



Informal caregiving and mental ill health – differential relationships by workload, gender, age and area-remoteness in a UK region

Journal:	<i>Health & Social Care in the Community</i>
Manuscript ID	HSCC-OA-15-0421.R2
Manuscript Type:	Original Article
Keywords:	Informal Care, Mental Health, Multi-Level Modelling, Population-Based Study, Statistical Analysis

SCHOLARONE™
Manuscripts

Peer Review

Abstract

Informal caregiving can be a demanding role which has been shown to impact on physical, psychological and social wellbeing. Methodological weaknesses including small sample sizes and subjective measures of mental health have led to inconclusive evidence about the relationship between informal caregiving and mental health. This paper reports on a study carried out in a UK region which investigated the relationship between informal caregiving and mental ill health. The analysis was conducted by linking three datasets, the Northern Ireland Longitudinal Study, the Northern Ireland Enhanced Prescribing Database and the Proximity to Service Index from the Northern Ireland Statistics and Research Agency. Our analysis used both a subjective measure of mental ill health, i.e. a question asked in the 2011 Census, and an objective measure, whether the respondents had been prescribed antidepressants by a General Practitioner between 2010 and 2012. We applied binary logistic multilevel modelling to these two responses to test whether, and for what sub-groups of the population, informal caregiving was related to mental ill health. The results showed that informal caregiving per se was not related to mental ill health although there was a strong relationship between the intensity of the caregiving role and mental ill health. Females under 50, who provided over 19 hours of care, were not employed or worked part-time and who provided care in both 2001 and 2011 were at a statistically significantly elevated risk of mental ill health. Caregivers in remote areas with limited access to shops and services were also at a significantly increased risk as evidenced by prescription rates for antidepressants. With community care policies aimed at supporting people to remain at home, the paper highlights the need for further research in order to target resources appropriately.

1
2
3 Key Words: Informal Caregiving, Mental Health, Multilevel Modelling, Population-based Study
4
5
6
7

8 *What is known about this topic?*
9

- 10 • Previous research suggests that the strain and burden associated with caregiving can be
11
12 detrimental to the mental health and wellbeing of informal caregivers.
13
14
15
16

17 *What this paper adds:*
18

- 19
20 • Factors such as caregiver workload, employment, gender and proximity to services were
21
22 shown to influence the mental health of informal caregivers.
23
24
- 25 • Informal caregivers delivering more than 19 hours of care per week were much more
26
27 likely to suffer from mental ill health than those delivering fewer hours of care.
28
29
- 30 • There is a need to target support towards high risk caregivers with due regard to the
31
32 heterogeneity of this population group and to the different support needs of men, women
33
34 and young people.
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Introduction

The relationship between informal caregiving and mental health is an important issue for health and social care providers and for policy makers. While there exists a sizeable body of literature on this relationship (Etters *et al.* 2008, Genet *et al.* 2011, Brown & Brown 2014, Ventura *et al.* 2014), the majority of studies rely on clinical trials or surveys with small samples. Studies that are representative of entire populations are rare (Roth *et al.* 2015). Furthermore, the majority (Cannuscio *et al.* 2004, Hirst 2005, O'Reilly *et al.* 2008, Vlachantoni *et al.* 2013) rely on subjective survey questions and do not use objective measures of mental health. Qualitative research is generally characterized by small and heterogeneous samples providing useful but incomplete data (Shortall & Radford 2012).

The findings from the literature on the relationship between informal caregiving and mental health are largely inconclusive. Several studies report links between informal caregiving and mental ill health (Morimoto *et al.* 2003, Hirst 2005, Molyneux *et al.* 2008) as a result of the strain and burden associated with a caregiving role (Morimoto *et al.* 2003, McCullagh *et al.* 2005, Etters *et al.* 2008). Many caregivers fulfil multiple and demanding roles, including caring for older relatives and children while also holding down a job. Experiences of isolation and stress were found to be common factors impairing the mental health of caregivers (Chambers *et al.* 2001, McCann *et al.* 2005). Moriarty *et al.* (2015) found that bereaved caregivers with a high burden were at a greater risk of mental ill health than non-bereaved caregivers and non-caregivers. Insufficient information about support services was also found to exacerbate experiences of stress (Chambers *et al.* 2001, Greenwood *et al.* 2015).

1
2
3 However, there is also evidence that informal caregiving may have positive effects on mental
4 health (Beach *et al.* 2000, Schulz & Sherwood 2008, Brown & Brown 2014) whereas other
5 studies have reported mixed results (Hirst 2005, O'Reilly *et al.* 2008). In a Census-based
6 mortality study performed in Northern Ireland, O'Reilly *et al.* (2015a) found that moderate
7 caregiving responsibilities were associated with better health and a lower risk of mortality and
8 suicide (O'Reilly 2015b). Similar findings have been reported in America (Brown *et al.* 2009,
9 Brown & Brown 2014) with studies reporting that informal caregiving can be emotionally
10 rewarding (Schwartz & Gidron 2002, Raschick & Ingersoll-Dayton 2004, Brown & Brown
11 2014). Brown and Brown (2014) recommend caution in the interpretation of these results as
12 many studies make ambitious assumptions based on insufficiently small samples and fail to
13 acknowledge differences by social strata.
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

32 This present study was conducted to address several gaps in the literature on informal caregiving
33 and mental health. Firstly, to date there is no population-representative study of the complex
34 relationship between caregiver workload, employment status and mental health in the UK that
35 analyses both subjective mental health and mental health medication prescriptions. Secondly,
36 there is a striking knowledge-gap regarding gender. Informal caregiving is widely recognised as
37 a highly gendered activity (Ryan *et al.* 2014, Ryan & McKenna 2013). The majority of full-time
38 caregivers are women and this population group has been shown to experience high levels of
39 burden and health problems (McCann *et al.* 2005). This could lead to bias regarding male
40 caregivers, as their needs are often ignored (McDonnell & Ryan 2011). Qualitative studies found
41 that men often face different challenges and struggle with (real and perceived) gendered
42 expectations towards their caregiving role (McDonnell & Ryan 2014). Differential statistical
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 relationships between caregiving and mental health by gender are under-researched (McDonnell
4 & Ryan 2011) and this study aims to address this gap.
5
6
7
8
9

10 Thirdly, the caregiver's age is important. Caregivers at different life-stages experience different
11 challenges and the aging process itself can result in declining stress resilience. Although several
12 studies have investigated age-effects on caregiver mental health (McCullagh *et al.* 2005, Schulz
13 & Sherwood 2008), this was rarely done using population-representative data. Finally,
14 geographical context-effects on caregivers' mental health are understudied due to a scarcity of
15 sufficiently large samples. Area-remoteness and proximity to services is of particular
16 significance in Northern Ireland as a result of rurality but also because people often travel further
17 than their nearest provision for political and religious reasons (Shortall 2002). Such obstacles can
18 put an additional strain on the mental health of caregivers, hence this study sought to examine
19 whether caregivers in remote areas are at an increased risk of mental ill health. In summary, this
20 study addressed several gaps in the literature regarding the impact of caregiver burden,
21 employment, gender, age and proximity to services on the relationship between informal
22 caregiving and mental health.
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43

