Systematic Review

Financial Stress, Unemployment, and Suicide – A Meta-Analysis

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Abstract: *Background:* Socioeconomic factors such as financial stress and unemployment are known predictors of suicide. However, no large-scale meta-analyses exist. *Aims:* Determine the suicide risk following unemployment or financial stress. *Method:* Literature searched through July 31, 2021. Robust meta-analysis and metaregression of the risk of suicide following financial stress (23 studies) or unemployment (43 studies), from 20 nations. Subgroup meta-analyses by sex, age, year, country, and methodology. *Results:* The suicide risk following financial stress or unemployment was not significantly elevated among those with diagnosed mental illness. In the general population, we found significantly elevated suicide risks for financial stress (RR: 1.742; 95% CI: 1.339, −2.266) and unemployment (RR: 1.874; CI: 1.501, −2.341). However, neither was significant among studies controlling for physical/mental health (perhaps partially due to lower statistical power). We observed no significant differences by sex, age, or by GDP. We observed a higher suicide risk following unemployment in more recent years. *Limitations:* Publication bias was evident. We could not examine some individual-level characteristics, most notably the severity/duration of unemployment/financial stress. Heterogeneity was high for some meta-analyses. Studies from non-OECD countries are under-represented. *Conclusion:* After accounting for physical/mental health, financial stress and unemployment weakly associated with suicide, and the associations may be nonsignificant.

Keywords: unemployment, financial stress, suicide, systematic review, meta-analysis

Unemployment has been widely recognized as a stressful event that has implications for health and longevity (Roelfs et al., 2011). Studies have shown that suicide rates increase notably in times/places where unemployment rises (Catalano et al., 2011; Chang et al., 2010, 2013; Stuckler et al., 2009). Investigating the effects of unemployment is particularly timely given the recent context of the COVID-19 pandemic. Between February and April 2020, unemployment around the globe rose sharply. In OECD nations, unemployment increased from 5.21% to 8.75%, with spikes in countries such as the United States (from 3.5% to 14.7%) and Canada (from 5.6% to 13.0%) being among the worst (OECD, 2021). While unemployment rates have subsequently dropped, they remain consistently above the levels observed at the beginning of 2020.

Furthermore, the COVID-19 pandemic has created multiple sources of financial stress, including reduced work hours, lost overtime pay, job instability, and lost self-employment income for small business owners (Kim et al., 2020). The financial stress associated with the pandemic may include housing instability (due to missed rent/mortgage payments), increased medical costs, stock market volatility (especially for those in or near retirement), and the collapse of portions of the labor market.

Gaps in governments' responses to the COVID-19 pandemic's economic fallout may further contribute to the financial stress experienced by individuals. Where wage protections exist, they only cover a portion of income (OECD, 2020). For example, in Germany, workers receive 60% of their pay for regular hours not worked; French workers receive 70% of their former gross pay. In the United States, unemployment compensation varies by state, with only partial coverage for work hour reductions or lost self-employment income. Because only a portion of workers' income is replaced, the risk of financial stress is substantial.

In our paper, we examine the risk of a fatal suicide (referred to from this point simply as suicide) following financial stress and unemployment. This investigation is consistent with a recent call for such research (Brenner, 2020). We conducted meta-analyses on the associations between both financial stress and unemployment and suicide using four decades of published results. In the next section, we review published systematic reviews and meta-analyses on the effects of financial stress and unemployment, focusing first on the literature related to all-cause mortality and then on the literature on suicide.

Existing Systematic Reviews of the Unemployment–Mortality Association

The literature on the association between unemployment and all-cause mortality is voluminous. In a meta-analysis of

this literature, we found a 63% elevated all-cause mortality risk for people who were unemployed relative to their employed counterparts (Roelfs et al., 2011). The risk was higher for men, lower for workers close to retirement age, and highest in the initial years after unemployment. We argued that the unemployment–mortality association was likely causal since the association was only partially attenuated among studies that controlled for pre-existing health status. In a follow-up meta-analysis, we also found that the general unemployment rate in the population did not affect the individual-level association between unemployment and mortality (Roelfs et al., 2015).

The association between unemployment and suicide has been less studied. Platt (1984) conducted the first qualitative systematic review, concluding that suicide fatalities were likely higher among the unemployed. Platt argued that unemployment increases uncertainty, leads to unhealthy behavioral responses, and causes material deprivation. More recently, Li et al. (2011) conducted a meta-analysis of suicide, a portion of which (based on four studies) found a 68% elevated suicide risk among the unemployed. A meta-analysis of six studies by Milner et al. (2013) found that unemployment was associated with a 70% increase in the suicide risk. The authors noted that the suicide risk was highest for men and during the early years of follow-up (150% elevated risk in the 1st 5 years) but lower after more time had passed (21% increased risk after five years and 10% after 12–16 years). This pattern was consistent with the pattern we previously reported for all-cause mortality (Roelfs et al., 2011).

