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Unpaid carers in Wales:
The determinants of mental wellbeing

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Contents

1. Introduction

With an ageing population, comes an increase in the proportion of the population living longer lives, and many with complex health needs and abilities requiring help with everyday activities [1]. The majority are often cared for informally by family, friends, and relatives, referred to as 'unpaid carers'. Understanding the benefits and impact of caring on the health and wellbeing of carers themselves is of key importance, to ensure support is in place to maintain their own good health whilst also caring for others.

In 2019, there were an estimated 400,000 unpaid carers in Wales …

In 2019, there were an estimated 400,000 unpaid carers in Wales, and this is estimated to rise to over half a million by 2037 [2]. It is known that caring duties are not evenly distributed across the population, with some population groups more likely to provide unpaid care than others. Studies have shown that providing unpaid care can have an adverse impact on the mental wellbeing of unpaid carers, which can result in significantly poorer health, quality of life, education outcomes and employment potential [3-5]. The higher the intensity and duration of care provided, the worse these effects tend to be [6-8]. Whereas high levels of mental wellbeing can help unpaid carers to maintain good mental health, fulfil their potential, realise ambitions and cope with adversity [9-11].

Improving mental wellbeing amongst the population plays a vital role in mental health and public health policy.

Improving mental wellbeing amongst the population plays a vital role in mental health and public health policy [12]. Government policies and strategies with a focus on mental health and unpaid carers in Wales include the *Social Services and Well-being (Wales) Act 2014; Together for Mental Health Delivery Plan 2019-22;* and the *Welsh Government's Strategy for Unpaid Carers; A Healthier Wales: long-term plan for health and social care*. Whilst these strategies recognise the value of unpaid carers as an informal workforce in Wales, and the need to support unpaid carers' wellbeing, less is understood about the relationship between caring intensity, socio-economic status (including level of education or being in employment) and mental wellbeing. Understanding the impact of caring, education and employment across the spectrum of mental wellbeing, and how this differs across socio-economic groups, can help to better target support to those who need it most.

The aims of this study are to:

- understand the association between caring intensity and mental wellbeing for unpaid carers in Wales and whether this differs across demographic groups; and
- examine the impact of socio-economic position (employment and education) on average and gradations of mental wellbeing among unpaid carers with different levels of caring intensity.

2. What do we already know?

2.1 Caring intensity and mental wellbeing

Caring can be rewarding but also challenging. Caring is widely reported as tiring, with unpaid carers experiencing increased stress and anxiety, and higher levels of uncertainty, fear, loneliness and isolation [13, 14], resulting in poor mental wellbeing. Many studies have shown that unpaid carers who provide high intensity care are more likely to report depression or anxiety [15, 16], experience mental health issues and be susceptible to negative wellbeing [4, 5, 17].

The association between caring intensity and mental wellbeing varies by unpaid carers' demographic factors [8, 16]. Female unpaid carers are likely to provide higher intensity care than males, and are more likely to experience negative impacts of caring on mental and physical health [18]. In the UK, the peak age for caring is between 50 and 64 years [19] but the impact of caring across the life course is unclear. Some studies report less frequent mental distress and life dissatisfaction in older compared to younger unpaid carers [20], whereas other research suggests older unpaid carers are more likely to experience negative consequences of providing care [21]. Emerging international evidence suggests that associations between caring intensity and mental wellbeing may be moderated by demographic factors [22, 23]. Therefore, a better understanding of the effects of demographic characteristics on both caring intensity and its association with mental wellbeing is needed [24].

2.2 Socio-economic position and mental wellbeing

Socio-economic position (i.e. economic status, level of education and income) can be both a cause and a consequence of poor mental wellbeing. A lower socio-economic position is associated with lower mental wellbeing. However, mental wellbeing can also impact socio-economic position. In the general population, those with poor mental health are more likely to move into areas of highest deprivation, whilst those with better mental health are more likely to move into areas of lowest deprivation. This can lead to a concentration of those with lower mental health in areas of higher deprivation, reinforcing socio-economic inequalities [25].

Being an unpaid carer further complicates the relationship between socio-economic position and mental wellbeing, as providing care can be a factor for both low socio-economic position and low mental wellbeing. For example, low income unpaid carers experience higher levels of distress than those receiving higher income [26]. Unpaid carers may have to reduce their working hours or even stop working completely to enable them to complete their caring responsibilities. The change to their employment status may result in reducing their income and potentially elevating their levels of distress [27]. Providing care can also increase household expenditure through the costs of equipment and medication [28], with a direct impact on financial security. Some unpaid carers have reported struggling to pay household bills and cutting back on essentials, such as or including food and heating [16, 29, 30].

Similarly, there is a bidirectional relationship between lower levels of education and lower mental wellbeing [26]. Young carers receive lower General Certificate of Secondary Education (GCSE) grades than non-carers and are less likely to think that they will go on to university after leaving school. Furthermore, evidence has suggested that young carers are less likely to be in full-time secondary or tertiary education [31-33]. Not being in education at early ages is associated with unemployment, reduced earnings, poor health and depression later in life. This can put those who provide unpaid care in a disadvantaged position from an early age: receiving a lower level of education and leading to poorer mental wellbeing [31].

The relationship between socio-economic position and mental wellbeing has been further complicated by research findings suggesting that socio-economic position predicts low mental wellbeing, but has a weaker relationship with high mental wellbeing [34-36]. One study pointed out that level of education and employment predict low and high mental wellbeing differently [37]. One explanation for this could be that as mental wellbeing improves, feelings of self-worth become less influenced by socio-economic position and more by life experiences [38].

The impact of socio-economic position on mental wellbeing for carers at different levels of mental wellbeing is not well-understood. Understanding the impact of caring across the spectrum of mental wellbeing, and how this differs across socio-economic groups can help to better target support to those who need it most.

3. What did we do?

3.1 Data source

We used data collected in the 2016/17 National Survey of Wales (NSW), which is the most recently available national survey to collect self-reported information on both caring status and mental wellbeing. The NSW is a large-scale population-level survey of people aged 16+ years in Wales and covers a wide range of topics, e.g. health, art and culture. The NSW is conducted annually using a random sampling approach to ensure representativeness [39, 40]. We used 2016/17 NSW data stored in the Secure Anonymised Information Linkage (SAIL) Databank [41]. The study data set included 8,932 responses. Unpaid carer is defined as a person who looks after, or gives any help or support to family members, friends, neighbours or others. Carer is used as a synonym in this study. After excluding responses with missing mental wellbeing, demographic or socio-economic information, 2,144 respondents self-identified as unpaid carers and formed our final study cohort.

3.2 Measures

Mental wellbeing

The outcome of interest, mental wellbeing was measured in the NSW using the self-reported Warwick-Edinburgh Mental Well-being Scale (WEMWBS), which is scored between 14 (lowest mental wellbeing score) and 70 (highest mental wellbeing score) [42]. Mean and percentiles of WEMWBS scores were used in the statistical analyses (see Section 3.3).

