

Death by suicide at the Ward level in Northern Ireland

B. Bunting¹, C. Corry², S. O'Neill¹ and A. Moore³

¹Bamford Centre, Psychology Research Institute, Ulster University; ²National Suicide Research Foundation, University College Cork and ³Environmental Sciences Research Institute, Ulster University

Original Article

Cite this article: Bunting B, Corry C, O'Neill S, Moore A (2018). Death by suicide at the Ward level in Northern Ireland. *Psychological Medicine* **48**, 1375–1380. <https://doi.org/10.1017/S0033291717003026>

Received: 20 January 2017
Revised: 12 September 2017
Accepted: 13 September 2017
First published online: 17 October 2017

Key words:

Suicide; northern ireland; standardised mortality ratios; empirical bayes, poisson

Author for correspondence:

B. Bunting, E-mail: bp.bunting@ulster.ac.uk

Abstract

Background. Deaths from suicide, as recorded within the Northern Ireland Coroner's Office for the years 2005–2011 inclusive, were analysed in terms of standardised mortality ratios (SMRs), within Wards and Local Government Districts (LGDs). The aim of the study is to examine factors relating to the ecological context of the area within which the person resided at time of death. Area deprivation, religious composition and age structure are examined in terms of SMRs, while controlling for the number of individuals living within a designated area.

Methods. Random-intercept Poisson regression models were used in conjunction with empirical Bayes prediction to examine area effects.

Results. Considerable variation occurs between the numbers of recorded deaths within each area. A strong association is shown between deprivation and the number of deaths by suicide within an area. There was considerable variation at the LGD level in terms of the number of deaths, but once the nested nature of Wards was taken into account and adjusted for level of deprivation, the variation between LGD was no longer statistically significant. When adjusted for the number of individuals within each age group, the number of deaths in the younger and middle-aged groups did not show a statistical difference (0.05 level), nor did the religious composition of the area in terms of the number of recorded deaths.

Conclusions. Based on SMRs, using empirical Bayes prediction, area effects were shown to be substantial, especially in urban locations where there are high rates of deprivation.

Introduction

Is suicide a unique individual event? It is certainly usually an individual act. However, suicides are not random acts. Such deaths are grounded in the individual who exists within an ecological structure, and this societal structure has its own determinants and commonalities. This paper examines the nature of these societal determinants on death by suicide within the context of deaths by suicide during the years 2005–2011 (inclusive) in Northern Ireland.

The relevance of an area (context) effect has been well demonstrated across a range of health outcomes, example lip cancer (Clayton & Kaldor, 1987), chronic illness (Jones & Duncan, 1995), birth weight (Pearl *et al.* 2001; Rauh *et al.* 2001), diabetes (Chaix *et al.* 2011). The number of deaths from suicide in Scotland (1981–1983 and 1991–1993) has shown a more marked differential between areas with the least and most deprivation (Boyle *et al.* 2005). In addition, Congdon (1996), Congdon (2013), Whitley *et al.* (1999) and Gunnell *et al.* (2011) have shown strong associations between rates of suicide and levels of deprivation.

Invariably, these area effects have been demonstrated with multilevel models. Studies where area deprivation has been included as a covariate at the individual level have frequently shown that area-level deprivation did not indicate a statistically significant result (Neeleman & Wessely, 1999; O'Reilly *et al.* 2008). A discussion of the issues involved with the analysis of area (ecological) level and that of the individual level in this choice of analysis can be found in Subramanian *et al.* (2003).

The importance of economic stressors, such as personal debt, unemployment and financial crisis on suicidal ideation has been demonstrated in a range of research papers (Platt & Hawton, 2000; Jenkins *et al.* 2008; Meltzer *et al.* 2011). In addition, economic stressors often covary with particular medical conditions in terms of suicidal ideation. It is the combination of these stressors which increases the risk of suicidal intent and behaviour (Nock *et al.* 2008), and it is likely that on average those in poorer neighbourhoods face the greatest combination of stressors and with the least resources to do something about them.

The current analysis does not set out to partition variance explained at the different levels, but to indicate the importance of economic well-being as a major contributory factor to personal and social well-being. The explanation is offered in terms of standardised mortality ratios (SMRs) at the area level.

