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Disability Benefits for Older People: How Does the UK Attendance Allowance System Really Work?

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Non-technical summary

In many countries, public systems of support for disabled older people are under pressure and there is active policy debate on the reform of existing systems of long-term care. In the UK, there are two parallel systems of support: commissioning (subject to a needs assessment) of home care services by local authorities; and a system of cash benefits (Attendance Allowance) claimable by all who satisfy an assessment of need arising from disability. Recommendations for the diversion of resources from cash benefits have been made in the independent Wanless report and the 2009 government Green Paper on social care. We argue that, before a fully-informed decision can be made on the future of Attendance Allowance, it is important to understand fully how the system works in terms of its actual delivery of benefit to people in different circumstances, rather than its stated rules and aims. This study attempts to do so, using data from the UK Family Resources Survey for the three years 2002/3-2004/5.

Attendance Allowance is, in principle, available to everyone over the age of 65 with substantial care needs arising from physical or mental impairment. It can be paid at a lower rate for those needing care either day or night, or at a higher rate if the need for care is both day and night. Our difficulty is that the observed pattern of receipt is the outcome of two processes: (i) the decision by individuals to make a claim or not; and (ii) the process of deciding the outcomes of claims and maintaining or uprating awards in payment. Although available data sources do not allow us to disentangle these two processes fully, we show that some aspects of these two decision processes can be inferred from survey data on benefit receipt.

The pattern of receipt of Attendance Allowance shows that the system mimics a means-tested benefit to some degree, in the sense that there is higher probability and level of receipt for low-income people. This occurs for two reasons: the higher incidence and severity of disability among poorer people and the lower propensity of higher-income people to claim Attendance allowance, at any given level of disability.

The aims and rules of the Attendance Allowance system lead us to expect that, for a recipient of Attendance Allowance, the odds of receiving higher-rate payment will depend only on the extent of care needs. Instead, we find that it also depends significantly on income, the type of disability and age. First, poorer people are more likely to receive higher-rate awards, possibly because of their stronger incentive to apply for uprating of the award as disability worsens over time. Second, there is evidence of a strong systemic bias in favour of claimants with physical rather than cognitive disability, given similar care needs (as measured by reported receipt of care). Third, older people receiving Attendance Allowance are less likely to be receiving the higher-rate payment than similarly disabled younger people, possibly arising from the implicit use of age-related norms by programme administrators, or from a failure of the system to uprate claims as care needs increase over time. It is estimated that removal of this bias against older claimants would add 4-5% to the total cost of Attendance Allowance payments to the household sector.

We have also been able to isolate some of the influences on claim behaviour, besides the obvious ones of income, age and disability. The most important of these is owner-occupation, which brings a substantially lower propensity to claim Attendance Allowance – by up to a third for people with moderate levels of disability. We speculate that this effect is due to the different social norms and weaker access to information and advisory systems among property-owners.

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Abstract

We analyse FRS survey data on the relationship between disability and receipt of the Attendance Allowance (AA) disability benefit by older people. Despite being non-means-tested, we find that AA is implicitly income-targeted and strongly targeted on those with care needs. We focus particularly on the receipt of higher-rate benefit, intended for those in need of day-and-night care, finding that, in practice, higher-rate payments are negatively related to age and income, in addition to care needs. The allocation of higher-rate AA awards strongly favours people with physical rather than cognitive disabilities.

Keywords: Disability benefits; welfare participation; Attendance Allowance; FRS

JEL codes: C14, I18, I38

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1 Introduction

In much of the developed world, systems for provision of social support for the older disabled population are under pressure. Aggregate costs are rising with the growth in need associated with population ageing and there is growing debate about the level, distribution and form that public provision should take (Bound and Burkhauser 1999, McVicar 2008). In the UK, the debate has centred on reform of the social care system, with the possibility of diverting public resources from cash benefits to extended local provision of care services (Wanless 2006, DH 2009).[1] Cash benefits have the advantage that they allow individual choice and flexibility and their existence alongside direct state provision commissioning of services gives a second route by which support may be found, so that risk for disabled individuals is reduced by diversification (Hancock et al 2009a). An important issue is the effective targeting of cash benefits, in terms of their distribution across income and disability groups, and the way that pattern differs from the stated aims underlying the design of the system. The consequences of a reform of the current system cannot be considered fully until the operation of the system is better understood.

Observation of the pattern of actual benefit receipt and non-receipt across the income-disability distribution confounds two behavioural processes: the decisions of disabled individuals to claim or not to claim; and the programme administration process leading to claim outcomes. Every conceivable source of data has deficiencies for analytical purposes. The household survey data used here do not give a full account of the information supplied to programme administrators on AA application forms, nor do they tell us about unsuccessful claims. Similarly, the administrative records of the AA system, were they available, would only give basic information on benefit payments, with little or no information on the household context underlying claim decisions – including income, assets, education, etc. Register data also do not tell us anything about unsuccessful claims or potential claims which were

[1] In the UK, local provision can take the form of personal budgets for the purchase of care services.

never pursued. Matched administrative-survey data may reduce the impact of measurement error in survey reports of benefit receipt, but they are not yet available in the UK and, in any case, introduce the issue of consent bias, which is difficult to deal with convincingly.

Any programme of disability benefit is inherently uncertain in its operation. The concepts of disability and need are hard to define and impossible to translate into an unambiguous set of formal eligibility rules similar to those used to administer income-related benefits. This implies far greater scope for judgement, both from claim decision makers in assessing claims for disability-related benefits and from claimants in constructing the strongest possible case. There is a consequent element of uncertainty in disability benefit administration, and the identical claim, pursued by different applicants or processed by different administrators, may lead to different outcomes. From the point of view of potential claimants, disability benefit systems share some aspects of a lottery and uncertainty is an inherent part of the claims process. In the case of the UK's Attendance Allowance system studied here, this has been highlighted by official reports on the benefit system: "the rules for deciding entitlement to these benefits are based on a range of subjective tests that require the decision-maker to reach conclusions based on the evidence available. There is therefore scope for different interpretations in apparently similar cases" (NAO 2001, page 55). No direct evidence is available on error in AA decisions, but the evidence for DLA suggests considerable scope for error in disability need assessments. For example, a recent DWP analysis of a random sample of applications for DLA found a 19.1% rate of errors not involving fraud (DWP 2005, Tables 2 and 4).[2]

Attendance Allowance (AA) is a programme of tax-free financial support for people resident in Great Britain and aged 65 or over, "with an illness or disability who need help with

[2]Of which 12.5% involved overpayment and 6.6% underpayment. The bulk of this error involved a failure to detect or be notified of changed circumstances. Note that this analysis applied to the whole age range of DLA recipients, not the subset of older claimants.

personal care". There is no income- or asset-related eligibility condition and such information is not requested during the application process. Entitlement to AA is, in principle, judged purely on grounds of need arising from physical or mental impairment. Specifically (DWP 2009):

> "To get Attendance Allowance, your disability must be severe enough for you to need any of the following:
>
> - help with things such as washing (and getting in or out of the bath or shower), dressing, eating, getting to and using the toilet, or communicating your needs
> - supervision to avoid putting yourself or others in substantial danger, for example, needing someone to keep an eye on your medical condition or diet, or because you cannot control the way you behave
> - someone with you when you are on dialysis"

This emphasis on need implies that, except for the minimum age restriction, entitlement should be independent of income, age and other personal characteristics and behaviour. However, information including gender, living arrangements and age which are, in principle, irrelevant, can be read or deduced from the AA application form and used by programme administrators, consciously or unconsciously. Some other circumstances (such as the existence of a formal diagnosis, use of medication and receipt of care services) are not formally required for eligibility but are elicited by the claim form as a means of demonstrating the strength of a case. DWP decision makers are generally not medically qualified, but are guided in their decision-making by a computerised assessment system[3] based on an official handbook (DSS 1998) which lists the "care needs [...] likely to arise from various disabilities and chronic illnesses". In addition to the information contained in the AA application form, applicants are invited to include a supporting statement from a carer, doctor or other relevant person. DWP claim decision makers may also require a medical examination carried out at home by a DWP contractor. The aim of these examinations is to assess care needs arising from disability, rather than diagnosis of disability itself. They are relatively uncommon: DWP does not release figures on the use of medical examinations in AA assessment but, in 2001, the

[3]See http://www.dwp.gov/publications/specialist-guides/medical-conditions/a-z-of-medical-conditions/.

