OPEN ACCESS

# How socio-political change is associated with the number of individually reported negative life events: a population-based study using the German reunification 1989/1990 as an example

Stefanie Hahm ,[1] Laura Altweck ,[1] Silke Schmidt ,[1] Toni Fleischer ,[2] Claudia Helmert,[2] Christine Ulke ,[2] Sven Speerforck ,[2] Georg Schomerus ,[2] Johanna Klinger-König ,[3] Hans J Grabe ,[3,4] Carsten Oliver Schmidt ,[5] Manfred E Beutel ,[6] Elmar Brähler ,[6] Holger Muehlan [1]

► Additional supplemental material is published online only. To view, please visit the journal online (https://doi.org/10.1136/jech-2023-221549).

For numbered affiliations see end of article.

**Correspondence to**
Stefanie Hahm, Department Health and Prevention, University of Greifswald, Greifswald, Germany; stefanie.hahm@uni-greifswald.de

Received 13 October 2023
Accepted 21 January 2024
Published Online First 8 February 2024



**To cite:** Hahm S, Altweck L, Schmidt S, *et al*. *J Epidemiol Community Health* 2024;**78**:311–318.

## ABSTRACT

**Background** Socio-political change often leads to disruptions in employment and social networks, which can exacerbate health issues and increase mortality rates. These consequences are likely observed as an increase in negative life events (NLEs), serving as indicators of the broader social and health impacts. Using the German reunification in 1989/1990 as an example, this study investigates changes in reported numbers of NLEs and differences regarding sociodemographic characteristics.

**Methods** We used data from the population-based Study of Health in Pomerania (SHIP-START-0, SHIP-Life-Events and Gene-Environment Interaction in Depression; N=1932). Numbers of NLEs in different categories (work/financial, social/interpersonal, illness (own) and illness/death (others)) were measured retrospectively in 5-year intervals (1980–2004) using a semistructured interview. Pre-reunification and post-reunification changes were modelled using piecewise mixed-effects Poisson regressions with the 1990–1994 interval (reunification) as change point. Interactions with age, sex and education were examined.

**Results** The number of most NLE categories, except social/interpersonal NLEs, increased at reunification. Whereas work/financial NLEs slightly decreased post-reunification, illness-related NLEs continued to increase. Higher numbers of social/interpersonal NLEs were found with younger age. More illness-related NLEs were reported with older age, lower education (illness (own)) and by women (illness/death (others)). However, the majority reported no NLEs at reunification (68.2%–80.7%, varying by category).

**Conclusion** Our findings suggest that although some individuals experience a marked increase in NLEs due to socio-political changes, many remain unaffected, emphasising the need for a differentiated understanding of these effects. This increase in NLEs may partly account for ongoing health and well-being disparities among countries with differing transformation histories.

### WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ There are many statistics concerning changes in socioeconomic parameters (eg, unemployment rates) and cross-sectional studies asking for personal experiences related to collective life events. However, studies examining longitudinal changes in the numbers of individual negative life events and especially in context of collective life events resulting from rapid socio-political change remain scarce.

### WHAT THIS STUDY ADDS

⇒ The results of this study reveal how collective life events such as the German reunification are reflected in retrospective reports of individual negative life events over a longer period of time, which domains are most affected and who is most exposed to such events.

### HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ These findings could provide one explanation for still existing disparities in health and well-being between countries with and without transformation experiences and inform interventions for future socio-political change events to alleviate adverse health consequences for the most affected individuals.

## INTRODUCTION

Historical events, such as the collapse of the communist system in Eastern Europe in the early 1990s, the 2009 global financial crisis or the COVID-19 crisis, often precipitate socio-political changes marked by significant transformations of economic, political and social institutions.[1] Such transformations pose immense challenges for the affected population, evidenced by, for example, higher rates of depression, morbidity and mortality as well as lower well-being in former socialist European countries.[1–3] For many persons, such pervasive changes may trigger individual stressful life events (LEs),[4] which are 'objective occurrences of sufficient magnitude to bring about change in the usual activities of most individuals who experience them'.[5] Differential effects of 'positive' LEs (eg, marriage, childbirth, reemployment) and 'negative' LEs (NLEs; eg, unemployment, divorce, bereavement) on health and well-being are well documented.[6–10]

The early 90s' socio-political transformation led to a steep increase in unemployment rates in several ex-communist countries.[3 11] Unemployment rates in East Germany rose to 10.3% in 1991,[12] with women witnessing a particularly stark increase to 21.5% in 1994, compared with men's 10.9%.[13] About 40% of East Germans experienced job loss until 1996[12]; a worsened occupational situation was reported by over one-third, more so among middle-aged individuals and women.[14] Moreover, an increase in job-related stress was experienced by East Germans, predominantly among women aged 25–44.[15] Those born after 1960 and with a university degree had the lowest risk for unemployment.[16] There was a notable increase in feelings of isolation in the early 90s, especially among women and young to middle-aged persons, partly due to the disruption of work teams caused by labour market changes.[15 17] Although divorce rates in East Germany initially decreased, they increased sharply between 1993 and 2003.[12] However, other studies do not support a general 'erosion' of social networks following reunification.[14 18 19] Lastly, the breakdown of the communist system was followed by temporary increases in morbidity and mortality, especially in men and those with low socioeconomic status (SES).[15 20 21] These trends were largely related to an increase in cardiovascular and alcohol-related diseases,[11 20 21] likely stemming from psychosocial stressors related to occupational changes and social isolation.[14 22 23]

As described above, collective LEs have individual repercussions varying by sociodemographic characteristics. Life stage and age significantly influence reported numbers and impacts of stressful LEs,[24] with younger individuals generally reporting more LEs,[7 25] and more LEs being recalled regarding adolescence or young adulthood.[26] However, these numbers vary by LE category, based on social roles and role changes: LEs concerning living situation, career and relationships occur more frequently in young adulthood, whereas illness and loss of loved ones increase with higher age.[27 28] The associations with sex and SES are complex as well and depend on the examined population and LE category. A review showed higher numbers of stressful LEs in men and those with low SES,[25] while women and those with a higher SES reported more LEs in a German sample.[7] Additionally, women tend to report more interpersonal events, while men report more work-related events.[29]

While previous studies often provide brief snapshots on various impacts of significant socio-political changes or focus on health and well-being trajectories, there is a lack of in-depth, long-term examination of different types of NLEs as potential indicators and drivers of health impacts. Consequentially, there is also a scarcity of research into the differential impact of socio-political changes across sociodemographic groups regarding the development of NLEs. Therefore, the present study focuses on changes in the reported number of different NLE categories surrounding socio-political change, using the German reunification as an example, as well as differences relating to age, sex and education to identify particularly vulnerable groups. The following hypotheses will be investigated:

1. The number of NLEs of all categories will increase around reunification, with stronger increases for work/financial and illness-related NLEs compared with social/interpersonal NLEs.
2. Younger persons, women and those with lower education will report higher numbers and stronger increases in NLEs compared with their older, male or more educated counterparts.