Caring intensity

Caring intensity is defined as the number of caring hours as reported in the NSW:

- Low : 1-19 hours per week
- Moderate : 20-49 hours per week
- High : 50 hours or more per week

Demographic and Socio-economic factors

NSW collated information from respondents on the following: demographics (including age and sex), and socio-economic factors (including economic status and highest educational qualification). We used income deprivation as a proxy to represent individual unpaid carer's income (See Box 1 in Appendix). To do this, we identified unpaid carers' geographic residence at the point of responding to the survey, using Lower Layer Super Output Areas (LSOA) in the Welsh Demographic Service dataset (WDSD) within the SAIL gateway, and subsequently obtained income deprivation data using the Welsh Index for Multiple Deprivation (WIMD) 2014 [43, 44].

3.3 Statistical analysis

We provided descriptive statistics with categorical variables (i.e. demographic and socio-economic factors) described using frequencies and percentages, and continuous variables (i.e. WEMWBS) described using the mean and standard deviation (SD). To understand the association between caring intensity and mental wellbeing, an ordinary least square (OLS) regression was performed to calculate average adjusted WEMWBS (using estimated marginal means) by controlling for demographic and socio-economic factors [45, 46]. We performed a similar analysis to explore the impacts of socio-economic position on average mental wellbeing. The overall model was assessed using the entire sample of unpaid carers in Wales, then stratified by caring intensity.

To explore the impact of socio-economic position on the mental wellbeing continuum, a quantile regression was used to calculate adjusted WEMWBS, with WEMWBS treated as a continuous variable. The use of quantile regression enabled us to explore the impact of socio-economic position on gradations of mental wellbeing, and examine how that association changed within the context of different caring intensities. Based on the continuous WEMWBS scale, the 15th percentile and the 85th percentile represented low and high mental wellbeing respectively [35]. We then set five percentile points (mental wellbeing low to high): Q1 (=15 percentile), Q2 (=32.5 percentile), Q3 (=50 percentile), Q4 (=67.5 percentile) and Q5 (=85 percentile) of WEMWBS in our sample. This approach is preferred when illustrating variation across the mental wellbeing continuum [38]. The overall model was assessed on the entire sample of unpaid carers in Wales across five percentile points, then stratified by caring intensity.

A p-value of <0.05 was considered statistically significant. To ensure the consistency of language through this report, we use 'significantly lower/higher/different' to describe statistically significant differences and 'similar' to indicate results that did not reach statistical significance.

4. What did we find?

4.1 Caring duties fall disproportionally on certain population groups

Overall, approximately 31.5% of the Welsh population aged 16+ years provided unpaid care[1]. Of them, more were female (59.7%) than male (40.3%). This is in line with estimates in England and Wales from the 2011 Census, which show that a higher proportion of women (57.7%) compared with men (42.3%) were unpaid carers [19, 47].

31.5% of the Welsh population aged 16+ years provided unpaid care

Most unpaid carers (76.7%) were providing low intensity care, i.e. less than 19 hours of care per week, and there was no significant difference in levels of caring intensity between men and women. By age group, those aged 45 to 64 years accounted for the largest proportion (43.1%) of unpaid carers (although this age group formed only 32.2% of the general population in Wales aged 16+ years [48]). A higher proportion of unpaid carers were living in the highest income areas compared to the lowest income areas (21.6% vs 15.2%, respectively). Of the unpaid carers in Wales, 49.5% reported being in paid work, and 56.8% had low levels of education (including no qualification). Summary statistics are shown in Table 1.

Table 1 Summary statistics of the population sample

	Total	
	N = 2144	
Age		
Mean (SD)	53.8	(16.2)
Warwick-Edinburgh Mental Well-being Scale - total score		
Mean (SD)	50.7	(9.1)
Sex		
Female	1280	(59.7%)
Male	864	(40.3%)
Age group		
16-44 years	593	(27.7%)
45-64 years	924	(43.1%)
65+ years	627	(29.2%)
Caring intensity (hours per week)		
1-19 hours	1645	(76.7%)
20-49 hours	219	(10.2%)
50+ hours	280	(13.1%)
In paid work		
Yes	1062	(49.5%)
No	1082	(50.5%)
Highest educational qualification		
NQF level 4 or above	927	(43.2%)
NQF level 3 or below	1217	(56.8%)
Income		
Most income deprived	326	(15.2%)
Mid income deprived	1354	(63.2%)
Least income deprived	464	(21.6%)

1 Weighted using mid-2016 Welsh population estimates for LSOAs by sex, age and WIMD quintile

4.2 Impact of caring status on mental wellbeing, by demographic factors

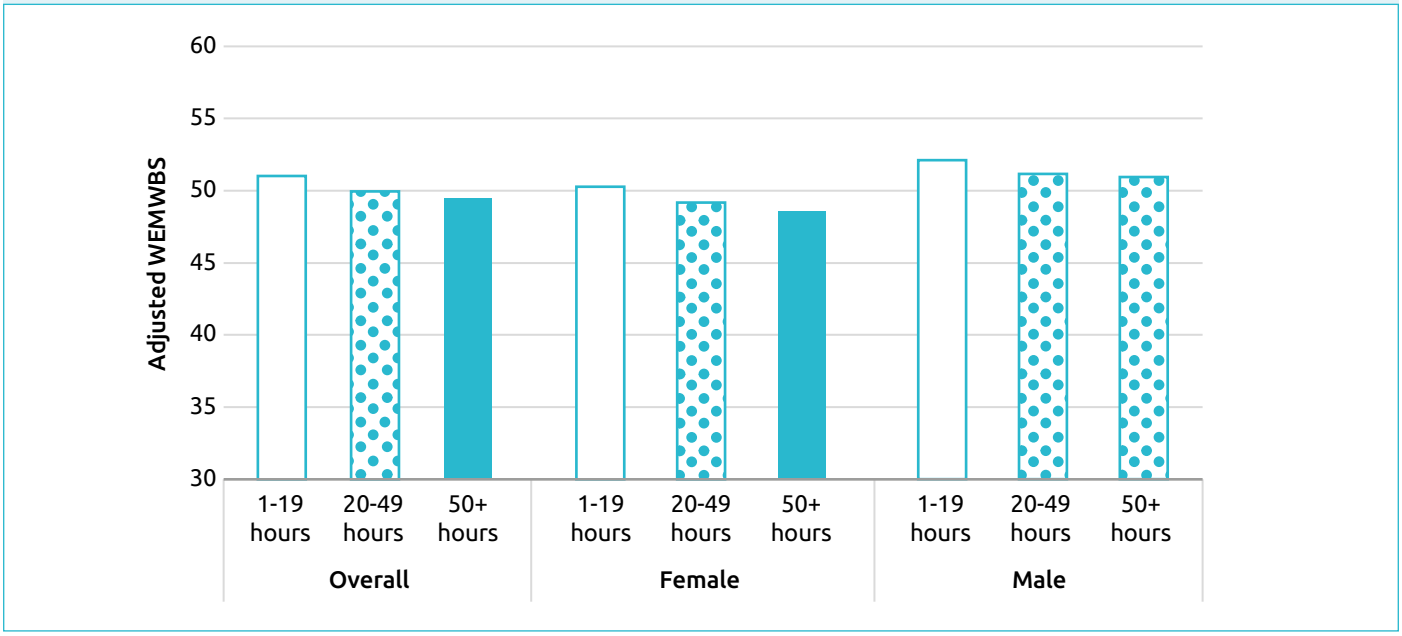
Overall, compared with unpaid carers who provided low intensity care, those who provided high intensity care experienced lower mental wellbeing (49.5 vs 51.0, p=0.01, Figure 1 and Table A1). Those who provided moderate intensity care reported similar mental wellbeing to those who provided low intensity care (adjusted WEMWBS 51.0 vs 50.0, p=0.11). However, this masks differences in the impact of caring intensity on mental wellbeing across demographic groups.