National Audit Office reported a figure of 16% (NAO 2001, appendix 7).[4] The AA system permits unsuccessful applicants to request a reconsideration of the claim by DWP; if that fails, they can invoke an appeal system administered by external tribunals. In 2002/3, 22% of new claims were rejected by DWP but 11% of new awards during that period were made following a request for reconsideration or on appeal (DWP 2008). The success rate on appeal has generally been in the region of 40-50%. A majority of successful appeals (72% in 2002/3) involve the production of new supporting evidence but many also involve the tribunal taking a different view of the existing non-medical (42%) or medical (24%) evidence (NAO 2003, page 22). This suggests that uncertainty arises on both sides of the AA claim: applicants are uncertain about how to present their evidence of eligibility and often fail to do so effectively at the first attempt; and there is variation across cases in the way that evidence is considered and interpreted by DWP decision makers.

Our aim here is to identify the influences on claim outcomes and determine whether those outcomes display the eligibility-irrelevance of certain personal characteristics which is implied by the stated aims and rules of the benefit system. A second aim is to identify what can be learned about the behaviour of potential claimants, from the pattern of AA receipt we observe in survey data, without making strong a priori assumptions.

We exploit two features of the AA system: that it can be paid at either of two alternative rates, depending on the nature of assessed need; and that only a general application for AA is made by the claimant – not an application for a specific rate of benefit. DWP guidance (DWP 2009) states that the criterion for eligibility at the lower rate is:

> "if you need help with personal care frequently or supervision continually throughout the day only, help with personal care or someone to watch over you during the night only, or someone with you when you are on dialysis"

For the higher rate:

[4]The definitional basis of the NAO figure is unclear, however.

> "if you need help with personal care, or someone to supervise or watch over you frequently throughout the day and also during the night"

However, the ambiguity of the concept of "need" means that it is difficult to disentangle continuity of need from severity – for example, the case of someone who has a great need of occasional care, and also milder need for continuous care, may or may not be regarded as deserving of AA at the higher rate.

The relationship between receipt of formal care services and receipt of AA is potentially problematic, since causation could flow in both directions. The actual receipt of care can act as evidence of the existence of care needs and may thus help establish entitlement to AA, but it is also possible that receipt of additional income from AA makes it possible to purchase care. We argue that it is a priori unlikely that AA payment has a significant causal impact on whether care is actually received, for four reasons. First, AA payments can be used for any purpose and there is no requirement for care actually to be received, either before or after the award of AA, so there is no automatic causal link between AA and use of care services. The limited qualitative research that exists (Age Concern 2008) suggests that, in practice, AA is used for a wide range of purposes (including use of taxis, purchase of mobility aids, etc) which are not classed as care services.[5] Second, in practice most care is not paid for and is provided informally by members of the disabled person's family and friends[6]. Third, the proportion of AA recipients actually receiving paid-for care services is low.[7] Fourth, AA benefit rates are modest relative to the cost of care services, so it is unlikely that AA will determine whether or not the individual is able to buy any care services, particularly in high-dependency cases. For example, in 2007/8 the two AA rates were £43.15 and £64.50

[5]Local Authorities (LAs) are permitted to use AA receipts as part of the income calculation for means-testing of LA care services, but they are required to make allowance for the additional costs of disability. As a result, some LAs disregard AA as a component of income. AA receipt is not permitted to determine eligibility for care services.

[6]For example, of FRS over-65 respondents receiving care, around two-thirds receive only informal care

[7]Only around a quarter of FRS respondents reporting receipt of AA also report receipt of care services which might involve payment.

per week.[8] Expressed in relation to the cost of care services – approximately £19.30 per hour for domiciliary services (Curtis 2009, page 38) – they would be sufficient to purchase only 2.2 and 3.3 weekly hours of care services respectively. Curtis (2009, pages 39-41) gives a range of typical examples of total weekly care costs, including a low-cost case (4 hours of LA care + 3 hours private care) costing £118, a median case (10 hours of LA care) at £193 and a high-cost example (10 hours LA care + 1 day at a day centre + 24 hours private care) at £732. At high levels of dependency, AA receipts are dwarfed by these levels of cost, so the receipt of AA is highly unlikely to influence whether or not day-and-night care is received. For these reasons, we treat receipt of care as predetermined in our analysis of AA receipt, although we also give results from a parallel analysis that excludes care variables – with only minor changes in the conclusions.

AA awards can be made for a fixed or indefinite term, following a 6-month waiting period from the documented date of onset of need.[9] Recipients are required to notify DWP of any change in their circumstances and occasional checks are made by DWP on the eligibility of long-term AA recipients. At the end of a fixed-term award, a claim for continuation can be made, and applications can be made at any time for uprating of an award from low- to high-rate payment, if the level of need changes.

There exist other disability benefits relevant to older people. Disability Living Allowance (DLA) can be claimed initially only by people under the age of 65, but receipt of DLA can then be continued past age 65 and there is no transfer of DLA claimants onto AA at age 65. A claim for DLA cannot be initiated after the age of 65. To avoid complications associated with the long duration of many episodes of DLA receipt, we exclude from our analysis all individuals who receive DLA rather than AA. Income from the AA programme is ignored when assessing the individual's eligibility for other means-tested benefits (such as Pension

[8] These rates relate to the latest period for which care costs are available; the rates for 2010/11 are £47.80 and £71.40

[9] An exception is made for applicants with terminal illnesses, for whom awards can start immediately.

Credit, Housing Benefit and Council Tax Benefit), but receipt of AA can trigger higher needs assessments for these benefits. We do not model this indirect benefit entitlement directly, but instead use original income (income from pensions, savings and other sources, excluding disability and means-tested benefits) as our measure of household resources.

The pattern of AA receipt is the joint outcome of decisions made by potential claimants on whether to pursue their uncertain claims and the assessment (and appeal and subsequent monitoring) process applied to those claims that do come forward. It is not immediately obvious what can be inferred about the nature of the two processes from observation of their joint outcome alone. In the absence of fully informative data, we ask what can be learned from the partial data that are available: a problem of partial identification (Manski 2003). We do not pursue Manski's line of estimating bounds on the primitives of the processes of claim-making and claim-adjudication[10] but instead ask what aspects of these processes can be identified exactly with the type of dataset available to us.

Disability status is measured in survey data by a vector of ordinal variables D, where $D = 0$ indicates absence of impairment. Receipt of disability benefit is recorded by a trichotomous variable $R \in \{0, 1, 2)$ indicating non-receipt and the two levels of receipt, respectively. We do not observe unsuccessful claims. Other variables relevant to the assessment of entitlement or to claims behaviour are in two groups. Personal and household circumstances which influence the propensity to make a claim but do not influence entitlement decisions by programme administrators appear in a vector Z. Information which may influence both claim and entitlement decisions is represented by a vector of variables X.

The probability of at least one claim having been made by an individual with disability level $D = d$ and personal characteristics and circumstances $(X, Z) = (x, z)$ is written $P_c(d, x, z)$. The eligibility probability, $P_e(r|d, x)$, is the probability that, conditional on a

[10] See Pudney (2009) for an application of the bounds approach in this context, under stronger assumptions.

claim having been made, it was upheld and in payment at rate $R = r$, conditional on disability $D = d$ and other factors relevant to the adjudication process, $X = x$. Assuming that there are no unobserved confounding factors linking claimants' behaviour and the adjudication process, the probability of an award at level $r > 0$, $\pi(r|d, x, z)$ is the product of P_e and P_c:

$$\pi(R = r|D = d, X = x, Z = z) = P_e(r|d, x)P_c(d, x, z) \quad r = 1, 2 \tag{1}$$

where $\pi(.)$ is generic notation for any probability directly identifiable from observable sample variables.

The non-confounding assumption can be formalised in either of the following ways.

Assumption 1 D is a complete description of the disability information relevant to the adjudication process;

Assumption 1* The disability information relevant to the eligibility and claim decisions are respectively $\{D, \delta^e\}$ and $\{D, \delta^c\}$ where δ^e and δ^c are unobserved and δ^e and (δ^c, Z) are statistically independent, conditional on D, X.

Under the weaker assumption 1*, there may exist unobserved information known to AA programme administrators, but this information is independent of any unobserved information relevant to claimants' behaviour, and independent of the personal characteristics Z, after conditioning on observed disability and care receipt (D) and characteristics (X). An example of this might be the detailed information on diagnoses and medication entered on the application form. Under assumption 1*, diagnosis and medication information are not predictive of claim behaviour, once D and X are allowed for, nor are they related to the characteristics in Z. In this case, the structure (1) holds with the eligibility probability $P_e(r|d, x)$ defined as $E\{P_e^*(r|d, \delta^e, x)|d, x\}$ and $P_c(d, x, z)$ as $E\{P_c(d, \delta^c, x, z)|d, x, z\}$, where P_e^* and P_c^* are the eligibility and claim probabilities conditioned on full disability information. The non-confoundedness assumption is discussed further in section 3 below.

