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# Longitudinal associations of suffering with subsequent multidimensional well-being in the Global Flourishing Study

Check for updates

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## Abstract

**Background** Suffering is a distressing personal experience that may have important implications for well-being, but little is known about its population-level links with well-being. We use longitudinal survey data from the multinational Global Flourishing Study to examine prospective associations between suffering and multidimensional well-being assessed approximately 1 year later.

**Methods** We analyzed two waves of nationally representative data from adults living in 23 countries and territories ($N = 207{,}919$). Following the analytic template for outcome-wide designs, we estimated a series of country-specific weighted regression analyses where each Wave 2 outcome was regressed on Wave 1 suffering (controlling for Wave 1 demographic and retrospectively recalled childhood variables). Random effects meta-analyses were used to pool country-specific estimates of associations for the 56 main outcomes encompassing psychological, social, physical, volitional, and material dimensions of well-being.

**Results** We find some evidence of association between suffering and worse well-being for both composite indicators and most specific well-being indicators when country-specific estimates are pooled meta-analytically. Somewhat stronger and more consistent associations are observed for some domains (e.g., psychological well-being) than others (e.g., social participation). Pooled cross-national estimates of association generally attenuate after applying a more conservative analytic approach in which additional adjustment is made for principal components extracted from the Wave 1 outcomes. Country-specific estimates show some cross-national variation.

**Conclusions** Our findings suggest that suffering is associated with worse well-being across a wide range of outcomes in diverse national contexts. Suffering may be an important consideration in research, interventions, and policies aimed at supporting population well-being.

## Plain language summary

Suffering is a personal experience of distress that can feel intense or persistent. We used two waves of longitudinal survey data from 207,919 adults living in 23 countries and territories to examine whether suffering predicts well-being about 1 year later. Outcomes covered many areas of life, such as physical health, mental well-being, social relationships, and financial circumstances. We found that suffering is associated with worse outcomes in many areas, though the strength of these associations varied across countries. These findings suggest that suffering may be an important factor to consider when trying to improve well-being in different populations.

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Human life is replete with difficulties, hardships, and adversities ranging from minor inconveniences to life-altering events. Some of these occurrences may lead to suffering, which might be defined as "an undesired experiential state, of considerable duration or intensity, involving the loss or privation of some perceived good" (p. 2)[1,2]. Although most empirical work on suffering intersects fields of medicine, nursing, and palliative care[3], a small but growing literature has extended beyond clinical contexts to examine "everyday" experiences of suffering in nonclinical samples (e.g., university students, working adults). This research suggests that even relatively healthy adults can experience substantial suffering with the potential to undermine various aspects of well-being[1,4,5]. Building on this work with population segments, Cowden et al.[6] used Wave 1 data from the Global Flourishing Study (GFS) to estimate the prevalence of suffering in the general adult population. Pooled nationally representative estimates from the 22 countries analyzed indicated that approximately 44% of adults reported some/a lot of suffering (12% reported a lot of suffering), suggesting the prevalence of quite considerable suffering in the general population is nontrivial. Given its prevalence and potential to diminish well-being, suffering may be an important public health concern that warrants greater prioritization in research and practice. In line with recent calls to advance an "epidemiology of suffering" (p. 65)[2], this study is the first to use nationally representative multinational data to examine the population-level effects of suffering on a wide range of well-being outcomes assessed approximately 1 year later.

While suffering frequently co-occurs with other forms of distress, it is a distinct experience that can be differentiated from closely related constructs on conceptual and empirical grounds[7]. Consider the example of physical pain. Conceptually, suffering entails experiencing a felt aversion toward one's situation (i.e., a desire that it not be occurring), whereas some types of pain (as in masochism or athletic training) may be desired and even experienced as pleasurable[8,9]. Even when pain and suffering share the same source, their objects may be different[2]. For instance, a broken leg may be the object of a person's physical pain, but the object of their suffering might center on their inability to pursue valued goals. In addition, many experiences of physical pain are localized to a specific area of the body, whereas suffering is usually diffuse and can permeate all aspects of a person's life[2,10]. Conceptual distinctions between physical pain and suffering have been supported empirically (for a review, see ref. 11). For example, one study of emergency department patients found that 16% of those reporting severe pain (i.e., ≥ 7 out of 10) did not report any suffering[12]. Along similar lines, Macchia et al.'s[13] recent analysis of Wave 1 GFS data showed that approximately 4% of individuals who endorsed some/a lot of pain reported no suffering (a similar percentage endorsed some/a lot of suffering and no pain). In follow-up longitudinal analyses, the authors found that individuals reporting no pain and a lot of suffering in Wave 1 showed worse subsequent outcomes on several well-being indicators in Wave 2 (e.g., happiness, sense of purpose) than those reporting a lot of pain and no suffering. Although the observed co-occurrence of pain and suffering in empirical studies may be influenced by differences in item wording, these conceptual and empirical considerations suggest that physical pain and suffering are not interchangeable constructs and may have different implications for well-being.

Similar nonequivalence has been shown for other negative affect-laden constructs, such as depression. Although suffering has a negative affective quality and may overlap with a prolonged state of negative affect characteristic of depressed mood, a person is only thought to be suffering when their negative affective experience is accompanied by an "occurrent desire that it not be occurring" (p. 27)[14]. Consistent with this distinction, prior work has shown that severe depression symptoms are not always accompanied by suffering[4], and suffering has been shown to be longitudinally associated with worse subsequent well-being across multiple outcomes (e.g., life satisfaction, meaning in life), even after adjustment is made for other negative affect-laden experiences such as anxiety and depression symptoms[3,5]. Taken together, these illustrations provide some support for the discriminant validity of suffering relative to related negative affect-laden constructs and are consistent with the view that suffering often overlaps with negative affective states but is not reducible to them[4,9].

Well-being has been conceptualized in various ways (for reviews, see refs. 15,16). One increasingly adopted model positions well-being as a multidimensional concept situated in a broader notion of human flourishing defined as "the relative attainment of a state in which all aspects of a person's life are good, including the contexts in which that person lives" (p. 19)[17]. In contrast to other models that tend to adopt a narrower view of well-being, human flourishing takes a more holistic approach by considering "the quality of [an individual's] personal subjective state" across the various dimensions of human existence (p. 4)[18]. In alignment with prior work[19–21], we organize the scope of the outcomes that are emphasized in the present study into physical (i.e., physical health & health behavior), psychological (i.e., psychological well-being, psychological distress), social (i.e., social well-being, social distress, social participation), material (i.e., socioeconomic), and volitional (i.e., character & prosocial behavior) dimensions. Because suffering can permeate the *whole person*, its implications may reasonably cut across these various dimensions of well-being[5].

A considerable number of studies have reported on the association between suffering and well-being. This body of literature has largely focused on population segments (often older adults) experiencing bodily pain or illness, diagnosed with a terminal condition (e.g., late-stage cancer), or receiving palliative care, typically using cross-sectional designs (for reviews, see refs. 22–24). The empirical work in this area has played an important role in advancing our understanding of the relationship between suffering and well-being. For example, many studies have reported evidence linking suffering with lower scores on measures that provide a broad indication of well-being, often those that center on the individual's physical health or functioning (e.g., dermatological quality of life, health-related quality of life)[25–27].

When research has addressed specific dimensions of well-being, the physical dimension has been frequently emphasized, in part because of the target populations (e.g., patients seeking medical care) and settings (e.g., hospitals) that are typically the focus of empirical studies on suffering. Perhaps unsurprisingly, evidence pertaining to the physical dimension suggests that suffering is related to worse physical health outcomes (e.g., greater physical health symptoms, more severe functional limitations)[28–30]. Many studies have linked suffering to a range of psychological sequelae as well (e.g., greater depression symptoms, lower happiness, less meaning in life)[31–33], possibly because suffering can thwart basic needs (e.g., autonomy), disrupt valued goal pursuits, and/or violate systems of meaning making that support healthy psychological functioning[2,3].

Comparatively fewer studies have addressed the social and material dimensions of well-being, which may reflect more indirect and downstream effects of suffering through other dimensions of well-being. For example, suffering may contribute to social isolation by giving rise to a desire to withdraw, or by altering psychological states (e.g., increased irritability) that strain interpersonal relationships. Along similar lines, individuals experiencing suffering might begin to worry about financial security amid an uncertain future, or their diminished psychological functioning may eventually lead to job loss. Although some evidence suggests that suffering is generally related to worse social (e.g., higher loneliness, greater impairment in social functioning)[34,35] and material (e.g., fewer years of education, unemployment)[6] dimensions of well-being, more extensive research is needed to develop a clearer understanding of the relationship between suffering and these dimensions[1].

Many ancient religious and philosophical writings portray suffering as a possible crucible for developing character and virtue, in part because suffering often makes a person's core personal values or moral convictions salient and challenges their agency, will, and commitment to respond accordingly[14,36–38]. One example is suffering that could arise after being deeply betrayed by a loved one. For some people, making a decision to forgive the wrongdoer might be a value-guided response that reflects their desire for and commitment to practicing goodwill towards others[39,40]. While

acknowledging the importance of not trivializing, minimizing, or romanticizing suffering, this example suggests that suffering may be a context for exercising and cultivating volitional forms of well-being. Some support for this theorizing can be found in anecdotal accounts[41] and qualitative research[42,43], but relatively little quantitative research has reported on the relationship between suffering and indicators of volitional well-being. In the few studies that have addressed this question, findings have been somewhat mixed. To illustrate, across four longitudinal samples examining delayed gratification and/or an orientation to promote good as outcomes of suffering, there was little evidence of association between suffering and subsequent delayed gratification in two samples and a negative association in one; for orientation to promote good, the pattern was null in one sample and negative in three[1,5,44]. While the population-average effects reported in existing quantitative research generally do not align with the idea that suffering leads to positive changes in volitional well-being, further research is needed to build a more robust evidence base in this area of the literature.

Although prior research has made substantial contributions to existing knowledge about the implications of suffering for well-being, some important gaps remain. First, existing research on suffering and well-being is based on population segments (e.g., older adults, medical patients). This selectivity can make inferences about the general population challenging, as associations observed in population segments may differ from the general population. For example, many studies involving older adults diagnosed with a medical condition have reported evidence suggesting that suffering is related to worse physical health[45–47], but this may be because older adults are generally more likely to have physical health problems due to aging. To better understand the potential impact of suffering on well-being at the population level, we need studies with samples that are more representative of the general population. Population-based estimates can provide an important epidemiologic starting point by clarifying whether suffering is associated with well-being on average in the general population, which can serve as a foundation for subsequent work examining heterogeneity across populations, sociocultural contexts, and other conditions under which these associations may differ[6,48].

Second, most observational studies on suffering and well-being have used cross-sectional designs, which are typically inadequate for drawing potential causal inferences. When suffering and indicators of well-being are assessed contemporaneously, discerning cause from effect is usually not possible because temporal sequencing is obscured. This can complicate decision-making around what intervention targets to prioritize. Longitudinal studies can be helpful in clarifying the directionality of effects.

Third, prior research in this area has typically focused on one or a few well-being outcomes, often within a single dimension of well-being[5]. Longitudinal cohort studies that incorporate multidimensional assessments of well-being are necessary to examine the temporal dynamics between suffering and the aspects of well-being under consideration, establish more precise estimates of associations, and develop a more comprehensive understanding of how suffering might be related to human flourishing. A few recent studies have attempted to address some of these gaps[1,5]. For example, Ho et al.[5] examined associations between suffering and 12 subsequent outcomes related to well-being (assessed approximately 1 month later) in a sample of predominantly young adult Indonesians. Overall suffering was associated with worse subsequent scores on most outcomes, with the largest effect sizes observed for psychological outcomes (e.g., depression symptoms) and the weakest found for social outcomes (e.g., satisfying relationships). These findings suggest that suffering may have heterogeneous effects on well-being, underscoring the value of applying a multidimensional lens to examine various well-being outcomes simultaneously in the same sample.