In Durkheim's view, the different expressions of religion such as Judaism, Catholicism and Protestantism could have consequences for individualistic acts such as suicide. Conversely, where the influence of social control as exercised by the family, religion or politics is weakened, then rates of suicide would be higher. For a critical evaluation of deaths by suicide from Durkheim's theoretical perspective, within the context of the Northern Irish society, see Tomlinson (2012). There is some evidence that community religiosity can assist in the development of a moral socialisation and integration, and act as a buffer against suicide (Maimon & Kuhl, 2008). However, when Maimon and Kuhl examined this in the context of major denominations they found, like Pescosolido & Georgianna (1989) before them, that the inclusion of different denominations did not have a significant effect on suicidality.

Deaths by suicide have frequently have been shown to occur with a greater frequency in the 35–50 age groups (Scowcroft, 2017). In this report, by Scowcroft, from the Samaritans, the number of deaths by suicide per 100 000 in England is 15.4, in Wales 21.0, Scotland 18.5 and Northern Ireland 26.0.

This study examines area variation in SMRs for deaths by suicide in Northern Ireland over a 7-year period. How large are these area effects in terms of SMRs within the society? A number of explanatory variables are examined as determinants of area-level SMRs: (1) area-level deprivation, (2) the religious composition of the area and (3) differential effects of age.

Method

Data

The current database was compiled by C.C. from records held in the Northern Ireland Coroner's office. Approval was provided by the then Senior Coroner Mr John Leckey and the then Presiding Coroner Lord Justice Weir, with the permission of the Lord Chief Justice for Northern Ireland The Right Honourable Sir Declan Morgan, Lord Chief Justice of Northern Ireland.

The current dataset contains information relating to deaths by suicide over a 7-year period (2005–2011). In order to conduct an analysis at an area level of aggregation, deaths by suicide were combined at the various area levels using figures obtained from the Northern Ireland Statistics and Research Agency (NISRA) website, for 2010. The population of Northern Ireland can be divided into Local Government Districts (LGDs) and Wards (amongst others) area subdivisions, and these can be further subdivided usually by gender and age.

At the time of the data collection, there were 26 LGDs within Northern Ireland before the recent re-organisation, which resulted in 11 new LGDs. The current analysis is based on the 26 LGDs. Northern Ireland's 582 Wards vary greatly in population size from fewer than 800 residents to more than 9000. The expected number of deaths was obtained by applying the Northern Ireland-wide rates to the area population.

The Northern Ireland Multiple Deprivation Measure (2010) comprises 52 indicators, which are grouped within seven different domains, with each domain being given a separate weight: (income deprivation 25%; employment deprivation 25%; health deprivation and disability 15%; education, skills and training deprivation 15%; proximity to services 10%; living environment 5% and crime and disorder 5%). In the current study, the combined index was used.

Deaths from suicide in Northern Ireland showed a marked increase from 2005. This may in a large part be due to an administrative reorganisation that took place. Prior to this period, there were six Coroners' Offices, one in each county. From 2004, these were all amalgamated into one office in Belfast. The current data are based on the reported date of death, rather than the registered time of death.

Analysis

The data are represented as counts within a given location (LGDs, Wards), and this can include zero events; and a Poisson regression strategy has been used, within a multilevel structure. A Poisson model in conjunction with empirical Bayes prediction was used to obtain SMRs for different locations using GLAMM software in STATA (Rabe-Hesketh *et al.* 2004; Skrondal & Rabe-Hesketh, 2004). SMRs are defined as the ratio of the number of suicides to the expected number of suicides. In the current data, the Northern Ireland population figures for 2010 have been used as the standard population. The number of deaths over a period of 7 years (years) was 1653, and the population was taken as 1 773 800. The Bayesian approach has a number of advantages in the current context, not least than the flexibility in terms of modelling strategy. In addition, the method is more appropriate where the number of deaths in an area may be small in number, and with the nature of the current data, this is a substantial problem. Further, the current approach allows us to take account of the potential distorting effects of clustering within the data. The standard errors are based on the use of a sandwich estimator, which takes into account the potential dependencies within the counts (spatial correlations).