Sex

The pattern of poorer mental wellbeing with increasing caring intensity was only evident in females. Females providing high intensity care reported lower mental wellbeing compared to females providing low intensity care (adjusted WEMWBS 48.6 vs 50.3, p=0.03, Figure 1 and Table A1). Whereas amongst men, mental wellbeing was similar across all levels of caring intensity (high vs low, 51.0 vs 52.1, p=0.22; moderate vs low, 51.2 vs 52.1, p=0.38).

The pattern of poorer mental wellbeing with increasing caring intensity was only evident in females …

Figure 1 Mental wellbeing (adjusted WEMWBS) by sex and caring intensity (solid bars represent a statistical difference to the reference category low intensity care [unfilled bars]; patterned bars represent a non-significant difference [Table A1])

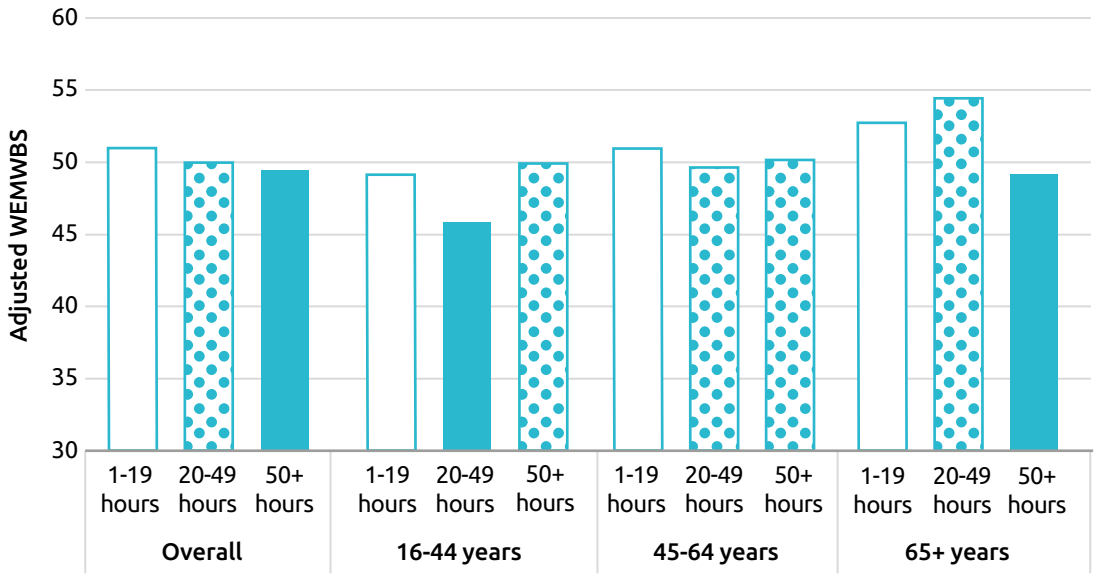


Age group

The impact of caring intensity on mental wellbeing also differed by age group. In the oldest age group (65+ years) those who provided high intensity care reported poorer mental wellbeing compared to those providing low intensity care (adjusted WEMWBS 49.2 vs 52.8, p<0.01, Figure 2 and Table A1).

Whereas, amongst the youngest unpaid carers (16 - 44 years) the impact on mental wellbeing was worse for those providing moderate intensity care, compared to low intensity care (45.9 vs 49.2, p= 0.01). In this age group, there was no significant difference in reported mental wellbeing between those providing low intensity care and those providing high intensity care (49.2 vs 50.0, p= 0.55). Unpaid carers aged between 45 and 64 with different levels of caring responsibilities experienced similar mental wellbeing (high vs low, 51.2 vs 51.0, p= 0.40; moderate vs low, 49.7 vs 51.0, p= 0.20).

Figure 2 Mental wellbeing (Adjusted WEMWBS) by age groups and caring intensity (solid bars represent a statistical difference to the reference category low intensity care [unfilled bars]; patterned bars represent a non-significant difference [Table A1]).



4.3 Impact of caring status on mental wellbeing, by socio-economic factors

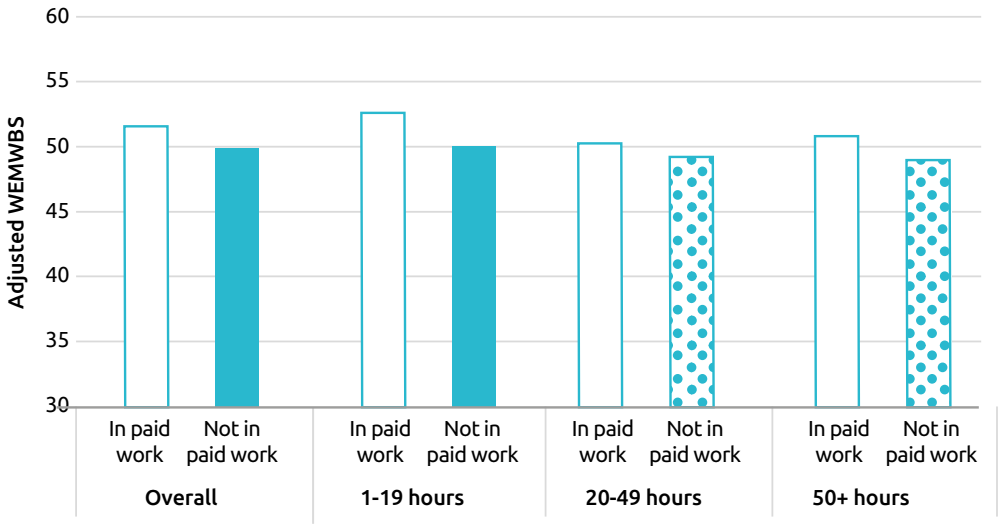
The differences in both average and gradations of mental wellbeing by economic status, level of education and income deprivation were explored. To explore the impact of socio-economic factors on gradations of mental wellbeing, five percentile points were selected in the WEMWBS distribution[2].