In a follow-up meta-analysis ($n = 5$), Milner et al. (2014) reviewed the literature on whether job loss leads to mental illness and then suicide versus the idea that mental illness is a common cause of both job loss and suicide. Their results showed a 58% increased suicide mortality risk in studies not controlling for baseline physical/mental health versus only a 15% increased risk when health was controlled. The results of Milner et al. suggest that pre-existing physical/mental health has the potential to be either a confounder or a mediator of the unemployment–suicide association.

While previous studies suggest that unemployment is associated with an increased suicide risk, less is known about the effects of other economic stressors. The recent pandemic created financial pressures across the globe, even for employed individuals. These include financial stresses related to one's work (e.g., job instability, reduced work hours), as well as to one's household finances (e.g., difficulty paying rent/mortgage or medical expenses, stock market losses). We note that, in the literature, financial stress is a general concept. We define financial stress as the psychological tension arising because of major, negative money-related household or personal events and/or a chronic state of monetary scarcity.

Despite the broad array of factors that might be considered financial stress, we found only one meta-analysis that examined the association between suicide and socioeconomic situations. In a systematic review of 31 studies of fatal and nonfatal suicide attempts that were conducted in low/middle-income countries, Knipe et al. (2015) concluded that low socioeconomic status (which included some studies assessing *financial difficulty*) was associated with a higher suicide risk. However, we are unaware of any quantitative (meta-analysis) estimate of the increased suicide risk.

Methods

Search Strategy and Inclusion Criteria

We led a team that searched for studies on the effect of individual-level unemployment (rather than aggregate unemployment rates) and financial stress on suicide. The search was completed on July 31, 2021. Medline, Embase, CINAHL, and Web of Science databases were searched for social factors associated with mortality, including suicide mortality. The search (see Electronic Supplementary Material 1 [ESM 1] for full details) captured relevant studies through the inclusion of the following terms: suicide$, mortalit$, death$, fatal$, (socioeconomic$ or socio economic$), (financ$ or money or economic$) and (stress$ or problem$ or hardship$ or burden$), work, and employ$. Manual searches of bibliographies, citing publications, and similar publications (in Web of Science and Google Scholar) were used extensively. We placed no search limits on publication year, considered publications in any language provided that the title and abstract had been translated into English, considered unpublished work, and reviewed both case–control and cohort studies (ecological studies were excluded). Because of the broad scope of this search, the review was not registered. Additional details on the review protocol, a data collection form template, the STATA data file, and analysis syntax are available on request.

Pairs of research assistants evaluated each study for eligibility and coded 333 publications on various predictors of suicide (which we then reviewed; see ESM 1 for the variables sought during coding). Of the 333 coded publications, 80 were on the association between economic-related stress and suicide (see Figure 1). We excluded three publications on unstable employment and