44 **Method**

45
46 The aim of this study was to analyse the relationship between informal caregiving and mental ill
47 health using data from a large data linkage study representative of the population of Northern
48 Ireland. Due to the legacy of the Northern Ireland conflict, average rates of mental ill health are
49 higher than in other countries (Kelly *et al.* 2003, Maguire 2013). This paper asks whether
50
51
52
53
54
55
56
57
58
59
60

1
2
3 informal caregivers have higher levels of mental ill health over and above the known ‘Northern-
4 Ireland-effect’ as a result of the burden associated with their caregiving role.
5
6
7
8
9

10 The study tested five hypotheses:

11
12 **H1:** The more hours per week someone spends providing care to a relative or neighbour,
13 the more likely is this person to report mental ill health and be prescribed antidepressants.
14
15
16
17

18
19 In addition to the number of hours spent providing care, caregiver burden is also influenced by
20 employment status, i.e. whether caregivers are employed and whether they work fulltime or part-
21 time (Berecki-Gisolf *et al.* 2008, Juratovac & Zauszniewski 2014). We therefore hypothesized:
22
23
24
25
26
27

28
29 **H2:** Caregivers who provide more than 19 hours of care per week while in full-time
30 employment are more likely to report mental ill health than caregivers who provide fewer than
31 19 hours of care and caregivers who work part-time or are not employed.
32
33
34
35
36
37

38
39 Regarding gender, we tested the Null-hypothesis that controlling for the caregiving
40 workload measured in hours of care-delivery per week, employment status, deprivation and
41 demography, there is no net-effect of gender on the caregivers’ likelihood of suffering mental ill
42 health.
43
44
45
46
47

48 **H3:** All other things being equal, female caregivers are no more likely than male
49 caregivers to suffer mental ill health.
50
51
52
53
54
55
56
57
58
59
60

1
2
3 The majority of caregivers are older than 50 years (O'Reilly *et al.* 2015a). With increasing age
4
5 individuals' resilience to stress and burden decreases (Iecovich 2008). We thus expected
6
7 caregiver-burden to have more adverse effects on the caregivers' mental health at older ages.
8
9

10 **H4:** The risk to informal caregivers of mental ill health increases with age.
11
12
13

14
15 The last step examined whether area-remoteness makes a statistically significant difference for
16
17 the mental health of caregivers.
18
19

20
21 **H5:** Informal caregivers who live in remote areas with limited access to services are more
22
23 likely to suffer mental ill health than non-caregivers in the same area and caregivers living in
24
25 areas that are closer to services.
26
27
28
29
30

31 **Data**

32
33 The analysis was conducted by linking data from three sources, the Northern Ireland
34
35 Longitudinal Study (NILS), the Northern Ireland Enhanced Prescribing Database (EPD) and the
36
37 *proximity to services index* from the Northern Ireland Statistics and Research Agency (NISRA).
38
39 The NILS is a representative random sample capturing approximately 28% of the population of
40
41 Northern Ireland. Sampling is based on 104 out of 365 possible birth-dates. The core of the NILS
42
43 data consists of health-card registration records held by GP practices linked to Northern Ireland
44
45 Census records. Our study used mainly the 2011-NILS-Census-link consisting of all NILS
46
47 members who were enumerated in the 2011-Census and aged 16 years or older (N=378,365).
48
49 This excludes 4,918 individuals living in communal establishments such as care homes and
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847
848
849
850
851
852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
991
992
993
994
995
996
997
998
999
1000

1
2
3 To analyse employment and caregiving transitions from 2001 to 2011, we also used the NILS-
4 Census-2001 link (N=463,574). Sample attrition (due to deaths and out-migration) accounted for
5
6 127,121 individuals, and 41,912 had immigrated into the sample between 2001 and 2011. Our
7
8 working sample for the analysis of employment and caregiving transitions over time consisted of
9
10 N= 336,453 individuals who were enumerated in both Censuses.
11
12

13
14 The NILS contains socio-structural variables and a measure of subjective mental ill health, as
15
16 asked in the 2011-Census: '*Do you have any of these conditions which have lasted, or are*
17
18 *expected to last at least 12 months? – an emotional, psychological or mental health condition*
19
20 *(such as depression or schizophrenia)*'. A score of one indicates a positive response and a score
21
22 of zero indicates that the respondent had not reported a mental health condition. Our objective
23
24 measure of mental ill health was whether respondents had been prescribed antidepressants (BNF-
25
26 category 4.1.3) (British National Formulary (BNF) 2014, NHSBSA 2014) by their GP at least
27
28 once in the period from 01 April 2010 to 30 March 2012. This binary measure was based on
29
30 records of antidepressant prescriptions by GP practices from the EPD. All 1,298,617 prescription
31
32 records of antidepressants were successfully linked from the EPD database to the NILS.
33
34

35
36 N=79,794 respondents have received antidepressants at least once during the time of study.
37
38

39
40 Our third data source consisted of publically available aggregate data on area-remoteness and
41
42 income-deprivation (NISRA 2010). NISRA's index of *proximity to services* operationalizes area-
43
44 remoteness as travel times by car to service providers such as GP practices, pharmacies, post
45
46 offices and supermarkets on a 10-point scale (NISRA 2010). High values indicate remote areas.
47
48

49
50 Our measure of income deprivation is the area-percentage of households in receipt of income
51
52 benefits. The data were measured on the level of Super Output Areas (SOA) and were linked to
53
54 the NILS using a unique SOA identifier. One SOA consists of 700 to 1000 households and is the
55
56
57
58
59
60

1
2
3 smallest geographical unit available for the analysis of Census-linked data in Northern Ireland
4
5
6 (Office for National Statistics 2011, NISRA 2015).
7
8
9

10 **Analysis**

11
12 The hypotheses were tested using binary logistic multilevel models. The response variables were
13
14 a) subjective mental ill health (Census question) and b) whether the respondent has been
15
16 prescribed antidepressants in the period between April 2010 and April 2012. For the purpose of
17
18 this study, an informal caregiver was defined as anyone who delivered unpaid care. This was
19
20 operationalized via the Census question '*Do you look after, or give any help or support to family*
21
22 *members, friends, neighbours or others because of either: long-term physical or mental ill-*
23
24 *health/disability/problems related to old age?*' Responses were scored as follows: 0 = No, 1 = 1-
25
26 19 hours per week (moderate workload), 2 = 20- 49 hours per week (high workload), 3 = 50 or
27
28 more hours per week (fulltime caregiver).
29
30
31
32
33
34
35

36 Differential effects of informal caregiving on mental health by caregiving workload, employment
37
38 status, gender and age were tested via interactions with the three intensities of informal
39
40 caregiving. In addition, interactions between caregiving and employment transitions from 2001
41
42 to 2011 were tested. The expectation was that individuals with higher long-term caregiving and
43
44 employment workloads would be more likely to experience mental ill health. To this end, we
45
46 computed binary indicators of caregiving-transitions between the two Censuses: Caregiver in
47
48 2001 and 2011; caregiver to non-caregiver; non-caregiver to caregiver, not a caregiver at either
49
50 time-point. We did the same for employment transitions between 2001 and 2011 (full-time to
51
52
53
54
55
56
57
58
59
60

1
2
3 full-time; full-time to part-time; part-time to full-time, and full-time to non-employed)¹. ‘Not
4 being a caregiver at either time-point’ and ‘part-time to part-time’ were left out as reference
5
6 categories.
7
8