## METHODS

### Data and sample selection

A sample from the Study of Health in Pomerania (SHIP)—a population-based study in North-East Germany—was used.[30 31] Post-reunification, this region had the lowest life expectancy in Germany due to the high prevalence of health-related risk factors. Additionally, due to its predominantly rural and maritime economy, this region differs from other more industrialised regions of East Germany.

Data were taken from SHIP-START-0 (baseline, 1997–2001) and the follow-up study 'Life-Events and Gene-Environment Interaction in Depression' (SHIP-LEGEND; 2007–2010). The sample selection procedure is presented in figure 1. From the initial sample of N=4308 (SHIP-START-0) individuals were excluded that did not participate in SHIP-LEGEND. As the focus of the study was on adults of working age at the point of the German reunification, participants who were younger than 18 or older than 64 between 1990 and 1994 were excluded. Finally, participants who did not live in East Germany in 1989

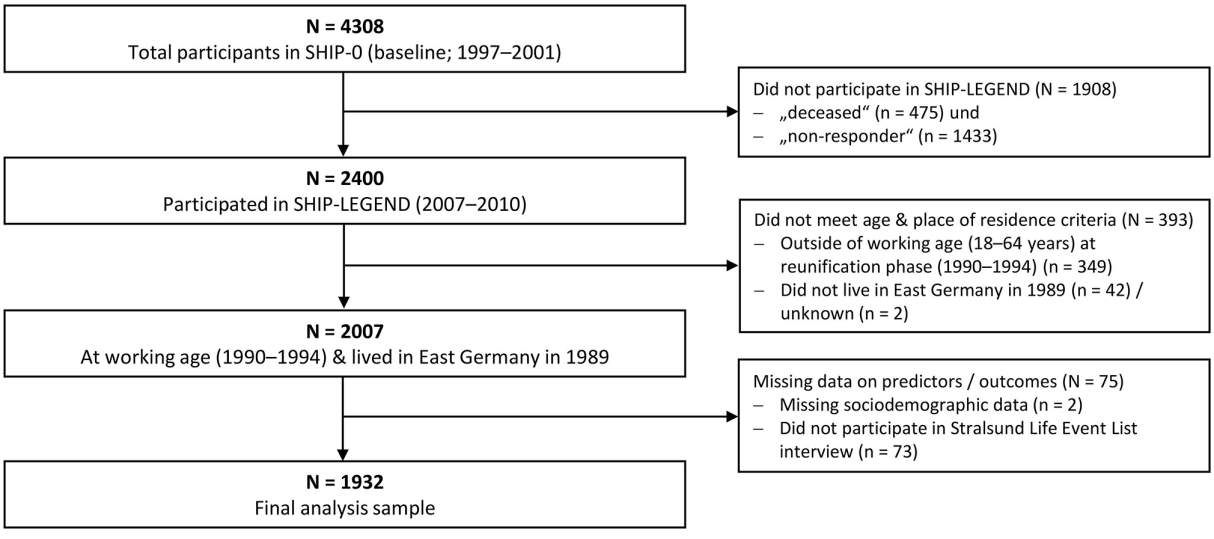


**Figure 1** Flow chart for the sample selection procedure. LEGEND, Life-Events and Gene-Environment Interaction in Depression; SHIP, Study of Health in Pomerania.

and participants with missing data on predictors (sociodemographic data) and outcomes (NLEs) were also excluded. This resulted in a final sample of 1932 participants. Those who were excluded were older, more likely male and had lower education (for further details, see online supplemental table S1).

## Measures

### Negative life events

In SHIP-LEGEND, LEs were measured using the Stralsund Life Event List (SEL),[32] a semistandardised interview comprising 81 LEs. The SEL employs the 'life history' method, a retrospective interview technique improving the accuracy of autobiographical memory recall by helping participants reconstruct significant LEs chronologically and contextually.[33] For most LEs, information about the period of occurrence (5-year intervals) and subjective emotional valence was collected. For the current study, LEs were selected based on (1) negative emotional valence,[32] (2) relevance to socio-political change and (3) availability of information regarding the period of occurrence:

- Work/financial (n=4): job loss, occupational failure/demotion, severe financial problems, being overburdened with work/household tasks.
- Social/interpersonal (n=6): serious conflicts with parents/children/colleagues, long-term friendship broke up, relationship crises, divorce/separation.
- Own illness (n=2): serious bodily illness/accident, long-term work incapacity due to health.
- Illness/death of significant others (n=3): serious bodily illness/accident of close person, death of close relative, death of partner.

To estimate the year of occurrence (eg, 1994), the mean of the period of occurrence (eg, 21–25 years: M=23 years) was added to the participant's birth year (eg, 1971). The total number of NLEs for each category was then calculated for 5-year intervals (1980–1984, 1985–1989, 1990–1994, 1995–1999, 2000–2004).

### Sociodemographic variables

Sociodemographic data—age at reunification (1990), sex (male (reference), female) and the number of school years (<10 years, 10 years (reference), >10 years)—were taken from SHIP-START-0.

## Statistical analysis

Analyses were conducted by using R V.4.2.2.[34] Effects of time and sociodemographic factors on the number of NLEs in four categories were analysed using mixed-effects Poisson regressions with the R-package glmmTMB.[35] All models were checked for violations of the Poisson distribution. Pre-reunification and post-reunification changes were modelled using 'piecewise' or 'segmented' regression, fitting two separate, but connected lines to data segments pre-reunification and post-reunification ($time_{pre}$: 1980–1984 (=−2), 1985–1989 (=−1); $time_{post}$: 1990–1994 (=0), 1995–1999 (=1), 2000–2004 (=2)). In preliminary analyses, this model was compared with competing models using Akaike and Bayesian information criteria (AIC/BIC) (see online supplemental table S2 and figure S1). For work/financial NLEs and own illness, the BIC favoured the piecewise model, whereas a linear solution was favoured for social/interpersonal NLEs and illness/death of others, with the piecewise model ranking close. For consistency, the piecewise model was selected for all NLE categories.