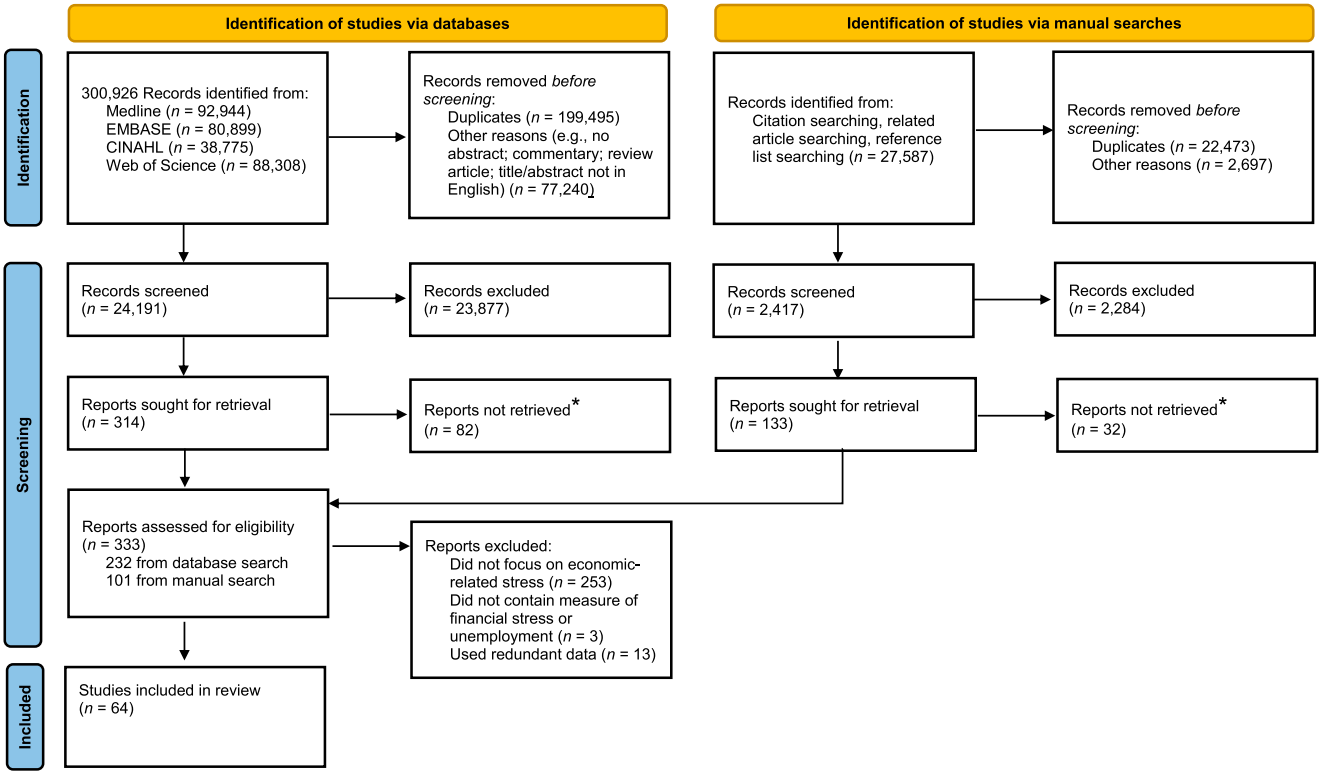

Figure 1. PRISMA flow diagram. (*The percentage of reports that could not be retrieved is higher than in a typical systematic review because of the breadth of the literature search. The most common reasons for a report being irretrievable are all connected to the limitations in the holdings and interlibrary loan programs of the libraries at the authors' respective institutions. Access to reports was especially limited if it was an article published in a relatively obscure journal, it was a book/chapter published by a smaller academic press, or if a report was published prior to 1990.)

suicide (which differs from unemployment and does not necessarily lead to financial stress). We noted earlier that financial stress is a general concept. Empirically, we included studies that reported some measure of financial stress, problems, trouble, deterioration, crisis, or losses. We also included studies that reported some measure of unmanageable debt, very low income, or the lack of needed financial resources. We excluded 13 publications because they used the same dataset or otherwise used data on person-years included in another study already included in our review (see Table E1 in ESM 1). In these instances, we utilized the study containing the greatest amount of data. Sixty-four publications were included in the final analyses (see Table A1 in the appendix for additional details).

Statistical Method

Studies in our sample reported rate ratios, odds ratios, and hazard ratios. In instances where the event of interest occurs frequently, these alternative metrics can slightly differ (Davies et al., 1998; Greenland, 1998). However, when the underlying risk is small (as with suicide) and/or the relative risks are not extreme (as was the case in this review), the three metrics are effectively equivalent and do not require conversion (see Table E2 and Table E3 in ESM 1).

We used random-effects meta-analyses to examine the suicide mortality of individuals who experienced financial stress or unemployment relative to those who did not. We also conducted subgroup analyses by (1) presence/absence of a mental illness; (2) sex; (3) age; (4) study date; (5) low versus high GDP per capita country; (6) whether the study controlled for physical health; and (7) whether the study controlled for mental health. We used random-effects metaregressions for multivariate examinations of potential moderators of suicide risk. All analyses were performed in Stata 15.0 using the *robumeta* (robust meta-analysis) package, which controls for the clustering of risk estimates that come from the same study (see Tanner-Smith & Tipton, 2013).

We used the subgroup meta-analyses and metaregressions to assess possible sources of heterogeneity and/or bias within studies. Subgroup meta-analyses were used to determine whether effect estimates were influenced by whether individuals were recruited from the general population versus from a population with a diagnosed mental illness. Subgroup meta-analyses were also used to

Table 1. Meta-analyses of suicide following financial stress

Data subset	Number of relative risks	Number of studies	Mean relative risk	95% CI	Cochrane's Q *p*-value	I^2
Overall	32	23	**1.740**	**[1.368, 2.215]**	.01	32.70
Mentally ill sample						
No	27	18	**1.742**	**[1.339, 2.266]**	.07	21.52
Yes[a]	5	5	1.844	[0.702, 4.846]	.01	58.04
Study design						
Case–control	23	16	**1.787**	**[1.319, 2.419]**	.47	0.00
Cohort	4	2	1.628	[0.023, 113.70]	.04	33.26
Controlled for physical health						
No	14	12	**2.022**	**[1.588, 2.574]**	.70	0.00
Yes	13	7	1.470	[0.949, 2.276]	.03	33.66
Controlled for mental health						
No	18	12	**1.600**	**[1.056, 2.423]**	.49	0.00
Yes	9	7	1.784	[0.900, 3.539]	.01	57.57
Sex of participants						
Female	2	2	1.534	[0.191, 12.336]	.25	0.00
Male/female mixed	21	15	**1.625**	**[1.192, 2.216]**	.25	0.00
Male	4	3	2.345	[0.470, 11.686]	.03	54.74
Baseline year						
1979–1989	4	2	1.820	n.s.*	.02	61.19
1990–1999	14	8	1.566	[0.846, 2.900]	.56	0.00
2000–2009	9	8	1.760	[0.890, 3.483]	.09	32.85
GDP per capita in country						
Low	6	5	1.751	[1.079, 2.843]	.80	0.00
High	21	14	1.779	[1.263, 2.506]	.02	31.91

