Confounders in studies of suicide by occupation

Milner et al. make a commendable analysis of the effect of occupation on suicide risk, drawing on an imperfect field of research. Their work does not, however, allow for the effects of the differential demographic profiles (particularly gender) of those employed in each occupational category. This is particularly important when, in the UK in 2011, there was an 18.2 per 100,000 suicide rate among males compared with a 5.6 per 100,000 rate among females.2

If an occupation were almost entirely filled with men aged 30 to 44, with their suicide rate of 22.2 per 100,000,2 it would not be surprising that its rate of suicides was significantly higher against all reference groups.

The United Nations Statistics Division figures show a striking difference in the gender balance of the ISCO categories in the UK from 2009 census data. In ISCO-9, with its high suicide rate ratio of 1.8 (95% CI 1.5–2.3) in Milner et al., 60.4% were male.3 In ISCO-4, with its rate ratio of 0.8 (95% CI 0.6–0.9), only 22.5% are male.3 This relationship does not correlate across the ISCO categories, but it is enough of a confounder to be of interest.

Despite the advantages of the rate ratio, it does not correct for gender, whereas the proportionate mortality ratio does. It may be premature to dismiss its utility, until we have better data-sets that are more amenable to correction for demographic factors.


The paper by Milner et al. is an excellent meta-analysis, but there are a few lacunae in the interpretation of results. First, suicide rates differ from country to country. Second, causes differ in age groups and in different countries. For example, in India a 2012 analysis revealed that the self-employed category accounted for 38.7% of victims, of whom 11.4% worked in farming/agriculture, 4.7% in business and 2.9% in professional occupations. Students and unemployed victims accounted for 5.5% and 7.4% respectively; 18% of those who died were housewives. Third, educational status also affects suicide rates. In India, the majority of suicides (46%) are by people with a middle- or primary-level education. These categories have been relatively constant for a long time.2,3 Fourth, the causes differ from culture to culture: in India, family problems constitute the majority (26%), followed by illness (21%). So, drawing and applying conclusions from meta-analysis to different cultures and countries is difficult.


Author’s reply: We welcome the responses to our meta-analysis on occupational gradients in suicide mortality,1 and would like to reply first to the comments raised by Forrest. He suggests that gender is an unmeasured factor that may be driving the higher rate ratios in the lowest-skilled occupational groups (ISCO-9, elementary and unskilled occupations such as labouring).

Certainly, gender has the potential to be a confounder in this circumstance – being associated with employment in high-risk, low-skilled occupations in the ISCO-9 category and suicide. However, it is inaccurate to suggest that our paper does not allow for the differential effects of gender. In fact, we conducted sensitivity tests and found similarities in patterns. Both women and men had higher rates of suicide in the lowest skilled occupational group. There were some differences in the highest skilled group, in which women had elevated rates. The argument by Forrest would suggest that there should also be an elevated rate ratio for males in the highest skilled group, which is largely comprised of a male workforce. Instead, rates for males are significantly lower than those for the working-age population.

Gender is only one of the myriad component causes that contribute to a set of sufficient conditions for suicide. As acknowledged in our paper, suicide in high-risk occupational groups is likely to be due to a number of factors related to socioeconomic disadvantage, low access to services, access to means, and detrimental working conditions. It has been shown in numerous studies that those working in lower skilled jobs are exposed to the worst psychosocial working conditions, including for example high job strain (high demands and low control at work)1 and job insecurity.2 Adverse work-related psychosocial stressors have been shown to be associated with common mental disorders3 and suicide1,5 across studies. Considering that both males and females have elevated suicide rates in the lowest skilled occupational group in our meta-analysis, we would suggest that factors connected to the social and working environments have the potential to be contributing risks. In short, to assume that the higher suicide rates among the lowest skilled occupational groups is due to a larger proportion of males oversimplifies what is a complex set of causes.

Bhatia and colleagues raise the issue of cultural differences in the epidemiology of suicide. Unfortunately, eligible studies on suicide by occupation were not available from India and because of this we agree that the results of the meta-analysis may not generalisable to this country. They go on to comment about suicide in groups out of the labour force. These were not the topic of our review and therefore have limited bearing on our
The rural employment advantage for people with psychosis: is it real?