Three models were computed for each NLE category. Model 1 included time variables (pre/post). Model 2 added sex, age (divided by 10) and education, with the coefficients representing the effects during the 'reunification phase' (1990–1994; coded as '0'). Models 3.1, 3.2 and 3.3 examined interactions between time variables and each sociodemographic factor. AIC/BIC differences <2 were considered as non-substantial.[36] Participant ID was included as random effect for repeated measures. Exponentiated coefficients (incidence rate ratios (IRRs)) indicate relative differences in NLE numbers, compared with the reference group (eg, sex: female vs male) or per unit change (eg, time interval, age decade) in a multiplicative fashion. Differences in IRRs pre-reunification and post-reunification are interpreted as direct effects of this event.

# RESULTS

## Descriptive analyses

The mean age at reunification (1990) was 38.09 years (SD=11.63; range: 18–60), with a slight majority of women in the sample (53.2%). Educational attainment varied, with 54.7% completing 10 years of school education, 27.3% less than 10 years and 18.1% more than 10 years.

Table 1 shows the number of reported NLEs across categories over time (see online supplemental table S3 for individual NLEs). Work/financial NLEs increased from low numbers in 1980–1984, reached their peak in 1990–1994 and then slightly declined. The number of social/interpersonal NLEs remained relatively constant. Both illness-related NLE categories rose over time, with a sharper increase in own illness-related NLEs until 1990–1994 comparable to work/financial NLEs. In 1990–1994, most participants reported no NLEs across all categories (68.2%–80.7%).

Figure 2 shows small negative correlations ($r \geq |0.10|$) between age and social/interpersonal NLEs, increasing from 1985–1989 to 2000–2004, and for work/financial NLEs in 1995–1999 and 2000–2004. There were no substantial correlations between NLEs and sex. School years showed small positive correlations with work/financial NLEs in 2000–2004 and social/interpersonal NLEs from 1985–89 to 2000–2004, and a small negative correlation with own illness-related NLEs in 1995–1999.

## Regression results

Regression results in table 2 and figure 3 (see online supplemental table S4 for full models) show improved model fit for each NLE category with sociodemographic main effects (model 2) according to AIC; the BIC improved for all NLE categories but own illness-related NLEs. Time×sex interactions (model 3.1) were supported for all NLEs except for social/interpersonal NLEs based on AIC to but not BIC. Time×age interactions (model 3.2) were substantial according to both AIC and BIC for all NLE categories except for own illness-related NLEs. Time×education interactions (model 3.3) were supported by AIC only. Comparisons of observed NLE numbers with predicted marginal means are found in online supplemental figures S2–S4.

Work/financial NLEs increased sixfold ($IRR^2=2.53^2=6.40$) from 1980–1984 (6 events per 100 persons) to 1990–1994 (38 events per 100 persons) and decreased by 29% afterwards ($IRR^2=0.84^2=0.71$). Age showed significant main and interaction effects, with a 14% NLE decrease per decade as well as less pre-reunification increase and more post-reunification decrease in older individuals. Additionally, those with 10 years of schooling showed the strongest pre-reunification increase; those with <10 years reported the largest post-reunification decrease.

**Table 1** Numbers of negative life events (NLE) for different categories

| NLE category | | Time interval | | | | |
|---|---|---|---|---|---|---|
| | | 1980–1984 | 1985–1989 | 1990–1994 (reunification) | 1995–1999 | 2000–2004 |
| Work/financial (n=4)* | | | | | | |
| M (SD) per 100 persons | | 4.92 (22.34) | 15.06 (38.96) | 35.97 (56.43) | 26.66 (52.28) | 26.35 (53.12) |
| Individual n (%) | 0 | 1840 (95.2) | 1664 (86.1) | 1318 (68.2) | 1486 (76.9) | 1500 (77.6) |
| | 1 | 89 (4.6) | 245 (12.7) | 537 (27.8) | 383 (19.8) | 363 (18.8) |
| | ≥2 | 3 (0.2) | 23 (1.2) | 77 (4.0) | 63 (3.3) | 69 (3.6) |
| Social/interpersonal (n=6)* | | | | | | |
| M (SD) per 100 persons | | 21.79 (50.54) | 24.74 (53.74) | 24.38 (55.00) | 27.69 (58.06) | 28.78 (61.40) |
| Individual n (%) | 0 | 1585 (82.0) | 1543 (79.9) | 1559 (80.7) | 1509 (78.1) | 1512 (78.3) |
| | 1 | 281 (14.5) | 310 (16.0) | 290 (15.0) | 329 (17.0) | 312 (16.1) |
| | ≥2 | 66 (3.4) | 79 (4.1) | 83 (4.3) | 94 (4.9) | 108 (5.6) |
| Illness (own) (n=2)* | | | | | | |
| M (SD) per 100 persons | | 8.49 (28.43) | 14.54 (37.95) | 31.42 (52.50) | 33.80 (53.96) | 35.82 (55.38) |
| Individual n (%) | 0 | 1771 (91.7) | 1670 (86.4) | 1383 (71.6) | 1344 (69.6) | 1314 (68.0) |
| | 1 | 158 (8.2) | 243 (12.6) | 491 (25.4) | 523 (27.1) | 544 (28.2) |
| | ≥2 | 3 (0.2) | 19 (1.0) | 58 (3.0) | 65 (3.4) | 74 (3.8) |
| Illness/death (others) (n=3)* | | | | | | |
| M (SD) per 100 persons | | 23.29 (49.29) | 31.00 (56.08) | 38.30 (61.34) | 39.65 (62.67) | 55.54 (70.70) |
| Individual n (%) | 0 | 1542 (79.8) | 1429 (74.0) | 1322 (68.4) | 1312 (67.9) | 1096 (56.7) |
| | 1 | 332 (17.2) | 408 (21.1) | 485 (25.1) | 476 (24.6) | 606 (31.4) |
| | ≥2 | 58 (3.0) | 95 (4.9) | 125 (6.5) | 144 (7.5) | 230 (11.9) |

The mean values (M) indicate the average number of NLEs for each period extrapolated to 100 persons for ease of interpretation.
*Number of different subcategories of NLEs that were included in each category.