Note. [a]Excluded from subsequent meta-analyses. *n.s. indicates a nonsignificant result with a CI that was too wide to be deemed reliable and reportable. Bolding indicates results that are statistically significant at the 95% confidence level.

determine whether effect estimates were confounded because of case–control versus cohort design; a lack of control for age, sex, physical health, or mental health; baseline year; or GDP per capita. Metaregressions were used to examine whether effect estimates (1) differed between case–control and cohort designs; (2) were biased by the presence of a physical health problem or other stress within the entire sample (prostate cancer diagnosis, combat/war exposure, imprisonment, or widowhood); and (3) were confounded because of a lack of control for age, sex, physical health, or mental health. We used funnel plots and Egger tests to assess publication bias. We examined *p*-values for Cochrane's *Q* and I^2 statistics to assess heterogeneity levels.

We checked whether the synthesis of large-*n* studies with small-*n* studies biased the results, by conducting separate analyses that excluded studies where the weight (highly correlated with *n*) was more than two *SD*s away from the mean. We used Box–Tidwell tests to confirm that the associations for our continuous variables in the metaregression were linear rather than nonlinear.

Results

Financial Stress and Suicide

In Table 1, we present meta-analyses of relative suicide mortality for people who experienced financial stress. Included in this table are heterogeneity statistics; individual results with corresponding I^2 values of 30–60 (or above) should be interpreted with some caution. Overall, we found that the financially stressed are 74.0% more likely to die by suicide (95% CI: 36.8%, −121.5%). We did not find a substantive difference between studies of the general population and studies that looked only at participants with a diagnosed mental illness. Still, because

Table 2. Meta regressions predicting the log relative suicide risk

	Financial stress[a]		Unemployment[b]			
	Bivariate models		Bivariate models		Multivariate model	
Covariates	Coef.	*p*	Coef.	*p*	Coef.	*p*
Proportion of sample that was male	−0.013	.978	−0.312	.182		
Mean age of participants	−0.014	.183	−0.018	.151		
Baseline year	−0.006	.718	0.020	.038	0.020	.105
Low-GDP country (high = reference)	0.052	.820	0.740	.092	0.318	.503
Case/control design (cohort = reference)	0.129	.760	−0.215	.381		
Physical health problem or other stress (no = reference)	−0.057	.907	−0.215	.381		
Controlled for:						
Age	0.190	.509	0.392	.386		
Sex	0.190	.509	0.005	.996		
Physical health	−0.384	.120	−0.556	.019	−0.529	.021
Mental health	−0.051	.873	−0.444	.087	−0.121	.579
Intercept	—	—	—	—	−39.618	.111

Note. [a]*n* = 27 RRs (18 studies). [b]*n* = 67 RRs (29 studies). [c]Obtained from a separate metaregression that excluded mean age and baseline year, which were collinear with the GDP variable. [d]Excluded due to errors in the eigenvalues. [e]Excluded due to collinearity.

these are two very different sampling frames (and to remain consistent with the unemployment analyses), all remaining financial stress meta-analyses were based on the 27 general population risk estimates. Among these, we found a 74.2% elevated suicide risk (95% CI: 33.9%, −126.6%). We use this increased risk of 74.2% as our point of comparison for the remaining analyses.

Subgroup analyses showed that the relative suicide risk was lower than +74.2% for studies that controlled for baseline physical health (47.0% elevated risk). However, we found that the relative suicide risk was slightly higher than +74.2% for studies that controlled for baseline mental health (78.4% elevated risk). Both subgroup results were not statistically significant, although this might stem from the low number of risk estimates (13 and 9, respectively). The metaregressions (see Table 2) showed no significant differences based on controlling for either physical or mental health).

Subgroup analyses showed no substantive differences between studies using a case–control design and those using a cohort design. The metaregressions also showed no significant difference between the two study designs. We found differences by sex, with the mean RR in studies of females being lower than in studies of males (mean RRs: 1.534 and 2.345, respectively). However, the metaregressions showed no significant sex difference. We also found nonsignificant differences by baseline year and when comparing low-GDP per capita with high-GDP countries. In supplementary analyses (see Table E4 in ESM 1), we observed differences between individual countries, which ranged from a 21.4% risk increase in Turkey to an 848.0% increase in Hong Kong. However, we advise interpretational caution because the results for any single country were mostly based on just one or two studies. There was not enough variation to perform meta-analyses by age, but age was not significant in the metaregression.