Fourth, most previous research reporting associations between suffering and indicators of well-being has been concentrated in more Western, educated, industrialized, rich, and democratic (WEIRD) societies[1,5]. Comparatively fewer studies have been conducted in less WEIRD contexts. Applying a socioecological systems theory lens[49], contextualized historical events, cultural processes, and social-structural factors can affect experiences of suffering and impacts on well-being[48,50]. This suggests that the implications of suffering for different aspects of well-being may vary across different countries or geographic regions. However, no previous study has had nationally representative data from multiple countries to offer insight into potential variation in how suffering affects well-being across different cultures and contexts.

In this preregistered study, we take a step toward addressing some of these gaps in knowledge by using two waves of nationally representative data from the multinational GFS to examine longitudinal associations of suffering assessed in Wave 1 with two subsequent composite well-being indicators and a wide range of specific well-being indicators across eight domains: psychological well-being, psychological distress, social well-being, social distress, social participation, character & prosocial behavior, physical health & health behavior, and socioeconomic outcomes. Drawing on prior research, we expected that suffering would generally be associated with worse subsequent well-being across the 23 countries included in the GFS. However, we anticipated that these associations would be somewhat stronger and more consistent for outcomes in some domains (e.g., psychological well-being) compared to others (e.g., character & prosocial behavior). Due to the diversity of socioecological contexts represented in the GFS, we expected that associations between suffering and the well-being outcomes would vary to some extent across contexts.

Using random effects meta-analyses to pool country-specific estimates from regression models that adjust for Wave 1 demographic characteristics and retrospectively recalled childhood factors, we find evidence of prospective associations between Wave 1 suffering and worse Wave 2 well-being across many outcomes. Associations are somewhat stronger and more consistent in some domains (e.g., psychological well-being) than others (e.g., social participation). Estimates generally attenuate under a more conservative analytic specification with additional adjustment for principal components extracted from Wave 1 outcomes. Country-specific estimates show some cross-national variation. Taken together, these findings suggest that suffering may be an important factor to consider in research, interventions, and policies addressing population well-being.

## Methods

The study design, sampling, and survey development for the GFS are described elsewhere[20,51–53]. The methodology for the analyses outlined below is described extensively in Padgett et al.[54] and VanderWeele et al.[55]. The GFS was ruled exempt by Baylor University's Institutional Review Board (#1841317-2) as minimal risk survey research involving adult participants under applicable federal regulations. Ethical approval for all data collection activities was also obtained from the Institutional Review Board at Gallup Inc. Data collection activities were performed in accordance with the Declaration of Helsinki, and informed consent was obtained from all participants. The present analyses were conducted using de-identified secondary data, for which additional institutional review board approval was not required. We report the present study in accordance with the GATHER statement (see Supplementary Data 1 for completed GATHER checklist).

### Study sample

Wave 1 of the GFS included nationally representative samples from 22 countries and one territory: Argentina, Australia, Brazil, China, Egypt, Germany, Hong Kong (Special Administrative Region of China), India, Indonesia, Israel, Japan, Kenya, Mexico, Nigeria, the Philippines, Poland, South Africa, Spain, Sweden, Tanzania, Turkey, the United Kingdom, and the United States ($N = 207{,}919$). The countries were selected to (1) maximize coverage of the world's population; (2) ensure geographic, cultural, and religious diversity; and (3) prioritize feasibility based on Gallup Inc.'s existing data collection infrastructure. Data for Wave 1 were collected from March 2022 to January 2024, except in China, where data were collected in March and April 2024[56]. Data for Wave 2 were collected from January 2024 to December 2024, with Wave 2 data collected at least 6 months after Wave 1. The rate of nonresponse to the Wave 2 survey was 38% in the total sample. Descriptive statistics for the total sample by retention status are reported in

Supplementary Data 2 and 3. Attrition was 38% or below in 11 samples (lowest in China at 8.5%), whereas attrition in the other 12 samples ranged from 41% to 80% (highest in Hong Kong). Descriptive statistics for each country by retention status are reported in Supplementary Data 4a–26a and Supplementary Data 4b–26b.

The GFS survey assesses various aspects of well-being, including happiness, health, meaning, character, relationships, and financial security, along with a range of other demographic, social, economic, political, religious/spiritual, personality, childhood, and community variables. Gallup Inc. translated the GFS survey into multiple languages following the TRAPD (translation, review, adjudication, pretesting, and documentation) model for cross-cultural survey research[57]. Translated versions of the GFS survey underwent cross-national cognitive interviewing to evaluate how participants across countries understood the items and response options in local languages, with the findings used to guide refinements aimed at improving cross-cultural comparability[58]. Additional details about the translation, cognitive interviewing, and pilot testing phases of the GFS can be found elsewhere[52,59]. A complete compendium of GFS survey translations, by language and by item, is freely available (see ref. 60).

### Sampling design

The precise sampling design varied by country to ensure samples were approximately nationally representative[53,57]. In most samples, local field partners implemented a probability-based face-to-face or telephone methodology to recruit panel members. Recruitment involved an intake survey gathering basic sociodemographic information and details for recontacting participants. Following recruitment, participants received invitations to participate in the annual survey via phone or online. Follow-up for Wave 2 data collection relied on the respondent-provided contact information. A minimum of three contact attempts were made on different days of the week and times of the day to maximize the possibility of retention. Post-stratification and nonresponse adjustments to the Wave 1 sampling weights were performed separately within each sample, using either census data or a reliable secondary source. Additional information about the sampling design and weighting scheme for Wave 2 is available elsewhere[54,56].

### Outcome-wide analytic design

An outcome-wide analytic approach for longitudinal designs[61] was employed as part of a coordinated set of GFS outcome-wide studies[54] to examine the associations of a single exposure (i.e., suffering) with a range of subsequent outcomes. Compared to traditional analytic strategies focused on a single outcome, this approach provides a more holistic assessment of an exposure's possibly differential relations with multiple life outcomes. The outcome-wide analytic design has several strengths, including (1) reducing researcher subjectivity or degrees of freedom in the analysis by ensuring a consistent analytic strategy and the same set of covariates across models for all outcomes; (2) mitigating publication bias by reporting results for all examined outcomes simultaneously; (3) and providing insights into beneficial, detrimental, and null associations with the exposure[62,63]. Further details about the outcome-wide approach can be found elsewhere[61].

### Measures

**Exposure**. The exposure of suffering was taken from Wave 1. Various measures of suffering are available and have been employed in the empirical literature (for reviews, see refs. 2,64–66); they vary in modality (e.g., standardized scales versus pictorial measures) and scope of assessment (e.g., generalized versus domain-specific). Because many existing measures of suffering are not particularly well suited for research outside clinical contexts (e.g., those that make reference to illness), the Personal Suffering Assessment was developed to provide a generalized measure of suffering applicable in broader nonclinical contexts[2]. In this study, we assessed suffering using a direct self-report item adapted from the *extent of suffering* item in the Personal Suffering Assessment[2]: "To what extent are you suffering? This can be any type of physical or mental suffering" (response options: Not at all, Not very much, Some, A lot). This item includes slight modifications to the original phrasing and response categories informed by the results of cognitive interviews performed during the survey development process to strengthen its cross-cultural equivalence (further details are available elsewhere[52,53,58,59]). For example, the clause (i.e., "This can be any type of physical or mental suffering") was added to provide clarification about the meaning of the term suffering. Some previous work has reported large to very large correlations between responses to variations of the original Personal Suffering Assessment item and scores on alternative brief measures of suffering that have been widely used, such as versions of the visual-based Pictorial Representation of Illness and Self Measure[67,68]. Consistent with prior public health and epidemiologic studies that have applied substantively meaningful contrasts for ordered exposure measures[69,70], we dichotomized responses to this variable into (0) not at all/not very much and (1) some/a lot in line with earlier studies using Wave 1 GFS data (see refs. 6,48). Although dichotomization can reduce information, this approach maintains consistency and comparability with earlier work in the GFS to support the cumulative development of evidence in this area and facilitates communication by framing results as differences between clearly defined groups.

**Covariates**. Country-specific analyses adjusted for 17 covariates (9 sociodemographic and 8 childhood variables) taken from Wave 1, unless data were not available (as described below and in relevant tables). We selected covariates from variables that were available in the GFS dataset in accordance with the modified disjunctive cause criterion for confounder selection, which prioritizes variables that could be plausible causes of the exposure, the outcomes, or both, while generally avoiding adjustment for variables that might reasonably be on the causal pathway from the exposure to the outcomes[71]. Additional details for all variables can be found in the GFS codebook (https://osf.io/cg76b). Weighted descriptive statistics for the demographic and childhood variables are reported in Supplementary Data 27 for the total sample and Supplementary Data 28–50 for each country or territory by wave (see also Supplementary Data 51).

Demographic covariates. Year of birth (age) was classified into 1998–2005 (18–24 years), 1993–1998 (25–29 years), 1983–1993 (30–39 years), 1973–1983 (40–49 years), 1963–1973 (50–59 years), 1953–1963 (60–69 years), 1943–1953 (70–79 years), and 1943 or earlier (80 years or older). Gender was assessed as male, female, or other. Marital status was assessed as single/never married, married, separated, divorced, widowed, and domestic partner. Employment was assessed as employed, self-employed, retired, student, homemaker, unemployed and looking for a job, and none of these/other. Education was assessed as up to 8 years, 9–15 years, and 16 or more years. Religious service attendance was assessed as more than once a week, once a week, one to three times a month, a few times a year, and never. Immigration status was assessed with yes/no responses to: "Were you born in this country, or not?" Religious affiliation was assessed in all countries, but there was considerable cross-national variation in endorsement of the response categories because some religious affiliations are only applicable in certain contexts. Religious affiliation response categories included Christianity, Islam, Hinduism, Buddhism, Judaism, Sikhism, Baha'i, Jainism, Shinto, Taoism, Confucianism, primal/animist/folk religion, Spiritism, Umbanda, Candomblé, and other African-derived religions, Chinese folk/traditional religion, some other religion, or no religion/atheist/agnostic. When more than 5% of a within-country sample endorsed the no religion/atheist/agnostic category, this was used as the reference category in the sample-specific analyses; otherwise, the most prominent religious group was used. Additionally, all religious affiliation categories endorsed by less than 3% of a specific sample were collapsed into a single religious affiliation category. Racial/ethnic identity was assessed in most contexts, but not in China, Germany, Japan, Spain, and Sweden. In countries or territories where racial/ethnic identity was assessed, response categories varied across

samples to be locally meaningful. Analyses that adjusted for racial/ethnic identity used a binary variable based on whether an individual was in the most prominent racial/ethnic group in the sample versus a minority racial/ethnic group.