9
10
11
12 Some argue that a caregivers’ mental health is influenced by the health of the care recipient
13 (McCullagh *et al.* 2005, Eppers *et al.* 2008). The NILES contains some information on other
14
15 members of the caregivers’ households and whether they suffered from chronic illness. In order
16
17 to capture caregiver-households with multimorbidity, the models included a variable picking up
18
19 caregiver households with more than one chronically disabled adult. We also included a binary
20
21 variable indicating whether the respondent lived with dependent children. The models adjusted
22
23 for socio-economic deprivation (tenure, having no access to a car), education and marital status.
24
25 Lastly, the models analysed the contextual effects of the *proximity to services* and levels of
26
27 income-deprivation of the respondents’ areas of residence. Super-Output Area (SOA) was the
28
29 cluster variable of the analysis. The contextual effect hypothesized in H5 was tested via cross-
30
31 level interactions between the three intensities of informal caregiving and *proximity to services*.
32
33
34
35
36
37

38 Table 1 provides the summary statistics of all variables of the analysis.
39
40
41
42

43 [Table 1 here]
44
45
46
47
48
49
50
51
52
53

54
55 ¹ The category “not employed” includes the retired and those who were economically inactive for reasons other than
56 unemployment. We chose the broader category over “unemployed” because this study is interested in whether or not
57 caregivers are employed at the two time-points and in the workload of the employment, rather than the stigma of
58 unemployment as such.
59
60

Results

In 2011, 15% of NLS members aged 16 years or older were informal caregivers. Of these, 56% provided 1 to 19 hours, 17% provided 20 to 49 hours and 27% provided 50 or more hours of care per week. A high percentage (29%) of caregivers in 2011 had already been caregivers in 2001. The majority (59%) of caregivers were women, 38% were full-time employed, 18% part-time employed and 44% were not employed. The majority of caregivers were located in the middle-age cohorts, 73% were over 40 years old; 25.3% were aged 40 to 49 years; 24% were aged 50 to 59 years; 15% were aged 60 to 69; 7% were aged 70 to 79 and 3% were 80 years or older. In relation to the two response variables, only 7% of the respondents reported having a mental health condition in the 2011 Census but 21% had been prescribed an antidepressant at least once between April 2010 and March 2012.

Looking at bivariate distributions, caregivers with a workload above 19 hours per week were more likely than non-caregivers to report mental ill health and to have been prescribed antidepressants. Additionally, 10% of full-time caregivers, compared to 7% of non-caregivers, reported having a mental health condition. The numbers were considerably higher for antidepressant-prescriptions. A quarter of caregivers providing 20 to 49 hours of care and 29% of those providing 50+ hours had been prescribed antidepressants between 2010 and 2012, compared to 20% of non-caregivers.

Table 2 contains the coefficients and confidence intervals of the multilevel models for the two responses. The first two columns show the uncontrolled model for each response, while the second two columns show the fully controlled model. We hypothesized in *H1* that the more hours per week someone spends providing care, the more likely it is that this person will report mental ill health and be prescribed antidepressants.

[Table 2 here]

Consistent with other literature (O'Reilly *et al.* 2008; Brown & Brown 2014), the coefficients in Table 2 show that a moderate caregiving workload was not linked to mental ill health.

Respondents who provided 1 to 19 hours of care per week were even significantly less likely than non-caregivers to report mental health condition in the 2011-Census. However, caregivers who delivered more than 19 hours of care per week were more likely than non-caregivers to have been prescribed antidepressants. Those who delivered 50 hours of care were also more likely to report a mental health condition. These results partly support *H1*. Being a caregiver per se was not related to mental ill health. However, there was a clear relationship between the intensity of the caregiving role and mental ill health.

The patterns of the relationships were the same across both responses, but were stronger for antidepressants prescriptions. This was expected, as our objective measure of mental ill health was less sensitive to underreporting than questionnaire items. The models adjusted for socio-economic deprivation, gender and age. Older people and those with lower socio-economic status and low education, those who experienced divorce and those living in income-deprived areas were more likely to exhibit mental ill health on both responses. In a second step, we examined differential relationships between informal caregiving and mental ill health by caregiving workload, gender and age. Because the patterns of the relationships did not differ between the two responses, we illustrate the results at the example of the respondent's likelihood of having been prescribed antidepressants.

1
2
3 *H2* hypothesized that caregivers who provide more than 19 hours of care per week while being
4 full-time employed are more likely to exhibit mental ill health than those providing fewer hours
5 of care and caregivers who were part-time or not employed. To analyse this, we included the
6 number of hours spent caregiving, employment status and interactions between employment
7 status and each category of caregiving (1-19 hours/week, 20-49 hours/week and 50+hours). Not
8 being a caregiver and not being in employment were the reference categories. The coefficients of
9 the interactions, together with the overall model fit and Wald-tests of each interaction are
10 supplied as supporting material (Supplementary Tables 1 and 2) in an online Appendix. Figure 1
11 combines visualizations of each interaction we performed. The upper left plot in Figure 1 shows
12 that across all three employment statuses, caregivers with a higher caregiving workload were
13 more likely to experience mental ill health than caregivers who provided fewer hours of care.
14
15 Among the non-caregivers, individuals who were not employed were the most likely to
16 experience mental ill health. This may be due to the composition of this group as 21% was over
17 60 years old and a considerable number were unemployed and may have been suffering the
18 known mental health effects of unemployment (Paul & Moser 2009). Contrary to expectations,
19 among high-intensity caregivers, it was not the full-time, but the part-time employed followed by
20 the non-employed, who were the most likely to have been prescribed antidepressants. This was
21 not a gender effect as the model adjusted for gender. *H2* is thus not supported by our findings.
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47

48 To ascertain how long-term employment and caregiving transitions interact with the caregivers'
49 risk of mental ill health, we fitted a set of interactions over time (Figure 1, upper middle). The
50 second bar-chart in Figure 1 (upper middle) shows that across all employment transitions,
51 respondents who were caregivers in both 2001 and 2011 were the most likely to experience
52
53
54
55
56
57
58
59
60

1
2
3 mental ill health. Interestingly, the full-time employed caregivers and those who transitioned
4 from part-time into full-time employment while also being a caregiver were *less* likely than most
5 other groups to exhibit mental ill health. Those who transitioned into non-employment from
6 2001 to 2011 were more likely than the employed to require antidepressants, and, among this
7 group, especially those who had also transitioned into a caregiving role. Due to the relatively
8 small sample sizes of sub-groups, confidence intervals were quite large, hence statistical
9 significance has to be interpreted cautiously.
10
11
12
13
14
15
16
17
18
19
20
21

22 Moving on to gender effects, we included interactions between caregiving workload and gender
23 (Figure 1, upper right). In *H3* we hypothesized that all other things being equal, female
24 caregivers were no more likely than male caregivers to suffer mental ill health. The predicted
25 probabilities in Figure 1 (upper right) suggest evidence to the contrary. Across all intensities of
26 caregiving, women were twice as likely as men to have been prescribed antidepressants.
27
28
29
30
31
32
33

34 Surprisingly, an overall positive relationship between the intensity of caregiving and mental ill
35 health was found in women and not in men. For women, the relationship was linear, the more
36 hours of care they provided, the more likely they were to have been prescribed antidepressants.
37
38
39

40 For men, the likelihood of being prescribed antidepressants increased only at caregiving
41 workloads of 50+ hours per week and the increase was modest. Moderate intensities of
42 caregiving (1 to 19 hours per week) were associated with a slightly lower likelihood of being
43 prescribed antidepressants for men, although this interaction was not statistically significant.
44
45
46
47
48
49