Unemployment and Suicide

In Table 3, we present meta-analyses for relative suicide mortality for people who were unemployed. As in Table 1, we report heterogeneity statistics to indicate instances where individual results should be interpreted with some caution. Overall, we found that the unemployed are 59.0% more likely than employed people to die by suicide (95% CI: 27.8%, −97.9%). Unlike our analyses of financial stress, the mean RR differed between studies of the general population and studies that looked only at participants with a diagnosed mental illness. For studies of the general population, the unemployed were 87.4% more likely to die by suicide (95% CI: 50.1%, −134.1%), while for studies of those with a diagnosed mental illness, there was no significant association.

In the remainder of Table 3, we explore some conditions under which results may differ from the overall finding of an 87.4% elevated risk of suicide for the unemployed general population. We found that the relative suicide risk was lower than +87.4% for the studies that controlled for physical health (31.9% elevated risk) or for mental health (50.3% elevated risk). While the relative risk was not statistically significant in studies that controlled for physical health and mental health, this might again stem from the low number of risk estimates (15 and 12,

Table 3. Meta-analyses of suicide following unemployment

Data subset	Number of relative risks	Number of studies	Mean relative risk	95% CI	Cochrane's *Q* *p*-value	I^2
Overall	85	43	**1.590**	**[1.278, 1.979]**	< .01	81.00
Mentally ill sample						
No	67	29	**1.874**	**[1.501, 2.341]**	< .01	71.01
Yes[a]	18	15	1.050	[0.708, 1.556]	.10	68.11
Study design						
Cohort	47	13	**1.592**	**[1.132, 2.239]**	< .01	71.85
Case–control	20	16	**2.116**	**[1.423, 3.147]**	.01	—
Controlled for physical health						
No	52	22	**2.223**	**[1.782, 2.772]**	.01	48.04
Yes	15	8	1.319	[0.831, 2.093]	.01	52.55
Controlled for mental health						
No	55	20	**2.078**	**[1.693, 2.551]**	< .01	54.03
Yes	12	10	1.503	[0.827, 2.732]	.08	58.20
Sex of participants						
Female	22	9	**2.021**	**[1.468, 2.782]**	< .01	55.91
Male/female mixed	21	18	**2.120**	**[1.428, 3.148]**	< .01	61.15
Male	24	11	**1.595**	**[1.177, 2.160]**	< .01	76.59
Mean age of participants						
<35	8	5	**2.511**	**[1.515, 4.160]**	.74	0.00
35–49	21	8	**2.068**	**[1.643, 2.603]**	.09	35.67
50+	5	4	1.443	[0.617, 3.375]	.42	0.00
Baseline year						
1972–1979	5	4	1.277	[0.477, 3.422]	.24	0.00
1980s	11	6	**2.002**	**[1.107, 3.622]**	< .01	84.92
1990s	36	12	**2.095**	**[1.412, 3.109]**	< .01	63.55
2000s	13	9	**2.403**	**[1.490, 3.876]**	.09	34.11
2010–2017	2	2	2.529	n.s.[a]	.49	0.00
GDP per capita in country						
Low	6	5	3.704	[1.350, 10.161]	.82	0.00
High	61	25	1.786	[1.425, 2.238]	.00	72.70

Note. [a]Excluded from subsequent meta-analyses. [b]Unavailable; maximum likelihood convergence was not achieved after 500 iterations. *n.s. indicates a nonsignificant result with a CI that was too wide to be deemed reliable and reportable. Bolding indicates results that are statistically significant at the 95% confidence level.

respectively). The metaregression coefficient for whether a study controlled for baseline physical health (see again Table 2, multivariate model) showed that controlling for this factor reduces the observed relative risk. We found no significant effect of controlling for mental health in the metaregression.

Subgroup analyses showed a higher relative suicide risk among studies using a case–control design (111.6% elevated risk) than those using a cohort design (59.2% elevated risk). However, the metaregression showed no significant difference between case–control studies and cohort studies.

We found no significant differences by sex (see Table 3), although the results weakly suggested that the risk was lower for men. We also found no significant differences by the mean age of study participants (see again Table 3), although the risk appeared somewhat higher for younger individuals. We noted a significant trend (see again Table 3) where the relative suicide risk is higher in more recent years. We also found an apparent difference in the mean relative risk between low-GDP countries (270.4% elevated risk) and high-GDP countries (78.6% elevated risk). Supplementary analyses (see Table E5 in ESM 1) again found differences in the relative suicide risk between individual countries, but we once again advise caution about interpreting such differences because of small sample sizes. The (nonsignificant) sex, (nonsignificant) age, and (significant)

baseline year results were confirmed by the metaregressions, but the difference between low-GDP and high-GDP countries was not significant (see again Table 2).