Retrospective childhood covariates. Quality of relationship with mother when growing up was assessed with the question: "Please think about your relationship with your mother when you were growing up. In general, would you say that relationship was very good, somewhat good, somewhat bad, or very bad?" Responses were dichotomized to very/somewhat good versus very/somewhat bad. "Does not apply" was treated as a dichotomous control variable for respondents who did not have a mother due to death or absence. An analogous variable was used for the quality of a person's relationship with their father when growing up. Parental marital status around age 12 was assessed with responses of married, divorced, never married, and one or both had died. Subjective financial status of one's family around age 12 was measured with: "Which one of these phrases comes closest to your own feelings about your family's household income when you were growing up, such as when you were around 12 years old?" Responses were lived comfortably, got by, found it difficult, and found it very difficult. Childhood abuse when growing up was assessed with yes/no responses to: "Were you ever physically or sexually abused when you were growing up?" Similarly, participants provided a yes/no response to whether they felt like an outsider in their family when growing up: "When you were growing up, did you feel like an outsider in your family?" Response options were yes/no. Self-rated health when growing up was assessed by: "In general, how was your health when you were growing up? Was it excellent, very good, good, fair, or poor?" Religious service attendance around age 12 was assessed with: "How often did you attend religious services or worship at a temple, mosque, shrine, church, or other religious building when you were around 12 years old?" with responses of at least once a week, one to three times a month, less than once a month, or never.

**Outcome variables**. Consistent with prior outcome-wide studies that have applied a multidimensional approach to well-being[72,73], we examined a wide range of Wave 2 well-being and related outcomes that could plausibly be downstream of Wave 1 suffering. Some outcomes may be more proximal to the experience of suffering than others. For example, suffering may be more proximally associated with psychological well-being (e.g., happiness, sense of purpose, depression symptoms) than socioeconomic circumstances (e.g., marital status, employment status, home ownership), and not all outcomes would be expected to be equally responsive to suffering over a roughly 1-year interval. The outcome-wide design provides an opportunity to develop a more integrative view of how suffering is associated with multiple aspects of well-being over the follow-up period, including potential heterogeneity in the strength and consistency of associations across different outcomes[1,5].

There were 56 main outcomes considered, including 54 specific indicators of well-being across eight domains: psychological well-being (12 indicators), psychological distress (four indicators), social well-being (nine indicators), social distress (two indicators), social participation (five indicators), character & prosocial behavior (nine indicators), physical health & health behavior (six indicators), and socioeconomic outcomes (seven indicators). The other two main outcomes were composite indicators of individual well-being from existing measures, including the 12-item Secure Flourishing Index that consists of two items for each of six domains—happiness & life satisfaction, mental & physical health, meaning & purpose, character & virtue, close social relationships, and financial & material stability—and the 10-item Flourishing Index that excludes financial & material stability because this domain is sometimes considered a means of flourishing rather than an end in itself[19,20]. In these Wave 2 data of the GFS, estimated internal consistency for the Secure Flourishing Index in the overall sample was $\alpha = 0.88$ (ranging from $\alpha = 0.75$ in Nigeria to $\alpha = 0.94$ in Japan). We followed prior outcome-wide studies by including suffering as a "benchmark outcome" to support the interpretation of results[70,74].

Although not part of the main outcomes that we preregistered, we also report results for 22 additional outcomes in the Supplementary Information for readers who may be interested and to support cumulative scientific progress. Of those outcomes, four were single-item measures of primary outcomes that combined two items (i.e., anxiety symptoms composite, depression symptoms composite) and six corresponded to the domains of the Secure Flourishing Index outlined above. The remaining 12 outcomes were indicators of religious/spiritual beliefs, experiences, and engagement.

Descriptions of each measure, response options, recoding decisions, and details about which outcomes were modeled as binary versus continuous variables can be found at https://osf.io/9kpd8 (see "W2-Core Team Analyses" worksheet). Weighted descriptive statistics for the outcomes are reported in Supplementary Data 52 for the total sample and Supplementary Data 53–75 for each sample by wave (see also Supplementary Data 76).

### Statistics and reproducibility

The research questions, variables, and analyses for the current study were preregistered with the Center for Open Science prior to accessing data (https://osf.io/qncdw). All analyses were performed using R 4.5[75] and the *Rglobalflourishing* package[76].

**Regression analyses with complex survey weights**. Weighted descriptive statistics for the total sample ($N = 207{,}919$) were estimated for each of the sociodemographic and outcome variables at both waves. All analyses, including imputation and attrition modeling described below, accounted for the complex survey design by including weights, primary sampling units, and strata. Additional methodological details, including the approach used to account for the complex sampling design, can be found elsewhere[54,56]. Within each country, we conducted a series of weighted linear (for continuous outcomes) or weighted modified Poisson (for binary outcomes) multivariate regression analyses and report 95% confidence intervals (CIs) for all estimated associations. A separate model was estimated for each of the 78 outcomes (though only the 56 main outcomes were considered in the primary meta-analyses).

As with any observational longitudinal analysis, causal interpretation of estimates from outcome-wide analyses depends on the extent to which key assumptions (e.g., appropriate temporal ordering, adequate control for confounding, limited reverse causality) are met. Because these assumptions are challenging to verify, particularly with just two waves of data, researchers commonly report multiple model specifications to assess the sensitivity of results to alternative adjustment choices[69,77]. We follow this practice by reporting two model specifications with increasingly conservative covariate adjustment, allowing readers to evaluate the robustness of prospective associations across different modeling specifications.

In Model 1, we regressed each Wave 2 outcome on Wave 1 suffering while controlling only for Wave 1 variables (i.e., demographic and childhood characteristics) that we could reasonably assume were not mediators on the pathway between suffering and one or more outcomes. However, there is a risk that Model 1 may not provide adequate confounding control[71]. We performed an alternative to Model 1 in which we additionally controlled for principal components extracted from Wave 1 variables other than the exposure of suffering (Model 2). This approach maintained a consistent covariate structure across outcome models, enabling more direct comparison of estimates across outcomes. Although Model 2 carries the risk of attenuated associations because the set of covariates could include one or more potential mediators, it provides an opportunity to evaluate how the results may differ after more extensive adjustment for potential confounding by incorporating Wave 1 well-being information[77]. Principal components were used to reduce the dimensionality of predictors to mitigate multicollinearity[78], while accommodating complex survey weights and missing data. The first seven principal components were used, accounting for an average of 51% of the variability in all covariates across the countries[54], with additional principal components each explaining only 1–2% of

additional variance (see Supplementary Data 77–99 for principal components results by sample). We present Model 1 as the primary specification and Model 2 as a more conservative alternative. Neither model is interpreted as establishing a definitive causal effect, and differences in estimates between the models could reflect a combination of additional confounding control and partial overadjustment[71].

**Meta-analyses**. All analyses were initially conducted by country or territory. Random effects meta-analyses were used to pool estimates (and derive 95% CIs) for the outcomes across the 23 samples and to estimate heterogeneity (tau), with our primary meta-analyses focusing on the 56 main outcomes that were preregistered. For each outcome, a global *p*-value corresponding to an omnibus Wald-type test for evidence of association in any sample is reported[79]. Bonferroni-corrected *p*-value thresholds for our primary meta-analyses are provided based on the number of main outcomes for which effect sizes were estimated: $p = 0.05/56 = 0.00089$. All meta-analyses were conducted using the *metafor* package[80]. We interpret results principally based on effect size magnitude using guidelines provided by Funder and Ozer[81].

**Sensitivity to unmeasured confounding**. We report *E*-values for all associations to evaluate the sensitivity of results to potential unmeasured confounding. An *E*-value is the minimum strength of the association (on the risk ratio scale) that an unmeasured confounder would need to have with both the exposure and the outcome, above and beyond all measured covariates, to explain away their association[82]. *E*-values range from a value of 1 to anything above 1. A high *E*-value signifies that an unmeasured confounder would need to have a strong association with both the exposure and the outcome to explain away the association observed between them. Approximate *E*-values can be obtained for continuous outcomes through scale conversions[82].

### Missing data

Primary analyses: fully imputed data. The primary analyses use all participants from Wave 1, including those who did not respond to the Wave 2 survey, by imputing missing data[83]. Multiple imputation by chained equations[84,85] was used for the exposure, covariates, and outcomes. Twenty imputed datasets were used. Using multiple imputation with all participants aligns with Wave 1 analyses and plans for subsequent waves of GFS data aimed at maximizing the use of information from those who enrolled in the study, thereby aligning the analytic sample across years and facilitating comparison of results[54]. For Wave 1 missing data, the imputation models used sampling weights, demographic characteristics, and retrospectively recalled childhood variables; for Wave 2 missing data, the imputation models additionally included the exposure of interest and prior values of all the outcomes assessed in Wave 1. Imputation was conducted separately by country or territory to account for variation in the assessment of certain variables across countries (e.g., racial/ethnic identity), thereby also reflecting sample-specific contexts and assessment methods.

Supplemental analysis: semi-complete case with attrition weights. As a sensitivity analysis for possible misspecification of the imputation models[86], analyses were conducted using only Wave 2 participants (semi-complete case analysis), with attrition weights multiplied by the sampling weights for use in the analysis[87]. Attrition weights were estimated separately by sample using logistic regression models for retention to calculate stabilized inverse probability of retention weights[88]. Attrition predictors included sampling weight, strata, mode of survey completion, age, gender, education, income, employment status, marital status, racial/ethnic identity, religious service attendance, urban/rural status of participants, the Big Five personality traits, days of exercise, depression symptoms, loneliness, and the six domains of the Secure Flourishing Index, covering a range of potentially important predictors[61,89]. A summary of attrition model results for each country or territory is presented in Supplementary Data 100–122.

## Results

### Descriptive statistics

Demographic characteristics of the total observed sample at Wave 1, weighted to be nationally representative within each of the 23 samples, are reported in Table 1 (see Supplementary Data 27 for the weighted distribution of the childhood characteristics). The most common age group was 30–39 years (20%), followed by 40–49 years (17%) and 50–59 years (16%). Gender was nearly evenly split between males (49%) and females (51%). A majority were married (53%), employed by an employer (39%) or self-employed (18%), had 9–15 years of education (57%), and were native-born (94%). Religious service attendance ranged from weekly (19%) or more often (13%) to never (37%).

Sample sizes were largest in the United States (19%), Japan (10%), and Sweden (7.4%), and smallest in Turkey (0.7%), South Africa (1.3%), and Hong Kong (1.5%). Weighted demographic and childhood characteristics for each country or territory are reported in Supplementary Data 28–50. There was some variability in demographic composition across contexts. As one illustration, the percentage of the population in Egypt who were 70 years of age or older (1.2% versus 15%), employed (45% versus 62%), and divorced (2.1% versus 7.8%) in Wave 1 was somewhat lower than in the United Kingdom.

### Cross-national associations between suffering and multi-dimensional well-being

Standardized results from the random effects meta-analyses for the main outcomes are reported in Tables 2 and 3 (see Supplementary Data 123 for unstandardized results), with results for each country or territory presented in Supplementary Data 124–146 (see also Supplementary Data 147-148). Pooled meta-analyzed effect estimates in Model 1 suggested medium-sized associations between suffering and worse well-being across the samples for both the Secure Flourishing Index ($\beta = -0.22$, 95% CI: −0.25, −0.18) and the Flourishing Index ($\beta = -0.21$, 95% CI: −0.24, −0.17).