Social/interpersonal NLEs increased slightly post-reunification, with fewer NLEs at higher age (29% less per decade). Additionally, women and those with >10 years of schooling reported 18% and 24% more NLEs, respectively. Pre-reunification and post-reunification trajectories differed with respect to age with younger adults showing stronger increases.

NLEs regarding own illness and illness/death of others increased fourfold ($IRR^2=1.98^2=3.92$) and 50% ($IRR^2=1.24^2=1.54$), respectively, pre-reunification; post-reunification, the growth rate of own illness NLEs decreased ($IRR_{pre}=1.98$; $IRR_{post}=1.08$), whereas the increase of illness/death of others remained stable ($IRR_{pre}=1.24$; $IRR_{post}=1.20$). Sociodemographic effects varied: fewer own illness-related NLEs were reported with higher education (15% higher for <10 years, 18% lower for >10 years vs 10 years), more NLEs regarding illness/death of others were reported by women (24%) and older individuals (+7% per decade). Marginal time×sex and time×age interactions were found for both illness-related categories. Pre-reunification, there was a slightly stronger increase in younger persons; post-reunification, men reported increasingly more NLEs, while the growth rates were lower for women.

## Robustness checks

Depressive symptoms at time of NLE measurement, assessed using Beck Depression Inventory-II,[37] were controlled (see online supplemental table S5). While more depressive symptoms correlated with a higher number of NLEs, overall trends and sociodemographic differences in reported NLEs were unaffected.

Additionally, the analyses were replicated with a smaller sample (n=1137) at working age (18–64 years) between 1980 and 2004 (see online supplemental table S6). Overall findings regarding time and sociodemographic characteristics were similar, with less pronounced differences regarding education except for own illness-related NLEs.

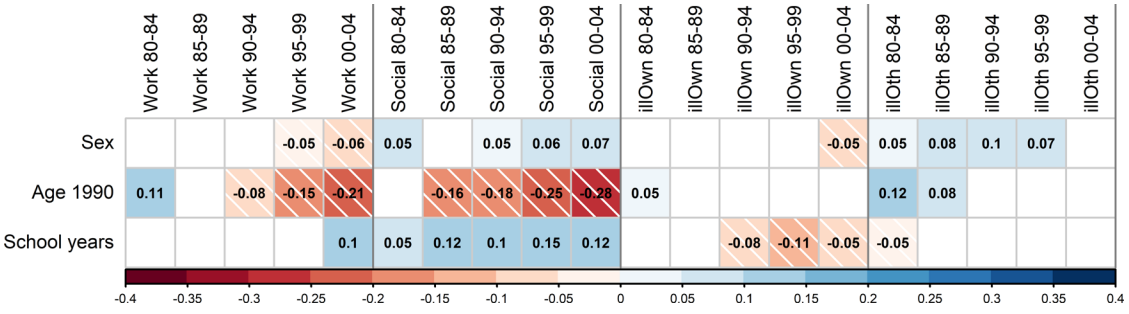


**Figure 2** Spearman rank correlations of the number of negative life events for different categories and time intervals with sociodemographic characteristics. Areas with diagonal white lines indicate negative correlations. Only significant correlations are shown (p<0.05). illOth, illness/death (others); illOwn, illness (own); Social, social/interpersonal; Work, work/financial.

**Table 2** Results of mixed-effects Poisson regressions for the effects of time interval, sociodemographic characteristics and their interactions on the total number of NLEs (N=1932)