Discussion

We conducted the first meta-analysis of the relationship between financial stress and suicide. When interpreting the results of this analysis, it is important to keep in mind that financial stress is a general concept that was empirically measured in a variety of ways in the original studies. We found a 74.2% elevated suicide risk among people in the general population who experienced financial stress. However, there was evidence that this may be confounded by physical health and mental illness (and indeed participant age/sex/baseline year and setting). In a meta-analysis focusing on the subset of 13 studies that controlled for baseline physical health, there was a nonsignificant association of financial stress with suicide (RR: 1.470 (95% CI: 0.949, −2.276). In the corresponding meta-analysis focusing on the subset of nine studies that controlled for baseline mental health, there was a nonsignificant association (RR: 1.784 [95% CI: 0.900, −3.539]). For these two subgroup analyses, it is important to keep in mind that lower statistical power may partially account for the nonsignificance of both results, and our metaregressions did not show a statistically significant difference for controlling for mental and/or physical health.

We also conducted the largest and most comprehensive meta-analysis to date examining the unemployment–suicide relationship. We found an 87.4% increased risk of suicide among the unemployed in the general population. However, the results again showed that controlling for baseline physical health may be important (lowering the elevated relative risk to a nonsignificant 31.9%) and also suggested that controlling for baseline mental health could be important (lowering the elevated risk to a nonsignificant 50.3%). Again, it is important to keep in mind that lower statistical power may partially account for the nonsignificance of both results (though the multivariate metaregression suggested that the relative risk was somewhat lower among studies controlling for physical health). The subgroup analyses and metaregressions showed that the apparent size of the association between unemployment and suicide may also depend to some degree on the study methods used, with risk estimates from case–control studies being somewhat higher than estimates from cohort studies. Especially for case–control studies, the elevation of the observed risk may be because physical and mental health can be either confounding or mediating factors in the association between unemployment and suicide. However, our metaregression models showed no significant differences between case–control and cohort designs. With respect to sex, the results suggested that the adverse effects of unemployment were more pronounced for women than for men (102.1% vs. 59.5% elevated risk, respectively; the result was not significant however). The results showed a weak trend where the suicide risk from unemployment declined with age. We also found differences in the relative risk by country, as well as an increasing risk in more recent years.

Strengths and Limitations

In the introduction to this paper, we outlined a number of strengths for our analyses. However, several limitations need to be acknowledged. First, our results are susceptible to publication bias. To examine the possibility of publication bias for our financial stress analyses, we examined the 27 general population risk estimates. The funnel plot (see Figure E1 in ESM 1) showed significant publication bias (p-value from the Egger test = .004). A visual examination indicated that our data were missing smaller-n studies where the relative risk was lower than 1.742 (0.555 on a logarithmic scale). Therefore, our results likely overestimate the mean suicide risk for financial stress.

To examine the possibility of publication bias for our unemployment analyses, we examined the 67 general population risk estimates. The funnel plot (see Figure E2 in ESM 1) also showed significant publication bias (p-value from the Egger test = .001). A visual examination indicated that our data were again missing smaller-n studies where the relative risk was lower than 1.874 (0.628 on a logarithmic scale). Therefore, our results also likely overestimate the mean suicide risk for unemployment, though less so than was the case for financial stress.

Meta-analyses can also be affected by bias in the included studies. While the PRISMA guidelines suggest always performing a risk of bias assessment using an established tool, the guidelines also note that "many tools have been criticized because of their content ... and the way in which the items are combined." PRISMA guidelines cite an assessment study of these bias tools (Bai et al., 2012), recommending the SIGN 50 checklists for case–control and cohort studies (https://www.sign.ac.uk/what-we-do/methodology/checklists/). We reviewed the items on these two checklists, concluding that most of them were either not applicable or did not vary between the included studies or were already addressed (see Table E6 and Table E7 in ESM 1). Still, we acknowledge that unaccounted bias in the included studies may have affected our results.

Another predominant limitation facing any meta-analysis is that aggregation masks important individual-level characteristics. For many of the studies in our data, we do not

know, for example, the prevalence of mental health diagnoses at baseline. We could identify studies that recruited only participants with a mental illness and conduct separate analyses. However, we lacked this information for studies that examined the general population. We attempted to account for individual-level mental and physical health status by comparing studies that controlled for health to those that did not. We acknowledge, however, that this approach can only partially account for the potential confounding between unemployment/financial stress and health.

Aggregation also prevented us from controlling for the effect of unemployment duration. Prior research has shown that the negative effects of unemployment increase with duration (Milner et al., 2013) and that they partially abate once an individual regains employment (Milner et al., 2013; Roelfs et al., 2011). Because many of our studies did not control for unemployment duration prior to baseline, the data combine the long-term and short-term unemployed. Furthermore, as follow-up durations also vary between studies, our results may misestimate the associations between suicide and unemployment/financial stress because people who regained employment early in the follow-up period were combined with those who did not.