Effect sizes for associations of suffering with worse well-being were smaller (but still notable) for the psychological well-being indicators of happiness ($\beta = -0.18$, 95% CI: −0.21, −0.14), life satisfaction ($\beta = -0.17$, 95% CI: −0.21, −0.14), current life evaluation ($\beta = -0.14$, 95% CI: −0.18, −0.11), future life evaluation ($\beta = -0.11$, 95% CI: −0.14, −0.08), optimism ($\beta = -0.10$, 95% CI: −0.14, −0.07), freedom to pursue what's important ($\beta = -0.12$, 95% CI: −0.15, −0.10), meaningful activities ($\beta = -0.13$, 95% CI: −0.16, −0.10), understanding one's purpose ($\beta = -0.12$, 95% CI: −0.14, −0.09), and self-rated mental health ($\beta = -0.18$, 95% CI: −0.23, −0.14); social well-being indicators of relationship contentment ($\beta = -0.12$, 95% CI: −0.15, −0.10) and relationship satisfaction ($\beta = -0.13$, 95% CI: −0.16, −0.11); social distress indicator of loneliness ($\beta = 0.15$, 95% CI: 0.12, 0.18); character & prosocial behavior indicators of hope ($\beta = -0.12$, 95% CI: −0.15, −0.09) and gratitude ($\beta = -0.10$, 95% CI: −0.13, −0.08); physical health & health behavior indicators of self-rated physical health ($\beta = -0.18$, 95% CI: −0.21, −0.14) and pain (RR = 1.10, 95% CI: 1.08, 1.11); and socioeconomic indicators of financial security ($\beta = -0.12$, 95% CI: −0.15, −0.10) and material security ($\beta = -0.11$, 95% CI: −0.13, −0.09).

Relatively small associations between suffering and worse well-being were observed for the psychological well-being indicators of inner peace (RR = 0.95, 95% CI: 0.94, 0.97) and life balance (RR = 0.95, 95% CI: 0.93, 0.97); psychological distress indicators of traumatic distress (RR = 1.07, 95% CI: 1.06, 1.08), depression symptoms (RR = 1.08, 95% CI: 1.06, 1.10), and anxiety symptoms (RR = 1.08, 95% CI: 1.07, 1.10); social well-being indicators of social support ($\beta = -0.09$, 95% CI: −0.11, −0.07) and sense of belonging in country ($\beta = -0.06$, 95% CI: −0.08, −0.04); character & prosocial behavior indicators of orientation to promote good ($\beta = -0.07$, 95% CI: −0.10, −0.05), delayed gratification ($\beta = -0.06$, 95% CI: −0.07, −0.04), and showing love/care ($\beta = -0.06$, 95% CI: −0.07, −0.05); the physical health & health behavior indicator of health problems (RR = 1.07, 95% CI: 1.05, 1.08); and the socioeconomic indicator of financially comfortable/getting by (RR = 0.95, 95% CI: 0.95, 0.96).

**Table 1 | Weighted sample characteristics**

| Characteristic | Wave 1 (*N* = 207,919) | Wave 2 (*N* = 128,868) |
|---|---|---|
| Suffering, *n* (%) | | |
| A lot | 21,048 (10.1%) | 13,089 (10.2%) |
| Some | 67,628 (32.5%) | 43,926 (34.1%) |
| Not very much | 69,657 (33.5%) | 44,279 (34.4%) |
| Not at all | 48,795 (23.5%) | 27,113 (21.0%) |
| (Missing) | 791 (0.4%) | 461 (0.4%) |
| Year of birth (age), *n* (%) | | |
| 1943 or earlier (current age: 80+ years) | 4,047 (1.9%) | 3,445 (2.7%) |
| 1943–1953 (current age: 70–79 years) | 16,902 (8.1%) | 12,684 (9.8%) |
| 1953–1963 (current age: 60–69 years) | 29,031 (14.0%) | 19,538 (15.2%) |
| 1963–1973 (current age: 50–59 years) | 32,409 (15.6%) | 20,495 (15.9%) |
| 1973–1983 (current age: 40–49 years) | 34,970 (16.8%) | 21,996 (17.1%) |
| 1983–1993 (current age: 30–39 years) | 40,297 (19.4%) | 24,641 (19.1%) |
| 1993–1998 (current age: 25–29 years) | 20,325 (9.8%) | 12,309 (9.6%) |
| 1998–2005 (current age: 18–24 years) | 29,920 (14.4%) | 13,760 (10.7%) |
| (Missing) | 18 (<0.1%) | 1 (<0.1%) |
| Gender, *n* (%) | | |
| Male | 100,661 (48.4%) | 62,160 (48.2%) |
| Female | 106,349 (51.1%) | 66,141 (51.3%) |
| Other | 523 (0.3%) | 370 (0.3%) |
| (Missing) | 386 (0.2%) | 197 (0.2%) |
| Education, *n* (%) | | |
| Up to 8 years | 46,842 (22.5%) | 22,657 (17.6%) |
| 9–15 years | 116,015 (55.8%) | 72,942 (56.6%) |
| 16+ years | 44,904 (21.6%) | 33,258 (25.8%) |
| (Missing) | 158 (0.1%) | 11 (<0.1%) |
| Country of respondent, *n* (%) | | |
| Argentina | 6724 (3.2%) | 2876 (2.2%) |
| Australia | 3844 (1.8%) | 2578 (2.0%) |
| Brazil | 13,203 (6.4%) | 4221 (3.3%) |
| China | 5022 (2.4%) | 4575 (3.6%) |
| Egypt | 4729 (2.3%) | 3044 (2.4%) |
| Germany | 9506 (4.6%) | 5585 (4.3%) |
| Hong Kong (S.A.R. of China) | 3012 (1.4%) | 608 (0.5%) |
| India | 12,765 (6.1%) | 6353 (4.9%) |
| Indonesia | 6992 (3.4%) | 2661 (2.1%) |
| Israel | 3669 (1.8%) | 2494 (1.9%) |
| Japan | 20,543 (9.9%) | 13,966 (10.8%) |
| Kenya | 11,389 (5.5%) | 7712 (6.0%) |
| Mexico | 5776 (2.8%) | 2264 (1.8%) |
| Nigeria | 6827 (3.3%) | 3144 (2.4%) |
| Philippines | 5292 (2.5%) | 2684 (2.1%) |
| Poland | 10,389 (5.0%) | 6545 (5.1%) |
| South Africa | 2651 (1.3%) | 962 (0.7%) |
| Spain | 6290 (3.0%) | 2917 (2.3%) |
| Sweden | 15,068 (7.2%) | 11,663 (9.1%) |
| Tanzania | 9075 (4.4%) | 5588 (4.3%) |
| Turkey | 1473 (0.7%) | 498 (0.4%) |
| United Kingdom | 5368 (2.6%) | 3621 (2.8%) |
| United States | 38,312 (18.4%) | 32,309 (25.1%) |

Table is based on non-imputed data; cumulative percentages for variables may not add up to 100% due to rounding; S.A.R., Special Administrative Region. Expanded summary tables of all sociodemographic characteristics and outcome variables are provided in Supplementary Data 27 and 52 aggregated over the observed total sample and Supplementary Data 28–50 and Supplementary Data 53–75 by country/territory.

Even smaller associations were observed between suffering and worse well-being for the psychological well-being indicator of sense of mastery (RR = 0.97, 95% CI: 0.96, 0.98); the social well-being indicator of city/place satisfaction (RR = 0.97, 95% CI: 0.96, 0.97); the social distress indicator of perceived discrimination (RR = 1.03, 95% CI: 1.03, 1.04); and the physical health & health behavior indicator of number of days of exercise per week ($\beta = -0.04$, 95% CI: −0.05, −0.03).

Evidence of association between suffering and worse well-being was more negligible for social well-being indicators of intimate/close friend (RR = 0.98, 95% CI: 0.98, 0.99), government approval (RR = 0.99, 95% CI: 0.98, 0.99), say in government (RR = 0.99, 95% CI: 0.98, 0.99), and trust within country (RR = 0.98, 95% CI: 0.97, 0.99); character & prosocial behavior indicators of forgivingness (RR = 0.99, 95% CI: 0.99, 1.00) and charitable giving (RR = 0.99, 95% CI: 0.99, 1.00); physical health & health behavior indicator of daily smoker (RR = 1.01, 95% CI: 1.00, 1.01); and socioeconomic indicators of currently employed (RR = 0.99, 95% CI: 0.99, 1.00), own home (RR = 0.99, 95% CI: 0.98, 0.99), and income (RR = 0.99, 95% CI: 0.99, 0.99). One exception to the general pattern of findings for the pooled cross-national effect estimates was that suffering predicted a subsequent increase in helping strangers (RR = 1.01, 95% CI: 1.00, 1.01), but the magnitude of this association was also quite negligible. There was relatively little evidence of association between suffering and the other main outcomes in Model 1 when estimates were pooled across contexts.

When applying a more conservative analytic approach to confounding control that additionally adjusted for the seven principal components extracted from Wave 1 outcomes (i.e., Model 2), we observed a general attenuation of the associations between suffering and the well-being outcomes (see Tables 2 and 3). For example, the strongest association in Model 1 was between suffering and the Secure Flourishing Index. After adjusting for principal components extracted from Wave 1 outcomes, the association attenuated from $\beta = -0.22$ to $-0.03$. Although it is not possible to discern whether such attenuation reflects adjustment that was made for residual confounding not accounted for by the set of demographic and childhood covariates controlled for in Model 1 or whether one or more of the Wave 1 outcomes lie on the pathway from Wave 1 suffering to one or more of the Wave 2 outcomes[61], some combination of these possibilities seems plausible. Even with a more conservative analytic approach and attenuated effect estimates for Model 2, many outcomes for which there was some evidence of association in Model 1 also showed some evidence of association in Model 2. We tentatively suggest that the actual estimates for each outcome might be somewhere between the results for Model 1 and Model 2, in which case suffering is likely meaningfully associated with many outcomes for which there was evidence of an association in Model 1.

**Sensitivity to unmeasured confounding.** Results of the *E*-value sensitivity analysis for the primary random effects meta-analyses involving the main outcomes are reported in Table 4. For Model 1, *E*-values corresponding with the effect estimates (not including the association of Wave 1 suffering with Wave 2 suffering) ranged from 1.00 to 1.73, with slightly smaller *E*-values for the CI limit (1.00 to 1.64). For example, to explain away the observed association between Wave 1 suffering and Wave 2 Secure Flourishing Index, an unmeasured confounder that was jointly associated with both of these variables by risk ratios of 1.73-fold each (above and beyond the demographic and childhood variables adjusted for in the model) could do so, but weaker joint confounder associations could not. For the limit of the CI, unmeasured confounder risk ratio associations of 1.64 for both Wave 1 suffering and Wave 2 Secure Flourishing Index could shift the CI to include the null, but weaker joint confounder associations could not.