| | Work/financial | | Social/interpersonal | | Illness (own) | | Illness/death (others) | |
|---|---|---|---|---|---|---|---|---|
| **Models (M)** | **IRR (95% CI)** | **P value** | **IRR (95% CI)** | **P value** | **IRR (95% CI)** | **P value** | **IRR (95% CI)** | **P value** |
| (M1) main effects (time) | | | | | | | | |
| Time: Pre | **2.53 (2.31 to 2.76)** | <0.001 | 1.06 (1.00 to 1.13) | 0.053 | **1.98 (1.83 to 2.14)** | <0.001 | **1.24 (1.17 to 1.31)** | <0.001 |
| Time: Post | **0.84 (0.80 to 0.89)** | <0.001 | **1.07 (1.01 to 1.14)** | 0.016 | **1.08 (1.02 to 1.14)** | 0.007 | **1.20 (1.15 to 1.26)** | <0.001 |
| $R^2$ (cond. \| marg.) | 0.320 \| 0.174 | | 0.329 \| 0.003 | | 0.240 \| 0.158 | | 0.110 \| 0.055 | |
| AIC \| BIC | 10212.87 \| 10241.58 | | 11639.89 \| 11668.6 | | 11185.57 \| 11214.27 | | 15007.31 \| 15036.01 | |
| (M2) M1+main effects (SCDs) | | | | | | | | |
| Sex: female | **0.89 (0.80 to 0.98)** | 0.023 | **1.18 (1.05 to 1.33)** | 0.005 | 0.98 (0.90 to 1.08) | 0.727 | **1.24 (1.15 to 1.33)** | <0.001 |
| Age/10 | **0.86 (0.82 to 0.91)** | <0.001 | **0.71 (0.67 to 0.75)** | <0.001 | 0.98 (0.94 to 1.03) | 0.460 | **1.07 (1.03 to 1.11)** | <0.001 |
| School: <10 years | **0.86 (0.74 to 0.99)** | 0.041 | 0.87 (0.73 to 1.03) | 0.101 | **1.15 (1.02 to 1.30)** | 0.020 | 0.99 (0.90 to 1.09) | 0.775 |
| School: >10 years | 0.97 (0.84 to 1.11) | 0.670 | **1.24 (1.07 to 1.44)** | 0.004 | **0.82 (0.72 to 0.93)** | 0.002 | 1.02 (0.93 to 1.13) | 0.613 |
| $R^2$ (cond. \| marg.) | 0.326 \| 0.191 | | 0.337 \| 0.084 | | 0.242 \| 0.163 | | 0.111 \| 0.065 | |
| AIC \| BIC | 10154.97 \| 10212.38 | | 11401.76 \| 11459.16 | | 11171.39 \| 11228.79 | | 14966.56 \| 15023.97 | |
| (M3.1) M2+interaction (time×sex) | | | | | | | | |
| Pre×female | 0.85 (0.71 to 1.01) | 0.066 | 1.01 (0.89 to 1.14) | 0.918 | 0.99 (0.85 to 1.17) | 0.933 | 1.06 (0.95 to 1.19) | 0.314 |
| Post×female | 0.91 (0.81 to 1.02) | 0.108 | 1.05 (0.93 to 1.18) | 0.413 | **0.86 (0.77 to 0.96)** | 0.005 | **0.88 (0.80 to 0.97)** | 0.008 |
| $R^2$ (cond. \| marg.) | 0.328 \| 0.194 | | 0.337 \| 0.084 | | 0.243 \| 0.165 | | 0.113 \| 0.068 | |
| AIC \| BIC | 10149.17 \| 10220.93 | | 11404.62 \| 11476.38 | | 11165.34 \| 11237.1 | | 14963.21 \| 15034.97 | |
| (M3.2) M2+interaction (time×age) | | | | | | | | |
| Pre×age/10 | **0.79 (0.73 to 0.85)** | <0.001 | **0.86 (0.81 to 0.91)** | <0.001 | **0.91 (0.85 to 0.98)** | 0.010 | **0.92 (0.88 to 0.97)** | <0.001 |
| Post×age/10 | **0.87 (0.82 to 0.91)** | <0.001 | **0.91 (0.86 to 0.97)** | 0.002 | 1.01 (0.96 to 1.05) | 0.802 | 0.97 (0.94 to 1.01) | 0.173 |
| $R^2$ (cond. \| marg.) | 0.345 \| 0.212 | | 0.345 \| 0.094 | | 0.248 \| 0.169 | | 0.122 \| 0.077 | |
| AIC \| BIC | 10052.08 \| 10123.84 | | 11322.16 \| 11393.91 | | 11167.69 \| 11239.45 | | 14944.93 \| 15016.68 | |
| (M3.3) M2+interaction (time×education) | | | | | | | | |
| Pre×<10 years | **0.78 (0.63 to 0.96)** | 0.018 | **0.77 (0.65 to 0.90)** | 0.002 | 1.01 (0.84 to 1.21) | 0.948 | 0.94 (0.83 to 1.07) | 0.363 |
| Pre×>10 years | **0.71 (0.57 to 0.89)** | 0.004 | 0.97 (0.83 to 1.13) | 0.669 | **0.72 (0.58 to 0.90)** | 0.004 | 1.06 (0.91 to 1.23) | 0.465 |
| Post×<10 years | **0.82 (0.71 to 0.95)** | 0.010 | 0.91 (0.77 to 1.08) | 0.296 | 0.99 (0.88 to 1.12) | 0.902 | 0.90 (0.81 to 1.01) | 0.068 |
| Post×>10 years | 1.06 (0.91 to 1.24) | 0.441 | 0.90 (0.78 to 1.05) | 0.175 | 1.09 (0.93 to 1.28) | 0.292 | 0.91 (0.81 to 1.03) | 0.147 |
| $R^2$ (cond. \| marg.) | 0.328 \| 0.193 | | 0.339 \| 0.087 | | 0.242 \| 0.163 | | 0.113 \| 0.068 | |
| AIC \| BIC | 10137.67 \| 10223.78 | | 11386.51 \| 11472.62 | | 11170.37 \| 11256.48 | | 14964.54 \| 15050.65 | |

Age is mean centred, sex (reference: male) and school years (reference: 10 years) are dummy coded; The reunification interval (1990–1994) is coded with 0, that is, the coefficients for age, sex and education represent the effects for this time interval. Coefficients with p<0.05 and confidence interval not containing 1 are marked in bold.
AIC, Akaike information criterion; BIC, Bayesian information criterion; cond, conditional $R^2$ (fixed+random effects); IRR, incidence rate ratio; marg, marginal $R^2$ (only fixed effects); NLE, negative life event; SDCs, sociodemographic characteristics.

## DISCUSSION

This study examined changes in reported NLEs during the German reunification as an example of rapid socio-political change. Significant trajectory shifts around reunification were observed in work/financial and own illness-related NLEs. However, especially post-reunification trends showed some heterogeneity based on sociodemographic characteristics.

Subjective NLE reports mirrored objective data on work-related events[12 15] as well as morbidity and mortality.[15 21] Notably, work/financial NLEs increased over sixfold, own illness-related NLEs nearly fourfold and illness/death of others by about 50%. While both illness-related categories continued to increase post-reunification, the growth rate of own illness-related NLEs slowed. The increase in own illness-related NLEs could stem from psychosocial stressors related to reunification.[14 22 23] The general upward trend in illness-related NLEs may also correlate to global lifestyle shifts like rising obesity rates[38] or age-related factors.[27]

Sociodemographic differences varied by NLE category. Contrary to some studies,[7 25] older individuals reported fewer work/financial and social/interpersonal NLEs. Post-reunification, older cohorts reported fewer work/financial NLEs, possibly due to (early) retirement, while younger individuals reported increasingly more social/interpersonal NLEs, likely due to frequent changes of social roles at their life stage.[27 28] For health-related NLEs, significant age-related differences that diminished over time were only found for illness/death of others, with older individuals initially reporting higher numbers. This contrasts with the expected higher health-related burden in older age,[27 28] but aligns with a study showing increased morbidity and mortality from cardiovascular diseases in East Germany across all ages.[15]

Women reported fewer work/financial but more social/interpersonal NLEs and NLEs related to illness/death of significant others, which is consistent with mixed findings concerning sex-related differences in critical LEs.[7 25 29] Men's lower life expectancy might contribute to women's elevated reporting of illness/death of significant others. Women's larger social networks might explain their higher reported number of social/interpersonal NLEs, increasing the likelihood of experiencing such events.