There are two exclusion restrictions implied by (1): P_e is independent of Z and P_c is independent of R. Despite these exclusions, the eligibility and claim probabilities are not identified without further restriction. If $P_e^0(r|d,x)$ and $P_c^0(d,x,z)$ are their true forms, any pair of functions P_e^+ and P_c^+ constructed as $P_e^+(r|d,x) = \lambda(d,x)P_e^0(r|d,x)$ and $P_c^+(d,x,z) = P_c^0(d,x,z)/\lambda(d,x)$ will produce the same value for $\pi(R = r|d,x,z)$ in (1), for any function $\lambda(d,x)$ satisfying:

$$\min_{r=1,2}\left(1/P_e^0(r|d,x)\right) \geq \lambda(d,x) \geq \max_{z\epsilon\mathbb{Z}} P_c^0(d,x,z)$$

Consequently, $\{P_e^0, P_c^0\}$ and $\{P_e^+, P_c^+\}$ are observationally equivalent and we can estimate neither $P_e(r|d,x)$ nor $P_c(d,x,z)$ directly from the FRS survey data, since unclaimed entitlements and unsuccessful claims are not observed. Despite this identification problem, some important inferences can be drawn.

2 Data

Our individual-level data come from the annual UK Family Resources Survey (FRS) for the three fiscal years, 2002/3 to 2004/5. We use the FRS rather than other surveys sometimes used for disability research, such as the British Household Panel Survey (BHPS) and the English Longitudinal Survey of Ageing (ELSA), because of the higher-quality income data in the FRS and the much larger samples of older people that it provides. The FRS dataset has been subjected to an intensive error correction process which identifies and resolves cases of confusion between income categories, where this can be done unambiguously. The procedure is similar to that described by Hancock and Barker (2005).

The FRS is a large household survey with full coverage of income and questions listing eight specific categories of difficulty arising from physical or mental impairments. We classify these into four which are primarily physical and four which have a substantial cognitive aspect. The questionnaire also covers the receipt of formal or informal care services. These

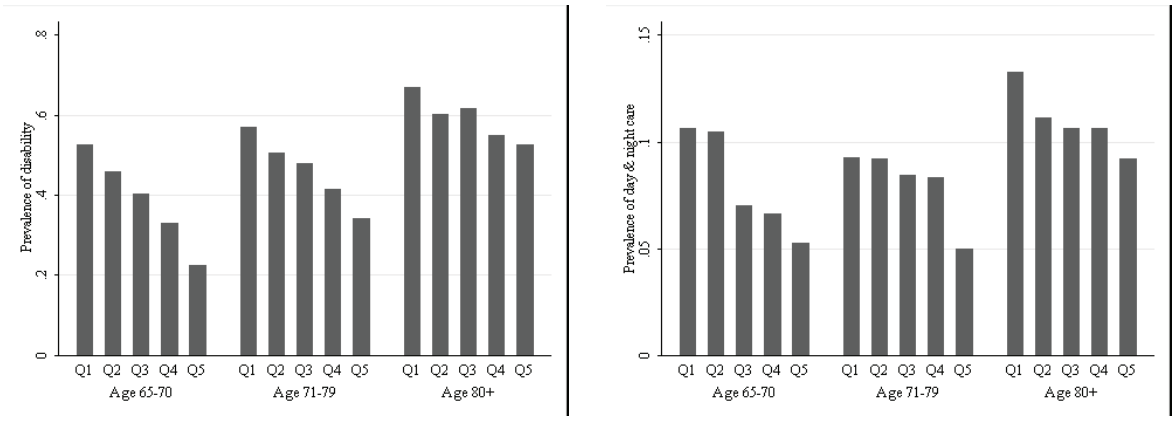
questions are detailed in Appendix 1, where Table A1 shows the sample proportion and the rate of AA receipt of people reporting each of the eight types of disability. We use the sample of over-65s who are not in receipt of DLA and who are therefore potentially eligible for AA. We use the data in pooled form, since the annual samples are independent cross-sections and we have found no significant year effects in any of the statistical analysis reported below.

The public-release version of FRS data files contain imputed values for AA receipt in many cases: in our pooled 3-year dataset, 1,932 of the 3,482 cases recorded as being in receipt of AA had imputed benefit amounts. Of these, 1,808 had missing values due to item non-response to the question about the amount of benefit, while the remaining 124 responded with a figure which was seen as impossible by FRS statisticians and replaced by an imputed value. The data files contain the original survey response as well as the imputed variable, so it is possible for us to distinguish these two groups of cases. Our strategy is as follows: in a case of non-response to the question on the amount of AA, we treat the case as being in receipt of AA but with an unknown amount.[11] In the case of a non-missing but 'invalid' original response, we use the DWP imputed value (which is one of the two official AA rates) provided that value is within £10 of the original response. This yields 113 further cases of measured rate of AA receipt. If the discrepancy is greater than £10, we treat it as a case of AA receipt of an unknown amount. Note that we use the observed value of AA only to define a dichotomous distinction between high- and low-rate recipients, so the analysis is not sensitive to small errors in the amount of benefit reported. Although there is a high rate of item non-response in FRS data on benefit receipt, there is no evidence of substantial distortion in the distribution of AA recipients across high- and low-rates. Published DWP caseload statistics for AA claims in payment show that, on average over the period May 2002-February 2005, 49.6% of AA payments were at the low rate, compared with 46.0% for

[11] This means that such cases are excluded from our analysis of the level of award conditional on AA receipt, but are included in analysis of the occurrence of AA receipt.

the FRS sample of AA-recipients after imputations are removed.[12]

Figures 1-4 show the relationship between disability, AA receipt and age and income. In this context, income is defined as the benefit unit's income from all sources except means-tested and disability benefits, equivalised by dividing by 1.0 for a single person and 1.6 for a couple. For summary purposes, we represent income by quintiles of the distribution of this income measure among the over-65 population. Figure 1 shows that, within each age group, there is a strong negative income gradient of disability prevalence, measured either by the existence of one or more self-reported impairment (Figure 1a) or by the receipt of day-and-night care from any source (Figure 1b). Note the slightly lower income gradient among the over-80 group, which is primarily a selection effect arising from differential rates of exit from the household population, through mortality and moves into residential care.



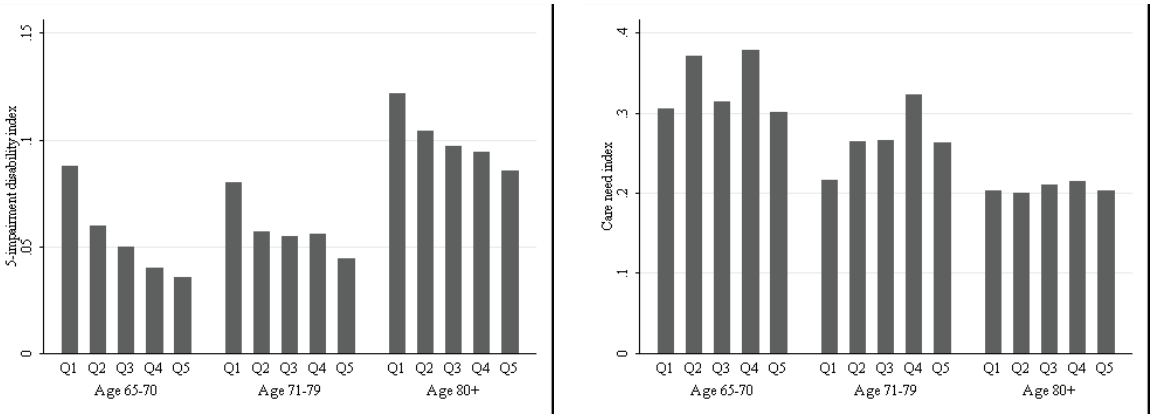
(a) sample proportion with any impairment (b) sample proportion receiving day and night care

Figure 1: Income gradient of severity of disability among disabled over-65s

In addition to the decreasing age-specific prevalence apparent in Figure 1, there is also a strong decrease across the income distribution in the average severity of reported disability.

[12]The DWP caseload statistics include the institutional population, which is not covered by FRS sampling. However, only around 4% of the over-65 population are in care homes and, of those who are, over 60% are not covered by the AA scheme, since their care home places are LA-funded (Hancock et al 2009b). Consequently, the difference in coverage causes only minor comparability problems. Attempts to work with data from the first wave of ELSA were abandoned because of its inadequate sample size and doubts about its consistency with DWP register data, which, like the FRS, suggests a much larger proportion of high-rate AA awards than the 35% rate in the ELSA sample.