As a reference point for considering the plausibility of unmeasured confounding, the risk ratio for Wave 1 suffering predicting Wave 2 suffering in Model 1 was 1.54, conditional on the demographic and childhood covariates. This indicates that for a particular observed association that had an

**Table 2 | Meta-analyzed associations of Wave 1 suffering with Wave 2 composite well-being, psychological well-being, psychological distress, social well-being, and social distress outcomes**

| Outcome | Model 1 | | | | | Model 2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | RR | ES | 95% CI | τ | Global *p*-value | RR | ES | 95% CI | τ | Global *p*-value |
| Human Flourishing | | | | | | | | | | |
| Secure Flourishing Index | | −0.22 | (−0.25, −0.18) | 0.08 | 2.84e-16*** | | −0.03 | (−0.04, −0.02) | 0.03 | 5.11e-15*** |
| Flourishing Index | | −0.21 | (−0.24, −0.17) | 0.08 | 3.31e-16*** | | −0.03 | (−0.05, −0.02) | 0.03 | 5.11e-15*** |
| Psychological Well-Being | | | | | | | | | | |
| Happiness | | −0.18 | (−0.21, −0.14) | 0.08 | 6.08e-16*** | | −0.04 | (−0.05, −0.02) | 0.02 | 1.05e-13*** |
| Life satisfaction | | −0.17 | (−0.21, −0.14) | 0.08 | 6.33e-16*** | | −0.04 | (−0.05, −0.02) | 0.03 | 5.11e-15*** |
| Current life evaluation | | −0.14 | (−0.18, −0.11) | 0.08 | 8.51e-16*** | | −0.03 | (−0.04, −0.02) | 0.02 | 1.69e-13*** |
| Future life evaluation | | −0.11 | (−0.14, −0.08) | 0.07 | 1.27e-15*** | | −0.01 | (−0.02, −0.00) | 0.02 | 1.85e-05*** |
| Optimism | | −0.10 | (−0.14, −0.07) | 0.08 | 8.51e-16*** | | −0.01 | (−0.02, −0.00) | 0.01 | 0.040* |
| Freedom to pursue what's important | | −0.12 | (−0.15, −0.10) | 0.06 | 8.38e-16*** | | −0.02 | (−0.02, −0.01) | <0.01† | 4.47e-03** |
| Inner peace | 0.95 | | (0.94, 0.97) | 0.04 | 8.51e-16*** | 0.99 | | (0.99, 1.00) | <0.01† | 1.71e-07*** |
| Life balance | 0.95 | | (0.93, 0.97) | 0.04 | 9.59e-16*** | 0.99 | | (0.98, 0.99) | <0.01† | 7.29e-06*** |
| Sense of mastery | 0.97 | | (0.96, 0.98) | 0.02 | 1.7e-15*** | 1.00 | | (1.00, 1.00) | <0.01† | 0.144 |
| Meaningful activities | | −0.13 | (−0.16, −0.10) | 0.08 | 9.64e-16*** | | −0.01 | (−0.02, 0.00) | 0.02 | 4.16e-03** |
| Understanding purpose | | −0.12 | (−0.14, −0.09) | 0.06 | 8.35e-16*** | | −0.01 | (−0.02, −0.00) | 0.02 | 0.010* |
| Self-rated mental health | | −0.18 | (−0.23, −0.14) | 0.10 | 4.25e-16*** | | −0.04 | (−0.06, −0.03) | 0.03 | 5.07e-15*** |
| Psychological Distress | | | | | | | | | | |
| Traumatic distress | 1.07 | | (1.06, 1.08) | 0.02 | 1.13e-15*** | 1.03 | | (1.02, 1.03) | <0.01† | 1.42e-07*** |
| Depression symptoms composite | 1.08 | | (1.06, 1.10) | 0.04 | 5.67e-16*** | 1.01 | | (1.01, 1.02) | <0.01† | 1.65e-03** |
| Anxiety symptoms composite | 1.08 | | (1.07, 1.10) | 0.03 | 5.1e-16*** | 1.01 | | (1.01, 1.02) | <0.01† | 2.11e-03** |
| Suffering | 1.14 | | (1.11, 1.17) | 0.07 | 3.64e-16*** | 1.09 | | (1.07, 1.11) | 0.04 | 7.26e-16*** |
| Social Well-Being | | | | | | | | | | |
| Relationship contentment | | −0.12 | (−0.15, −0.10) | 0.06 | 1.01e-15*** | | −0.02 | (−0.03, −0.01) | 0.01 | 8.74e-04*** |
| Relationship satisfaction | | −0.13 | (−0.16, −0.11) | 0.06 | 7.27e-16*** | | −0.03 | (−0.03, −0.02) | <0.01† | 4.07e-04*** |
| Social support | | −0.09 | (−0.11, −0.07) | 0.04 | 1.7e-15*** | | −0.01 | (−0.02, 0.00) | 0.01 | 0.120 |
| Intimate/close friend | 0.98 | | (0.98, 0.99) | <0.01† | 5.11e-15*** | 1.00 | | (1.00, 1.00) | <0.01† | 0.402 |
| Government approval | 0.99 | | (0.98, 0.99) | <0.01† | 1.01e-07*** | 1.00 | | (0.99, 1.00) | <0.01† | 0.888 |
| Say in government | 0.99 | | (0.98, 0.99) | 0.01 | 4.71e-10*** | 1.00 | | (0.99, 1.00) | <0.01† | 0.311 |
| Belonging in country | | −0.06 | (−0.08, −0.04) | 0.04 | 2.44e-15*** | | 0.00 | (−0.00, 0.01) | <0.01† | 0.657 |
| City/place satisfaction | 0.97 | | (0.96, 0.97) | 0.02 | 1.7e-15*** | 0.99 | | (0.99, 1.00) | 0.01 | 3.45e-05*** |
| Trust within country | 0.98 | | (0.97, 0.99) | 0.02 | 2.55e-15*** | 1.00 | | (0.99, 1.00) | <0.01† | 0.275 |
| Social Distress | | | | | | | | | | |
| Loneliness | | 0.15 | (0.12, 0.18) | 0.07 | 6.35e-16*** | | 0.03 | (0.02, 0.04) | 0.02 | 5.44e-06*** |
| Perceived discrimination | 1.03 | | (1.03, 1.04) | 0.01 | 3.65e-15*** | 1.01 | | (1.00, 1.01) | <0.01† | 0.084 |

$N$ = 207,919; Reference for suffering: Not at all/not very much; RR, risk-ratio, null effect is 1.00; ES, effect size measure for standardized regression coefficient, null effect is 0.00; CI, confidence interval; τ (tau), estimated standard deviation of the distribution of effects; Global *p*-value, joint test of the null hypothesis that the country-specific Wald tests are null in all countries/territories.

Multiple imputation was performed to impute missing data on the covariates, exposure, and outcomes. Model 1 controlled for sociodemographic and childhood factors assessed at Wave 1: relationship with mother growing up; relationship with father growing up; parent marital status around age 12; experienced abuse growing up (except for Israel); felt like an outsider in family growing up; self-rated health growing up; subjective financial status growing up; frequency of religious service attendance around age 12; year of birth; gender; education; employment status; marital status; immigration status; religious affiliation; frequency of religious service attendance; and racial/ethnic identity when available. Model 2 controlled for all variables included in Model 1, and additionally controlled for the first seven principal components of the entire set of Wave 1 outcomes (except for suffering). Selected outcome variables were not assessed in certain countries, including government approval in China and Egypt, belonging in country in China, and say in government in China.

An outcome-wide analytic approach was used, and a separate model was run for each outcome. A different type of model was run depending on the nature of the outcome: (1) for each binary outcome, a weighted generalized linear model (with a log link and Poisson distribution) was used to estimate a RR; and (2) for each continuous outcome, a weighted linear regression model was used to estimate an ES. All effect sizes were standardized. For binary outcomes, the RR represents the change in risk of being in the upper category compared to the lower category between the lower and upper categories of suffering. For continuous outcomes, the ES represents the change (in standard deviations) in the outcome between the lower and upper categories of suffering.

*p*-value significance thresholds: $p < 0.05$*, $p < 0.005$**, (Bonferroni) $p < 0.00089$***, correction for multiple testing to significant threshold; †Estimate of τ (heterogeneity) is likely unstable. See forest plots in the Supplementary Information for more detail on heterogeneity of effects.

*E*-value of 1.54, an unmeasured confounder would need to be jointly associated with suffering and the outcome of interest by risk ratios of at least 1.54 each to fully explain away the observed association; these unmeasured confounder relationships would have to be comparable in strength to the longitudinal stability of suffering itself. A number of the *E*-values for the effect estimates in Model 1 exceeded this threshold, suggesting that some of those observed associations may be potentially robust to unmeasured confounding; it seems unlikely that an unmeasured variable would be as strongly related to both Wave 1 suffering and an outcome as suffering is to itself over time. However, *E*-values for Model 2 (effect estimate: 1.01 to 1.40, CI limit: 1.00 to 1.35) were smaller than those observed for Model 1, reflecting weaker evidence of associations in Model 2 after additionally

adjusting for principal components extracted from Wave 1 outcomes and a higher susceptibility of Model 1 to unmeasured confounding because fewer covariates were adjusted for.

**Supplemental analyses**. When we repeated the meta-analyses using a semi-complete case approach with attrition weights for both Models 1 and 2 (see Supplementary Data 149 and 150, respectively, as well as Supplementary Data 151 for corresponding *E*-values), effect estimates were either the same or differed only marginally from those observed for the random effects meta-analyses with multiply imputed data. These findings suggest that the results are not sensitive to the approach used to handle missing data. Meta-analytic results from repeating the primary analyses using a continuous rather than dichotomous operationalization of Wave 1 suffering are reported in Supplementary Data 152.

### Similarities and differences across contexts

In addition to the meta-analytic pooled estimates of the associations, Tables 2 and 3 also present global *p*-values and tau ($\tau$) values that provide evidence of cross-national heterogeneity in the associations between suffering and each subsequent outcome for Models 1 and 2. A more detailed description of the heterogeneity of these effects can be found in the forest plots displaying effect estimates and corresponding 95% CIs for outcomes for each country or territory (see Supplementary Figs. S1–S78). Most global *p*-values for Model 1 passed the Bonferroni-corrected threshold, providing robust evidence of an association between suffering and a given outcome in at least one country or territory (somewhat fewer global *p*-values passed the Bonferroni-corrected threshold for Model 2). Tau values for Model 1 were ≤ 0.10 (and were generally smaller for Model 2), suggesting modest heterogeneity in effect estimates across the samples.

Standardized results for associations between suffering and the subsequent outcomes in each country or territory are reported in Supplementary Data 124–146 (see also Supplementary Data 147 and 148), with corresponding *E*-values presented in Supplementary Data 153–175. Accompanying forest plots provide a visual display of country-specific associations ordered on the *y*-axis by magnitude of association (see Supplementary Figs. S1–S78).

There was some evidence of a near-universal association between suffering and several outcomes in Model 1 (see Table 5), with suffering predicting worse well-being in nearly all samples on the Secure Flourishing Index (23/23 samples at $p < 0.05$, 22/23 samples at $p < 0.00089$) and the Flourishing Index (23/23, 22/23); psychological well-being indicators of life satisfaction (23/23, 19/23), happiness (22/23, 21/23), freedom to pursue what's important (22/23, 14/23), current life evaluation (21/23, 18/23), and self-rated mental health (21/23, 18/23); psychological distress indicators of traumatic distress (22/23, 20/23), depression symptoms (22/23, 20/23), and anxiety symptoms (22/23, 20/23); social well-being indicators of relationship contentment (22/23, 17/23) and relationship satisfaction (22/23, 17/23); social distress indicator of loneliness (21/23, 19/23); physical health & health behavior indicators of pain (22/23, 22/23), self-rated physical health (22/23, 20/23), and health problems (22/23, 18/23); and socioeconomic indicators of financial security (22/23, 19/23) and financially comfortable/getting by (21/23, 17/23). Many of the outcomes that showed more consistent evidence of association with suffering in the country-specific analyses were among those most strongly associated with suffering in the meta-analyses. While all domains except social participation had at least one outcome predicted by suffering in at least half the samples, the domains in which suffering tended to show the most consistent associations with worse well-being on the outcomes across the samples included psychological well-being, psychological distress, and physical health & health behavior.