50 Men who delivered 20 to 49 hours of care per week were no more likely than male non-
51 caregivers to have been prescribed antidepressants between 2010 and 2012. We ran the same
52
53
54
55
56
57
58
59
60

1
2
3 model for subjective mental ill health (Census question) as the response (Table 2) and the gender
4
5 difference is the same. *H3* is thus not supported by the data.
6
7
8
9

10 We hypothesized in *H4* that the risk to informal caregivers of mental ill health increases with
11
12 age. We argued that this is to be expected because of decreased stress-resilience and increased
13
14 frailty associated with old age. To test *H4*, we computed ten-year age-cohorts (16-19, 20-29, 30-
15
16 39, 40- 49, 50-59, 60-69, 70-79 and 80 plus) and then fitted the fully controlled model including
17
18 interactions between being a fulltime caregiver and each age-cohort. Figure 1 (lower left) shows
19
20 the differential relationships by age-cohort between full-time caregiving (50 hours+ per week)
21
22 and antidepressant prescription. Contrary to expectations, it was not the older, but rather, the
23
24 younger cohorts below 50 that showed strong and statistically significant relationships between
25
26 full-time caregiving and mental ill health. Within the 20-29-year cohort, full-time caregivers had
27
28 a 7% higher probability of being prescribed antidepressants than everybody else, and the same
29
30 holds for the 30-39-year cohort. In the 40 to 49-year cohort the difference was 3%. For older
31
32 cohorts over 50, the effect size of full-time caregiving was negligible. The confidence intervals
33
34 show that full-time caregiving did not make a statistically significant difference to older cohort-
35
36 members' probability of requiring antidepressants. Thus, *H4* is unsupported.
37
38
39
40
41
42
43
44
45

46 These results may be explained by a closer examination of the younger caregivers. Table 3
47
48 contains the percentages of younger and older caregivers with high burden and shows that 58%
49
50 of caregivers under 50 had at least one child in the household and 11.2% had one or more
51
52 children while also living with one or more disabled adults in the household. Not surprisingly,
53
54 these numbers are much smaller for older caregivers. Across the caregiver population, it was the
55
56
57
58
59
60

1
2
3 younger cohorts who faced higher strain and often a double burden, while older caregivers, who
4 have fewer professional and family roles to juggle, did not show a statistically enhanced risk of
5 mental ill health. It is important to note that having children and living in a household with
6 multiple disabled adults did decrease the coefficient sizes of the age and full-time caregiving
7 interactions terms slightly, but did not fully mediate their effect. Thus, there still remains an
8 unexplained age effect (of the younger caregiver cohorts) over and above high caregiver burden.
9
10
11
12
13
14
15
16
17

18
19
20 The last step focused on the context-effect of area-remoteness. Because access to services such
21 as GP practices, dentists and shopping facilities is important for caregivers, we hypothesized in
22 *H5* that informal caregivers who live in remote areas with limited access to services are more
23 likely to suffer mental ill health than non-caregivers in the same area and caregivers living closer
24 to services. To test this, we fitted cross-level interactions between the three categories of (hours
25 spent) caregiving and NISRA's *Proximity to Services* index whereby high values indicate remote
26 areas. Figure 1 (lower right) shows the marginal effects for each category of caregiving across
27 the degrees of area-remoteness, confirming that individuals who provide care for more than 19
28 hours per week do indeed show a strong increase in their likelihood of mental ill health by area-
29 remoteness. The further away their area of residence was from service providers, the more likely
30 caregivers with a workload above 19 hours were to suffer mental ill health. Caregivers with a
31 lighter workload (1 to 19 hours per week) and non-caregivers did not show a significant change
32 in their likelihood of mental ill health by area-remoteness. Caregivers with a workload of 20+
33 hours were significantly more likely than non-caregivers to require antidepressant prescriptions
34 and the gap increased with area-remoteness. *H5* is thus confirmed by the analysis.
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Discussion

The results confirm some known patterns and contribute to new insights regarding differential relationships between caregiving workload, employment, gender, age and *proximity to services* and the mental health of informal caregivers. The relatively high antidepressant prescription rates of our baseline sample (21% of the population) may come as a surprise to some readers but it is a well-documented phenomenon (Kelly *et al.* 2003, Maguire 2013) and has been attributed to the unique history of the Northern Ireland conflict, which caused and continues to cause distress and mental ill health for a large percentage of the population (Bunting *et al.* 2012, Bunting *et al.* 2013). A second finding of significance is the overall lower number of respondents who reported mental ill health in the Census compared to the high number that were prescribed antidepressants. This may be due to the stigma associated with mental health problems and a resulting reluctance to talk about them. Mental ill health is a sensitive topic and under-reporting in the Census was expected.

To ensure the validity and reliability of the results, it was important for this study to include measures of mental ill health that were not reliant on questionnaire responses. Although the percentages differed across our two measures of mental ill health, the patterns of the relationships with caregiving were consistently the same.

Consistent with the findings of other researchers (Brown & Brown 2014, O'Reilly *et al.* 2015a), this study found that informal caregiving per se was not related to mental ill health. However, females under 50 who provided over 19 hours of care and who were not employed or worked part-time were at a statistically significantly enhanced risk of mental ill health. Furthermore, those who were caregivers in 2001 and in 2011 and those who transitioned into non-employment

1
2
3 or part-time employment while taking up caring responsibilities were significantly more likely
4
5 than full-time employed caregivers to experience mental ill health. High caregiver workload was
6
7 clearly related to a higher risk of mental ill health irrespective of gender and age. This is
8
9 consistent with previous findings from the literature on carer burden (McCullagh *et al.* 2005,
10
11 Molyneux *et al.* 2008, Eters *et al.* 2008, Iecovich 2008). However, in the present study, the
12
13 adverse effect of not having employment on mental health appeared to be stronger than the effect
14
15 of (moderate to high intensity) caregiving. Contrary to H2, fulltime employed caregivers were
16
17 *better* off than those who worked part-time or were not employed. The models controlled for age
18
19 and prior chronic disabilities of the caregiver.
20
21
22
23

24 There are a number of plausible explanations for these results. Firstly, people in full-time
25
26 employment tend to be more financially secure and less likely to be distressed by financial
27
28 pressures. Many part-time jobs are in the low income sector. The majority of part-time employed
29
30 caregivers in our sample had lower levels of education, lived in rented rather than owned
31
32 accommodation and resided in more deprived areas than the fulltime employed. Given that
33
34 informal caregiving is associated with considerable personal and financial costs (Wolff *et al.*
35
36 2006, Heitmueller & Inglis 2007), caregivers who are not in fulltime employment may likely
37
38 face higher financial strain and be less able to afford external help. All of these factors may well
39
40 have contributed to the poor mental health among this group in our study. Another important
41
42 aspect is that full-time employment can be associated with higher social status and self-
43
44 fulfilment and this, too, may have contributed to the respondents' mental health. Furthermore,
45
46 full-time employment can sometimes help individuals maintain social contacts while also
47
48 distracting them from the strain associated of their caregiving role. The literature on employment
49
50 and caregiver mental health is inconclusive. Rozario *et al.* (2004) found that employment and
51
52
53
54
55
56
57
58
59
60