Differences regarding education increased post-reunification, with those having intermediate or higher education reporting more work/financial and social/interpersonal NLEs, but fewer own illness-related NLEs. The latter might reflect social health

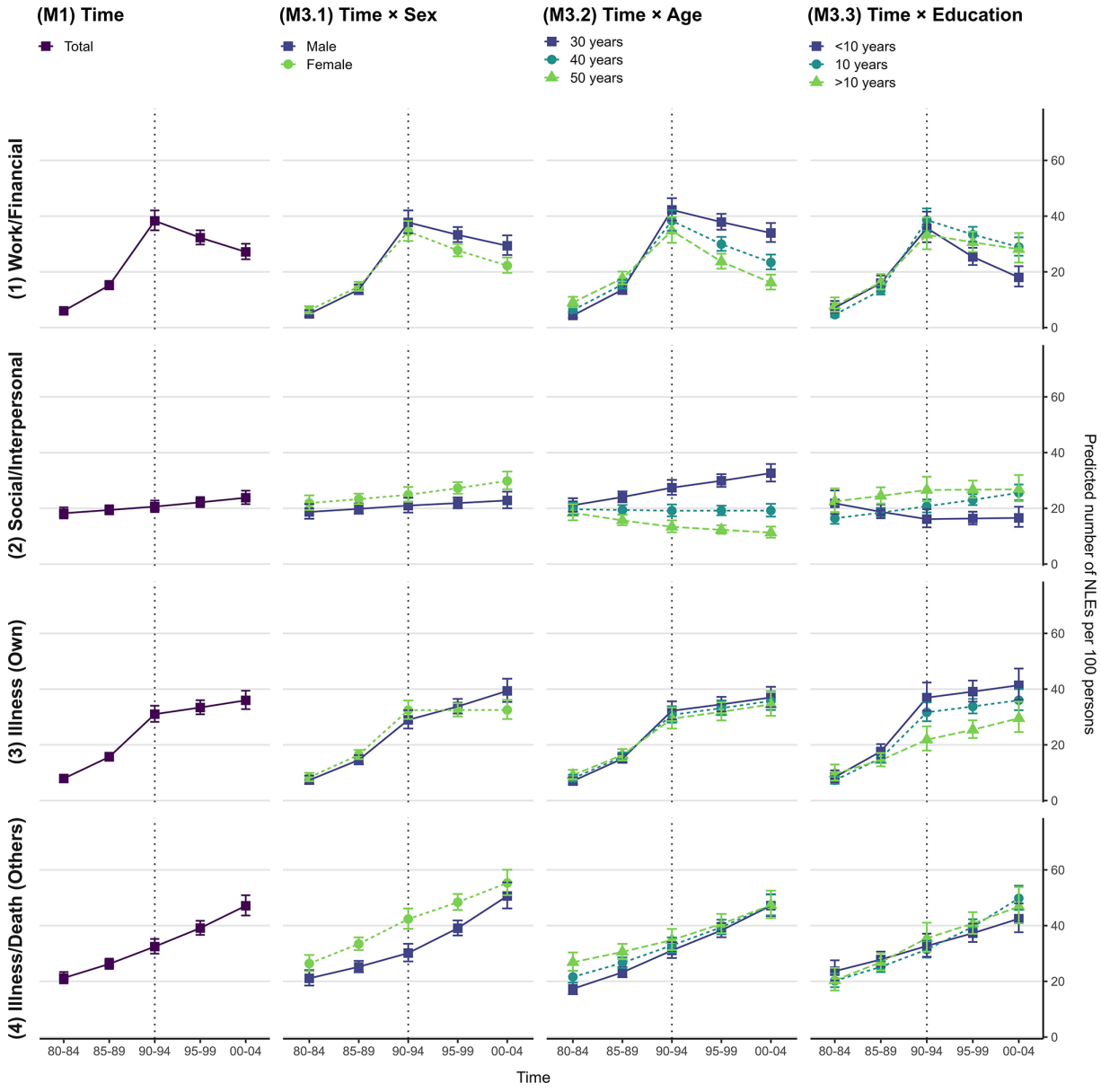


**Figure 3** Predicted marginal mean numbers of reported NLEs in total and stratified by sociodemographic characteristics. Marginal means are shown for 100 persons for ease of interpretation. Values over time are based on regression model 1 (M1); values for men and women, age groups and educational level (school years) are based on interaction models (M3.1 to M3.3). The dotted line indicates the reunification time interval (left=pre-reunification, right=post-reunification). Error bars denote 95% CIs. NLEs, negative life events.

inequalities, with more highly educated persons generally reporting better health and lower mortality.[39] Socio-political change may cause or exacerbate health inequalities.

Nonetheless, most individuals did not report NLEs during reunification (67%–80% across categories), which is consistent with studies indicating that most East Germans experienced stability in different domains.[14 18] Unlike many Eastern European countries, East Germany received significant economic and structural investments, which could have played a role in mitigating the adverse impacts of the socio-political transformation. Public spending, particularly in healthcare and social security infrastructure, significantly improved life expectancy in East Germany,[40] potentially accounting for the relative stability and minimal differences in NLEs across sociodemographic groups. However, the significant East-West migration following the German reunification, primarily involving younger, healthier and more highly educated individuals, caused a demographic shift in East Germany,[12] which may have increased certain types of NLEs, particularly those related to health. Nonetheless, while migration could have had adverse impacts on the social fabric, social/interpersonal NLEs only showed a slight increase post-reunification.

### Strengths, limitations and future directions

First, a strength of our study lies in using the SHIP dataset with a robust sample size of 1932 participants, allowing for detailed regional analyses of pre-reunification and post-reunification experiences. However, North-East Germany's distinct regional characteristics and East-West migration post-reunification may limit generalisability due to potential selection bias. Furthermore, participants in SHIP-LEGEND were younger and healthier, which likely introduced further selection bias.[32] Thus, while providing valuable regional insights, generalising

these findings to entire East Germany requires caution. Second, using the 'life history' method to collect NLE data helped improve memory recall accuracy.[32 33] Despite some limitations of retrospective data such as the vulnerability to recall biases (eg, under-reporting, mood congruence), studies concerning early life experiences have demonstrated the reliability of adult retrospective reports and their validity in revealing long-term impacts on adult health, although it is better to combine retrospective and prospective assessments.[41 42] The identification of reunification-related changes in specific NLE categories in our study, despite potential recall bias, further attests to the method's validity. Third, it is uncertain whether reported NLEs were directly related to the reunification. Nonetheless, not focusing exclusively on reunification-specific NLEs also enabled the detection of indirect effects like illness-related NLEs, typically not linked to socio-political change. Fourth, NLEs were only measured in 5-year 'life-stages', limiting the precision of calculations regarding the year of occurrence, raising the possibility of overlaps with adjacent time intervals.