Most outcomes for which there was little evidence of association with suffering when estimates were pooled meta-analytically (e.g., ever been married, number of drinks per week) were not predicted by suffering in any of the samples. There were also instances in which pooled estimates across the samples did not suggest evidence of an association with a given outcome, but evidence of such an association was found in certain samples. For example, there were four countries in which suffering was associated with a slight decrease in subsequent weekly community participation (i.e., Australia, Japan, Sweden, United States), two of which passed the Bonferroni-corrected threshold of $p < 0.00089$. There were a few instances in which suffering was associated with better subsequent well-being on selected outcomes in certain countries, such as an increase in life balance in India, higher educational attainment in Mexico, increased volunteering in Poland, and an increase in helping strangers in Poland, Sweden, and the United States, although effect sizes were extremely small and none passed the Bonferroni-corrected threshold of $p < 0.00089$.

The samples in which suffering showed evidence of associations with worse well-being on the greatest number of outcomes (not including suffering itself) included the United States (49/55 outcomes at $p < 0.05$, 46/55 at $p < 0.00089$), Sweden (46/55, 44/55), Japan (44/55, 40/55), Australia (42/55, 35/55), and the United Kingdom (42/55, 35/55). The samples in which there was the least consistent evidence of association between suffering and worse well-being across the outcomes included Nigeria (8/55 outcomes at $p < 0.05$, 0/55 at $p < 0.00089$), South Africa (18/55, 3/55), the Philippines (21/55, 10/55), Indonesia (22/55, 13/55), and Turkey (28/55, 10/55). Country-specific results for Model 2 showed a similar pattern to Model 1, except that effect sizes were somewhat attenuated (see Supplementary Data 124–146). Effect estimates using imputed data were also similar to those observed after repeating the country-specific analyses using a semi-complete case approach with attrition weights for both Models 1 and 2 (see Supplementary Data 176–198).

## Discussion

Using two waves of longitudinal data from 23 countries and territories in the GFS, this study estimated population-level associations between suffering and numerous indicators of multidimensional well-being assessed approximately 1 year later. Our main findings are twofold. First, pooled estimates across the samples provided some evidence of association between suffering and worse outcomes on two composite indicators of well-being and most specific indicators of well-being on nearly all domains that were examined, although there was stronger and more consistent evidence of association for outcomes on some domains (e.g., psychological distress) compared to others (e.g., social participation). Second, there was evidence of cross-national similarities and differences in the pattern of associations between suffering and subsequent well-being, with some outcomes showing more consistent evidence of association across the samples than others (e.g., life satisfaction vis-à-vis delayed gratification) and more consistent evidence of association between suffering and the entire set of main outcomes in some samples compared to others (e.g., United States vis-à-vis Nigeria). By leveraging a multinational dataset comprising nationally representative samples that cover about two-thirds of the global population, our findings provide insights into population-level prospective associations between suffering and multidimensional well-being within and across a diverse range of socioecological contexts.

Pooled estimates from Model 1 in our primary analyses offered some evidence supporting associations between suffering and worse well-being on both composite well-being indicators and most specific well-being indicators across nearly all domains. Although estimates of association were generally modest (and attenuated after applying more extensive confounding control in Model 2), the strongest associations we observed were spread across 7 of the 8 domains of outcomes. This pattern of findings aligns with theorizing on the permeating quality of suffering that can impact multiple areas of a person's life[2], as well as empirical research suggesting that the negative impacts of suffering may extend to various dimensions of well-being[1,4,5]. Our outcome-wide analytic approach contributes to a small but growing number of studies that have applied a holistic and integrative approach to better understand how suffering might be related to the well-being of the whole person, which we expand upon by considering a broader range of outcomes in a diverse multinational sample. For example, Cowden et al.[1] conducted one of the most comprehensive outcome-wide analyses on

**Table 3 | Meta-analyzed associations of Wave 1 suffering with Wave 2 social participation, character & prosocial behavior, physical health & health behavior, and socioeconomic outcomes**

| Outcome | Model 1 | | | | | Model 2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | RR | ES | 95% CI | τ | Global *p*-value | RR | ES | 95% CI | τ | Global *p*-value |
| Social Participation | | | | | | | | | | |
| Ever been married | 1.00 | | (1.00, 1.00) | <0.01† | 0.972 | 1.00 | | (1.00, 1.00) | <0.01† | 0.967 |
| Currently divorced | 1.00 | | (1.00, 1.00) | <0.01† | 0.947 | 1.00 | | (1.00, 1.00) | <0.01† | 0.989 |
| Number of children | | 0.00 | (−0.01, 0.01) | <0.01† | 0.410 | | 0.00 | (−0.01, 0.01) | 0.01 | 7.79e-05*** |
| Weekly+ community participation | 1.00 | | (0.99, 1.00) | <0.01† | 4.8e-04*** | 1.00 | | (1.00, 1.00) | <0.01† | 0.826 |
| Weekly+ religious attendance | 1.00 | | (1.00, 1.00) | <0.01† | 0.036* | 1.00 | | (1.00, 1.00) | <0.01† | 0.620 |
| Character & Prosocial Behavior | | | | | | | | | | |
| Orientation to promote good | | −0.07 | (−0.10, −0.05) | 0.05 | 1.7e-15*** | | 0.00 | (−0.01, 0.01) | 0.01 | 0.029* |
| Delayed gratification | | −0.06 | (−0.07, −0.04) | 0.04 | 1.7e-15*** | | 0.00 | (−0.01, 0.01) | 0.01 | 0.049* |
| Hope | | −0.12 | (−0.15, −0.09) | 0.07 | 9.77e-16*** | | −0.01 | (−0.02, −0.00) | 0.01 | 2.76e-03** |
| Gratitude | | −0.10 | (−0.13, −0.08) | 0.06 | 1.16e-15*** | | −0.02 | (−0.03, −0.01) | <0.01† | 0.016* |
| Showing love/care | | −0.06 | (−0.07, −0.05) | 0.03 | 2.55e-15*** | | −0.00 | (−0.01, 0.01) | <0.01† | 0.005* |
| Forgivingness | 0.99 | | (0.99, 1.00) | <0.01† | 5.61e-05*** | 1.00 | | (0.99, 1.00) | <0.01† | 0.663 |
| Charitable giving | 0.99 | | (0.99, 1.00) | <0.01† | 3.04e-04*** | 1.00 | | (0.99, 1.00) | <0.01† | 0.526 |
| Helping strangers | 1.01 | | (1.00, 1.01) | <0.01† | 0.038* | 1.00 | | (1.00, 1.01) | <0.01† | 0.762 |
| Volunteering | 1.00 | | (0.99, 1.00) | <0.01† | 3.01e-03** | 1.00 | | (0.99, 1.00) | <0.01† | 0.017* |
| Physical Health & Health Behavior | | | | | | | | | | |
| Self-rated physical health | | −0.18 | (−0.21, −0.14) | 0.08 | 4.85e-16*** | | −0.04 | (−0.05, −0.03) | 0.02 | 7.81e-13*** |
| Health problems | 1.07 | | (1.05, 1.08) | 0.04 | 7.52e-16*** | 1.02 | | (1.02, 1.03) | 0.01 | 2.55e-15*** |
| Pain in past 4 weeks | 1.10 | | (1.08, 1.11) | 0.04 | 4.61e-16*** | 1.05 | | (1.04, 1.06) | 0.02 | 2.55e-15*** |
| Daily smoker | 1.01 | | (1.00, 1.01) | <0.01† | 6.83e-04*** | 0.99 | | (0.99, 1.00) | <0.01† | 5.11e-15*** |
| Number of drinks per week | | −0.00 | (−0.01, 0.01) | <0.01† | 0.809 | | −0.00 | (−0.01, 0.00) | <0.01† | 0.329 |
| Days exercise per week | | −0.04 | (−0.05, −0.03) | 0.02 | 5.11e-15*** | | −0.00 | (−0.01, 0.01) | <0.01† | 0.976 |
| Socioeconomic Outcomes | | | | | | | | | | |
| Financial security | | −0.12 | (−0.15, −0.10) | 0.05 | 8.51e-16*** | | −0.01 | (−0.02, 0.00) | <0.01† | 1.01e-03** |
| Material security | | −0.11 | (−0.13, −0.09) | 0.05 | 1.28e-15*** | | −0.00 | (−0.01, 0.01) | <0.01† | 0.133 |
| Educational attainment (16+ years) | 1.00 | | (1.00, 1.00) | <0.01† | 0.720 | 1.00 | | (1.00, 1.00) | <0.01† | 0.753 |
| Currently employed | 0.99 | | (0.99, 1.00) | <0.01† | 0.032* | 1.00 | | (1.00, 1.00) | <0.01† | 0.976 |
| Financially comfortable/getting by | 0.95 | | (0.95, 0.96) | 0.02 | 1.7e-15*** | 0.99 | | (0.99, 1.00) | <0.01† | 0.533 |
| Own home | 0.99 | | (0.98, 0.99) | <0.01† | 6.11e-04*** | 1.00 | | (1.00, 1.00) | <0.01† | 0.696 |
| Income – top quintile | 0.99 | | (0.99, 0.99) | <0.01† | 4.25e-05*** | 1.00 | | (1.00, 1.00) | <0.01† | 0.939 |

*N* = 207919; Reference for suffering: Not at all/not very much; RR, risk-ratio, null effect is 1.00; ES, effect size measure for standardized regression coefficient, null effect is 0.00; CI, confidence interval; τ (tau), estimated standard deviation of the distribution of effects; Global *p*-value, joint test of the null hypothesis that the country-specific Wald tests are null in all countries/territories.

Multiple imputation was performed to impute missing data on the covariates, exposure, and outcomes. Model 1 controlled for sociodemographic and childhood factors assessed at Wave 1: relationship with mother growing up; relationship with father growing up; parent marital status around age 12; experienced abuse growing up (except for Israel); felt like an outsider in family growing up; self-rated health growing up; subjective financial status growing up; frequency of religious service attendance around age 12; year of birth; gender; education; employment status; marital status; immigration status; religious affiliation; frequency of religious service attendance; and racial/ethnic identity when available. Model 2 controlled for all variables included in Model 1, and additionally controlled for the first seven principal components of the entire set of Wave 1 outcomes (except for suffering). Selected outcome variables were not assessed in certain countries, including government approval in China and Egypt, belonging in country in China, and say in government in China.

An outcome-wide analytic approach was used, and a separate model was run for each outcome. A different type of model was run depending on the nature of the outcome: (1) for each binary outcome, a weighted generalized linear model (with a log link and Poisson distribution) was used to estimate a RR; and (2) for each continuous outcome, a weighted linear regression model was used to estimate an ES. All effect sizes were standardized. For binary outcomes, the RR represents the change in risk of being in the upper category compared to the lower category between the lower and upper categories of suffering. For continuous outcomes, the ES represents the change (in standard deviations) in the outcome between the lower and upper categories of suffering.

*p*-value significance thresholds: $p < 0.05$*, $p < 0.005$**, (Bonferroni) $p < 0.00089$***, correction for multiple testing to significant threshold; †Estimate of τ (heterogeneity) is likely unstable. See forest plots in the Supplementary Information for more detail on heterogeneity of effects.

suffering to date, examining associations with 16 well-being outcomes in factory worker and flight attendant samples; the present study included more than three times as many outcomes, including quite a number that have received little attention in prior research on suffering (e.g., life balance, forgivingness, future life evaluation). Our findings highlight the value of considering a range of well-being outcomes simultaneously to build a more comprehensive understanding of how suffering might impact well-being. The findings of this study also help to address a significant gap in the literature by highlighting potential implications of suffering in contexts where little research on suffering and well-being has been done (e.g., Egypt, the Philippines). This represents a major step forward in making research on suffering more culturally inclusive and representative of the human population.