Results

Deaths by LGDs (adjusted for population size)

There is a discernible pattern of deaths when the analysis is at the level of the LGD (Fig. 1). A number of LGDs can be seen to have 20% less deaths by suicide than the overall average; i.e. those below the value of 80 on the horizontal axis. For every five deaths

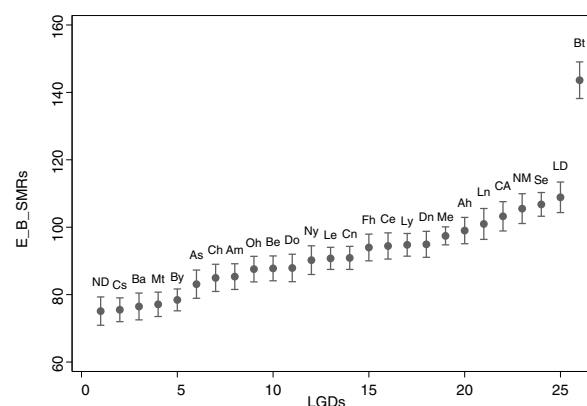


Fig. 1. Empirical Bayes standardised mortality ratios for the 26 Local Government Districts (LGDs) in Northern Ireland. Notes: LGD names are as follows. North Down (Nd), Carrickfergus (Cs), Ballymena (Ba), Magherafelt (Mt), Ballymoney (By), Ards (As), Castlereagh (Ch), Antrim (Am), Omagh (Oh), Banbridge (Be), Down (Do), Newtownabbey (Ny), Larne (Le), Cookstown (Cn), Fermanagh (Fh), Coleraine (Ce), Limavady (Ly), Dungannon (Dn), Moyle (Me), Armagh (Ah), Lisburn (Ln), Craigavon (CA), Newry&Mourne (NM), Strabane (Se), Derry/Londonderry (LD) and Belfast (Bt).

Table 1. Number of deaths, unadjusted for the number of individuals, within each of the 582 Wards

Deaths	0	1	2	3	4	5	6	7	8	9	10	11	12	13	19	24	25
Wards	79	114	128	101	59	33	22	15	7	6	5	6	3	1	1	1	1

by suicide (during the past 7 years), one less occurred within this cluster of areas than the Northern Ireland average. If the figures from these areas were generalised to the average number of deaths within a LGD, then some 330 fewer deaths would have occurred, over this 7-year period. At the other end of the continuum, Belfast has over 40% more deaths by suicide than the Northern Ireland average (calculations based on LGDs). If during the past 7 years, the Belfast rate had occurred across Northern Ireland, the society would have been faced with over 660 more deaths by suicide, approaching an extra 100 deaths per year.

Deaths by Wards

Within Northern Ireland, there are 582 Wards. Over a period of 7 years (2005–2011), records of 1653 deaths were obtained from the Northern Ireland Coroner's Office. In 79 Wards, no deaths were reported, and in 422 Wards (73%), less than three deaths were recorded. The remaining 160 Wards (27%) had deaths ranging from 4 to 25 (Table 1).

Empirical Bayes SMRs

The recorded number of deaths within an area, from any cause, will be influenced by a number of factors, and not least amongst these will be the number of individuals living in the designated area. Within this analysis, an adjustment has been made for the number of individuals within a specified Ward. SMRs were calculated for each Ward: where the SMR is defined as the ratio of the number of suicides to the expected number; and in the current analysis this is based on the premise that the expected number of deaths in any Ward is equal to that in the general population (Northern Ireland) (Table 2).

The exponent of the intercept (cons) value indicates that the average number of deaths by suicide within Wards, over this 7-year period, has been 2.35. The random coefficient for the LGD shows that once the effect of the Wards has been taken into account, here as a random coefficient, that the variance between the LGD is small when compared with the standard

error. However, there is substantial random variation present between the Wards.

The estimated SMRs indicate that 33 of the 582 Wards (6%) had at least 50% more deaths than the background average in the society (see online Supplementary Appendix 1 for a map of deaths by Wards in Northern Ireland) (Table 3).

Area deprivation has a strong association with the number of deaths occurring in a location. With the average rate of deaths in the society set at 100 for the SMRs, it is evident from the results in Fig. 2 that nearly all of the 200 most deprived Wards had deaths above the societal norm. It is equally evident that very few Wards above the 200 most deprived had deaths above the societal average. The number of deaths by suicide increases dramatically in areas with the highest levels of deprivation, controlling for the percentage of Catholics living in a Ward.