The population-based study on employment outcome for people with schizophrenia in rural v. urban China by Yang et al.1 has revived the issue of rural advantage for people with psychoses in terms of functional outcome. However, I would like to point out a few methodological issues and practical considerations in the study that limit the interpretation of its results.

Non-inclusion of premorbid employment as a socio-demographic variable prevents us from gaining insight into the current employment status as a functional outcome marker. In addition, not incorporating elements of total work hours, income status and, most importantly, satisfaction with the current employment and simply considering the dichotomy of employed and unemployed with six subcategories seems too simplistic considering that employment outcome is the primary (and only) outcome that the study deals with. Inclusion of the category of underemployment (in addition to the categories of employed and unemployed), defined as employment not commensurate with one’s educational level or premorbid occupational functioning, might have provided further valuable information regarding the employment outcome for these patients.2 Not including the type of psychotic illness in the regression model is a major drawback, given that some forms of psychotic illness included in the study (such as delusional disorder and brief psychotic disorder) typically are associated with better functional outcome than others (such as schizophrenia).3,4 Further, a basic question that has been left unaddressed in the discussion is whether the differences in rates of employment in patients in rural v. urban China is simply reflective of differences in the overall employment/unemployment rates for the general population in the rural and urban regions of the country. Reports have documented higher unemployment in the urban regions of China than in the rural regions.5 It would also be important to conceptualise the social integration or social inclusion that the authors have discussed as a composite of employment, community networking and a supportive social environment without undue emphasis only on employment measures.6 Last, but not least, the authors could have avoided using the term schizophrenia as a synonym for psychotic illnesses in the title of their paper, considering the spectrum of psychotic illnesses apart from schizophrenia that the study population covered. Notwithstanding the above methodological issues and practical considerations, I would like to congratulate the authors for undertaking a population-based study addressing the crucial issue of rural advantage in psychotic illnesses and the variables mediating the advantage, which has potential policy implications for this disadvantaged population.


Authors’ reply: Dr Gnanavel’s letter has raised several interesting methodological issues related to our paper.1 He notes that employment is only one measure of social integration and social inclusion. We certainly agree that other measures of social integration beyond employment are needed.2 But fundamental differences in urban and rural environments make it extremely difficult to develop instruments that can validly assess social integration in both settings. Employment status is one of a very small set of variables about social functioning that can be readily measured and meaningfully compared (with the caveats noted below) between urban and rural settings. More detailed evaluation of community networking and social support may require the development of rural-specific and urban-specific measures; information from surveys that use these scales could then be used to devise and assess targeted interventions.

He also remarks on the need to consider work hours and work satisfaction when assessing the occupational functioning of persons with schizophrenia. We agree with the general point that more in-depth quantitative and qualitative data would enhance the interpretation of rural v. urban differences in employment, and encourage researchers to collect such data in future studies. Separate consideration of part-time v. full-time work would provide a more detailed understanding of the work status of persons with schizophrenia. As we indicate in the discussion, we believe that the greater flexibility of work in rural areas (i.e., allowing for part-time and full-time work depending on the individual’s condition) may be an important factor in the higher rates of employment in rural areas. Comparisons of work satisfaction could also be useful, but such comparisons would require careful development of measures of work satisfaction that can be meaningfully compared for people with schizophrenia across these settings; to our knowledge, such measures are not yet available.

As regards collapsing all psychotic illnesses under the ‘schizophrenia’ rubric when assessing work status in our study 90% (86/96) of urban residents with a psychotic illness and

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nevertheless, an important indicator of social integration. Further
to that of agricultural worker and may only be part-time, but it is,
with psychotic illnesses are much greater in rural than in urban
opportunities of rural residents with schizophrenia are related to
determine the extent to which the increased employment
affect our final results.

Finally, Gnanavel points to the need to adjust comparison of urban v. rural employment rates in persons with schizophrenia
differences in urban v. rural rates of employment in the general
population. Official unemployment rates – the proportion of
individuals 15 to 59 years of age in the workforce – in China
are notoriously unreliable. Moreover, comparison of urban v. rural
employment rates are confounded by the much larger number
of young adults in school in urban v. rural areas (an issue we have
adjusted for in our analysis) and by the huge number of
individuals who migrate from rural to urban areas for work. Thus,
it was not feasible to adjust for this factor in our analysis. We think
it is unlikely that any differences in general employment levels
between urban and rural residents would explain the more than
threefold difference in employment (94% v. 27%) that we
identified in rural v. urban residents with psychotic disorders.
Nonetheless, if reliable data on rural v. urban differences in
the general population were available, they might enhance
interpretation of our results.