The findings of this study partially address an unresolved empirical question about whether suffering has the potential to bring about positive changes in volitional forms of well-being[2,14]. Similar to prior quantitative research in this area[1,5,44], pooled estimates from Model 1 generally did not provide support for this theorizing (though follow-up in this study was

**Table 4 | *E*-value sensitivity analysis for meta-analyzed associations of Wave 1 suffering with Wave 2 outcomes**

| Outcome | Model 1 | | Model 2 | |
|---|---|---|---|---|
| | *E*-value | *E*-value for CI | *E*-value | *E*-value for CI |
| Human Flourishing | | | | |
| Secure Flourishing Index | 1.73 | 1.64 | 1.20 | 1.14 |
| Flourishing Index | 1.71 | 1.62 | 1.21 | 1.16 |
| Psychological Well-Being | | | | |
| Happiness | 1.63 | 1.53 | 1.22 | 1.17 |
| Life satisfaction | 1.61 | 1.52 | 1.22 | 1.16 |
| Current life evaluation | 1.54 | 1.45 | 1.19 | 1.14 |
| Future life evaluation | 1.45 | 1.37 | 1.12 | 1.04 |
| Optimism | 1.43 | 1.33 | 1.11 | 1.02 |
| Freedom to pursue what's important | 1.48 | 1.41 | 1.14 | 1.09 |
| Inner peace | 1.28 | 1.21 | 1.10 | 1.06 |
| Life balance | 1.29 | 1.23 | 1.12 | 1.08 |
| Sense of mastery | 1.22 | 1.17 | 1.04 | 1.00 |
| Meaningful activities | 1.50 | 1.41 | 1.10 | 1.00 |
| Understanding purpose | 1.47 | 1.40 | 1.12 | 1.03 |
| Self-rated mental health | 1.65 | 1.54 | 1.25 | 1.19 |
| Psychological Distress | | | | |
| Traumatic distress | 1.35 | 1.31 | 1.19 | 1.16 |
| Depression symptoms composite | 1.37 | 1.33 | 1.14 | 1.10 |
| Anxiety symptoms composite | 1.38 | 1.33 | 1.13 | 1.11 |
| Suffering | 1.54 | 1.46 | 1.40 | 1.35 |
| Social Well-Being | | | | |
| Relationship contentment | 1.48 | 1.41 | 1.16 | 1.12 |
| Relationship satisfaction | 1.51 | 1.43 | 1.18 | 1.14 |
| Social support | 1.40 | 1.34 | 1.09 | 1.00 |
| Intimate/close friend | 1.14 | 1.11 | 1.04 | 1.00 |
| Government approval | 1.12 | 1.08 | 1.05 | 1.00 |
| Say in government | 1.12 | 1.08 | 1.07 | 1.02 |
| Belonging in country | 1.31 | 1.25 | 1.07 | 1.00 |
| City/place satisfaction | 1.23 | 1.19 | 1.09 | 1.04 |
| Trust within country | 1.16 | 1.12 | 1.05 | 1.00 |
| Social Distress | | | | |
| Loneliness | 1.55 | 1.47 | 1.19 | 1.14 |
| Perceived discrimination | 1.22 | 1.19 | 1.10 | 1.07 |
| Social Participation | | | | |
| Ever been married | 1.02 | 1.00 | 1.03 | 1.00 |
| Currently divorced | 1.01 | 1.00 | 1.01 | 1.00 |
| Number of children | 1.00 | 1.00 | 1.07 | 1.00 |
| Weekly+ community participation | 1.06 | 1.00 | 1.05 | 1.00 |
| Weekly+ religious attendance | 1.05 | 1.03 | 1.04 | 1.00 |
| Character & Prosocial Behavior | | | | |
| Orientation to promote good | 1.34 | 1.26 | 1.05 | 1.00 |
| Delayed gratification | 1.29 | 1.23 | 1.05 | 1.00 |
| Hope | 1.47 | 1.39 | 1.11 | 1.02 |
| Gratitude | 1.42 | 1.35 | 1.14 | 1.10 |
| Showing love/care | 1.30 | 1.25 | 1.06 | 1.00 |
| Forgivingness | 1.09 | 1.05 | 1.04 | 1.00 |
| Charitable giving | 1.08 | 1.01 | 1.06 | 1.00 |
| Helping strangers | 1.08 | 1.06 | 1.04 | 1.00 |
| Volunteering | 1.05 | 1.00 | 1.05 | 1.00 |
| Physical Health & Health Behavior | | | | |
| Self-rated physical health | 1.62 | 1.53 | 1.24 | 1.20 |
| Health problems | 1.34 | 1.28 | 1.18 | 1.14 |
| Pain in past 4 weeks | 1.42 | 1.37 | 1.27 | 1.24 |
| Daily smoker | 1.09 | 1.05 | 1.08 | 1.04 |
| Number of drinks per week | 1.04 | 1.00 | 1.06 | 1.00 |
| Days exercise per week | 1.23 | 1.19 | 1.03 | 1.00 |
| Socioeconomic Outcomes | | | | |
| Financial security | 1.48 | 1.42 | 1.09 | 1.00 |
| Material security | 1.45 | 1.38 | 1.06 | 1.00 |
| Educational attainment (16+ years) | 1.00 | 1.00 | 1.00 | 1.00 |
| Currently employed | 1.09 | 1.07 | 1.05 | 1.00 |
| Financially comfortable/getting by | 1.27 | 1.24 | 1.08 | 1.05 |
| Own home | 1.13 | 1.12 | 1.03 | 1.00 |
| Income – top quintile | 1.12 | 1.11 | 1.04 | 1.00 |

CI, confidence interval. The formula for calculating *E*-values can be found in VanderWeele and Ding[82]. *E*-values for the estimate are the minimum strength of association on the risk ratio scale that an unmeasured confounder would need to have with both the exposure and the outcome to fully explain away the observed association between the exposure and outcome, conditional on the measured covariates. *E*-values for the 95% CI closest to the null denote the minimum strength of association on the risk ratio scale that an unmeasured confounder would need to have with both the exposure and the outcome to shift the CI to include the null value, conditional on the measured covariates.

limited to 1 year). In particular, we found that suffering was associated with a (mostly very small) decline in almost all character indicators, while there was little evidence of association observed for most indicators of prosocial behavior. The one exception was that suffering was associated with a marginal increase in helping strangers, consistent with the concept of *altruism born of suffering*, which captures the notion that a person's experience of suffering might elicit empathic emotions that motivate them to help vulnerable or disadvantaged members of society[90,91]. Although this finding differs from the general pattern of findings observed for the character indicators, the helping strangers item used in the GFS assesses the occurrence rather than the frequency of such behavior in the last month. It is possible that suffering might lead to an increase in episodic attempts to help strangers, but this may not be sufficient to consolidate dispositional changes in character because more frequent, consistent, or emotionally costly changes in habits might be required for this to occur. Methodological factors may provide alternative explanations, including the possibility that longer follow-up periods might be needed to establish whether suffering might precipitate meaningful positive changes in the character indicators examined in this study[1,5]. It is also worth noting that there may be considerable heterogeneity in the effects of suffering on character. While suffering may not lead to positive character changes for the majority of people, it might for some, and it seems important to understand the conditions and pathways that could enable such growth[2]. As subsequent waves of the GFS panel data become available, there will be opportunities to investigate these possibilities in greater depth.

Given the general pattern of findings observed in this study, suffering may be a key obstacle to achieving the "good health and well-being" goal that is part of the Sustainable Development Goals put forward by the United

**Table 5 | Cross-national trends for associations of Wave 1 suffering with Wave 2 outcomes across the 23 samples (Model 1)**

| Outcome | Number of countries where association is negative | | Number of countries where association is positive | | Country with the largest point estimate at $p < 0.05$ (direction of association) |
|---|---|---|---|---|---|
| | $p < 0.05$ | $p < 0.00089$ | $p < 0.05$ | $p < 0.00089$ | |
| Human Flourishing | | | | | |
| Secure Flourishing Index | 23 | 22 | 0 | 0 | Japan (negative) |
| Flourishing Index | 23 | 22 | 0 | 0 | Japan (negative) |
| Psychological Well-Being | | | | | |
| Happiness | 22 | 21 | 0 | 0 | Japan (negative) |
| Life satisfaction | 23 | 19 | 0 | 0 | Japan (negative) |
| Current life evaluation | 21 | 18 | 0 | 0 | Japan (negative) |
| Future life evaluation | 18 | 13 | 0 | 0 | Japan (negative) |
| Optimism | 15 | 13 | 0 | 0 | Australia (negative) |
| Freedom to pursue what's important | 22 | 14 | 0 | 0 | United States (negative) |
| Inner peace | 16 | 12 | 0 | 0 | Japan, United Kingdom (negative) |
| Life balance | 17 | 14 | 1 | 0 | Japan, United Kingdom (negative) |
| Sense of mastery | 16 | 14 | 0 | 0 | Sweden (negative) |
| Meaningful activities | 20 | 16 | 0 | 0 | Japan, United States (negative) |
| Understanding purpose | 19 | 16 | 0 | 0 | Japan (negative) |
| Self-rated mental health | 21 | 18 | 0 | 0 | Japan (negative) |
| Psychological Distress | | | | | |
| Traumatic distress | 0 | 0 | 22 | 20 | Japan (positive) |
| Depression symptoms composite | 0 | 0 | 22 | 20 | United Kingdom (positive) |
| Anxiety symptoms composite | 0 | 0 | 22 | 20 | United Kingdom (positive) |
| Social Well-Being | | | | | |
| Relationship contentment | 22 | 17 | 0 | 0 | Japan (negative) |
| Relationship satisfaction | 22 | 17 | 0 | 0 | Japan (negative) |
| Social support | 20 | 13 | 0 | 0 | Japan, United States (negative) |
| Intimate/close friend | 12 | 5 | 0 | 0 | Japan (negative) |
| Government approval | 8 | 2 | 0 | 0 | Israel, Poland (negative) |
| Say in government | 7 | 3 | 1 | 0 | Israel (negative) |
| Belonging in country | 15 | 7 | 0 | 0 | Japan, United States (negative) |
| City/place satisfaction | 19 | 12 | 0 | 0 | Japan (negative) |
| Trust within country | 10 | 8 | 0 | 0 | Japan (negative) |
| Social Distress | | | | | |
| Loneliness | 0 | 0 | 21 | 19 | Japan (positive) |
| Perceived discrimination | 0 | 0 | 19 | 13 | Brazil, Turkey, United Kingdom (positive) |
| Social Participation | | | | | |
| Ever been married | 0 | 0 | 0 | 0 | — |
| Currently divorced | 0 | 0 | 0 | 0 | — |
| Number of children | 1 | 0 | 1 | 0 | Germany (negative), Kenya (positive) |
| Weekly+ community participation | 4 | 2 | 0 | 0 | Australia (negative) |
| Weekly+ religious attendance | 1 | 0 | 0 | 0 | United States (negative) |
| Character & Prosocial Behavior | | | | | |
| Orientation to promote good | 16 | 10 | 0 | 0 | Japan (negative) |
| Delayed gratification | 13 | 7 | 0 | 0 | Japan (negative) |
| Hope | 19 | 14 | 0 | 0 | Australia, Sweden (negative) |
| Gratitude | 16 | 13 | 0 | 0 | Australia (negative) |
| Showing love/care | 15 | 6 | 0 | 0 | Japan (negative) |
| Forgivingness | 4 | 3 | 0 | 0 | Australia (negative) |
| Charitable giving | 2 | 2 | 0 | 0 | Israel (negative) |
| Helping strangers | 0 | 0 | 3 | 0 | Poland (positive) |
| Volunteering | 1 | 1 | 1 | 0 | Poland (positive), United States (negative) |