Random intercept model with covariates for deprivation and religion

A second possible explanation, at the Ward level, for the number of deaths that are reported could be that of religion. Within Northern Ireland, a high degree of religious segregation is in place. This segregation by religion within areas may have consequences for group solidarity, social norms and social cohesion. Area deprivation and the religious composition of an area have a moderate level of association (0.36). In order to assess if the percentage of Catholics living in an area was associated with the number of deaths by suicide over and above the effects of deprivation, both variables were included as possible area-level-associated measures in terms of the area SMRs (Table 4).

The result indicates that only deprivation has explanatory power in terms of SMRs. In the current analysis, LGDs and Wards have been included as random effects. From the variance and standard errors shown in relation to LGD, it is evident that the differences between these LGDs can be explained by the inclusion of information regarding Wards. This was further confirmed in a separate analysis where LGDs were included within the model as a fixed effect for all 26 LGDs. The results showed no statistical

Table 2. Empirical Bayes standardised mortality ratios for the 582 Wards in Northern Ireland

tot_suicides	exp(b)	s.e.	z	p > z	(95% confidence interval)
_cons	0.8549715	0.0336453	-3.98	0.000	0.7915068–0.9235248
ln	1 (offset)				
Variances of random effects					
***level 2 (Ward_id)					
var(1): 0.1770996 (0.03787968)					
***level 3 (LGD_Code)					
var(1): 0.02316367 (0.01180958)					

Note. Robust standard errors.

Table 3. Empirical Bayes standardised mortality ratios for Wards where the predicted value exceeded a 50% increase in deaths over the average expected value in Northern Ireland

Wards	E_B_SMRs	Wards	E_B_SMRs
Annagh	149.638	Bellevue	179.170
Parklake	150.031	Duncairn	181.774
Woodstock	150.838	Cliftonville	184.481
The Mount	151.367	Ballycolman	185.528
Armoy	151.757	Blackstaff	191.928
Glencolin	152.725	Kilkeel South	194.946
Ballyhackamore	153.159	Falls	201.565
Caw	155.094	Crumlin	202.607
Knock	155.792	Whiterock	205.333
Legoniel	158.904	Strand	216.363
Ballynafeigh	160.398	Clonard	216.738
Old Warren	165.861	Twinbrook	236.558
Glen Road	165.917	The Diamond	238.624
Atlantic	168.398	Shaftesbury	253.946
Brandywell	175.004	Water Works	331.360
Shankill	188.085	New Lodge	395.285
Callan Bridge	177.532		

difference (0.05 level) between the number of deaths occurring at the LGD level once an adjustment for population size, Ward and deprivation was included within the model.

The $\exp(0.5884718 + 1.020655) = 4.998$ indicates that one-unit shift in deprivation was associated with a change in the standardised mortality ratio of five units. The multiple deprivation scores ranged from 1.43 to 83.33, with a mean value = 21.59 and standard deviation = 19.95.

The results indicated that the number of deaths recorded ($\exp 1.02 = 2.77$), controlling for the other variables in the model, indicated that SMRs were increased by nearly three points for every one-unit change in deprivation. The deprivation score ranged from 1.43 to 83.33 between Wards.

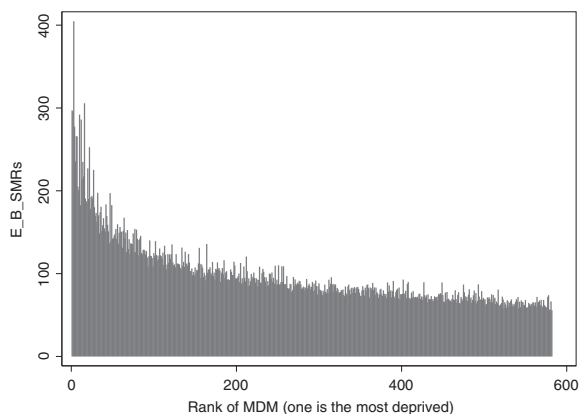


Fig. 2. Plot showing the relationship between the Empirical Bayes standardised mortality ratios and Ward deprivation.

