ELSA-HCAP Sample weights

Design weights were calculated by using the inverse of the probability of selection (equal to either 1 or 5) multiplied by the cross-sectional weight from the last ELSA wave in which the individual took part (e.g., wave 8 for most participants and wave 7 otherwise). The resulting weight was adjusted (at the 99th percentile) to eliminate any extreme weights.

Non-response weights were then modelled using logistic regression with a suite of socio-demographic and health measures (from ELSA) used as explanatory variables of the individual response to HCAP, in models weighted by the design weights. The response rates and pattern of non-response were found significantly different ($p \leq 0.05$) between the three sampling cognition groups (described in the eligibility criteria section above). The lowest level of response was found as expected in the low cognition group. Therefore, two sets of variables were created to allow for adjustments to be made both across and within the three cognition groups. Each variable with four or more categories was then recoded to have only two or three categories; thus, there were two versions of most explanatory variables. For example, the highest education in five categories was recoded into three categories. The original set of variables was used for main effects (e.g., adjustments for the whole sample) and the reduced set of variables for interactions (e.g., adjustments within the group). The final model included the following variables: age and cognition group, region, ethnicity, tenure, current work status, self-rated long-standing limiting illness, health status, memory, hearing, taking part in mildly energetic activities, moderately energetic activities, or strenuous activities, difficulties with daily living activities (ADL), objective measures (quartiles) of memory, verbal fluency and interactions between cognition groups with each of the age groups, tenure, self-rated memory, ADL, objective memory. A non-response weight was created by taking the inverse of the response probability from the model, trimmed at the 99th percentile, and multiplied by the selection weight.

Calibration weighting was then created to adjust the weights in order to match population estimates. The choice of variables used in calibration was informed by a comparison between the achieved sample (weighted by the composite non-response weight) and ELSA core members aged 65+ at wave 8 (weighted by the cross-sectional weight). Age group and sex were included in the calibration within cognition group, while region, ethnicity, tenure, education (highest qualification), marital status, self-reported health status, whether have a long-standing limiting illness, were included in the overall sample. The weights were calibrated by age and sex within each cognition group, and by

education, ethnicity, and marital status across groups, although the calibration adjustment was minimal in ELSA-HCAP, meaning that the distributions of other variables used in the non-response weighting were very close to population estimates.