1
2
3 having many social contacts was beneficial for the mental health of caregivers. Juratovac and
4
5 Zauszniewski (2014) acknowledged the importance of social contact but reported that caregivers
6
7 who worked full-time were more likely to suffer from depression, while Cannuscio *et al.* (2004)
8
9 found no relationship between full-time employment and the mental health of caregivers.
10
11
12
13

14
15 Our findings regarding gender differences merit further consideration. The models adjusted for
16
17 the fact that women are generally more likely than men to admit mental health problems.
18

19
20 Nevertheless, the analysis found significant gender-differences in the statistical effect of the
21
22 caregiving workload. Women were more strongly affected by caregiver burden than men. One
23
24 reason for this may be that in full-time caregiver households, it is mostly women who take on the
25
26 bulk of the caregiving tasks (Casado-Marín *et al.* 2011, Vlachantoni *et al.* 2013). Even in
27
28 situations where men and women share caring responsibilities for an older relative, it is often the
29
30 women who manage the physically and psychologically demanding activities associated with
31
32 personal care and pain-management, while men help with chores, transportation and the social
33
34 aspect of caregiving. While this interpretation concurs with other studies (Pinquart & Sörensen
35
36 2006, Lee & Tang 2013), it is important to avoid over simplistic generalisations as the NILS
37
38 does not contain information on the actual caregiving tasks undertaken by respondents. A second
39
40 explanation why, for male caregivers, an increased caregiving workload is not statistically
41
42 related to the prescription of antidepressants may be that male caregivers, like men in general,
43
44 may be reluctant to seek professional help when their mental health deteriorates (Lindinger-
45
46 Sternart, 2014). It is also possible that male gender-role expectations not to display signs of
47
48 weakness, may have prevented male caregivers from seeking help (Vogel *et al.* 2014). Again,
49
50 this interpretation remains speculative, as the NILS does not contain variables on gender-roles.
51
52
53
54
55
56
57
58
59
60

1
2
3 While there are qualitative studies on female caregivers that concur with our evidence, there is a
4 dearth of research on male caregiving (McDonnell & Ryan 2011). The results of this study
5 suggest that the interrelationships between gender and caregiving, especially the mental health of
6 male caregivers require further investigation.
7
8
9
10
11

12
13
14
15 Regarding our finding of significant age differences in the relationship between caregiving
16 workload and mental ill health, an enhanced burden on younger caregivers due to multiple and
17 competing roles and responsibilities, lack of experience and of resources to develop coping
18 mechanisms are all plausible interpretations. In contrast to older caregivers, younger people often
19 find themselves in a 'sandwich-position' (Buck 2013), struggling with the burden of caring
20 responsibilities for both children and older relatives, while at the same time holding demanding
21 jobs. This was demonstrated in our study which showed that 58% of younger caregivers had one
22 or more children and 11% had one or more children and lived in a household with more than one
23 disabled adult. Our data indicates that it is the younger caregivers (<50 years) who face the
24 highest burden and are therefore at a much higher risk of mental ill health than older caregivers
25 and non-caregivers. In addition, a considerable number of younger caregivers may be struggling
26 with the financial and emotional strains of not having employment. Our findings on employment
27 status showed that particularly caregivers without employment struggled with poor mental
28 health. This situation affects primarily the younger and middle-age groups. Young caregivers
29 also often lack experience and are less likely than older caregivers to have developed strategies
30 to deal with caregiver strain. As a result, they can easily be overburdened by their caregiving role
31 especially if they do not receive the support required to help them in this role. However, a key
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 result of this study was that *all* caregivers with a caregiving workload higher than 19 hours per
4
5 week are at a higher risk of mental ill health, if services are not within easy reach.
6
7

8 9 10 *Limitations*

11
12 The scope of this paper is constrained by the following limitations. The analysis of transitions in
13
14 caregiving over time is affected by sample attrition. We cannot rule out that selective mortality
15
16 of caregivers may have created some bias in our findings regarding caregivers' mental health.
17
18 However, findings by O'Reilly *et al.* (2015a) of a *negative* link between caregiving and mortality
19
20 in Northern Ireland suggests that selective mortality of caregivers was unlikely to be an issue in
21
22 the NILS. Regarding long-term employment and caregiving transitions, the NILS only has data
23
24 for the two Census years 2001 and 2011. It is possible that some individuals may have
25
26 experienced transitions between the two time-points that our analysis did not detect. The NILS
27
28 does not provide information on the health of the care recipient or on their relationship with the
29
30 caregiver, however, previous studies found these to influence the mental health of caregivers
31
32 (Etters *et al.* 2008, McDonnell & Ryan 2014). Our data did supply some information on
33
34 multimorbidity of the household and the analysis adjusted for this. Factors influencing caregiver
35
36 decision-making such as whether the caregiving role was commenced by choice or in response to
37
38 external pressures may also impact on the caregivers' mental health. The NILS does not provide
39
40 information on this, nor on the caregivers' attitudes towards their role. Future studies that allow
41
42 for these subjective factors may yield important additional insights.
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Conclusions

This study provides new insights into the complex relationship between caregiving workload, gender, age and service access, all of which were found to influence the mental health of informal caregivers. The results have important implications for policy makers. They suggest that females under 50 who provide over 19 hours of care and who are not employed or work part-time and long-term caregivers are at a statistically significantly enhanced risk of mental ill health. Caregivers in remote areas with limited access to shops and services were also at a significantly increased risk as evidenced by prescription rates for antidepressants. It is important to recognise and support at risk caregivers so as to enable these individuals to balance their caregiving responsibilities with a fulfilling work-life balance. Future follow-up studies could contribute in important ways by supplying qualitative in-depth insights from the perspectives of caregivers who are members of the at risk groups this study identified. With community care policies aimed at supporting people to remain at home, this paper highlights the need for policies and procedures to ensure that resources are targeted at caregivers with the greatest need. Extra support for caregivers in remote areas may also help counteract the additional mental health disadvantage faced by this particular group.