Random intercept model with covariates for age, deprivation and religion

In order to test the effects of age, the data were restructured, so that deaths within each Ward were divided into four age categories ($582 \times 4 = 2328$), and in this case, the number of individuals within each age group was used as the offset. This had little consequence for the effects of deprivation or religion on SMRs. However, for age, the results indicate that the number of deaths amongst those in the 16–39 age group was similar to that occurring in the 40–64 age group once the number of individuals in both age groups had been controlled. It is also apparent that fewer deaths were occurring, as might be expected based on governmental-level data, in the very young age group and in the older population (Table 5).

Discussion

The fraction of the population who died over this 7-year period, given the 2010 population size, was close to one in every 1000 individuals in the society. However, these deaths were far from equally distributed across the population. From an examination of the LGDs, it appears that the larger urban areas of population were most affected, and in particular Belfast. This was followed by a number of other largely urban areas. The difference between these LGDs can be explained in terms of deprivation, since once the area deprivation level was controlled, the statistical differences (0.05 level) between the LGDs was no longer present. This powerful effect of deprivation indicates the importance of economics in deaths from suicide, but since these are area-aggregated data, it is not reasonable to take this as a proxy for what is happening at the level of the individuals (ecological fallacy).

Indeed, once the area of aggregation moved to the Ward level, the importance of the LGDs has little explanatory power, since the Wards are a more sensitive marker for both deaths by suicide and deprivation. Thirty-three Wards with deaths from suicide had an excess of 50% more deaths above the societal average. This is <6% of Wards with this level of excess deaths. Seventy per cent of the 33 Wards listed in Table 3 were in the top 100 areas as ranked in terms of the Multiple Deprivation Measures (MDM). This indicates an important association between deprivation and the measure of SMR, but one that is far from perfect, thus showing a potentially unique effect at the Ward level. Of course this is a partial picture, as it only relates to 33 of the possible 582 Wards. Without an adjustment for deprivation or any other explanatory variable, the average number of deaths by suicide within Wards, over this 7-year period, has been 2.35. A small number of Wards had between two and four times this societal expected value, though this is a relatively small number of Wards ($N = 10$; 2%). Seventy-nine (14%) of the Wards had no deaths within the same period. It is therefore apparent that the excess in deaths during this 7-year period is highly concentrated in a small number of areas.

There are certain characteristics of the areas with a high number of deaths, though without the data for all areas this is speculative; nevertheless, the areas with the highest SMRs are largely in locations with a high proportion of the housing in the private sector rented, which may indicate a more transient population. However, many of the areas with at least twice the expected number of deaths are areas with much public housing. These are issues that require further investigation.

Table 4. Random-intercept Poisson model as a predictor of the empirical Bayes SMRs, using area deprivation and the percentage of Catholics living in an area as explanatory measures

tot_suicides	exp(b)	s.e.	z	p > z	(95% confidence interval)
MDM_score	1.020655	0.0010737	19.43	0.000	1.018553–1.022762
Per_Catholic	0.9998481	0.0009445	−0.16	0.872	0.9979987–1.001701
_cons	0.5884718	0.0264479	−11.80	0.000	0.5388525–0.6426603
lne	1 (offset)				
Variances of random effects					
***level 2 (Ward_id)					
var(1): 0.05122376 (0.0177645)					
***level 3 (LGD_Code)					
var(1): 1.228e-18 (5.258e-16)					

Note. Robust standard errors.

Suicide and religion have been much discussed since Durkheim's influential work entitled 'Suicide' was published in 1897. If area deprivation is ignored, then religion has some impact as an explanatory measure, because in a society such as Northern Ireland, given its political history, religion and deprivation are related. However, in the present analysis, once deprivation is included within the model, the effect of the area's religious composition is no longer statistically significant and the effect of deprivation is shown to be very strong. The results indicated that the number of deaths recorded ($\exp 1.02 = 2.77$), controlling for the other variables in the model, indicated that SMRs increased by nearly three points for every one-unit change in deprivation.