The amount of heterogeneity present in the meta-analyses of financial stress (likely stemming from variations in how financial stress was measured) was generally acceptable. We found moderate to substantial levels of heterogeneity for our meta-analyses of unemployment. The I^2 statistic indicated moderate to substantial levels of heterogeneity even when the analysis was restricted to general population studies. The I^2 statistic remained elevated in our subgroup analyses of whether the study controlled for physical health or for mental health and in our analyses by sex and baseline year. The I^2 statistic was not generally elevated, however, in our subgroup analyses by age and country (though this is likely due to the smaller sample sizes for these analyses). For the unemployment analyses, there remain unaccounted factor(s) that have produced the heterogeneity we observed.

Another limitation common to systematic reviews is that the literature tends to contain more studies from certain nations (mainly high income ones) and less from others (mainly low and middle income nations, particularly within Africa). This is certainly the case here, although our study does cover a much greater portion of the globe than prior reviews. Our estimates are therefore more robust for OECD nations than for developing nations.

Conclusions

Our results differ in some ways from those of previous systematic reviews and meta-analyses on the effects of financial stress (Knipe et al., 2015) and of unemployment (Li et al., 2011; Milner et al., 2013, 2014) on suicide. The observed patterns in the increased risk of suicide following unemployment also differ from those we previously reported in the literature on all-cause mortality (Roelfs et al., 2011).

Future studies should account for pre-existing physical and mental health, as these may moderate the association with suicide (as suggested by the significantly different results depending on whether a study used a sample with a diagnosed mental illness and by the significant or near significant effect of controlling for physical health in the metaregressions). Our results (see again Table 1) showed a (nonsignificant) 47% overall increase in the relative risk of suicide following financial stress among studies that controlled for physical health and a (nonsignificant) 78% overall increase among studies that controlled for mental health. The overall (nonsignificant) increase in the suicide risk following unemployment is in the range of 32% to 50% among studies that controlled for baseline physical or mental health. These are lower than some previous estimates and may call into question whether the associations remain after accounting for health selection and publication bias. Milner et al. (2014) also found that controlling for baseline physical health mattered (dropping the increase in the relative suicide risk following unemployment from 58% to 15%), which is similar to what we found (a drop from an 87.4% higher relative risk to a 32%–50% higher risk). Taken together, our work and previous work indicates that accounting for pre-existing physical and mental health is crucial for accurately assessing suicide risks. Our work (see again Table 3) further suggests that the effects of unemployment are different in general populations (significant 87% increase in the relative risk) than in people with mental illness (nonsignificant 5% increase). Our findings suggest that unemployment may not increase the already substantial risk of suicide for people who have been diagnosed with mental illness.

Electronic Supplementary Material

The electronic supplementary material is available with the online version of the article at https://doi.org/10.1027/0227-5910/a000908

ESM 1. Full search algorithm for Medline; variables; relevant publications; full bibliographic information for studies included in the analyses; estimates of error; results by country; funnel plots; items of SIGN 50 checklists.

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Appendix

Table A1. Studies included in the analyses[a]

Author(s)	Unemployment or financial stress	Nation	Baseline year	Entire sample mentally ill	Entire sample unhealthy or stressed	Study design	Number of effect estimates
Altindag et al. (2005)	Unemployment	Turkey	2000			Case/ control	1
Andres et al. (2010)	Both	Denmark	1981			Case/ control	4
Appleby et al. (1999)	Unemployment	England	1995			Case/ control	1
Bergen et al. (2012)	Financial stress	England	2000	Yes		Cohort	1
Bertelsen et al. (2007)	Unemployment	Denmark	1998	Yes		Cohort	1
Bhise and Behere (2016)	Financial stress	India	2007			Case/ control	1
Blakely et al. (2003)	Unemployment	New Zealand	1991			Cohort	6
Boardman et al. (1999)	Both	England	1991			Case/ control	2
Brown et al. (2000)	Unemployment	The Unites States	1975	Yes		Cohort	1
Chan et al. (2009)	Both	Hong Kong	2002			Case/ control	2
Chen et al. (2013)	Unemployment	Taiwan	2006	Yes		Cohort	1
Cheng et al. (2000)	Unemployment	Taiwan	1989			Case/ control	1
Conner et al. (2003)	Financial stress	New Zealand	1991	Yes		Cohort	1
Dalela et al. (2016)	Financial stress	The United States	1998		Yes	Cohort	2
De Leo et al. (2013)	Unemployment	Australia	2006			Case/ control	1
Dennehy et al. (1996)	Unemployment	England	1993	Yes		Case/ control	1
Dobscha et al. (2014)	Financial stress	The United States	2009			Case/ control	1
Dong et al. (2005)	Unemployment	Hong Kong	1997	Yes		Case/ control	1
Duberstein et al. (2004)	Both	The United States	1996			Case/ control	2
Dunlavy et al. (2019)	Unemployment	Sweden	1993			Cohort	4
Dutta et al. (2011)	Unemployment	England and Scotland	1965	Yes		Cohort	1
Farberow et al. (1990)	Unemployment	The United States	1972		Yes	Case/ control	1
Feigelman et al. (2014)	Unemployment	The United States	1978			Cohort	1
Goodin et al. (2019)	Financial stress	The United States	2008			Case/ control	1