We measure this in two ways: the proportion of those with any reported disability who nominate five or more impairments (Figure 2a); and the proportion of care recipients who receive day-and-night care (Figure 2b). Note that, in contrast to the prevalence plots in Figure 1, there is a contradiction between the impairment- and care-based measures of severity, with the former showing an increase from the under-80 group to the 80+ group, while the latter shows a steadily declining relationship with age. This suggests a dissonance between the need for care and its delivery. If care need arises early it is more likely to be met through formal and informal means, whereas for people with late-onset care needs, there is less likely to be a surviving spouse able to meet day-and-night needs and a greater risk of isolation from sources of formal care.

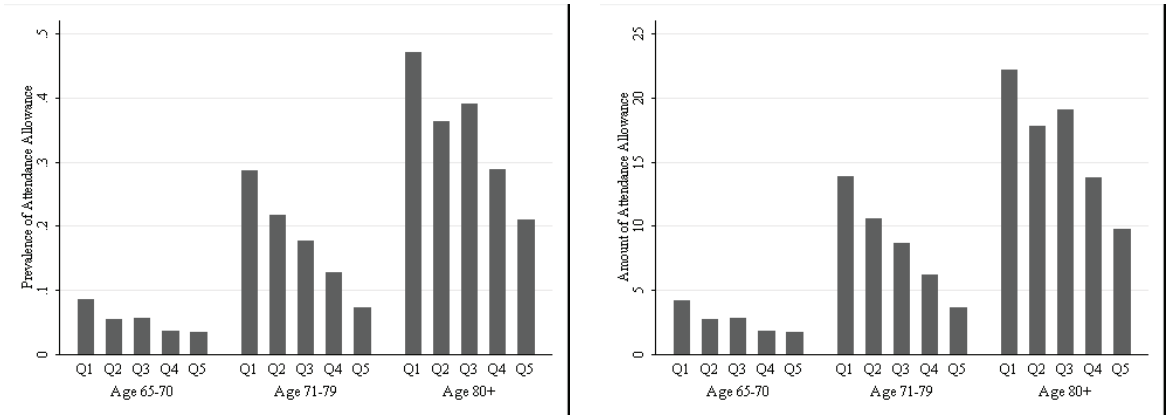


(a) Number with 5+ impairments as a proportion of those with any impairment

(b) Number receiving day and night care as a proportion of those receiving any care

Figure 2: Income gradient of severity of disability among disabled over-65s

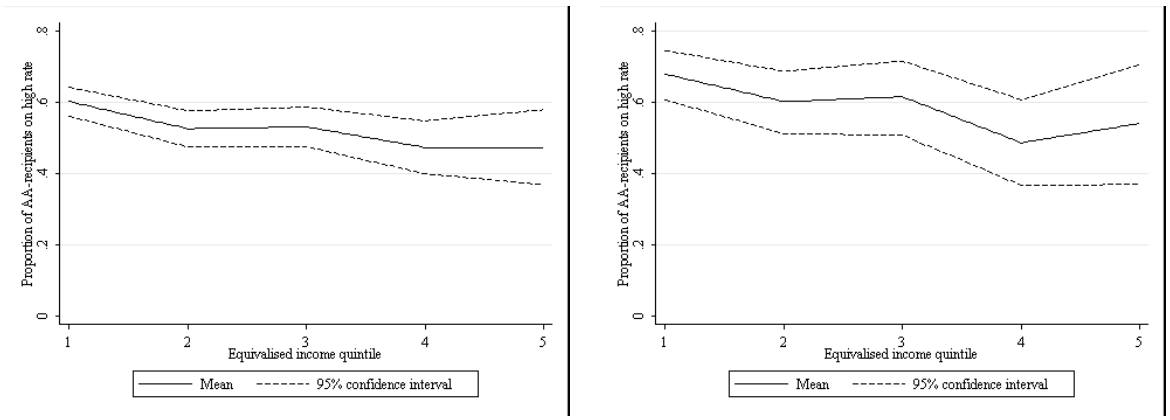
The prevalence and average amount of AA income (Figure 3) display rather stronger age and income gradients than do the two measures of disability prevalence (Figure 1), suggesting that younger and wealthier people are less likely to receive this form of support, for a given level of disability, than older poorer people. We investigate this further in section 3 below.



(a) prevalence of AA receipt (b) amount of AA

Figure 3: Income gradient of AA receipt among over-65s with at least one disability

Figure 4 shows the relationship between the rate structure of AA receipts and income. Both parts of the figure plot the proportion of the FRS cases of AA receipt (where the level of payment is known) which are paid at the higher rate. Figure 4a is based on the subsample of people reporting any impairment or receipt of care, and Figure 4b is constructed from the smaller subsample of respondents who receive day-and-night care. Although cell sample sizes are small, there is a definite picture of a decline in the odds of high-rate versus low-rate AA with increasing income. We investigate this in section 3 below.

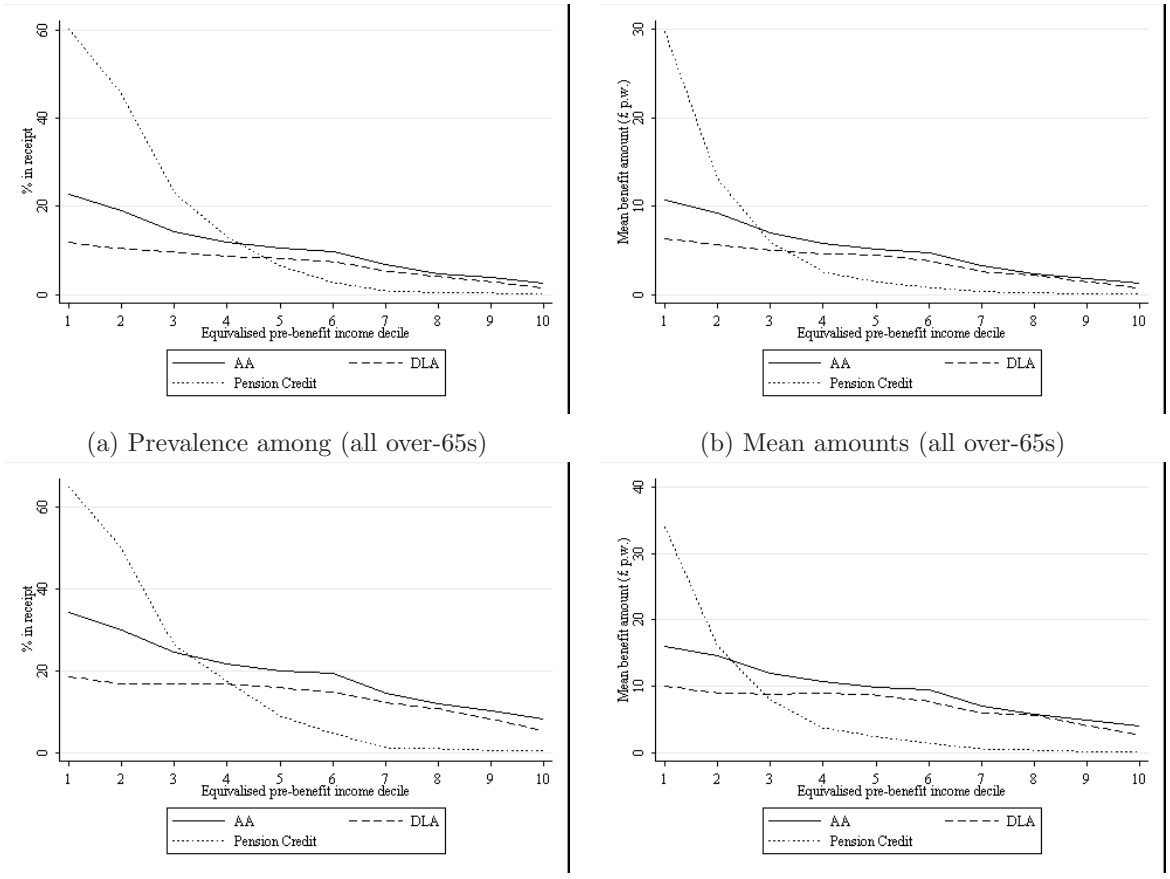


(a) any disability or care (n = 1573) (b) receiving day and night care (n = 515)

Figure 4: Income gradient of the proportion of AA cases with receipt at high rate

How does AA compare with other benefits for older people? Figure 5 looks at income targeting of AA in relation to DLA (mobility and care components) and the explicitly means-

tested Pension Credit. It shows the FRS percentages receiving AA, DLA and Pension Credit and the mean amounts of those benefits, within each income decile group, for the whole over-65 sample (Figures 5a and 5b) and for the subsample of people with at least one reported disability (Figure 5c and 5d).[13]



(a) Prevalence among (all over-65s)

(b) Mean amounts (all over-65s)

(c) Prevalence (disabled over-65s)

(b) Mean amounts (disabled over-65s)

Figure 5: Income gradients of benefit prevalence and mean amounts

Although AA and DLA are not means-tested, they are implicitly income targeted, since there is a clear negative income gradient for each programme. In both the full sample of over-65s and the restricted sample of those reporting a disability, AA has a stronger income gradient and is therefore slightly more targeted than DLA. For example, the ratio of AA prevalence in the first and tenth deciles is 8.8 in the full sample, compared with 8.4 for DLA;

[13]In each case, the decile groups are defined in relation to the sample distribution of real equivalised pre-benefit income.

and 4.1 in the restricted sample, compared to 3.1 for DLA. The contrast between AA and DLA is less marked in terms of average amounts paid, but AA remains significantly better income-targeted than DLA overall. It has been suggested in the current policy debate that DLA is more worthy of protection from reform than AA because DLA recipients necessarily experience disability prior to state retirement age and consequently tend to have a more interrupted earnings history and thus lower income in old age. This argument is not borne out by FRS data.