**Table 5 (continued) | Cross-national trends for associations of Wave 1 suffering with Wave 2 outcomes across the 23 samples (Model 1)**

| Outcome | Number of countries where association is negative | | Number of countries where association is positive | | Country with the largest point estimate at $p < 0.05$ (direction of association) |
|---|---|---|---|---|---|
| | $p < 0.05$ | $p < 0.00089$ | $p < 0.05$ | $p < 0.00089$ | |
| Physical Health & Health Behavior | | | | | |
| Self-rated physical health | 22 | 20 | 0 | 0 | Japan (negative) |
| Health problems | 0 | 0 | 22 | 18 | Australia, Sweden, United Kingdom (positive) |
| Pain in past 4 weeks | 0 | 0 | 22 | 22 | United States (positive) |
| Daily smoker | 0 | 0 | 5 | 2 | Brazil (positive) |
| Number of drinks per week | 0 | 0 | 0 | 0 | — |
| Days exercise per week | 11 | 4 | 0 | 0 | United States (negative) |
| Socioeconomic Outcomes | | | | | |
| Financial security | 22 | 19 | 0 | 0 | Japan (negative) |
| Material security | 20 | 17 | 0 | 0 | Japan (negative) |
| Educational attainment (16+ years) | 0 | 0 | 1 | 0 | Mexico (positive) |
| Currently employed | 2 | 0 | 0 | 0 | Sweden, United States (negative) |
| Financially comfortable/getting by | 21 | 17 | 0 | 0 | Turkey (negative) |
| Own home | 8 | 3 | 0 | 0 | Israel, United Kingdom (negative) |
| Income – top quintile | 4 | 2 | 0 | 0 | Australia (negative) |

Counts reflect significant associations between suffering and the outcomes across the sample-specific regression results for each country/territory reported for Model 1 in Supplementary Data 124–146, both before ($p < 0.05$) and after Bonferroni correction ($p = 0.05/56 = 0.00089$). See forest plots in the Supplemental Information for more detail on heterogeneity of associations. For some outcomes, the largest point estimate among those $p < 0.05$ before Bonferroni correction was the same in more than one country/territory. "—" is used when none of the estimates of association were significant at $p < 0.05$ before Bonferroni correction in any of the countries/territories.

Nations for the human population. Although the estimates of association that we observed were mostly modest, our findings suggest that progress towards this goal may be strengthened by addressing "everyday" suffering more directly in the general population. While not all forms of suffering are amenable to purely psychological intervention, growing calls have been made for a population health psychology approach that makes evidence-based psychological resources widely accessible and reduces barriers to care (e.g., treatment costs, provider shortages, stigma concerns)[92,93]. Adopted alongside (not in place of) clinical forms of treatment, a population health psychology approach to suffering could provide those experiencing "everyday" suffering opportunities to benefit from suitable supports that they may not otherwise be able to access[94,95]. The efficacy of population health psychology interventions for addressing suffering will vary, but even those that produce modest benefits at the individual level could translate into improved population-level well-being if they can be widely disseminated and used[96,97].

Our probing of country-specific results suggested some similarities and differences across contexts in the observed pattern of associations. When evidence of an association was found for an outcome in a particular country or territory, suffering was generally linked to worse well-being (with only a few exceptions in certain samples). The outcomes for which suffering exhibited the most consistent associations with worse well-being across the samples encompassed both composite well-being indicators, as well as specific indicators across psychological well-being (e.g., life satisfaction, happiness), psychological distress (e.g., traumatic distress, depression symptoms), social well-being (e.g., relationship contentment, relationship satisfaction), social distress (i.e., loneliness), physical health & health behavior (e.g., pain, self-rated physical health), and socioeconomic (e.g., financial security, financially comfortable/getting by) domains. These findings suggest that suffering may be near universally associated with worse outcomes across various dimensions of well-being, reflecting the ubiquity of suffering as a challenging human experience that transcends demographic and cultural differences[2,7].

On the other hand, our cross-national findings also suggest that the associations of suffering with worse well-being might vary to some extent across sociocultural contexts. To illustrate, suffering showed some evidence of association with worse well-being on most outcomes in Sweden, whereas it was associated with comparatively fewer outcomes in South Africa. While there may be several reasons for such cross-national variation (e.g., differences in social-structural conditions), one potentially salient factor might be population differences in age composition across countries. Many countries with the most consistent evidence of associations between suffering and worse well-being have a larger older adult population (e.g., the United States, Japan) compared to countries where less consistent evidence of associations was observed (e.g., Nigeria, the Philippines). Given the co-occurrence of suffering with age-related health problems and disability, the negative implications of suffering for well-being may be more pronounced in countries or territories with older age profiles[2,98]. Although further work is needed to better understand how different sociocultural factors influence when and why suffering might be more (or less) strongly associated with subsequent well-being in particular contexts, the findings of this study suggest that population-level interventions and policies designed to address suffering should be sensitive and tailored to the sociocultural realities of each context[6,48].

This study has methodological limitations. First, while we used longitudinal samples from a diverse set of 23 countries and territories that are roughly representative of the populations from which they were drawn, some cultures and contexts are not represented in the GFS. Appropriate caution should be exercised when attempting to generalize the findings beyond the countries or territories in our analytic sample, and further research is needed in nations not currently represented in the GFS.

Second, the overall attrition rate from Wave 1 to Wave 2 was 38%, with the lowest in China (8.5%) and the highest in Hong Kong (80%). Our primary analytic models used multiply imputed data, which has the benefits of preserving the roughly nationally representative sample structure and reducing the risk of attrition bias. However, some factors that could bias results might not be fully addressed by multiple imputation. For example, our results could be biased if participants in both waves differ systematically from Wave 2 nonrespondents on unobserved characteristics. Although we did not observe substantial differences between Wave 1 and 2 responders on the measured variables in the overall sample, and results from our semi-

complete case analysis with attrition weights yielded similar results to our primary analyses, we cannot completely rule out the possibility that attrition may have introduced bias and weakened the generalizability of our findings (especially in samples where attrition was higher).

Third, all psychosocial covariates, the exposure of suffering, and almost all outcomes were assessed using single items. While it is common for large-scale epidemiologic studies to prioritize single items due to their efficiency and uniform approach to assessment under the resource constraints of conducting multinational research, there are trade-offs to consider[99]. For example, our single-item measure of suffering provides a broad indication of the extent of suffering experienced, but it is unable to distinguish different forms of suffering (e.g., mental versus physical) and the broader context of suffering (e.g., cause or object of suffering) that may be important to consider[6,48]. Single-item measures can also lead to imprecision and reduce estimates of association. The extent of precision or measurement error might also vary by country. Future research could build on our findings by using measures that offer more comprehensive conceptual coverage of the psychosocial constructs assessed.

Fourth, this study is based entirely on self-report data from the GFS survey, which may be influenced by various forms of response bias (e.g., extreme- or midpoint-tendency responding, socially desirability) that could introduce measurement error[100]. While our findings advance existing knowledge on the associations between suffering and indicators of well-being in the general adult population, future longitudinal research might consider collecting more objective data (e.g., standardized clinical assessments) to triangulate results derived from self-report data.

Fifth, potential unmeasured confounding likely affects our estimates of association, though *E*-values suggest that many associations for Model 1 might be modestly robust to unmeasured confounding. *E*-values for Model 2 are generally smaller. However, it is unclear whether such attenuation stems from more extensive confounding control or from control for mediators on the pathway between Wave 1 suffering and one or more of the Wave 2 outcomes[71]. A combination of these possibilities is likely, in which case the actual estimates of association might be somewhere between the Model 1 and Model 2 coefficients. Further clarity on this will be possible when additional waves of the GFS panel data become available, as the temporal sequence of variables, confounding, and reverse causality can be addressed with greater precision when more than two waves of data are used.

Sixth, the exposure variable and roughly half of our main outcomes were analyzed as binary variables. Many were originally assessed using ordinal response scales with four or fewer response options. Recoding decisions were made a priori on the basis of several practical and interpretive reasons, including the goals of maintaining consistency with coding used in a coordinated set of Wave 1 analyses[101,102] and facilitating comparability with other coordinated outcome-wide studies using the same two-wave GFS panel data[54]. While modeling binary outcomes can make interpretation easier, especially for non-technical audiences and when policy considerations are in view, they may be less sensitive to the effect of an exposure because dichotomizing an outcome reduces its variability; this could partly explain why there was generally weaker evidence of association between suffering and the binary outcomes examined in this study. Future work might consider alternative operationalizations of the key study variables (e.g., ordinal coding of the exposure, finer-grained outcome specifications) to evaluate whether our findings replicate under different coding decisions.

Seventh, although the study was longitudinal in design, it included only 1 year of follow-up. Some outcomes may be more likely to change over a 1-year interval than others. Our findings should be considered in light of the follow-up period between Waves 1 and 2 of the GFS, which may be better suited to detecting change in some outcomes than others. Thus, associations involving outcomes that typically change more slowly over time (e.g., educational attainment, number of children) should be interpreted more cautiously. Longer follow-up periods may be important for clarifying whether (and to what extent) suffering is associated with outcomes that are less likely to change over a 1-year interval.

Eighth, the outcome-wide analytic approach employed in this study involved estimating population-average associations, providing a summary of the overall pattern of associations within a specified target population. However, individual-level average associations may mask heterogeneity across subgroups (e.g., age, gender). While our findings represent a significant advancement toward developing a more well-rounded understanding of the ways suffering may be related to well-being, further work is needed to identify the boundary conditions (i.e., when and for whom) under which associations might vary and the mediating mechanisms (i.e., how and why) that could explain the associations observed in this study.

## Conclusion

This multinational study provided longitudinal population-level evidence suggesting that suffering is generally associated with worse subsequent multidimensional well-being. Although estimates of association were generally modest and there are limits to the causal inferences that can be drawn from the two-wave longitudinal design, our findings raise the possibility that lower population-level suffering may be associated with broad improvements in population well-being. The population-average associations reported in this study contribute to building a more robust "epidemiology of suffering" (p. 65)[2] and suggest that suffering may be an important factor to consider in efforts to improve well-being across different populations.

## Data availability

The raw data that support the findings of this study are publicly available on the Open Science Framework[51]. The Waves 1 and 2 non-sensitive global dataset was used, which is publicly available (https://osf.io/c8hbk). The source data for the main tables are available in Supplementary Data 10.

## Code availability

All code to reproduce analyses is openly available in an online repository (https://doi.org/10.17605/osf.io/rbcmp)[76].

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## Author contributions

R.G.C. conducted the analyses and wrote the manuscript. R.N.P. and C.F. provided the code for data analysis. B.R.J. and T.J.V. acquired funding, coordinated data collection, participated in survey design, and supervised the development of the analytic code. R.N.P., C.F., R.W., L.M., Z.J.C., D.W., S.M.K., C.G., B.R.J. and T.J.V. contributed to the review and editing of the manuscript.

## Competing interests

The authors declare the following competing interests: Tyler J. VanderWeele reports consulting fees from Gloo Inc., along with shared revenue received by Harvard University in its license agreement with Gloo Inc. according to the University IP policy. All other authors declare no competing interests.

## Additional information

**Supplementary information** The online version contains supplementary material available at https://doi.org/10.1038/s43856-026-01693-5.

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