Employment

Overall, unpaid carers who were in paid employment reported higher mental wellbeing than those who were not in paid employment (51.5 vs 49.9, p<0.01, Figure 3 and Table A2). However, the effect was different depending on the level of care provided. Amongst those providing low levels of care (<19 hours per week), levels of mental wellbeing were lower in unpaid carers not in paid work compared to those who were in employment (50.0 vs 52.0, p<0.01, Figure 3 and Table A3). Amongst unpaid carers providing moderate (20-49 hours per week) and high (50+ hours per week) intensity care, those who were not in employment reported similar mental wellbeing than others, as the differences did not reach statistical significance (moderate intensity carers: 49.1 vs 50.1, p=0.52, Figure 3 and Table A4; high intensity carers: 48.7 vs 50.5, p=0.22, Figure 3 and Table A5).

2 Refer to Section 3.3 Statistical analysis.

Figure 3 Mental wellbeing (Adjusted WEMWBS) by economic employment status and caring intensity (solid bars represent a statistical difference to the reference category economically active [unfilled bars]; patterned bars represent a non-significant difference [Table A2 to Table A5]).



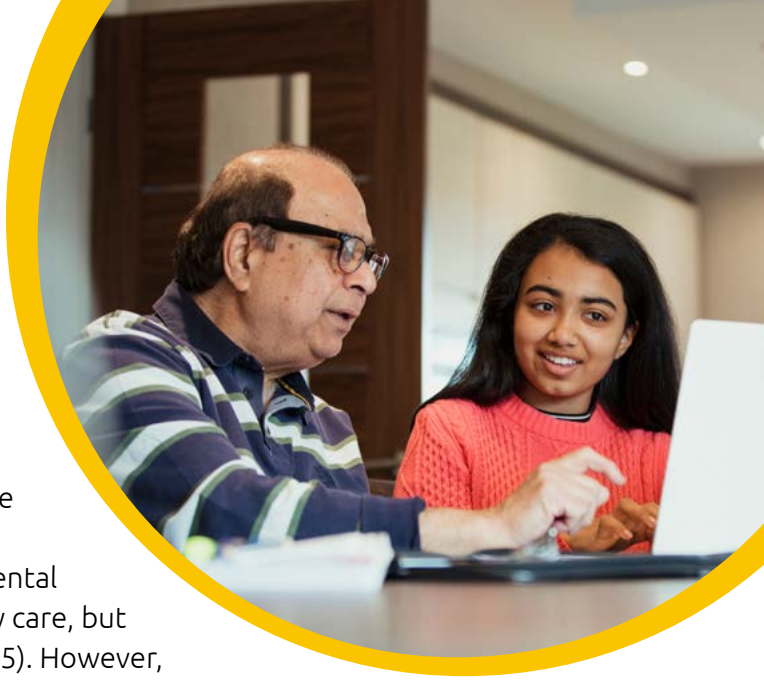
Comparing average mental wellbeing may mask discrepancies in the effect of employment across gradations of mental wellbeing. To address this, we further considered the impact of employment status across five percentiles of mental wellbeing ranging from low mental wellbeing (represented by the 15th percentile, Q1) to high mental wellbeing (represented by the 85th percentile, Q5).

Among unpaid carers providing high intensity care, those in paid work experienced higher mental wellbeing than unpaid carers who were not in employment at all five percentiles of mental wellbeing (i.e. in paid work vs not: 38.8 vs 42.8 at Q1, a difference of 4; 58.6 vs 59.1 at Q5, a difference of 0.5 Figure 4 and Table A5). This suggests a protective effect of employment on the mental wellbeing of those also providing high levels of care, in particular at the lower end of the mental wellbeing scores (Q1). The protective effect of being in paid employment reduced significantly as mental wellbeing increased (p=0.01, Figure 4).

Among unpaid carers providing low or moderate intensity care, those in paid employment reported higher mental wellbeing at all five percentiles than those who were not, suggesting a protective effect of paid employment on mental wellbeing. Unlike unpaid carers providing high intensity care, we observed a similar protective effect of paid employment on mental wellbeing across five percentiles for unpaid carers providing low (p=0.07, Table A3) or moderate intensity care (p=0.44, Table A4).

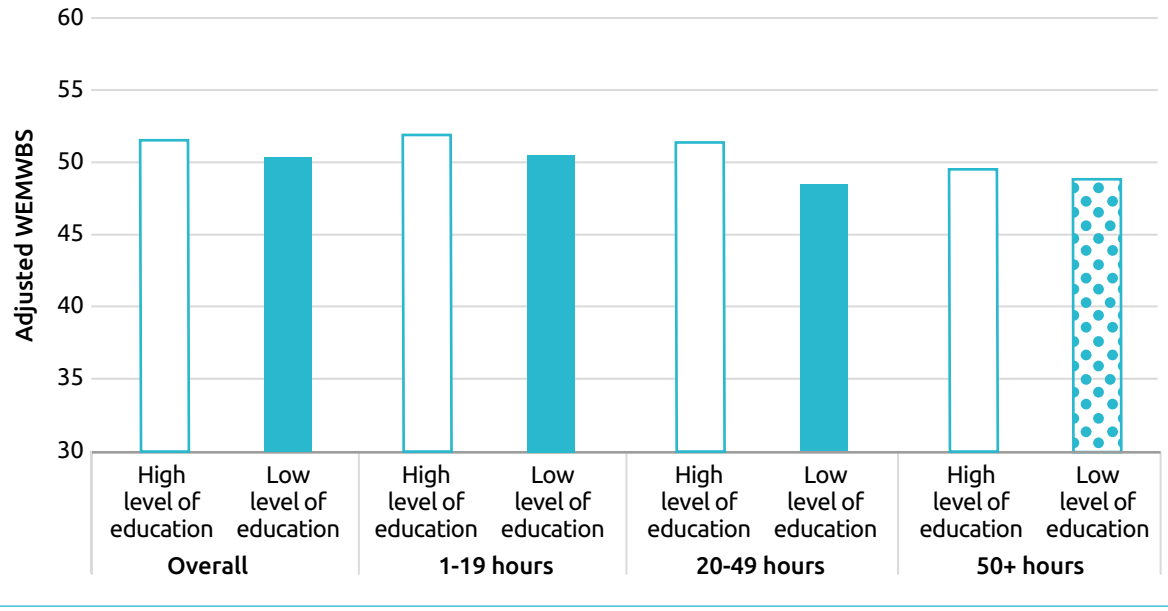
Figure 4 Mental wellbeing (adjusted WEMWBS) by percentiles and employment status among high intensity unpaid carers