Comparison of the income profiles for the full sample (Figures 5a and 5b) with those for the disability-restricted subsample (Figures 5c and 5d) indicates that the implicit targeting of AA comes from two sources. Just over half of the income gradient is due to the declining prevalence of disability as we move up the income distribution: for example, the bottom-to-top decile ratio of AA prevalence falls from 8.8 to 4.1 when we restrict the sample to those with disability. Nevertheless, this leaves a substantial remaining gradient, arising partly from the lower propensity to claim among higher-income people and partly (as shown by Figure 4 above), the lower prevalence of high-rate AA payments among wealthier AA-recipients.

3 What are the influences on entitlement decisions?

The official specification of the AA benefit system indicates that eligibility is based only on the need for care arising from physical or mental disability and is unaffected by other personal characteristics. These 'officially irrelevant' characteristics can be divided into two groups: those which are entered on the application form and are thus available to DWP decision makers; and those which are not available to them and are therefore known a priori to be causally unrelated to eligibility judgements. Examples of the former include age, marital status and living arrangements, while the latter include income, education and housing tenure. The stated aims and rules of the AA system constitute an official specification of the vector Z, which might differ from the specification we find to hold in practice.

Relax the exclusion restrictions on the eligibility probability so that P_e may now depend on Z as well as D and X. The conditional probability that an AA recipient receives the benefit at the higher level is:

$$\pi(R = 2|D = d, X = x, Z = z, R > 0) = \frac{P_e(2|d, x, z)}{P_e(1|d, x, z) + P_e(2|d, x, z)} \tag{2}$$

The distribution of Z conditional on D, X and a specific level of AA receipt is:

$$\pi(Z = z|R = r, D = d, X = x) = \frac{P_e(r|d, x, z)P_c(d, x, z)\pi(d, x, z)}{\sum_{s\in\mathbb{Z}} P_e(r|d, x, s)P_c(d, x, s)\pi(d, x, s)} \tag{3}$$

A necessary and sufficient condition for the right hand side of (2) to be independent of z and the right hand side of (3) to be independent of r is that the eligibility probability has a separable structure:

$$P_e(r|d, x, z) = \theta(r|d, x)\psi(d, x, z) \tag{4}$$

Note that θ and ψ need not be interpretable as probabilities[14] but an important special case is a two-stage adjudication process involving an initial judgement about general eligibility, implying $\psi(d, x, z) = Pr(\text{eligible at some rate}|d, x, z)$ and a secondary assessment of the rate of entitlement (assumed independent of Z), giving $Pr(\text{eligible at high rate}|\text{eligible}, d, x) = \theta(r|d, x)$.

Condition (4) means that Z-invariance of $\pi(R = 2|D, X, Z, R > 0)$ and R–invariance of $\pi(Z|R, D, X)$ do not necessarily imply that Z has no influence on the outcomes of AA claims. However, Z-invariance of P_e implies both Z-invariance of $\pi(R = 2|DD, X, Z, R > 0)$ and R-invariance of $\pi(Z|R, D, X)$. The transposition rule of logic then tells us that a failure of either invariance assertion implies that P_e is not Z-invariant. Our empirical procedure implements this line of reasoning: we first restrict the FRS sample to AA recipients and then estimate a binary model of the rate of AA receipt (using D, X and Z as covariates), and a model of each of the Z-variables (using R, D and X as covariates), testing the significance

[14]For example, they need not be restricted to the $[0, 1]$ interval

of Z and R respectively. Any rejection then implies a rejection of the hypothesis that the variables in Z are irrelevant to AA claim outcomes.

This is a process of multiple inference, and the actual significance level of the overall testing procedure generally exceeds the significance level used for each constituent test, so we tend to over-reject the null hypothesis of $Z-$invariance unless some adjustment is used. Let A be the desired overall significance level and α be the level used in each of the m constituent tests. We use two alternative adjustment procedures:[15]

(i) Bonferroni: $\alpha_B = A/m$, based on the assumption that the probability of more than one false rejection is zero, giving a lower bound on the correct α.

(ii) Šidák: $\alpha_S = 1 - (1 - A)^{1/m}$, based on the assumption that the tests are independent.

Implementation of the testing procedure requires a specification of the vector X. We use two alternatives: (i) allocate all covariates except those representing disability and receipt of care to Z so that X is empty; (ii) use significance tests on the coefficients of covariates in model (2), assigning those with insignificant coefficients to Z and retaining all others in X.

The estimated probit models used for the distribution (2) are set out in columns [1] and [2] of Appendix Table A2. Because of the doubts over the direction of causation underlying the link between AA receipt and receipt of care services, we work with two variants of each model, one including, the other excluding, measures of the receipt of care. We arrived at the final specifications by starting with very detailed specifications of the covariate vector and using conservative parameter significance tests to give a more parsimonious model specification. These more general models included a full set of dummy variables representing individual impairments in addition to the indicators of numbers of physical and cognitive impairments that appear in the final model, 4-part linear splines in age and income, a dummy for zero

[15] Alternative multiple testing approaches are available, notably those based on the false discovery rate (Benjamini and Hochberg 1995). Another approach is to use a single Wald test based on a simultaneous model encompassing all of the single-equation models in Table 1, with allowance for cross-equation correlation. In our case, the conclusion is so clear that choice of method is not a major issue.

assets and a 3-part linear spline in assets. Each model was validated by a series of tests, including the Hosmer-Lemeshow goodness-of-fit test and (for the specification involving care variables) a Wald test for the significance of interaction terms between day-and-night care and other covariates, since this is a dominant variable, both empirically and a priori. All the models pass these tests at the 10% significance level or better. Models corresponding to the conditional X-distribution (3) use linear regression for continuous covariates (age, age of spouse and income) and probits for binary covariates (zero assets, home-ownership, education and presence of a partner).

P-values for the constituent tests and significance levels constructed from the Bonferroni and Šidák rules are reported in Table 1, which covers three different specifications of X: (1) the null set; (2) the age and income splines and the zero assets dummy; (3) the age, income, assets, the dummy for presence of a partner and the partner's age. There is a clear conclusion. The hypothesis of invariance with respect to age, income and assets is strongly rejected but there is no rejection for housing tenure and education. The two partnership variables have a more ambiguous role, being significant only when care variables are omitted. The nature of the findings hold for the Bonferroni and Šidák versions of the multiple test adjustment. Without adjustment, the two partnership variables are significant even when care variables are included as covariates, in contradiction to the Bonferroni and Šidák tests.[16] We therefore have a definite conclusion that the entitlement decision process is influenced by income, assets and age and (possibly) also household circumstances, in contradiction to the stated criteria used in the administration of AA.

[16]Note that unadjusted tests are appropriate only in the degenerate case where, if one component test is significant, then all must be. This is contrary to what we find, so unadjusted testing is clearly inappropriate here.