References

- 1
2
3
4
5
6 Beach S.R., Schulz R., Yee J.L., Jackson S. (2000) Negative and positive health effects of caring
7 for a disabled Spouse: Longitudinal findings from the Caregiver Health Effects Study.
8 *Psychology & Aging* 15(2), 259–271. DOI: 10.1037/0882-7974.15.2.259.
9
- 10 Berekci-Gisolf J., Lucke J., Hockey R., Dobson A. (2008) Transitions into informal caregiving
11 and out of paid employment of women in their 50s. *Social Science & Medicine*, 67(1),
12 122–127. DOI: 10.1016/j.socscimed.2008.03.031.
13
14
- 15 British National Formulary (BNF) (2014) 4.1.3 Antidepressants. *British National Formulary*.
16 Available at: <http://www.bnf.org/products/bnf-online/> [Accessed July 30, 2016].
17
18
- 19 Brown R.M. & Brown S.L. (2014) Informal caregiving: A reappraisal of effects on caregivers.
20 *Social Issues and Policy Review*, 8(1), 74–102. DOI: 10.1111/sipr.12002.
21
- 22 Brown S.L., Smith D., Schulz R. *et al.* (2009) Caregiving behavior is associated with decreased
23 mortality risk. *Psychological Science*, 20(4), 488–494. DOI: 10.1111/j.1467-
24 9280.2009.02323.x.
25
- 26 Bunting BP., Murphy SD., O’Neill SM. & Ferry F.R. (2012) Lifetime prevalence of mental
27 health
28 disorders and delay in treatment following initial onset: Evidence from the Northern
29 Ireland Study of Health and Stress. *Psychological Medicine*, 42(8), 1727-39. DOI:
30 10.1017/S0033291711002510.
31
32
- 33 Bunting BP, Ferry F.R., Murphy SD, O’Neill S.M. & Bolton D. (2013) Trauma associated with
34 civil conflict and posttraumatic stress disorder: Evidence from the Northern Ireland Study
35 of Health and Stress. *Journal of Traumatic Stress*, 26(1), 131-141. DOI:
36 10.1002/jts.21766.
37
38
- 39 Buck H.G. (2013) Help family caregivers in the “sandwich generation”: *Nursing*, 43(11), 19–20.
40 DOI: 10.1097/01.NURSE.0000435206.88399.c8.
41
42
- 43 Cannuscio C.C., Colditz G.A., Rimm E.B., Berkman L.F., Jones C.P. & Kawachi I. (2004)
44 Employment status, social ties, and caregivers’ mental health. *Social Science & Medicine*
45 58(7), 1247–1256. DOI: 10.1016/S0277-9536(03)00317-4.
46
- 47 Casado-Marín, D., García-Gómez, P. & López-Nicolás, Á. (2011) Informal care and labour force
48 participation among middle-aged women in Spain. *SERIEs*, 2(1), 1–29. DOI:
49 10.1007/s13209-009-0008-5.
50
51
- 52 Chambers M., Ryan, A.A. & Connor, S. (2001) Exploring the emotional support needs and
53 coping strategies of family carers. *Journal of Psychiatric and Mental Health Nursing*,
54 8(2), 99–106. DOI: 10.1046/j.1365-2850.2001.00360.x.
55
56
57
58
59
60

- 1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
- Etters L., Goodall D. & Harrison, B.E. (2008) Caregiver burden among dementia patient caregivers: a review of the literature. *Journal of the American Academy of Nurse Practitioners*, 20(8), 423–428. DOI: 10.1111/j.1745-7599.2008.00342.x.
- Genet N., Boerma, W., Kringos, D. *et al.* (2011) Home care in Europe: a systematic literature review. *BMC Health Services Research*, 11(1), 207. DOI: 10.1186/1472-6963-11-207.
- Greenwood N., Habibi R., Smith R. & Manthorpe J. (2015) Barriers to access and minority ethnic carers' satisfaction with social care services in the community: a systematic review of qualitative and quantitative literature. *Health & Social Care in the Community*, 23(1), 64–78. DOI: 10.1111/hsc.12116.
- Heitmueller A. & Inglis K., (2007) The earnings of informal carers: Wage differentials and opportunity costs. *Journal of Health Economics*, 26(4), 821-841. DOI: 10.1016/j.jhealeco.2006.12.009.
- Hirst M.A. (2005) Carer distress: A prospective, population-based study. *Social Science & Medicine*, 61(3), 697–708. DOI: 10.1016/j.socscimed.2005.01.001.
- Iecovich, E. (2008) Caregiving burden, community services, and quality of life of primary caregivers of frail elderly persons. *Journal of Applied Gerontology*, 27(3), 309–330. DOI: 10.1177/0733464808315289.
- Juratovac E. & Zauszniewski, J.A. (2014) Full-time employed and a family caregiver: A profile of women's workload, effort, and health. *Women's Health Issues*, 24(2), e187–e196. DOI: 10.1016/j.whi.2014.01.004.
- Kelly C.B., Ansari T., Rafferty T. & Stevenson M. (2003) Antidepressant prescribing and suicide rate in Northern Ireland. *European Psychiatry*, 18(7), 325–328. DOI: 10.1016/j.eurpsy.2003.03.005.
- Lee Y. & Tang F. (2013) More caregiving, less working caregiving roles and gender difference. *Journal of Applied Gerontology*, 34(4), 465-483. DOI: 10.1177/0733464813508649.
- Lindinger-Sternart S (2015) Help-seeking behaviors of men for mental health and the impact of diverse cultural backgrounds. *International Journal of Social Science Studies* 3(1), 1-6. DOI: 10.11114/ijsss.v3i1.519.
- Maguire A. (2013) *Measuring mental health: a pharmacoepidemiological study of the factors affecting antidepressant and anxiolytic uptake in Northern Ireland*. Ph.D. Queen's University Belfast. Available at: <http://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.602363> [Accessed January 22, 2015].
- McCann S., Ryan A.A. & McKenna H. (2005) The challenges associated with providing community care for people with complex needs in rural areas: a qualitative investigation. *Health & Social Care in the Community*, 13(5), 462–469. DOI: 10.1111/j.1365-2524.2005.00573.x.

- 1
2
3 McCullagh E., Brigstocke G., Donaldson N. & Kalra L. (2005) Determinants of caregiving
4 burden and quality of life in caregivers of stroke patients. *Stroke*, 36(10), 2181–2186.
5 DOI: 10.1161/01.STR.0000181755.23914.53.
6
7
8 McDonnell E & Ryan A. (2011) Male caregiving in dementia: A review and
9 commentary. *Dementia: The International Journal of Social Research and*
10 *Practice*, 12 (2), 284-250. DOI: 0.1177/1471301211421235.
11
12
13 McDonnell, E. & Ryan, A.A. (2014) The experience of sons caring for a parent with dementia.
14 *Dementia*, 13(6), 788-802. DOI: 10.1177/1471301213485374.
15
16 Molyneux, G.J., McCarthy G.M., McEniff S., Cryan M., & Conroy R.M. (2008) Prevalence and
17 predictors of carer burden and depression in carers of patients referred to an old age
18 psychiatric service. *International Psychogeriatrics*, 20(6), 1193–1202. DOI:
19 10.1017/S1041610208007515.
20
21
22 Moriarty J., Maguire A., O'Reilly D., McCann M. (2015) Bereavement After Informal
23 Caregiving: Assessing Mental Health Burden Using Linked Population Data. *American*
24 *Journal of Public Health*, 105(8), 1630–1637. DOI: 10.2105/AJPH.2015.302597.
25
26
27 Morimoto T., Schreiner A.S. & Asano, H. (2003) Caregiver burden and health-related quality of
28 life among Japanese stroke caregivers. *Age and Ageing*, 32(2), 218–223. DOI:
29 10.1093/ageing/32.2.218.
30
31
32 NHSBSA (2014) *BNF Classification and Pseudo Classification Used by the NHS Prescription*
33 *Services*, NHSBSA, Medicine Data Services, Newcastle upon Tyne. Available at:
34 [http://www.nhsbsa.nhs.uk/PrescriptionServices/Documents/PrescriptionServices/BNF__](http://www.nhsbsa.nhs.uk/PrescriptionServices/Documents/PrescriptionServices/BNF__Classification_Booklet-2015.pdf)
35 [Classification_Booklet-2015.pdf](http://www.nhsbsa.nhs.uk/PrescriptionServices/Documents/PrescriptionServices/BNF__Classification_Booklet-2015.pdf). [Accessed July 30, 2016].
36
37
38 NISRA (2010) *Northern Ireland Multiple Deprivation Measure 2010*. Belfast: Northern Ireland
39 Statistics and Research Agency (NISRA). Available at:
40 [http://www.nisra.gov.uk/deprivation/archive/updateof2005measures/nimdm_2010_report](http://www.nisra.gov.uk/deprivation/archive/updateof2005measures/nimdm_2010_report.pdf)
41 [.pdf](http://www.nisra.gov.uk/deprivation/archive/updateof2005measures/nimdm_2010_report.pdf). [Accessed May 18, 2016].
42
43
44 NISRA (2015) Super Output Areas. How the NI SOAs have been created. Available at:
45 http://www.nisra.gov.uk/deprivation/super_output_areas.html. [Accessed May 18, 2016].
46
47
48 Office for National Statistics (2011) Super Output Area (SOA). *Office for National Statistics*.
49 Available at: [http://www.ons.gov.uk/ons/guide-method/geography/beginner-s-](http://www.ons.gov.uk/ons/guide-method/geography/beginner-s-guide/census/super-output-areas--soas-/index.html)
50 [guide/census/super-output-areas--soas-/index.html](http://www.ons.gov.uk/ons/guide-method/geography/beginner-s-guide/census/super-output-areas--soas-/index.html) [Accessed May 18, 2016].
51
52
53 O'Reilly D., Rosato M., Maguire A., Wright D. (2015a) Caregiving reduces mortality risk for
54 most caregivers: a census-based record linkage study. *International Journal of*
55 *Epidemiology*, 44(6), 1959–1969. DOI: 10.1093/ije/dyv172.
56
57
58
59
60