Education



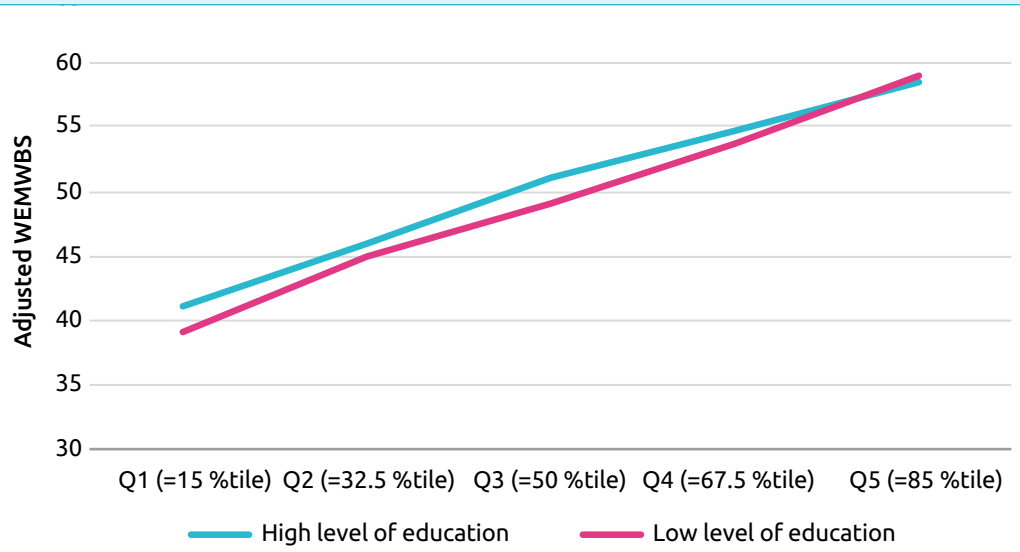
Overall, unpaid carers with low levels of education experienced worse mental wellbeing, compared to those with high levels of education (50.1 vs 51.6, p<0.01, Figure 5 and Table A2). The effect was different depending on the level of care provided. Amongst those providing low and moderate levels of unpaid care, levels of mental wellbeing were markedly lower in unpaid carers with low levels of education, but no statistically significant difference was evident in those providing high intensity care (Figure 5 and Table A3). In other words, higher education protected against low mental wellbeing in those providing low and moderate intensity care, but not amongst those providing high intensity care (Figure 5). However, this could have masked differences in the effect of education on gradation of mental wellbeing.

Figure 5 Mental wellbeing (adjusted WEMWBS) by educational level and caring intensity (solid bars represent a statistical difference to the reference category high level education [unfilled bars]; patterned bars represent a non-significant difference [Table A2 to Table A5]).



For unpaid carers with high intensity caring responsibilities, those with a high level of education reported higher mental wellbeing than those with a low level of education across mental health gradations except at the 85th percentile (Figure 6 and Table A5). This indicates a protective impact of education on mental wellbeing amongst unpaid carers providing high levels of care. However, the protective effect decreased as wellbeing improved (p=0.04, Figure 6). Unlike those with high intensity caring responsibilities, the protective effects of education stayed the same across five percentiles for unpaid carers providing low (p=0.57) or moderate (p=0.89) intensity care.

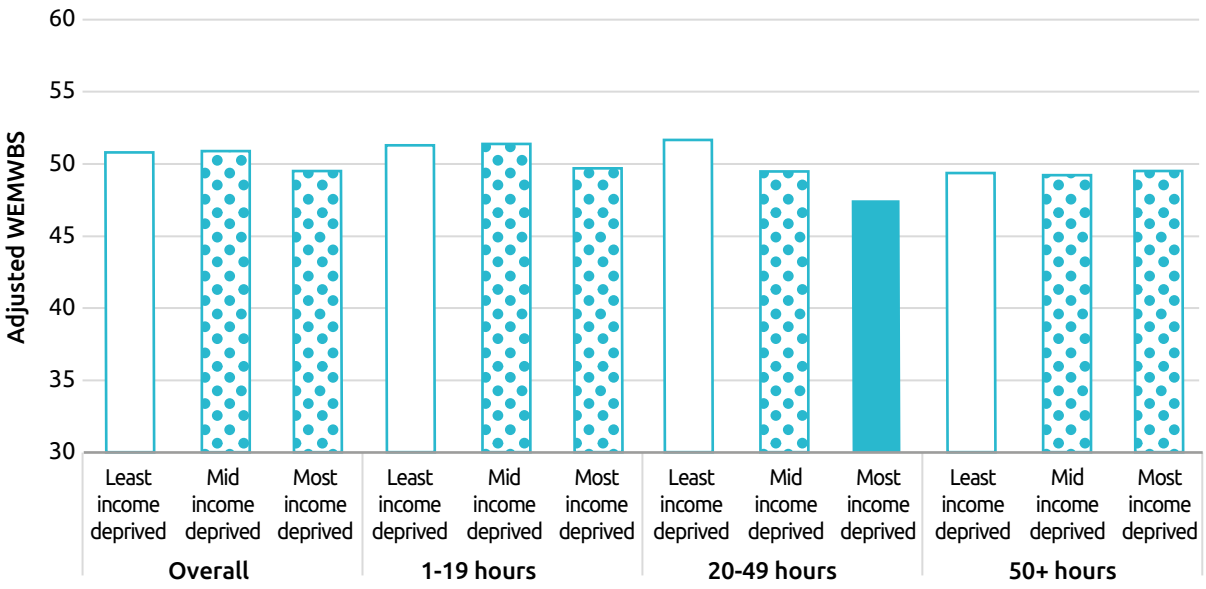
Figure 6 Mental wellbeing (Adjusted WEMWBS) by percentiles and educational level among high intensity unpaid carers



Income

Overall, unpaid carers who were living in more income deprived areas experienced similar mental wellbeing to those living in the least deprived areas, regardless of their caring intensity (Figure 7 and Table A2). The same patterns were observed for unpaid carers providing low and high intensity care. Whereas, among unpaid carers providing moderate intensity care, those living in the most income deprived communities experienced significantly worse mental wellbeing than the ones living in the least income deprived communities (47.5 vs 51.8, p=0.04, Figure 7 and Table A4).

Figure 7 Adjusted WEMWBS by income and caring intensity (solid bars represent a statistical difference to the reference category least income deprived [unfilled bars]; patterned bars represent a non-significant difference [Table A2 to Table A5]).



No overarching themes were observed while exploring the impact of income deprivation on gradations of mental wellbeing. A possible reason for this was due to use of an area deprivation, income deprivation quintile, as a proxy for individual level income, given the absence of individual/household income information.