Future studies should investigate short-term and long-term effects of NLEs used in the present study on different indicators of health and well-being to better understand the impact of individual NLEs stemming from collective LEs. Furthermore, examining changes in NLEs in other postsocialist countries with extensive societal transformations, such as Poland or the Czech Republic, is crucial to determine whether the present results are generalisable to other contexts. Additionally, associations between and sequences of different LEs should be investigated in context of socio-political change.

## Conclusion

This study, using the German reunification as an example, identified changes in the number of specific NLEs, which underlines the value of biographical interviews in detecting the individual consequences of collective LEs. The results also indicate variations regarding the susceptibility to consequences of socio-political change based on individual characteristics. These findings contribute to the discussion around existing disparities in health and well-being between countries with and without transformation experiences and can inform interventions for future socio-political change events to alleviate adverse health consequences for the most affected individuals.

**Author affiliations**
[1]Department Health and Prevention, University of Greifswald, Greifswald, Germany
[2]Department of Psychiatry and Psychotherapy, University of Leipzig Medical Center, Leipzig, Germany
[3]Department of Psychiatry and Psychotherapy, University Medicine Greifswald, Greifswald, Germany
[4]German Center for Neurodegenerative Diseases Site Rostock/Greifswald, Rostock, Germany
[5]ICM - SHIP/KEF, University Medicine Greifswald, Greifswald, Germany
[6]Department of Psychosomatic Medicine and Psychotherapy, University Medical Center of the Johannes Gutenberg University, Mainz, Germany

**Correction notice** This article has been corrected since it fist published online. It is now open access.

**Contributors** HM, SSpeerforck, GS, MEB, EB and SSchmidt conceived the research idea. SH designed the study, analysed the data and drafted the manuscript. LA, HM and SSchmidt provided major initial criticism of the manuscript. TF, CU, CH, SSpeerforck, GS, JK-K, HJG, COS, MEB and EB contributed to subsequent revisions of the manuscript. All authors reviewed and approved the final version the manuscript for publication. SH is the guarantor.

**Funding** This study is part of the DDR-PSYCH project which is funded by the Federal Ministry of Education and Research (BMBF; Grant no. 01UJ1911DY). SHIP is part of the Community Medicine Research Network of the University Medicine Greifswald, which is supported by the German Federal State of Mecklenburg-West Pomerania. SHIP is funded by the Federal Ministry of Education and Research (BMBF; Grant nos. 01ZZ9603, 01ZZ0103, 01ZZ0701 and 01ZZ0403), the Ministry of Cultural Affairs and the Social Ministry of the Federal State of Mecklenburg-West Pomerania. SHIP-LEGEND was funded by the German Research Foundation (DFG; GR 1912/5-1).

**Competing interests** HJG has received travel grants and speakers' honoraria from Fresenius Medical Care, Neuraxpharm, Servier and Janssen Cilag as well as research funding from Fresenius Medical Care.

**Patient consent for publication** Not applicable.

**Ethics approval** This study involves human participants and was approved by Ethics committee of the University Medicine Greifswald (approval number BB 39/08). Participants gave informed consent to participate in the study before taking part.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** Data may be obtained from a third party and are not publicly available. Data are available from the Institute of Community Medicine, University of Greifswald at the Transfer Unit for Data and Biomaterials and can be accessed following an application (https://transfer.ship-med.uni-greifswald.de/FAIRequest/; email: transfer@uni-greifswald.de).



**ORCID iDs**
Stefanie Hahm http://orcid.org/0000-0001-5900-5891
Laura Altweck http://orcid.org/0000-0002-6623-1958
Silke Schmidt http://orcid.org/0000-0002-4194-1937
Toni Fleischer http://orcid.org/0000-0002-6668-0681
Christine Ulke http://orcid.org/0000-0002-8277-1671
Sven Speerforck http://orcid.org/0000-0002-9281-8461
Georg Schomerus http://orcid.org/0000-0002-6752-463X
Johanna Klinger-König http://orcid.org/0000-0003-2287-7914
Hans J Grabe http://orcid.org/0000-0003-3684-4208
Carsten Oliver Schmidt http://orcid.org/0000-0001-5266-9396
Manfred E Beutel http://orcid.org/orcid.org/0000-0003-1743-0042
Elmar Brähler http://orcid.org/0000-0002-2648-2728
Holger Muehlan http://orcid.org/0000-0001-8048-5682

## REFERENCES

1 Eiroá Orosa FJ. Psychosocial wellbeing in the Central and Eastern European transition: an overview and systematic bibliographic review. *Int J Psychol* 2013;48:481–91.
2 Guriev S, Melnikov N. Happiness convergence in transition countries. J Comp Econ 2018;46:683–707.
3 Pinquart M, Silbereisen RK. Human development in times of social change: theoretical considerations and research needs. Int J Behav Dev 2004;28:289–98.
4 Wundrack R, Asselmann E, Specht J. Personality development in disruptive times: the impact of personal versus collective life events. *Soc Personal Psych* 2021;15.
5 Dohrenwend BS, Krasnoff L, Askenasy AR, *et al*. Exemplification of a method for scaling life events: the PERI Life Events Scale. *J Health Soc Behav* 1978;19:205–29.
6 McKee-Ryan F, Song Z, Wanberg CR, *et al*. Psychological and physical well-being during unemployment: a meta-analytic study. *J Appl Psychol* 2005;90:53–76.
7 Tibubos AN, Burghardt J, Klein EM, *et al*. Frequency of stressful life events and associations with mental health and general subjective health in the general population. *J Public Health (Berl)* 2021;29:1071–80.
8 Altweck L, Hahm S, Muehlan H, *et al*. The interplay of gender, social context, and long-term unemployment effects on subjective health trajectories. *BMC Public Health* 2021;21:290.
9 Luhmann M, Hofmann W, Eid M, *et al*. Subjective well-being and adaptation to life events: a meta-analysis. *J Pers Soc Psychol* 2012;102:592–615.
10 Ihle W, Esser G, Schmidt MH, *et al*. Prevalence, course, and risk factors for mental disorders in young adults and their parents in East and West Germany. *American Behavioral Scientist* 2001;44:1918–36.
11 Kozieł S, Łopuszańska M, Szklarska A, *et al*. The negative health consequences of unemployment: the case of Poland. Econ Hum Biol 2010;8:255–60.