- 1
2
3 O'Reilly D., Rosato M., Maguire A., Wright D. (2015b) Caregiving is associated with a lower
4 risk of suicide: a longitudinal study of almost 200,000. *Journal of Epidemiology and*
5 *Community Health*, 69(Suppl 1), A29–A29. DOI: 10.1136/jech-2015-206256.46.
6
7
8 O'Reilly D., Connolly S., Rosato M., Patterson C. (2008) Is caring associated with an increased
9 risk of mortality? A longitudinal study. *Social Science & Medicine*, 67(8), 1282–1290.
10 DOI: 10.1016/j.socscimed.2008.06.025.
11
12 Paul K.I. & Moser K. (2009) Unemployment impairs mental health: Meta-analyses. *Journal of*
13 *Vocational Behavior*, 74(3), 264–282. DOI: 10.1016/j.jvb.2009.01.001.
14
15 Pinquart M. & Sörensen, S. (2006) Gender differences in caregiver stressors, social resources,
16 and health: An updated meta-analysis. *The Journals of Gerontology Series B:*
17 *Psychological Sciences and Social Sciences*, 61(1), P33–P45.
18
19 Raschick M. & Ingersoll-Dayton B. (2004) The costs and rewards of caregiving among aging
20 spouses and adult children*. *Family Relations*, 53(3), 317–325. DOI: 10.1111/j.0022-
21 2445.2004.0008.x.
22
23
24 Roth D.L., Fredman, L. & Haley W.E. (2015) Informal caregiving and its impact on health: A
25 reappraisal from population-based studies. *The Gerontologist*, 55(2), 309–319. DOI:
26 10.1093/geront/gnu177.
27
28
29 Rozario P.A., Morrow-Howell N. & Hinterlong J.E. (2004) Role enhancement or role strain
30 Assessing the impact of multiple productive roles on older caregiver well-being.
31 *Research on Aging*, 26(4), 413–428. DOI: 10.1177/0164027504264437.
32
33
34 Ryan A. & McKenna H. (2013) Familiarity as a key factor influencing rural family
35 carers experience of the nursing home placement of an older relative: a qualitative
36 study. *BMC Health Services Research*, 13:252. DOI: 10.1186/1472-6963-13-252.
37
38
39 Ryan, A. McTaggart, L. Truesdale-Kennedy & Slevin E. (2014) Issues in caregiving for
40 older people with intellectual disabilities and their ageing family carers: a review and
41 commentary. *International Journal of Older People Nursing*, 9(3), 217-226.
42 DOI: 10.1111/opn.12021.
43
44
45 Schulz R. & Sherwood P.R. (2008) Physical and mental health effects of family caregiving. *The*
46 *American Journal of Nursing*, 108(9 Suppl), 23–27. DOI:
47 10.1097/01.NAJ.0000336406.45248.4c.
48
49
50 Schwartz C. & Gidron R. (2002) Parents of mentally ill adult children Living at home rewards of
51 caregiving. *Health & Social Work*, 27(2), 145–154. DOI: 10.1093/hsw/27.2.145.
52
53 Shortall S. (2002) Gendered agricultural and rural restructuring: a case study of Northern Ireland.
54 *Sociologia Ruralis*, 42(2), 160–175. DOI: 10.1111/1467-9523.00208.
55
56
57
58
59
60

- 1
2
3 Shortall S. & Radford K. (2012) Social Enterprising communities: the dynamics and readiness
4 for service innovation. In *Socially Enterprising Communities: Service Co-Production in*
5 *Rural Areas*. Cheltenham: Elgar.
6
7
8 Ventura A.D., Burney S., Brooker J., Fletcher J. & Ricciardelli L. (2014) Home-based palliative
9 care: A systematic literature review of the self-reported unmet needs of patients and
10 carers. *Palliative Medicine*, 28(5), 391–402. DOI: 10.1177/0269216313511141.
11
12 Vlachantoni A., Evandrou M., Falkingham J., Robards J. (2013) Informal care, health and
13 mortality. *Maturitas*, 74(2), 114–118. DOI: 10.1016/j.maturitas.2012.10.013.
14
15
16 Vogel D.L., Wester S.R., Hammer J.H., Downing-Matibag T.M. (2014) Referring men to seek
17 help: The influence of gender role conflict and stigma. *Psychology of Men & Masculinity*,
18 15(1), 60–67. DOI: 10.1037/a0031761.
19
20
21 Wolff N., Perlick D.A., Kaczynski R., Calabrese J., Nierenberg A. & Miklowitz D.J. (2006)
22 Modeling costs and burden of informal caregiving for persons with bipolar disorder. *The*
23 *journal of mental health policy and economics*, 9(2), 99–110. PMID:17007487.
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Table 1: Frequency Distributions of all Variables used in the Analysis

Binary Variables:	N, Total Sample Obs.	Obs. in category:	Percent
Has been prescribed antidepressants 2010-12	378365	79,794	21.0
Self-reported mental ill health	378365	26,675	7.0
Caregiving: 0 hours, not a caregiver (reference category)	378365	321,972	85.1
Caregiving: 1 to 19 hours per week	378365	31,819	8.4
Caregiving: 20 to 49 hours per week	378365	9,211	2.4
Caregiving: 50plus hours/week	378365	15,363	4.1
Long-term caregiver (2001 and 2011)	336,453	15,828	4.7
Sex: female	378365	197,629	52.2
Homeowner (reference category)	378365	288,958	76.4
Social Housing	378365	44,557	11.8
Private Renter	378365	44,850	11.8
Education: low, no qualification	378365	108,948	28.8
Education: GCSE	378365	44,345	11.7
Education: A-levels (reference category)	378365	135,688	35.9
Education: Degree	378365	89,384	23.6
Fulltime Employed (2011)	378365	147,897	39.0
Part-time Employed (2011)	378365	54,335	14.4
Unemployed (2011)	378365	16,680	4.4
Retired (2011)	378365	73,552	19.4
Other economically inactive (reference category)	378365	85,901	22.8
Has Children	378365	147,818	39.0
No access to a car	378365	59,423	15.7
Multiple (Two or more) disabled adults in the household	378365	46,373	12.2
Married (reference category)	378365	185,622	49.1
Single	378365	132,287	35.0
Widowed	378365	24,746	6.5
Divorced	378365	35,710	9.4
Took part in the 2011 Census	378365	378365	100
Took part in both 2001 and 2011 Censuses:	378365	336,453	89.0

Note: Table 1 shows the frequencies and percentages of all independent and dependent variables of the analysis for the whole sample. For continuous variables, the means and standard deviations are shown.