5. What are the implications?

Using data from a large nationally representative survey sample, our findings provide an overview of the correlates of mental wellbeing amongst unpaid carers in Wales. We show that generally, high intensity care is negatively associated with mental wellbeing. But while females and those older (65+ years) are more likely to report poorer mental wellbeing when providing more than 50 hours of care per week (compared to those providing lower intensity care), this pattern does not hold for men or younger paid carers. This is in line with previous evidence from cross-European data on unpaid carers [3].

Looking at socio-economic variables, we also show that overall unpaid carers who are not in employment and those with low levels of education report significantly lower mental wellbeing compared to unpaid carers in employment or those with high levels of education. The negative association of both unemployment, and low educational attainment with poor average mental wellbeing was specifically seen for those who provide low and moderate intensity care, but not those providing more than 50 hours of care per week.

Existing research shows that socio-economic factors are important when looking at poor mental wellbeing but are less closely linked with good mental wellbeing in the general population [34, 35]. To understand if this may be relevant to unpaid carers, we applied a quantile regression modelling approach, to retain differences in caring experience that could have been lost by the selection of cut points to categorise levels of mental wellbeing [38]. This granularity allowed us to show that for high intensity carers, the relationship between both unemployment and low levels of education with poorer mental wellbeing is strongest amongst those with lower levels of mental wellbeing – in line with data from the general population.

These variations highlight that mental wellbeing among unpaid carers has a complex relationship with not only demographic and socio-economic factors but also the nature of the unpaid care that carers undertake. Qualitative evidence has also underscored the importance of considering the wellbeing of both the carer and the person receiving care, and how these are often closely linked [49]. Unfortunately, the survey data used in this study does not contain other information on this; data that may be relevant include details on the relationship between carer and the care-recipient, demographics of the care-recipient, the care-recipient's health condition and mental wellbeing, and the duration of care provision.

As mentioned, given this is a cross-sectional study, we are not able to determine causal relationships between caring intensity, socio-economic variables and mental wellbeing. But we know from other studies that unpaid carers experience barriers to entering and staying in education and employment. For example, our previous research showed that young unpaid carers are significantly less likely to be in full-time education, especially tertiary education, compared to their peers in Wales [33], and longitudinal data suggests this is a consequence of caring responsibilities [50]. Other studies have also reported that younger unpaid carers feel their education and employment choices are limited [51-53]. These findings contribute to the need for continued support for routes into education/employment amongst unpaid carers.

Given the variation in the relationships between caring intensity, demographic and socioeconomic factors, and mental wellbeing, a co-productive approach addressing the needs of unpaid carers is needed. This approach is particularly necessary for those providing high levels of care, in order to consider the many underlying factors which contribute to differences in mental wellbeing across unpaid carers.

5.2. Conclusion

The Welsh Government has recognised that action is needed to support unpaid carers and has launched a Strategy for unpaid carers [54]. Our findings provide useful evidence to support the development and implementation of this strategy, providing new in-depth understanding on mental wellbeing among unpaid carers, and how different groups of unpaid carers may be disproportionately affected. These findings highlight that addressing socio-economic factors such as low levels of education and employment are highly relevant to improving mental wellbeing among unpaid carers, in particular amongst those with the lowest levels of mental wellbeing. **Addressing barriers to education, retention of employment and good, fair employment is key to supporting unpaid carers in Wales.** Supporting unpaid carers in education and the workforce is one of the four priorities in the Strategy for Unpaid Carers [54]; here we give evidence of the wellbeing implications of addressing these issues and also highlight that effective action in this space needs to recognise the varied circumstances of unpaid carers, and how these impact on both the barriers to but also the possible benefits from employment.

Continued action to support unpaid carers to prevent worsening mental health is needed, including respite care, breaks from caring, and extending access to psychological support. These approaches can all have a beneficial impact on mental wellbeing [5, 51], but must be developed to ensure they support the wellbeing needs of those demographic groups that we have highlighted as being most likely to experience poor mental wellbeing [54]. A plan to fund a short-break respite scheme is included in Welsh Government's Programme for Government 2021-2026 [52], and Welsh Government have also accepted the recommendation from the Caring For Our Future inquiry to ensure equitable provision of this support [55, 56]. But these policies will have greatest benefit when co-produced, with an embedded evaluation approach to ensure that support is effective and reaches those in greatest need.

A remaining challenge is the lack of routinely collected data on caring status over time, limiting the ability to examine the large-scale longitudinal impacts of caring on unpaid carers, and generate robust evidence on how best to support this population. **Approaches to best capture routine data on unpaid carers are needed to help ensure the generation of insights at the right time to support local and national action.** This is being considered in the Strategy for Unpaid Carers [54], in terms of both the lack of data in this space due to the lack of systems to collect the information, but also unpaid carers themselves not recognising themselves as carers. Carers UK have reported on the impact of people not recognising themselves as unpaid carers [57]. But, given the highly varied circumstances and needs of unpaid carers, to most effectively use this data to support unpaid carers, information on caring should be linked to other data sources to ensure that the wider circumstances and impacts of unpaid care can be understood.

Ethical statement

This study is based on anonymised routinely collected electronic health records. All routinely collected anonymised data held in the SAIL Databank are exempt from consent due to the anonymised nature of the databank (under section 251, National Research Ethics Committee (NREC)). We have applied to and been granted approval by the independent Information Governance Review Panel (IGRP) for permission to conduct this study (project number 1213). The IGRP contains independent members from the NREC and the British Medical Association (BMA), as well as lay members. The review process has checked that the study is useful, not a service evaluation, and will not break anonymisation standards.

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Appendix

Box 1: Measures of demographic information, caring intensity, mental wellbeing and socio-economic position

Measure	Source	Derived variable
Mental wellbeing	Consisted of 14 positively worded questions (for further information see NSW questionnaire [39] and WEMWBS website [58])	WEMWBS: Scaled between 14 and 70
Caring intensity	Unpaid carers - look after, or give any help or support to family members, friends, neighbours or others.	Caring intensity (hours/week): Low (1-19 hours) Moderate (20-49 hours) High (50+ hours)
Age	Age at time of interview	Age group: 16-44 years 45-64 years 65+ years
Sex	Sex	Female Male
In paid employment	Respondent currently in paid work (either full-time or part-time)	Yes No
Education	Highest qualification under National Qualification Framework (NQF)	NQF level 4 or above (high educational qualification) NQF level 3 or below (low educational qualification)
Income deprivation	Information obtained through Welsh Demographic Service dataset (WDSD).	Most income deprived (Q1) Mid income deprived (Q2, Q3 and Q4) Least income deprived (Q5)

Data analysis were undertaken using Stata version 16.1.