Given the current data, it was possible to address the issue of age cohorts and deaths by suicide, within broad age groupings. This was done using four age bands, with those in the 45–64 age group being used as the reference category. Again adjustments for the number of individuals within each of the age groups was undertaken, as it is obvious that if more young people are in the society then, if all else was equal, it would be reasonable to expect

that more deaths would occur amongst younger individuals, but it may not be a higher proportion of younger people than those in the older age group. Once the number of individuals in each age category was controlled, no difference was seen between those in the 16–39 age group and those in the 40–64 age group. Not unexpectedly, fewer deaths occurred amongst those in the very young age group and amongst those in the oldest age group. Deaths from suicide are occurring with about the same level of frequency across all age groups from 16 to 64 years.

Limitations

Within the current dataset, it is not possible to address how the social context might influence the data. Who is it that dies by suicide within an area? It is possible that in some areas with a high number of deaths by suicide, many of these individuals have come from other locations, or their actions may have been influenced by others in the vicinity. The social context, of access to relevant types of work, housing, greater exposure to threats to physical and mental health and historical disadvantage can be perceived

Table 5. Random-intercept Poisson model as a predictor of the empirical Bayes SMRs, to test age classification while using area deprivation and the percentage of Catholics living in an area as explanatory measures

Age_deaths	exp(b)	s.e.	z	p > z	(95% confidence interval)
MDM_score	1.020942	0.0009957	21.25	0.000	1.018992–1.022895
Per_Catholic	1.000199	0.0008852	0.22	0.822	0.9984654–1.001935
Age_0_15	0.0525896	0.0132075	−11.73	0.000	0.032146–0.0860346
Age_16_39	0.9673801	0.0843048	−0.38	0.704	0.815487–1.147565
Age_65_plus	0.3771481	0.035003	−10.51	0.000	0.3144215–0.4523886
_cons	0.8445919	0.056633	−2.52	0.012	0.7405778–0.9632148
lne	1 (offset)				
Variances of random effects					
***level 2 (Wards)					
var(1): 0.05099162 (0.01793445)					
***level 3 (LGD)					
var(1): 1.115e-22 (1.017e-17)					

Note. Robust standard errors.

and understood differently in different locations. Nevertheless, it is obvious that places are different, and the 'choices' made to live in one location against another come, in part, with a given view of oneself and the world. The disaggregation of these contextual factors from individual compositional factors of income, work experience, living arrangements and physical and mental health have not been examined, in part because this would require a much larger sample, due to the small number of event counts within a substantial number of Wards. In addition, as pointed out by a reviewer of an earlier draft of this paper, future researchers should examine '... how integrated a person feels within his ecological context and the impact of this integration on his well-being'. This suggestion has implications for sampling strategies, if the ecological context is to be taken more seriously.

Seventy-eight per cent of the sample were men. Consideration was given to doing the analysis separately for females and males, but given that the number of deaths in many areas was small, separate analyses were not done as this would have had consequences for the reproducibility of the results.

A significant challenge is the issue of neighbourhood *v.* community. The current study has used Wards as a key area designation. This has considerable advantages since Local Government Elections are based on this area of designation and hence some common political identification is established. A key advantage in using the Wards is that it is possible to adjust for the number of people living in this designated area. Within Northern Ireland, Wards vary in size from 800 to around 9000 residents, and it is important to have adjusted for the number of individuals living in a given area. Location matters, but the boundaries of these locations will come down to different types of indicators depending on the individuals concerned and without much greater detail of the context within which each Ward or area exists this separation of neighbourhood from community will remain a substantial challenge.

Supplementary material. The supplementary material for this article can be found at <https://doi.org/10.1017/S0033291717003026>.