These issues raised by Gnanavel, in addition to considering
premorbid employment as we indicate in the discussion, certainly
merit consideration and suggest directions for future research. We
do not, however, believe that they seriously undermine the key
finding of our paper. This large, community-based study in
China4,5 found that opportunities for employment for individuals
with psychotic illnesses are much greater in rural than in urban
areas. The employment available in rural areas is largely restricted
to that of agricultural worker and may only be part-time, but it is,
nevertheless, an important indicator of social integration. Further
studies are needed to unravel the full implications of this rural v.
urban employment difference for social integration, and to
determine the extent to which the increased employment
opportunities of rural residents with schizophrenia are related to
stigma5 and to other measures of social integration.

Religious service attendance as a protective factor
against suicide

We compliment Kleiman & Liu for their important research on
suicide.1 Suicide is the most preventable cause of death among
the top 20 leading causes of mortality for all ages.2 It is a complex
and multifaceted problem that requires multidimensional
prevention programmes. Therefore, this research effort of Kleiman
& Liu is worth praising for demonstrating the protective role
of religious service attendance against suicide. This paper has
additional merits as it was a prospective study of time to
completed suicide as an outcome variable in a large, nationally
representative sample that was assessed directly rather than by
proxy informants as in most other studies. We would also like
to mention several important limitations. First, the numbers
of suicides might not be true figures, so the overall findings
might not be a fair representation of this major public health problem.
Second, the rate of depression appears too low in the overall
sample as well as zero in individuals who died by suicide, which
might be because of improper evaluation and record-keeping
rather than actual low prevalence in this population. Third, the
authors addressed religiosity only by attendance of religious
services and ignored other measures of religiosity such as practices
at home or in other settings. They also make no mention of
spiritual beliefs and practices. Fourth, their finding of a protective
effect of religious service attendance in a specific population may
not be generalisable to other religions across the globe. Fifth,
dichotomising religious service attendance (i.e. 24 times per year)
has an inherent conceptual problem in defining religiosity and its
effects.

1 Kleiman EM, Liu RT. Prospective prediction of suicide in a nationally
representative sample: religious service attendance as a protective factor.

2 Ram D, Darshan MS, Rao T, Honagodu AR. Suicide prevention is possible:

Authors’ reply: We agree that several of the points raised by
Nebhinani merit consideration. Indeed, many are discussed in
detail in our paper.1 However, we further elaborate on some of
them below. First, Nebhinani noted that the suicides reported in
the study might not be accurate figures. We direct readers to the
second paragraph of our method section, where we discuss the
accuracy of our mortality data. We also direct readers to several
studies that show that the National Death Index, our data source
for mortality information, is highly accurate, with sensitivity and
specificity nearing or exceeding 99%.2,3 Moreover, the data-set
from which our baseline data were drawn (the National Health
and Nutrition Examination Survey) is a nationally representative
sample, and so is indeed representative of the USA. Second, we
agree that zero suicides among depressed individuals required
further thought. This point was mentioned as a limitation in
our paper. We speculated that this might be because the
individuals became depressed after the baseline assessment, or
because of a slightly lower estimate of the prevalence of depression
in our sample compared with a similar epidemiological study.
Third, we agree that the examination of religious service
attendance is only one component of the multifaceted construct
of religion, and other constructs (e.g. practising religion at home)
may also be important. In fact, in our paper, we highlighted the
need for future research to clarify the specific aspects of this

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broader construct that are most directly relevant to resilience to suicide. We mentioned social contact or connectedness and religious beliefs as potential factors relevant to resilience to suicide. Finally, we dichotomised religious service attendance in order to be consistent with previous research that used the same variable from this data-set and to allow easy interpretation of the survival analysis. Moreover, as we noted in our paper, using lower cut-offs was overly inclusive and using higher cut-offs was overly exclusive.


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Sundar Gnanavel
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