Table A1 Adjusted WEMWBS by caring intensity and demographic factors for all carers (N=2144)

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	WEMWBS Q1(=15.0%)	WEMWBS Q2(=32.5%)	WEMWBS Q3(=50.0%)	WEMWBS Q4(=67.5%)	WEMWBS Q5(=85.0%)
Overall (N=2144)						
1-19 hours	51.02	42.28	48.29	51.72	55.24	59.42
	[50.59,51.45]	[41.47,43.08]	[47.71,48.88]	[51.24,52.20]	[54.74,55.73]	[58.83,60.02]
20-49 hours	49.98	**40.28**	**45.29**	**51.22**	**55.24**	**60.42**
	[48.80,51.16]	[38.08,42.48]	[43.69,46.90]	[49.90,52.54]	[53.89,56.59]	[58.79,62.05]
50+ hours	**49.52**	**40.28**	**45.29**	**49.22**	**54.24**	**59.42**
	[48.45,50.58]	[38.29,42.27]	[43.84,46.75]	[48.02,50.41]	[53.02,55.46]	[57.95,60.90]
Sex Female (N=1280)						
1-19 hours	50.28	41.29	47.04	50.64	55.04	59.41
	[49.70,50.86]	[40.20,42.37]	[46.30,47.78]	[49.96,51.31]	[54.26,55.81]	[58.54,60.27]
20-49 hours	**49.16**	**39.95**	**44.04**	**50.14**	**54.04**	**58.41**
	[47.69,50.64]	[37.20,42.71]	[42.17,45.91]	[48.42,51.85]	[52.08,55.99]	[56.22,60.60]
50+ hours	**48.60**	**39.29**	**45.04**	**48.14**	**53.04**	**58.41**
	[47.24,49.96]	[36.74,41.83]	[43.31,46.76]	[46.56,49.71]	[51.23,54.84]	[56.39,60.43]
Male (N=864)						
1-19 hours	52.12	44.34	49.81	53.07	55.80	59.91
	[51.48,52.75]	[43.29,45.40]	[48.94,50.68]	[52.38,53.76]	[55.09,56.51]	[59.07,60.74]
20-49 hours	**51.18**	**39.34**	**47.81**	**51.74**	**55.80**	**62.91**
	[49.21,53.15]	[36.08,42.61]	[45.11,50.50]	[49.60,53.87]	[53.60,58.01]	[60.33,65.48]
50+ hours	**50.95**	**41.34**	**45.81**	**50.74**	**55.80**	**60.91**
	[49.23,52.68]	[38.49,44.20]	[43.45,48.17]	[48.87,52.60]	[53.87,57.73]	[58.65,63.16]
Age group 16-44 years (N=593)						
1-19 hours	49.19	40.08	45.39	49.52	53.57	58.09
	[48.37,50.01]	[38.62,41.53]	[44.37,46.40]	[48.49,50.55]	[52.65,54.49]	[56.84,59.34]
20-49 hours	45.91	34.08	43.39	46.52	50.57	55.09
	[43.57,48.24]	[29.93,38.22]	[40.50,46.27]	[43.60,49.44]	[47.96,53.17]	[51.54,58.64]
50+ hours	49.99	44.08	46.39	51.52	54.07	58.09
	[47.55,52.43]	[39.74,48.41]	[43.37,49.41]	[48.47,54.57]	[51.34,56.79]	[54.38,61.80]
45-64 years (N=924)						
1-19 hours	50.98	42.42	47.80	51.48	55.45	59.97
	[50.31,51.65]	[41.11,43.72]	[46.85,48.76]	[50.74,52.22]	[54.65,56.25]	[59.00,60.93]
20-49 hours	49.74	39.42	44.80	50.48	54.95	59.97
	[47.98,51.49]	[36.02,42.82]	[42.31,47.29]	[48.56,52.40]	[52.86,57.03]	[57.46,62.48]
50+ hours	50.18	40.42	46.80	51.48	54.95	61.97
	[48.46,51.90]	[37.09,43.75]	[44.36,49.24]	[49.60,53.36]	[52.91,56.99]	[59.51,64.43]
65+ years (N=627)						
1-19 hours	52.80	45.20	49.87	53.34	56.33	61.04
	[52.04,53.55]	[43.87,46.53]	[48.99,50.75]	[52.50,54.17]	[55.37,57.30]	[60.03,62.04]
20-49 hours	**54.52**	**44.20**	**50.87**	**56.34**	**59.33**	**63.04**
	[52.37,56.68]	[40.42,47.99]	[48.37,53.38]	[53.96,58.71]	[56.59,62.08]	[60.17,65.90]
50+ hours	49.21	41.20	44.87	48.34	53.33	58.04
	[47.64,50.79]	[38.42,43.98]	[43.04,46.71]	[46.59,50.08]	[51.32,55.35]	[55.93,60.14]

N reports number of observations. Adjusted WEMWBS in bold are statistically significant (p<0.05) compared to reference group (adjusted for socio-economic factors). 95% confidence interval in brackets

Table A2 Adjusted WEMWBS by socio-economic factors for all carers (N=2144)

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	WEMWBS Q1(=15.0%)	WEMWBS Q2(=32.5%)	WEMWBS Q3(=50.0%)	WEMWBS Q4(=67.5%)	WEMWBS Q5(=85.0%)
In paid work						
Yes	51.50	43.72	48.55	51.82	55.58	59.52
	[50.91,52.08]	[42.63,44.81]	[47.75,49.34]	[51.16,52.47]	[54.92,56.25]	[58.72,60.33]
No	**49.86**	**39.72**	**46.55**	**50.82**	**54.58**	**59.52**
	[49.24,50.47]	[38.57,40.87]	[45.71,47.39]	[50.12,51.51]	[53.88,55.29]	[58.67,60.38]
Highest educational qualification						
NQF level 4 or above	51.55	42.95	48.73	52.19	55.68	60.09
	[50.98,52.13]	[41.87,44.03]	[47.94,49.52]	[51.54,52.84]	[55.01,56.34]	[59.29,60.89]
NQF level 3 or below	50.08	**40.95**	**46.73**	**50.69**	**54.68**	**59.09**
	[49.57,50.58]	[40.01,41.89]	[46.05,47.42]	[50.13,51.26]	[54.10,55.25]	[58.40,59.79]
Income						
Least income deprived	50.80	41.49	47.75	51.42	55.26	59.68
	[49.99,51.61]	[39.97,43.00]	[46.64,48.86]	[50.50,52.33]	[54.33,56.19]	[58.55,60.80]
Mid income deprived	50.94	42.49	47.75	51.42	55.26	59.68
	[50.47,51.41]	[41.61,43.37]	[47.10,48.39]	[50.89,51.95]	[54.72,55.80]	[59.02,60.33]
Most income deprived	49.66	39.49	46.75	50.92	54.26	58.68
	[48.68,50.63]	[37.66,41.32]	[45.41,48.08]	[49.82,52.02]	[53.14,55.38]	[57.32,60.03]

