; Vandenbroucke JP, et al. PLoS Med 2007;4:e297). "Location" cites the manuscript section heading and the relevant Table/Figure; Additional file 1 tables are labelled S1-S5. Items 6b, 12d (matched design) and 16c are marked N/A where the design does not use them.

Item	Recommendation (verbatim)	Location in this manuscript
Title and abstract		
1a	Indicate the study's design with a commonly used term in the title or the abstract.	Title; Abstract (Methods): ecological GBD trend analysis plus a longitudinal CHARLS cohort.
1b	Provide in the abstract an informative and balanced summary of what was done and what was found.	Abstract (Background/Methods/Results/Conclusions), 349 words, structured.
Introduction		
2	Explain the scientific background and rationale for the investigation being reported.	Background (all three paragraphs), with cited prior GBD and CHARLS work.
3	State specific objectives, including any prespecified hypotheses.	Background, final paragraph (the contribution of coupling the two sources); Methods, Overall design (pre-specified age rule and analyses).
Methods		
4	Present key elements of study design early in the paper.	Methods, Overall design (two non-linkable sources; GATHER for GBD, STROBE for the cohort; qualitative comparison, never pooled).
5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection.	Methods, GBD 2023 source and definitions (mainland China, 1990-2023); CHARLS cohort, exposures and outcomes (2013/2015/2018/2020 waves; cohort anchored 2015; follow-up 2018 and 2020).
6a	Cohort study: Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up.	Methods, CHARLS cohort, exposures and outcomes (age ≥45, no 2015 fall, valid performance tests; ever-positive follow-up rule); Fig. 1.
6b	For matched studies, give matching criteria and number of exposed and unexposed.	N/A — no matched design.
7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable.	Methods, CHARLS cohort, exposures and outcomes (grip/gait/chair-stand definitions; fall, hip fracture, BADL per Katz/IADL per Lawton; confounders age, sex, urban residence, BMI); GBD source and definitions (six measures, twelve sites, low-BMD PAF).
8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group.	Methods (IHME GBD 2023 Results Tool, three queries; CHARLS grip = max of four trials, 2.5-m timed walk, five-time chair-stand; self-reported outcomes and wave-specific recall window); Additional file 1, Table S4.

Item	Recommendation (verbatim)	Location in this manuscript
9	Describe any efforts to address potential sources of bias.	Methods (non-response-adjusted survey weights, PSU cluster-robust SE, ever-positive rule, no worst-value imputation for unable-to-test); Statistical analysis (stabilised IPW for attrition); Additional file 1, Table S2; Discussion (two-stage walking selection).
10	Explain how the study size was arrived at.	Methods and Fig. 1: secondary analysis using the full eligible CHARLS sample at each stage (20,967 interviewed → 11,449 analytic; 9,649 at risk for incident BADL); GBD uses the complete national modelled series; no sample-size calculation because no sampling was performed.
11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why.	Methods (consensus binary cut-points AWGS/EWGSOP2; sex-specific grip quartiles vs highest-function group; restricted cubic splines at fixed knots; age-standardised rates and five-year age bands); Results; Table 7.
12a	Describe all statistical methods, including those used to control for confounding.	Methods, Statistical analysis: GBD and Statistical analysis: CHARLS (EAPC, joinpoint, Das-Gupta, ARIMA; survey-weighted binomial GLM with the pre-specified adjustment set and rationale).
12b	Describe any methods used to examine subgroups and interactions.	Methods/Results (sex-stratified estimates; harmonised 45-59/60-74/75+ bands; quartiles and splines; three age domains 15+/45+/60+ in the decomposition); Figs 4, 6, 9; Additional file 1, Table S5.
12c	Explain how missing data were addressed.	Methods and Table 6 footnote (effective N per model; missing BMI/covariates reduce N); unable-to-test not assigned the worst value; frequency vs analytic vs unweighted comparison and IPW in Additional file 1, Table S2B-C.
12d	Cohort: If applicable, explain how loss to follow-up was addressed.	Methods (830 answering neither follow-up excluded; informative-attrition test and stabilised IPW); Fig. 1; Additional file 1, Table S2C-D.
12e	Describe any sensitivity analyses.	Methods; Results, Sensitivity analyses; Additional file 1, Tables S1-S2 (extended adjustment, endpoint-wave split, forced d=1 ARIMA, weight specification, IPW, alternative spline knots and 1.0 m/s gait cut).
Results		
13*	(a) Report numbers of individuals at each stage of the study; (b) give reasons for non-participation at each stage; (c) consider use of a flow diagram.	Fig. 1 (flow diagram with counts and reasons at every stage); Results, CHARLS: prevalence and the longitudinal cohort.
14*	(a) Give characteristics of study participants and information on exposures and potential confounders; (b) indicate participants with missing data for each variable; (c) summarise follow-up time.	Table 5 (baseline by fall status); Additional file 1, Table S3 (full cohort vs walking sub-sample); Table 6 footnote (effective N); Methods (fixed 3-5-year follow-up, 2018/2020 endpoints).

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15*	Report numbers of outcome events or summary measures over time.	Results (2,783 incident falls, 175 hip fractures, 1,937 incident BADL cases); Tables 5-7; wave prevalence in Fig. 8.
16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (95% CI). Make clear which confounders were adjusted for and why.	Tables 6-7 (adjusted OR with 95% CI and P); unweighted/complete-case comparison in Additional file 1, Table S2; adjustment rationale in Methods, Statistical analysis: CHARLS.
16b	Report category boundaries when continuous variables were categorized.	Methods (grip <28/<18 kg; gait <0.8 m/s with <1.0 m/s sensitivity; chair-stand ≥12 s; quartile boundaries); Table 7.
16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period.	Fig. 9D and Results, The cascade (absolute proportions: disability after a fall 33.2% vs 14.3%; survey-weighted 26.5% vs 12.6%).
17	Report other analyses done—subgroups, interactions and sensitivity analyses.	Results (quartiles, splines, wave-specific and IPW analyses, cross-database comparison); Figs 9-10; Additional file 1, Tables S1-S2, S5.
Discussion		
18	Summarise key results with reference to study objectives.	Discussion, opening paragraph; Conclusions.
19	Discuss limitations, including the direction and magnitude of any potential bias.	Discussion, limitations paragraph (modelled GBD values, self-report, informative attrition, 175 hip fractures, 29 deaths, univariate ARIMA); magnitude quantified by IPW shifts <0.03 and 8-23% back-test error in Additional file 1, Table S2 and Table 4.
20	Give a cautious overall interpretation considering objectives, limitations, multiplicity, similar studies and other evidence.	Discussion (associations not causal; exploratory tests with no formal multiplicity correction stated in Methods; explicit reconciliation with Sui 2025 and Huang 2025; no J-curve claimed).
21	Discuss the generalisability (external validity) of the study results.	Discussion and Conclusions (nationally representative CHARLS adults ≥45; GBD mainland China; bounds from self-report, the walking sub-sample and the older-only cohort).
Other information		
22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which it is based.	Declarations, Funding (no specific grant); Acknowledgements (CHARLS team and IHME).

** Give information separately for exposed and unexposed groups: Table 5 reports characteristics and Table 6 estimates by the exposure groups of interest.*