Table 1 Compound tests of eligibility-irrelevance

	X =					
	Ø		**age, income, assets**		**age, income, assets, partnership**	
Dependent variable	(a)	(b)	(a)	(b)	(a)	(b)
	Uncorrected P-values of constituent tests					
High-rate AA [1]	0.000	0.000	0.003	0.090	0.333	0.432
Equivalised income [2]	0.002	0.001	-	-	-	-
No assets [2]	0.000	0.000	-	-	-	-
Age [2]	0.002	0.003	-	-	-	-
Home-owner [2]	0.427	0.854	0.049	0.170	0.188	0.320
Education [2]	0.722	0.433	0.900	0.590	0.664	0.486
Couple [2]	0.001	0.035	0.002	0.030	-	-
Partner's age [2]	0.006	0.090	0.005	0.060	-	-
Compound significance level	*Significance levels for constituent tests*					
A = 10%	$\alpha_B = 0.0125; \alpha_S = 0.0131$		$\alpha_B = 0.0200; \alpha_S = 0.0209$		$\alpha_B = 0.0333\ ; \alpha_S = 0.0345$	
A = 5%	$\alpha_B = 0.0063; \alpha_S = 0.0064$		$\alpha_B = 0.0100; \alpha_S = 0.0102$		$\alpha_B = 0.0167\ ; \alpha_S = 0.0170$	
A = 1%	$\alpha_B = 0.0013\ ; \alpha_S = 0.0013$		$\alpha_B = 0.0020; \alpha_S = 0.0020$		$\alpha_B = 0.0033\ ; \alpha_S = 0.0033$	

Notes: (a) Receipt of care excluded from covariates; (b) Receipt of care included in covariates ; [1] Wald test on coefficients of Z-variables [2] t-test on coefficient of dummy for high-level AA receipt

The probability (2) can be used to draw partial inferences about the dependence of the eligibility probability P_e on disability D and other eligibility-relevant attributes X. Define the odds of high-rate relative to low-rate receipt as $O(d,x) = \pi(R = 2|d,x,R > 0)/[1 - \pi(R = 2|d,x,R > 0)]$. This is independent of claim behaviour and equal to the ratio $P_e(2|d,x)/P_e(1|d,x)$. The differenced odds is therefore:

$$\Delta O(d,x) = \Delta \frac{P_e(2|d,x)}{P_e(1|d,x)} \tag{5}$$

where Δ represents the operation of differencing across alternative values for a specific variable in (D,X), with all other variables held constant. The differenced odds (5) is constructed empirically from the estimated probit model for the event $R = 2$ conditional on receipt of AA and the covariates D and X, but excluding Z. From this fitted model, we first define a baseline group within the sample and then simulate the effect of a specified change in characteristics as follows:

$$n_{\mathbb{B}}^{-1} \sum_{i \in \mathbb{B}} \left\{ \left[\frac{\Phi\left(w_i^1 \hat{\beta}\right)}{1 - \Phi\left(w_i^1 \hat{\beta}\right)} \right] - \left[\frac{\Phi\left(w_i \hat{\beta}\right)}{1 - \Phi\left(w_i \hat{\beta}\right)} \right] \right\} \tag{6}$$

where: $\mathbb{B}$ is the set of $n_{\mathbb{B}}$ sample individuals with baseline characteristics; $w_i = w(d_i, x_i)$ is the set of probit covariates constructed from sample information on disability and other characteristics; $\Phi(.)$ is the standard normal distribution function; and w_i^1 is the same set of covariates perturbed by the simulated change.[17]

Results are presented in Table 2. The inclusion or exclusion of covariates representing receipt of care makes little difference to estimates of the differenced odds, except in two cases: the estimated effect of physical disability and presence of a spouse is much larger for the model without care variables, since the extent of disability and existence of a potential care-giver provide a good proxy for the receipt of day-and-night care. When included in the model, receipt of day-and-night care is a dominant factor (as the AA system rules suggest it should be), with the odds of high-rate AA increasing by an absolute amount 1.73 with receipt of day and night care, from a baseline of 1.096.

There is a strong contrast between the effect of physical disabilities, which are positively associated with the odds of high-rate AA receipt, and cognitive disabilities, which have a negative association. These effects are large and suggest that the AA adjudication process does not only hinge on the existence of day-and-night care needs. The negative impact of cognitive disability implies that cognitive impairments tend not to generate day-and-night care needs or, at least, are not interpreted by the DWP decision makers as doing so. It may also be that people with cognitive difficulties find it harder to gain access to the intensive support services that can be quoted in the AA application as evidence of care needs. The finding of a sharp difference between physical and cognitive impairments casts doubt on the common practice of using a simple count of the number of reported disabilities as an index of the severity of disability.

The odds of high-rate AA declines significantly with age, which is unexpected, given that the formal criterion for high-rate eligibility is age-independent. This finding is consistent

[17]Note that a logit model would imply $\Delta\hat{O} = n_{\mathbb{B}}^{-1} \sum \exp\left([w_i^1 - w_i]\hat{\beta}\right)$; logit results are very similar to the probit results in Table 2.

with the opinion of many practitioners involved in disability support[18] that people in extreme old age often experience lower standards of care because lower norms for quality-of-life are implicitly adopted by society, including those responsible for managing the care system. However, it may also arise because disabled people are slow to apply for uprating of their AA payments from low- to high-rate when their condition deteriorates. Thus high-rate recipients may tend disproportionately to be those whose initial award of AA is at the high rate because high-dependency need occurs at an early stage in their disability, whereas those whose disability slowly evolves into a high-dependency state later in life tend to continue their initial lower-rate award. Without much more detailed longitudinal data than currently exists, the source of this age effect cannot be unambiguously determined.

The income loss to older disabled pensioners entailed by this negative age gradient is not large in a macro sense. For an odds function $O(D, X)$, the expected amount of AA received conditional on being an AA recipient is:

$$\mu(D, X) = A_1 + O(D, X)\,(A_2 - A_1) \tag{7}$$

where A_1 and A_2 are the high and low rates of AA. We first evaluate the sample mean of this for all FRS recipients of AA, using the predicted odds function from the probit model of high-rate receipt. We then calculate the same quantity, recalculating the odds function after setting the age variable to 65 for all individuals, so as to remove the age gradient. For both versions of the probit model (with and without care variables as covariates), the result is an increase of 4-5% in the average amount of AA. If the programme administrators were able to make and uprate AA awards in such a way as to remove the apparent age bias, the resulting increase in the aggregate cost of the AA programme would be modest.

However, we can confidently rule out unobserved confounding as a spurious source of the estimated age and income effects. Suppose, for example, that information on formal

[18]For example, oral evidence given by Age Concern and Help the Aged, Counsel and Care, and Alzheimers Society to the House of Commons Health Select Committee's inquiry on social care, 26 November 2009.

diagnoses and medication is recorded on the AA application form and (in conflict with assumption 1* above) also increases the propensity to make a benefit claim. This might happen as an outcome of the medical system: for example, a doctor might simultaneously deliver a diagnosis and advise the patient to apply for AA. In that case, we would expect a positive bias in the age and income profiles of the odds of high-rate AA, since the seriousness of diagnosis and use of medication increase with age.[19] Instead, we find a strong negative age gradient.

Table 2 Differential effects on entitlement probabilities

Baseline circumstances	**Change in circumstances**	**Care excluded**		**Care included**	
		O	ΔO	O	ΔO
No disabilities or care	+ 4 physical difficulties	1.134 (0.208)	1.541 (0.673)	1.048 (0.196)	0.911 (0.460)
No disabilities or care	+ 4 cognitive difficulties	1.134 (0.208)	-0.679 (0.238)	1.048 (0.196)	-0.770 (0.205)
Some disability, no care	+ continuous care	_	_	1.107 (0.086)	1.770 (0.574)
Age 65-69 + some disability	+ 5 years of age	2.791 (0.651)	-0.473 (0.302)	3.136 (0.835)	-0.591 (0.406)
Age 70-74 + some disability	+ 5 years of age	1.839 (0.237)	-0.303 (0.149)	1.977 (0.279)	-0.358 (0.178)
Age 75-79 + some disability	+ 5 years of age	1.420 (0.174)	-0.149 (0.065)	1.525 (0.784)	-0.182 (0.285)
1st income quintile + some disability	+ £10 per week	1.777 (0.283)	-0.188 (0.091)	1.952 (0.913)	-0.207 (0.188)
2nd income quintile + some disability	+ £10 per week	1.185 (0.098)	-0.026 (0.008)	1.281 (0.130)	-0.028 (0.038)
3rd income quintile + some disability	+ £10 per week	1.199 (0.105)	-0.019 (0.005)	1.221 (0.129)	-0.018 (0.005)
No assets + some disability	+ asset ownership	1.870 (0.284)	-0.468 (0.229)	2.030 (0.338)	-0.483 (0.255)

Notes: Clustered bootstrap standard errors in parentheses

Income and assets also have a negative impact on the odds of high-rate AA receipt, confirming that the income gradient observed in the empirical odds (Figure 4 above) remains

[19]This argument is supported by analysis of ELSA data, which does give information on formal diagnioses. Using data from wave 1 of ELSA, a binary probit model of the existence of any serious diagnosis, using age, income and other personal characteristics as covariates, gives no significant income effect and a positive age coefficient. Details available on request.