12 Stöbel-Richter Y, Brähler E, Zenger M. Demografische Veränderungen in den Neuen Ländern Zwischen 1989 und 2013: Parallelisierung, Angleichung Oder Differenzierung von Entwicklungen?. In: Brähler E, Wagner W, eds. *Kein Ende mit der Wende?: Perspektiven aus Ost und West*. Giessen: Psychosozial-Verlag, 2014.
13 Behringer F. Arbeitsmarktsituation von Frauen in den neuen Bundesländern: Erwerbsverhalten, frauenspezifische Beschäftigungsrisiken, betriebliche Handlungsspielräume. *Vierteljahrshefte Zur Wirtschaftsforschung* 1995;64:590–601. Available: http://hdl.handle.net/10419/141112
14 Bohley S, Kluttig A, Werdan K, *et al*. Changes of individual perception in psychosocial stressors related to German reunification in 1989/1990 and cardiovascular risk factors and cardiovascular diseases in a population-based study in East Germany. *BMJ Open* 2016;6:e008703.
15 Barth W, Claßen E, Heinemann L, *et al*. Entwicklung der Herz-Kreislauf-Morbidität und -Mortalität in Ostdeutschland nach der politisch-ökonomischen Wende. *J Public Health* 1998;6:120–36.
16 Mayer KU, Diewald M, Solga H. Transitions to post-communism in East Germany: worklife mobility of women and men between 1989 and 1993. *Acta Sociologica* 1999;42:35–53.
17 Meyer S, Schulze E. After the fall of the wall: the impact of the transition on East German Women. *Political Psychology* 1998;19:95–116.
18 Westerhof GJ, Keyes CLM. After the fall of the Berlin Wall: perceptions and consequences of stability and change among middle-aged and older East and West Germans. *J Gerontol B Psychol Sci Soc Sci* 2006;61:S240–7.
19 Nauck B, Schwenk OG. Did Societal Transformation Destroy the Social Networks of Families in East Germany? *American Behavioral Scientist* 2001;44:1864–78.
20 Scheiring G, Irdam D, King LP. Cross-country evidence on the social determinants of the post-socialist mortality crisis in Europe: a review and performance-based hierarchy of variables. *Sociol Health Illn* 2019;41:673–91.
21 Nolte E, Shkolnikov V, McKee M. Changing mortality patterns in East and West Germany and Poland. II: short-term trends during transition and in the 1990s. *J Epidemiol Community Health* 2000;54:899–906.
22 Barger SD. Social integration, social support and mortality in the US National Health Interview Survey. *Psychosom Med* 2013;75:510–7.
23 Eller NH, Netterstrøm B, Gyntelberg F, *et al*. Work-related psychosocial factors and the development of ischemic heart disease: a systematic review. *Cardiol Rev* 2009;17:83–97.
24 Kuh D, Ben-Shlomo Y, Lynch J, *et al*. Life course epidemiology. *J Epidemiol Community Health* 2003;57:778–83.
25 Hatch SL, Dohrenwend BP. Distribution of traumatic and other stressful life events by race/ethnicity, gender, SES and age: a review of the research. *Am J Community Psychol* 2007;40:313–32.
26 Munawar K, Kuhn SK, Haque S. Understanding the reminiscence bump: a systematic review. *PLoS One* 2018;13:e0208595.
27 Almeida DM, Horn MC. Is daily life more stressful during middle adulthood? In: Brim OG, Ryff CD, Kessler RC, eds. *How Healthy Are We?: A National Study of Well-Being at Midlife*. Chicago: University of Chicago Press, 2003.
28 Koffer RE, Thurston RC, Bromberger JT, *et al*. Racial/ethnic differences in women's life event exposure across midlife. *J Gerontol B Psychol Sci Soc Sci* 2022;77:272–83.
29 Kendler KS, Thornton LM, Prescott CA. Gender differences in the rates of exposure to stressful life events and sensitivity to their depressogenic effects. *Am J Psychiatry* 2001;158:587–93.
30 Völzke H, Schössow J, Schmidt CO, *et al*. Cohort profile update: the study of health in Pomerania (SHIP). *Int J Epidemiol* 2022;51:e372–83.
31 Völzke H, Alte D, Schmidt CO, *et al*. Cohort profile: the study of health in Pomerania. *Int J Epidemiol* 2011;40:294–307.
32 König J, Block A, Becker M, *et al*. Assessment of subjective emotional valence and long-lasting impact of life events: development and psychometrics of the Stralsund Life Event List (SEL). *BMC Psychiatry* 2018;18:105.
33 Caspi A, Moffitt TE, Thornton A, *et al*. The life history calendar: a research and clinical assessment method for collecting retrospective event-history data. *Int J Method Psychiat Res* 1996;6:101–14.
34 R Core Team. R: a language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing; 2022. Available: https://www.R-project.org/
35 Brooks ME, Kristensen K, van Benthem KJ, *et al*. glmmTMB Balances Speed and Flexibility Among Packages for Zero-inflated Generalized Linear Mixed Modeling. *R J*;9:378.
36 Burnham KP, Anderson DR. Multimodel inference: understanding AIC and BIC in model selection. Sociol Methods Res 2004;33:261–304.
37 Beck AT, Steer RA, Ball R, *et al*. Comparison of beck depression inventories -IA and -II in psychiatric outpatients. *J Pers Assess* 1996;67:588–97.
38 Malik VS, Willet WC, Hu FB. Nearly a decade on - trends, risk factors and policy implications in global obesity. *Nat Rev Endocrinol* 2020;16:615–6.
39 Arcaya MC, Arcaya AL, Subramanian SV. Inequalities in health: definitions, concepts, and theories. *Glob Health Action* 2015;8:27106.
40 Vogt TC, Kluge FA. Can public spending reduce mortality disparities? Findings from East Germany after reunification. *The Journal of the Economics of Ageing* 2015;5:7–13.
41 Reuben A, Moffitt TE, Caspi A, *et al*. Lest we forget: comparing retrospective and prospective assessments of adverse childhood experiences in the prediction of adult health. *J Child Psychol Psychiatry* 2016;57:1103–12.
42 Hardt J, Rutter M. Validity of adult retrospective reports of adverse childhood experiences: review of the evidence. *J Child Psychol Psychiatry* 2004;45:260–73.