(Continued on next page)

Table A1. (Continued)

Author(s)	Unemployment or financial stress	Nation	Baseline year	Entire sample mentally ill	Entire sample unhealthy or stressed	Study design	Number of effect estimates
Gururaj et al. (2004)	Both	India	2001			Case/control	2
Hawton et al. (1993)	Unemployment	Scotland	1968	Yes		Case/control	1
Hung et al. (2015)	Financial stress	Taiwan	1985	Yes		Case/control	1
Hunt et al. (2007)	Unemployment	England	1999	Yes		Case/control	1
Hunt et al. (2009)	Unemployment	England	2000	Yes		Case/control	1
Hunt et al. (2013)	Unemployment	England	2001	Yes		Case/control	1
Innamorati et al. (2014)	Financial stress	Italy	1994	Yes		Case/control	1
Iribarren et al. (2000)	Financial stress	The United States	1979			Cohort	2
Johansson et al. (1997)	Unemployment	Sweden	1984	Yes		Case/control	1
Kaplan et al. (2007)	Unemployment	The United States	1986			Cohort	1
Kerkhof and Bernasco (1990)	Unemployment	Netherlands	1973		Yes	Cohort	1
Kim et al. (2012)	Financial stress	The United States	1999	Yes		Case/control	1
King et al. (2001)	Unemployment	England	1988	Yes		Case/control	1
Kolves, Sisask, et al. (2006)	Both	Estonia	1999			Case/control	4
Kolves, Vaernik, et al. (2006)	Both	Estonia and Germany	1999			Case/control	2
Kposowa (2001)	Unemployment	The United States	1979			Cohort	2
Kposowa et al. (2019)	Unemployment	The United States	1990			Cohort	2
Lemogne et al. (2011)	Unemployment	France	1991 1996			Cohort	2
Lewis and Sloggett (1998)	Unemployment	England and Wales	1983			Cohort	1
Lin et al. (2009)	Unemployment	Taiwan	2002		Yes	Case/control	1
Lukaschek et al. (2014)	Unemployment	Germany	1997	Yes		Case/control	1
Lundin et al. (2012)	Unemployment	Sweden	1990 1992			Cohort	6
Lusyne and Page (2008)	Unemployment	Belgium	1991		Yes	Case/control	2
Madsen et al. (2013)	Unemployment	Denmark	1998	Yes		Cohort	1

(Continued on next page)

Table A1. (Continued)

Author(s)	Unemployment or financial stress	Nation	Baseline year	Entire sample mentally ill	Entire sample unhealthy or stressed	Study design	Number of effect estimates
Maki and Martikainen (2012)	Unemployment	Finland	1988 1992 1996 2000			Cohort	8
Manoranjitham et al. (2010)	Financial stress	India	2006			Case/ control	1
McGirr et al. (2007)	Unemployment	Canada	2001	Yes		Case/ control	1
Milner et al. (2014)	Unemployment	Australia	2003			Case/ control	1
Oguzhanoglu et al. (2018)	Financial stress	Turkey	2009		Yes	Case/ control	1
Overholser et al. (2012)	Financial stress	The United States	1994			Case/ control	1
Owens et al. (2003)	Financial stress	England	1995			Case/ control	1
Powell et al. (2000)	Unemployment	The United Kingdom (all)	1963	Yes		Case/ control	1
Rasouli et al. (2019)	Unemployment	Iran	2017			Case/ control	1
Read et al. (1993)	Unemployment	New Zealand	1984	Yes		Case/ control	2
Rubanzana et al. (2015)	Unemployment	Rwanda	2011		Yes	Case/ control	1
Seguin et al. (2011)	Financial stress	Canada	2009			Case/ control	2
Sonderman et al. (2014)	Unemployment	The United States	2002			Cohort	1
Voaklander et al. (2008)	Financial stress	Canada	1993			Case/ control	4
Waern et al. (2003)	Financial stress	Sweden	1994			Case/ control	1
Yamauchi et al. (2013)	Unemployment	Japan	1980 1985 1990 1995 2000 2005			Cohort	12

Note. Of the 64 publications, 17 reported effect estimates for financial stress only, 40 for unemployment only, and 7 for both financial stress and unemployment. A total of 24 publications contributed to one or more of the financial stress analyses. A total of 47 publications contributed to one or more of the unemployment analyses. [a]Full citations provided in the Electronic Supplementary Material