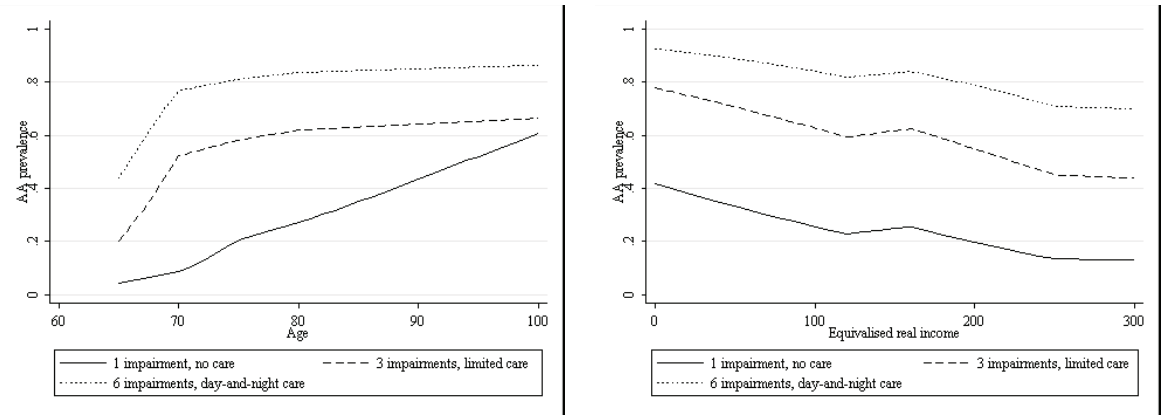
after allowing for other personal characteristics and circumstances. This finding is surprising because information on income and assets is not required by the application system and is therefore not known to programme administrators. There are three plausible explanations for this income gradient. First, the application form does ask whether claimants are in receipt of means-tested benefits, which may (perhaps unconsciously) be brought into consideration as an indicator of financial need.[20] Second, high-income people are less likely to receive LA care services for a given level of need (since the charge for LA home care is means-tested), so their lower level of formal care receipt may be interpreted by DWP as a signal of a weaker case for higher-rate AA. Third, higher-income people have a weaker financial incentive to uprate an initial low-rate award to the higher rate as disability worsens. Lack of contact of high-income people with LAs may also be relevant here, since LAs have a budgetary incentive to maximise uptake of social security benefits and are required to offer their care service clients advice and assistance with benefit applications.

4 What are the influences on claim behaviour?

Our second research question concerns the nature of claims behaviour. How does the probability of making a claim for AA vary with factors which influence the behaviour of claimants but not programme administrators? We begin by estimating a probit model for the probability of AA receipt: $\pi(R > 0|D, X, Z)$. The final preferred specification for this model is more complex than the probit structure found adequate for the odds of high-rate receipt among the set of AA-recipients, and we have introduced into the model more detail on the type of disability and care received, and several interaction terms which were not required for the model of $\pi(R = 2|R > 0, D, X, Z)$. The results are given in Appendix Table A3.

[20] Information on means-tested benefits is mainly requested to identify cases where an AA award would imply additions to other entitlements. Financial need should not be a consideration in AA claim decisions. Note that we do not use receipt of means-tested benefits as an explanatory variable because of the likelihood of reverse causation: an AA application may often lead to encouragement to apply for other benefits.

The estimated age and income profiles of AA receipt, after allowing for the influence of all other covariates, is illustrated in Figure 6, which plots the predicted probability of receipt for a baseline individual (a 77-year-old single female renter with £135 weekly income and some assets), with three alternative disability/care levels, as (a) age and (b) income are varied. At low levels of measured disability, AA prevalence rises steadily with age, suggesting either that age itself is used as an eligibility criterion for people without multiple impairments or receiving no care, or that age is a strong factor influencing the propensity to make a claim. For more severely disabled people, there is instead a rapid rise to age 70, after which the probability of receiving AA is nearly constant. The income profiles are steadily decreasing for all three disability levels, which is predominantly the result of a weakening marginal incentive to make a claim as income rises.



(a) age profile

(b) income profile

Figure 6: Conditional income and age profiles of AA receipt

We find significant impacts on the probability of AA receipt of home ownership and the presence of a spouse or partner, despite the insignificance of these variables for the odds of higher-rate AA among AA-recipients (Table 1, above). The negative effect of home ownership is a common finding in the literature on UK benefits (Hernandez et al 2007) and is believed to arise partly from home owners' poorer access to the benefits information and support provided by LAs and housing associations, and partly by the social norms associated with property ownership. There is a significant interaction between the gender of the disabled

person and the presence of a spouse, with married women significantly more likely to receive AA than married men, but no significant gender difference detected among those without partners. As in the model of the odds of high-rate versus low-rate AA, we find no evidence of an effect of educational attainment on receipt of AA.

The lack of influence of housing tenure, gender and partnership on the odds of higher rate receipt means that the adjudication process as reflected in the eligibility probability $P_e(R|D, X, Z)$ may be independent of those factors but is not necessarily so – the impact may be multiplicatively separable as in (4). However, separability is a highly special property, so it is reasonable to entertain the assumption that P_e is tenure-invariant and consequently that the observed influence comes through the claim probability P_c. In that case, using the model of Table A3 to generate an estimate of the function $\pi(R > 0|D, X, Z)$, the dependence of P_c on tenure Z can be identified through its exclusion from P_e, as the profile $P_c(d, x, z)/P_c(d, x, z^0) = \pi(R > 0|d, x, z)/\pi(R > 0|d, x, 0)$, where z^0 is the benchmark level of Z and d, x are reference values used for the comparison.

Table 3 shows the impact of household structure and housing tenure on claim behaviour, P_c. The figures presented there are the predicted proportionate changes in the claim probability for a hypothetical baseline individual type, with three alternative levels of disability. The effects vary with the degree of disability: there is greater scope for influence of other factors on claim decisions when disability is relatively mild. Home ownership is associated with a large reduction in the probability of an AA claim ranging from a third for those with only a single (mobility) impairment, to a tenth for those with severe disability (six impairments and day-and-night care).

An intriguing feature of the results in Table 3 is the significant difference in the propensity to apply for AA between a disabled married man and a disabled married woman. This is not the effect of partner's age because, although disabled married women generally have older spouses than disabled married men, a covariate recording the age of the spouse was never

statistically significant. Interpretation of this finding in terms of gender roles and attitudes within the family is tempting, but would require further research in greater depth than is currently possible.

Table 3 Impact of household circumstances on claim behaviour

Simulated change	Degree of disability		
	mild [1]	moderate [2]	severe [3]
Model without care variables			
Renter → Homeowner	-34.6	-17.6	-10.7
	(3.6)	(2.7)	(1.8)
Single male → Male in couple	-16.1	-11.3	-6.8
	(4.8)	(3.5)	(2.2)
Single female → Female in couple	2.1	1.4	0.8
	(6.0)	(4.1)	(2.3)
Model with care variables			
Renter → Homeowner	-23.8	-10.4	-5.6
	(4.6)	(2.2)	(1.4)
Single male → Male in couple	0.6	0.2	0.1
	(7.5)	(2.9)	(1.5)
Single female → Female in couple	17.7	6.5	3.2
	(9.2)	(3.2)	(1.6)

Figures are estimates of $100 \times \left(P_c(d,x,z)/P_c(d,x,z^0) - 1\right)$. Standard errors in parentheses.
Baseline: 77-year-old single female renter with £135 weekly income and some assets.
[1] mobility impairment, receiving no care; [2] mobility, dexterity& lifting impairments, receiving occasional care;
[3] mobility, dexterity, lifting, continence, communication and memory impairments, receiving day and night care

5 Conclusions

For any benefit system subject to an eligibility assessment, it is important to examine how the system works in terms of the achieved pattern of benefits delivered to claimants, rather than relying on the stated aims and rules of the system. This is particularly important for the current debate over the reform of support for disabled older people. We have examined Attendance Allowance (AA), which is the principal cash benefit programme designed to deliver support to members of the over-65 population who have care needs arising from disability. AA is a non-means-tested benefit but, despite the absence of means-testing, FRS survey data reveals that receipt of AA is related to many factors besides the observable indicators of disability and care needs. In particular, AA mimics a means-tested system like

Pension Credit to some degree, in the sense that the probability of receiving AA is highest for low-income and older people. In terms of both the incidence of receipt and mean levels of benefit received, AA is more strongly income-targeted than Disability Living Allowance, which is restricted to people whose need arose initially before the age of 65. Like means-tested benefits, the probability of receipt of AA tends to be lower for homeowners, possibly because of differences in social norms or in access to sources of advice and information.