Table 1 Continued:

Continuous Variables:	N Level-1 Obs.	Mean	Standard. Deviation	Minimum	Maximum
Age		45.74	18.63	16 years	100 plus years
N	378,365 individuals			N (16 years old): 6,583	N (100plus years old): 33
Household-size		2.32	1.06	1 individual	6 individuals
N	378,308 individuals			N (1 person-HH): 72861	N (6 person-HH): 4333
Macro-Level Variables	N Level-2 Obs. (SOA)	Mean	Std. Dev.	Min.	Max.
Proximity to Services / SOA	890 SOAs	3.01	2.07	0.5	11.37
N individuals in SOA				285	516
Income-deprivation/SOA	890 SOAs	0.25	0.15	<5% deprived	90% deprived
N individuals in SOA				5963	392

Note: Table 1 shows the frequencies and percentages of all independent and dependent variables of the analysis for the whole sample. For continuous variables, the means and standard deviations are shown. In parentheses: N (number of observations for some categories of variables).

Table 2: Binary Logistic Multilevel Models

	DV: Self-reported Mental Ill Health		DV: Whether has been prescribed antidepressants	
	Coef.	95% CI	Coef.	95% CI
Caregiving: 1 to 19 hours /week	-0.053*	[-0.105, -0.008]	0.014	[-0.015, 0.043]
Caregiving: 20 to 49 hours/week	-0.034	[-0.114, 0.046]	0.098***	[0.047, 0.014]
Caregiving: 50plus hours/week	0.173***	[0.116, 0.229]	0.207***	[0.169, 0.244]
Household-size	-0.097***	[-0.112, -0.081]	-0.068***	[-0.077, -0.058]
Children	-0.126***	[-0.159, -0.092]	-0.116***	[-0.137, -0.094]
Multiple adults w. disabilities in the HH.	1.425***	[1.389, 1.460]	0.823***	[0.799, 0.846]
Age	0.010***	[0.008, 0.011]	0.014***	[0.013, 0.014]
Sex	0.350***	[0.322, 0.377]	0.743***	[0.725, 0.760]
Social housing	0.702***	[0.666, 0.737]	0.446***	[0.420, 0.471]
Private renter	0.388***	[0.348, 0.427]	0.197***	[0.169, 0.224]
Number of cars in the HH.	-0.347***	[-0.366, -0.327]	-0.154***	[-0.165, -0.142]
Education: low	0.375***	[0.341, 0.408]	0.226***	[0.204, 0.247]
Education: GCSE	-0.185***	[-0.234, -0.136]	-0.104***	[-0.133, -0.074]
Education: Degree	-0.413***	[-0.456, -0.369]	-0.294***	[-0.317, -0.270]
Unemployed	-0.648***	[-0.714, -0.581]	-0.025	[-0.066, 0.016]
Part-time employed	0.492***	[0.262, 0.721]	0.445***	[0.329, 0.560]
Retired	-0.860***	[-0.907, -0.812]	-0.404***	[-0.433, -0.374]
Single	-0.015	[-0.052, 0.222]	-0.249***	[-0.272, -0.225]
Widowed	-0.382***	[-0.440, -0.323]	-0.212***	[-0.247, -0.176]
Divorced	0.652***	[0.612, 0.691]	0.432***	[0.404, 0.459]
Proximity to Services/SOA	-0.010	[-0.021, 0.001]	-0.014***	[-0.019, -0.008]
Income-deprivation / SOA	0.844***	[0.728, 0.959]	0.468***	[0.385, 0.550]
Constant	-3.119***	[-3.207, -3.03]	-2.077***	[-2.137, -2.116]
Level-2 Variance (Sigma u)	-1.863***		-2.106***	

N	375213	377276
BIC	168867.1	361283.8

Note: *P<0.05, ** P<0.01, *** P<0.001, All models were run including caregiving alone as a separate step (not displayed here). Reference categories of the binary variables: caregiving - not a caregiver; sex - male; tenure - homeowner; education - low, no qualification; employment status - fulltime employed; marital status - married.

Table 3: Percentages of Caregivers with High Burden

	One or more children in the household		At least one disabled elderly in the household		More than one disabled adult in the household		Two or more disabled adults and at least one child in the household	
	N	%	N	%	N	%	N	%
Older Caregiver (>50)	18,377	11.8	11,379	41.7	8,032	29.4	856	3.1
Younger Caregiver (<50)	129,441	58.0	6,504	22.3	5,129	17.6	3,239	11.2
Overall Caregivers	22,254	39.5	17,883	31.7	13,161	23.3	4095	7.2
Non-caregivers	124,030	38.9	63,007	19.8	33,034	10.4	7,927	2.5

Supporting Material

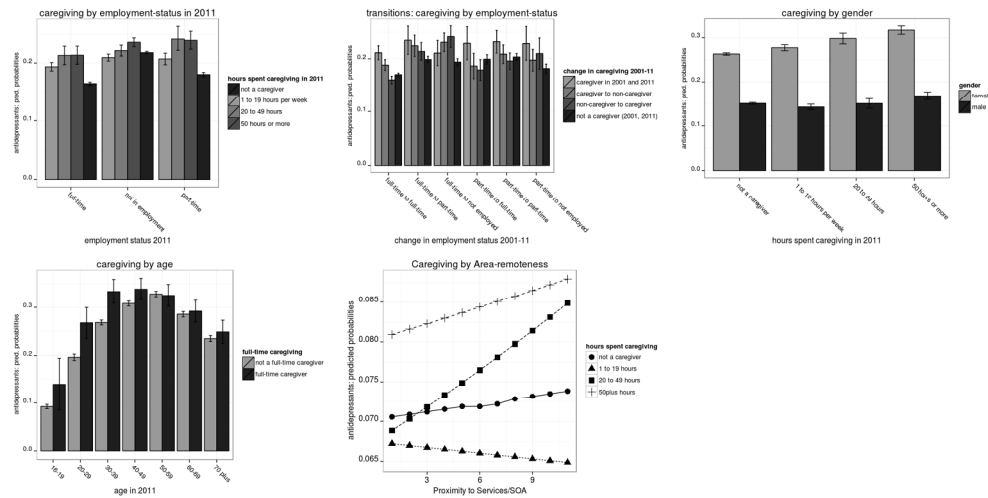


Figure 1: Interactions: Predicted Probabilities of being prescribed Antidepressants by Caregiving Status, Employment-Status, Long-term-Caregiving, Gender, Age and Area-Remoteness. Note: Each plot represents a full interaction model, which includes all control variables as displayed in Table 2, the interaction terms as pictured in each plot and the main effects of each interaction. On the Y-axes: The predicted probabilities of having been prescribed antidepressants at least once during the time of study. The lines on top of the bars are the 95% confidence intervals for each interaction category

Figure 1
529x264mm (96 x 96 DPI)

Review

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60