N reports number of observations
Adjusted WEMWBS in bold are statistically significant (p<0.05) compared to reference group (adjusted for sex and age)
95% confidence interval in brackets

Table A3 Adjusted WEMWBS by socio-economic factors for low intensity carers (N=1645)

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	WEMWBS Q1(=15.0%)	WEMWBS Q2(=32.5%)	WEMWBS Q3(=50.0%)	WEMWBS Q4(=67.5%)	WEMWBS Q5(=85.0%)
In paid work						
Yes	51.95	44.39	49.58	52.16	55.59	60.02
	[51.34,52.55]	[43.09,45.69]	[48.74,50.41]	[51.50,52.82]	[54.82,56.35]	[59.23,60.81]
No	**50.01**	**40.39**	**46.58**	**51.16**	**54.59**	**59.02**
	[49.27,50.75]	[38.79,41.99]	[45.55,47.60]	[50.35,51.98]	[53.65,55.53]	[58.05,59.99]
Highest educational qualification						
NQF level 4 or above	51.91	43.55	49.43	52.85	55.72	60.15
	[51.29,52.54]	[42.20,44.90]	[48.57,50.29]	[52.16,53.53]	[54.93,56.51]	[59.34,60.97]
NQF level 3 or below	50.51	**42.05**	**47.43**	**50.85**	**54.72**	**59.15**
	[49.95,51.08]	[40.84,43.27]	[46.65,48.21]	[50.23,51.47]	[54.01,55.44]	[58.42,59.89]
Income						
Least income deprived	51.08	42.04	48.46	51.88	55.44	59.74
	[50.21,51.96]	[40.15,43.92]	[47.25,49.67]	[50.92,52.84]	[54.33,56.55]	[58.59,60.88]
Mid income deprived	51.46	43.54	48.46	51.88	55.44	59.74
	[50.94,51.98]	[42.42,44.65]	[47.75,49.18]	[51.31,52.45]	[54.78,56.10]	[59.06,60.41]
Most income deprived	49.72	40.04	47.46	50.88	53.44	58.74
	[48.57,50.87]	[37.57,42.51]	[45.88,49.05]	[49.62,52.14]	[51.99,54.90]	[57.24,60.23]

N reports number of observations
Adjusted WEMWBS in bold are statistically significant (p<0.05) compared to reference group (adjusted for sex and age)
95% confidence interval in brackets

Table A4 Adjusted WEMWBS by socio-economic factors for moderate intensity carers (N=219)

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	WEMWBS Q1(=15.0%)	WEMWBS Q2(=32.5%)	WEMWBS Q3(=50.0%)	WEMWBS Q4(=67.5%)	WEMWBS Q5(=85.0%)
In paid work						
Yes	50.10	40.52	46.03	50.35	54.43	60.44
	[48.06,52.14]	[37.18,43.86]	[42.90,49.16]	[47.86,52.83]	[51.43,57.42]	[58.51,62.37]
No	49.13	37.52	45.53	**50.35**	**54.23**	**59.19**
	[47.30,50.95]	[34.54,40.51]	[42.73,48.33]	[48.12,52.57]	[51.55,56.91]	[57.46,60.92]
Highest educational qualification						
NQF level 4 or above	51.48	41.29	47.26	52.16	56.49	61.87
	[49.47,53.50]	[37.98,44.59]	[44.16,50.36]	[49.69,54.62]	[53.52,59.46]	[59.95,63.78]
NQF level 3 or below	**48.30**	37.29	44.76	49.16	52.89	**58.37**
	[46.67,49.93]	[34.62,39.95]	[42.27,47.26]	[47.17,51.14]	[50.50,55.28]	[56.83,59.91]
Income						
Least income deprived	51.81	40.91	51.61	52.62	55.09	58.96
	[48.80,54.82]	[35.98,45.84]	[46.99,56.23]	[48.94,56.29]	[50.67,59.52]	[56.10,61.81]
Mid income deprived	49.56	38.91	**44.61**	49.62	54.29	60.71
	[47.98,51.15]	[36.32,41.50]	[42.18,47.04]	[47.69,51.55]	[51.97,56.62]	[59.21,62.21]
Most income deprived	**47.54**	36.91	**44.11**	50.62	53.69	57.46
	[44.70,50.37]	[32.28,41.55]	[39.76,48.46]	[47.16,54.07]	[49.53,57.86]	[54.77,60.14]

N reports number of observations
Adjusted WEMWBS in bold are statistically significant (p<0.05) compared to reference group (adjusted for sex and age)
95% confidence interval in brackets

Table A5 Adjusted WEMWBS by socio-economic factors for high intensity carers (N=280)

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	WEMWBS Q1(=15.0%)	WEMWBS Q2(=32.5%)	WEMWBS Q3(=50.0%)	WEMWBS Q4(=67.5%)	WEMWBS Q5(=85.0%)
In paid work						
Yes	50.54	42.76	47.52	50.43	55.49	59.11
	[47.96,53.13]	[38.52,46.99]	[43.85,51.20]	[46.96,53.90]	[52.42,58.55]	[54.73,63.49]
No	48.68	38.76	44.52	**49.43**	**53.49**	**58.61**
	[47.35,50.00]	[36.58,40.93]	[42.64,46.41]	[47.65,51.21]	[51.91,55.06]	[56.36,60.86]
Highest educational qualification						
NQF level 4 or above	49.46	40.96	45.85	50.94	54.59	58.40
	[47.47,51.46]	[37.69,44.23]	[43.02,48.69]	[48.26,53.62]	[52.22,56.95]	[55.02,61.79]
NQF level 3 or below	48.90	38.96	44.85	48.94	53.59	58.90
	[47.45,50.36]	[36.57,41.34]	[42.78,46.93]	[46.99,50.90]	[51.86,55.31]	[56.43,61.37]
Income						
Least income deprived	48.98	37.89	44.40	48.62	53.28	61.72
	[46.23,51.72]	[33.40,42.39]	[40.50,48.30]	[44.94,52.30]	[50.03,56.53]	[57.07,66.38]
Mid income deprived	48.84	40.89	45.40	49.62	53.28	57.22
	[47.36,50.32]	[38.47,43.32]	[43.29,47.50]	[47.64,51.61]	[51.53,55.03]	[54.71,59.73]
Most income deprived	49.92	37.89	45.40	50.62	56.28	60.22
	[47.38,52.45]	[33.74,42.04]	[41.79,49.00]	[47.22,54.02]	[53.28,59.28]	[55.93,64.52]

N reports number of observations
Adjusted WEMWBS in bold are statistically significant (p<0.05) compared to reference group (adjusted for sex and age)
95% confidence interval in brackets

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