Receipt of AA can be decomposed into two underlying processes: the behaviour of potential claimants in deciding whether or not to make an application; and DWP's delivery process, which determines whether, and at what level, to make an award once a claim has been made. These two processes cannot be fully distinguished from observation of the pattern of AA receipt alone, but it is possible to show that the odds of high-rate against low-rate AA receipt is independent of claim behaviour under standard assumptions and depends only on the nature of the delivery process. If the AA system works according to its stated aims and criteria, the high/low-rate odds should be independent of all but the need for day-and-night care arising from disability. Contrary to this expectation, we have found that the odds of high-rate AA depends on income and age, so that the process of claim assessment (and subsequent uprating) is not blind to all considerations but need. The system works in such a way as to disadvantage higher-income people and, more worryingly, older people. A possible explanation for this finding is that receipt of care services is often used as evidence to support an AA claim, and that people in extreme old age may experience lower standards of care for any given level of need, because lower norms for quality-of-life are implicitly adopted by advisers and managers of the care system. Another possibility is that disabled people are slow to apply for uprating of their AA payments from low- to high-rate as their condition deteriorates. Thus high-rate recipients may tend disproportionately to be those whose initial award of AA is at the high rate because high-dependency need occurs at an early stage in their disability, whereas those whose disability slowly evolves into a high-dependency state later in life tend to continue their initial lower-rate award.

Under slightly stronger assumptions, we are also able to draw inferences about the impact of some personal characteristics on claim behaviour. Housing tenure, gender and marital status have a strong influence on the probability of making a claim for AA. Homeowners are less likely (by up to one-third) than renters, and married women are significantly more likely (by one-tenth) than married men, to make a claim. Although income, age and disability are also likely to be important determinants of claim behaviour, our finding that they are relevant to the adjudication/uprating process means that we are not able to identify their impact on claim behaviour without further assumptions or information.

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Appendix 1: Disability questions from the AA application form and FRS questionnaire

FRS disability questions

Q1 Do you have any long-standing illness, disability or infirmity? By 'long-standing' I mean anything that has troubled you over a period of time or that is likely to affect you over a period of time?

Q2 Does this physical or mental illness or disability (Do any of these physical or mental illnesses or disabilities) limit your activities in any way?

Q3 Does this health problem(s) or disability(ies) mean that you have significant difficulties with any of these areas of your life? Please read out the numbers from the card next to the ones which apply to you.

SHOW CARD:
1: Mobility (moving about)
2: Ability to lift, carry or otherwise move everyday objects
3: Manual dexterity (using your hands to carry out everyday tasks)
4: Continence (bladder control)
5: Communication (through speaking, listening, reading or writing)
6: Memory or ability to concentrate, learn or understand
7: Understanding when you are in physical danger
8: Other area of life
9: None of these

Free text follow-up to response 8 was coded post hoc, yielding a further category of difficulty: co-ordination / balance problems.

Impairments are recorded only if there are positive answers to Q1 and Q2 and at least one of the eight specific ADLs is indicated at Q3. For some purposes, we classify the first four response categories as physical impairments and the remaining four as cognitive.

Table A1 Sample proportions and AA rates by disability type

	Prevalence	**Receipt of AA: sample percentages**		
Disability	**(%)**	**Low-rate**	**High-rate**	**Unknown rate**
Mobility	32.8	21.7	25.9	52.4
Lifting	29.7	21.3	25.7	53.1
Dexterity	12.6	20.4	26.3	53.4
Continence	7.2	18.3	30.1	51.6
Communication	7.0	21.5	25.2	53.3
Memory	6.9	21.0	26.7	52.3
Danger	1.4	21.4	26.8	51.8
Co-ordination	6.5	21.9	28.3	49.8

Appendix 2: Parameter estimates

Table A2 Marginal effects from probit models of higher-rate AA receipt

	$Pr(R=2\|D,X,Z,R>0)$		$Pr(R=2\|D,X,R>0)$	
Covariate	**(1)**	**(2)**	**(3)**	**(4)**
1 physical impairment$^{(d)}$	0.062	0.056	0.148	0.133
	(0.047)	(0.048)	(0.122)	(0.122)
2 physical impairments$^{(d)}$	-0.000	-0.015	0.009	-0.026
	(0.042)	(0.042)	(0.106)	(0.106)
3 physical impairments$^{(d)}$	0.040	0.014	0.110	0.042
	(0.042)	(0.042)	(0.106)	(0.107)
4 physical impairments$^{(d)}$	0.196***	0.147***	0.517***	0.382***
	(0.049)	(0.053)	(0.141)	(0.144)
1 cognitive impairment$^{(d)}$	0.030	0.023	0.080	0.061
	(0.031)	(0.031)	(0.077)	(0.078)
2 cognitive impairments$^{(d)}$	-0.018	-0.041	-0.039	-0.100
	(0.043)	(0.044)	(0.107)	(0.109)
3 cognitive impairments$^{(d)}$	0.047	0.001	0.118	-0.004
	(0.061)	(0.065)	(0.157)	(0.163)
4 cognitive impairments$^{(d)}$	−0.220**	−0.299***	−0.562**	−0.804***
	(0.096)	(0.087)	(0.264)	(0.273)
External care weekly hours		0.004**		0.010**
		(0.002)		(0.004)
Receives all-hours care$^{(d)}$		0.167***		0.440***
		(0.033)		(0.089)
Income spline: under £120	−0.281***	−0.274***	−0.664***	−0.651***
	(0.072)	(0.071)	(0.173)	(0.171)
Couple$^{(d)}$	0.485**	0.338	1.486**	1.036*
	(0.183)	(0.214)	(0.589)	(0.603)
Age spline: under 80	−0.092**	−0.100***	−0.216**	−0.237***
	(0.038)	(0.038)	(0.095)	(0.096)
Age of partner	−0.006*	-0.004	−0.017**	-0.012
	(0.003)	(0.003)	(0.008)	(0.008)
No financial assets$^{(d)}$	0.074***	0.068**	0.172**	0.159**
	(0.028)	(0.028)	(0.071)	(0.071)
Homeowner$^{(d)}$	0.039	0.031		
	(0.027)	(0.028)		
Post-compulsory education$^{(d)}$	-0.017	-0.022		
	(0.027)	(0.028)		
Hosmer-Lemeshow $\chi^2(8)$	3.92	2.00	6.41	7.12
Wald test of coefficient stability	-	$\chi^2_{16} = 12.49$	-	$\chi^2_{14} = 11.40$

Notes: Robust standard errors adjusted for clustering within households in parentheses;
$^{(d)}$ discrete variation of binary variable; *, **, *** significance at 10, 5 and 1% levels

Table A3 Marginal effects from probit models of AA receipt

Covariate	Reduced model	Full model	Covariate	Reduced model	Full model
Mobility impairment [d]	0.116***	0.095***	Single male [d]	-0.005	-0.001
	(0.007)	(0.008)		(0.011)	(0.010)
Difficulty lifting [d]	0.071***	0.056***	Male in couple [d]	−0.029***	0.001
	(0.008)	(0.008)		(0.009)	(0.010)
Dexterity impairment [d]	0.102***	0.072***	Female in couple [d]	0.004	0.022**
	(0.010)	(0.010)		(0.011)	(0.011)
Incontinence [d]	0.070***	0.043***	Spline: age 65-70	0.301***	0.166**
	(0.011)	(0.011)		(0.052)	(0.068)
Difficulty communicating [d]	0.051***	0.024**	Spline: age 70-75	0.228***	0.257***
	(0.011)	(0.011)		(0.034)	(0.044)
Memory impairment [d]	0.073***	0.027**	Spline: age 75-80	0.130***	0.099***
	(0.012)	(0.011)		(0.026)	(0.035)
Impaired sense of danger [d]	0.083***	0.048**	Spline: age over 80	0.096***	0.104***
	(0.025)	(0.023)		(0.013)	(0.021)
Co-ordination difficulty [d]	0.080***	0.057***	Homeowner [d]	−0.049***	−0.035***
	(0.012)	(0.012)		(0.008)	(0.008)
Receives LA care [d]		0.036***	Post-compulsory education [d]	-0.009	-0.005
		(0.013)		(0.008)	(0.007)
Receives care [d]		−0.838*	No financial assets [d]	0.019**	0.012
		(0.253)		(0.008)	(0.008)
Receives all-hours care [d]		0.195***	Spline: income under £120	−0.114***	−0.105***
		(0.036)		(0.022)	(0.021)
No. impairments × care		-0.003	Spline: income £120-160	0.026	0.050
		(0.006)		(0.031)	(0.030)
No. impairments		−0.018***	Spline: income £160-250	−0.127***	−0.117***
× all-hours care		(0.007)		(0.018)	(0.018)
Spline: age 65-70 × care		0.255**	Spline: income over £250	−0.014	−0.014**
		(0.109)		(0.009)	(0.009)
Spline: age 70-75 × care		−0.186***	Hosmer-Lemeshow $\chi^2(8)$	12.92	6.17
		(0.069)			
Spline: age 75-80 × care		-0.052			
		(0.050)			
Spline: age over 80 × care		−0.090***			
		(0.025)			

FRS sample of over-65s with at least one disability or receiving care ($n = 12,894$).