Population estimates are taken from ELSA wave 8 core members aged 65+ weighted by the cross-sectional weight. The final weight for this study is a combination of the design and non-response weights. The calibration weights thereby make the weighted HCAP sample representative of the population aged 65+ in England. The unweighted results of this sample will not be the same as the population.
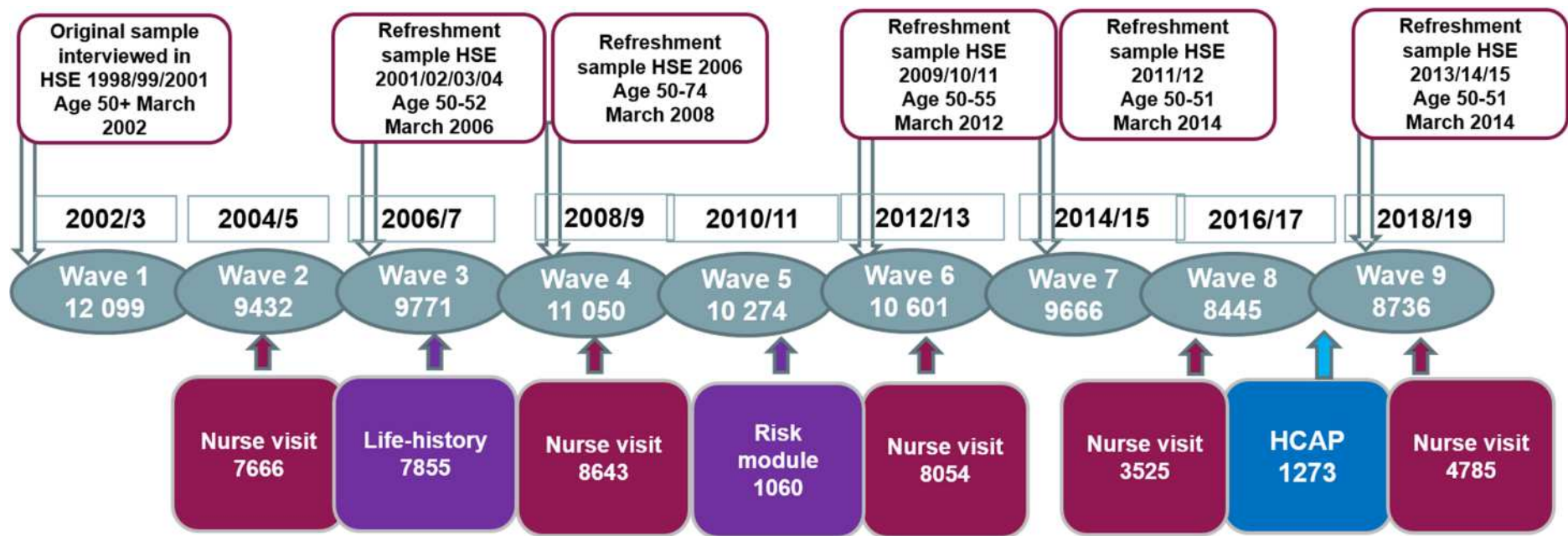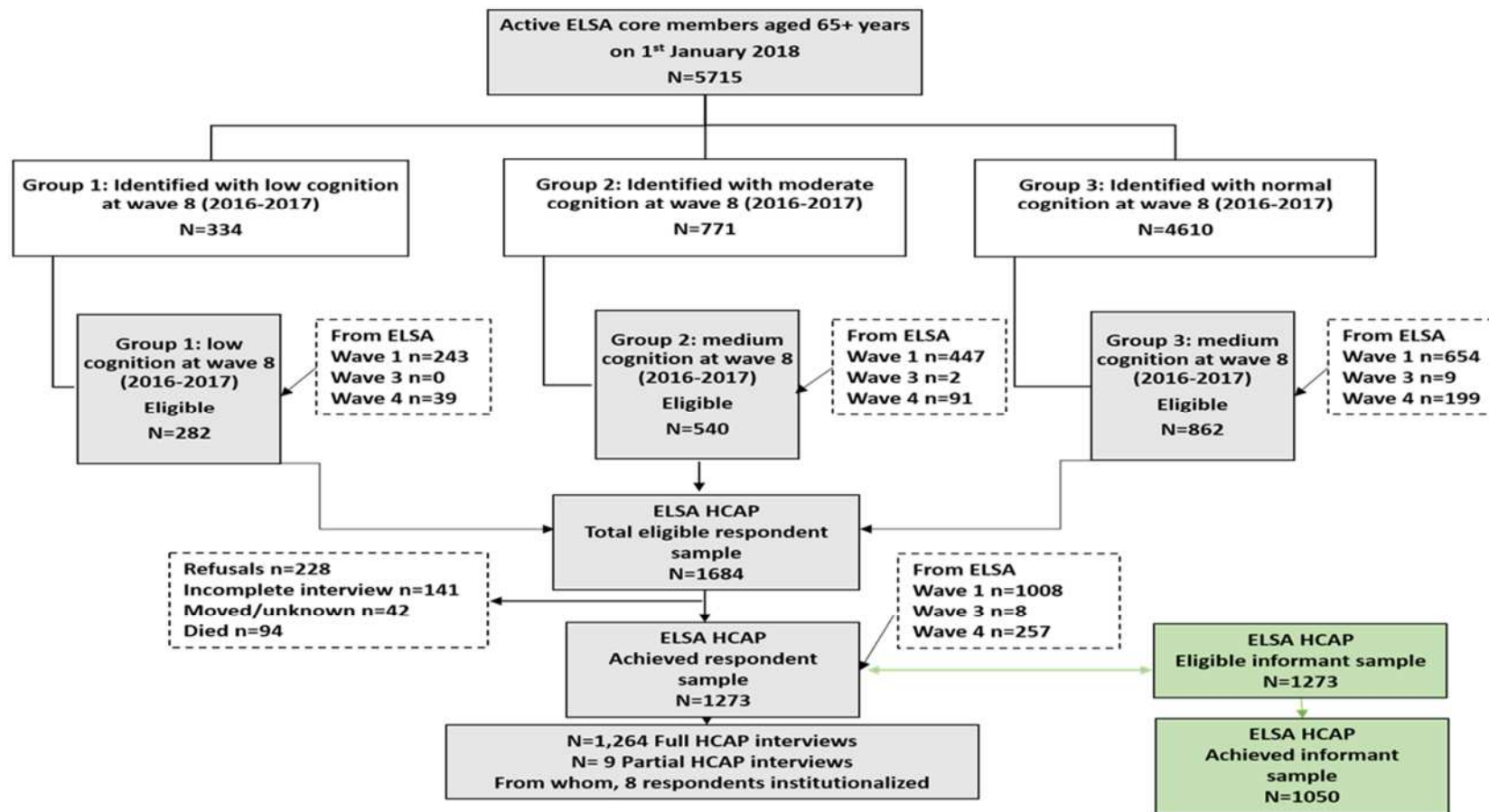
Figure 1. The timeline of the ELSA-HCAP sub-study within the main ELSA waves