References

- Boyle P, Exeter D, Feng Z, Flowerdew R (2005) Suicide gap among young adults in Scotland: population study. *British Medical Journal* **330**, 175–176.
- Chaix B, Billaudeau N, Thomas F, Havard S, Evans D, Kestens Y, Bean K (2011) Neighborhood effects on health correcting bias from neighborhood effects on participation. *Epidemiology* **22**, 18–26.
- Clayton D, Kaldor J (1987) Empirical Bayes estimates of age-standardized relative risks for use in disease mapping. *Biometric* **43**, 671–681.
- Congdon P (1996) Suicide and parasuicide in London: a small-area study. *Urban Studies* **33**, 137–158.
- Congdon P (2013) Assessing the impact of socioeconomic variables on small area variations in suicide outcomes in England. *International Journal of Environmental Research and Public Health* **10**, 158–177.
- Durkheim E (1897) [1951]. *Suicide: A Study in Sociology*. Translation of 1897 by J.A. Spaulding and G. Simpson and edited with Introduction by G. Simpson, New York, The Free Press.
- Gunnell D, Wheeler B, Chang S, Thomas B, Sterne J, Dorling D (2011) Changes in the geography of suicide in young men: England and Wales 1981–2005. *Journal Epidemiology. Community Health* **66**, 536–543.
- Jenkins R, Bhugra D, Bebbington P, Brugha T, Farrell M, Coid J, Fryers T, Weich S, Singleton N, Meltzer H (2008) Debt, income and mental disorder in the general population. *Psychological Medicine* **10**, 1–9.
- Jones K, Duncan C (1995) Individuals and their ecologies: analysing the geography of chronic illness within a multilevel modelling framework. *Health & Place* **1**, 27–40.
- Maimon D, Kuhl DC (2008) Social control and youth suicidality: situation Durkheim's ideas in a multilevel framework. *American Sociological Review* **73**, 921–943.
- Meltzer H, Bebbington P, Brugha T, Jenkins R, McManus S, Dennis MS (2011) Personal debt and suicidal ideation. *Psychological Medicine* **41**, 771–778.
- Neeleman J, Wessely S (1999) Ethnic minority suicide: a small area geographical study in south London. *Psychological Medicine* **29**, 429–436.
- Nock MK, Borges G, Bromet EJ, Alonso J, Angermeyer M, Beautrais A, Bruffaerts R, Chiu WT, de Girolamo G, Gluzman S, de Graaf R, Gureje O, Haro JM, Huang Y, Karam E, Kessler RC, Lepine JP, Levinson D, Medina-Mora ME, Ono Y, Posada-Villa J, Williams DR (2008) Cross-national prevalence and risk factors for suicidal ideation, plans, and attempts. *British Journal of Psychiatry* **192**, 98–105.
- Northern Ireland Multiple Deprivation Measure (2010) Retrieved from (http://www.nisra.gov.uk/deprivation/super_output_areas.htm).
- O'Reilly D, Rosato M, Connolly S, Cardwell C (2008) Area factors and suicide: 5-year follow-up of the Northern Ireland population. *The British Journal of Psychiatry* **192**, 106–111.
- Pearl M, Braveman P, Abrams B (2001) The relationship of neighborhood socioeconomic characteristics to birthweight among five ethnic groups in California. *American Journal of Public Health* **91**, 1808–1824.
- Pescosolido B, Georgianna S (1989) Durkheim, suicide and religion: toward a network theory of suicide. *American Sociological Review* **54**, 33–48.
- Platt S, Hawton K (2000) Suicidal behaviour and the labour market. In *The International Handbook of Suicide and Attempted Suicide* (ed. K. Hawton and K. van Heeringen), pp. 309–384. John Wiley & Sons: Chichester.
- Rabe-Hesketh S, Skrondal A, Pickles A (2004) Generalized multilevel structural equation modelling. *Psychometrika* **69**, 167–190.
- Rauh VA, Andrews HF, Garfinkel R (2001) The contribution of maternal age to racial disparities in birthweight: a multilevel perspective. *American Journal Public Health* **91**, 1815–1824.
- Scowcroft E (2017) Suicide statistics report. London: Samaritans.
- Skrondal A, Rabe-Hesketh S (2004) *Generalized Latent Variable Modeling: Multilevel, Longitudinal and Structural Equation Models*. Chapman & Hall/CRC Press: Boca Raton, FL.
- Subramanian SV, Jones K, Duncan C (2003) Multilevel methods for public health research. In *Neighborhoods and Health* (ed. I. Kawachi and L. F. Berkman). Oxford University Press, pp. 65–111.
- Tomlinson MW (2012) War, peace and suicide: the case of Northern Ireland. *International Sociology* **27**, 464–482.
- Whitley E, Gunnell D, Dorling D, Davey Smith G (1999) Ecological study of social fragmentation, poverty, and suicide. *British Medical Journal* **319**, 1034–1037.