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1 **Using occupational history calendars to capture lengthy and complex working lives: a**
2 **mixed method approach with older people.**

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32

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57 **Abstract (159 words)**

58 Accurately documenting the occupational biographies of older people can be challenging given their
59 lengthy duration and the complexity of contemporary employment. This paper shows how a
60 traditionally quantitative occupational history calendar (OHC) instrument can be adapted for use in a
61 in a mixed methods research design, to gather in-depth information about long working lives. The
62 OHCs were embedded within semi-structured interviews and recorded lifetime work histories of
63 between 33 and 53 years for 56 participants. Sequence analysis of the calendar data was undertaken
64 in parallel to thematic analysis of interview transcripts. This included in-depth exploration of the
65 factors motivating occupational changes and transitions and their impact in older age. Mixing
66 methods allowed us to collate data over relatively long periods of time and enabled an examination
67 of the complex interplay between work, family and personal circumstances that shapes employment
68 histories. Selected research findings are used to demonstrate how this tool can effectively facilitate
69 the exploration of long working lives.

70

71 **Key Words:** occupational history calendars, work histories, older people, mixed methods research,
72 sequence analysis

73

74 **Introduction**

75 Population ageing is a global phenomenon which poses significant social, economic and political
76 challenges coupled with opportunities as well as pressures for labour market participation (Green,
77 2009). Longevity, longer working lives and in some countries the abolishment of a default retirement
78 age also poses methodological challenges for research requiring a lifecourse perspective on
79 employment. Green (2009) purports 'a need for more research on how the life course varies for
80 different subgroups in different regions and local areas and how the employment to non-
81 employment transition of older people fits alongside other life course transitions' (p.57).
82 Nevertheless, accurately documenting patterns and transitions in the occupational biographies of
83 the elderly can be difficult, given their long duration and the transient and multifarious nature of
84 contemporary employment (Lilley, Cryer, Firth, Herbison & Feyer, 2011).

85 Employment patterns and transitions involve complex processes that are socially determined;
86 shaped by personal and contextual factors (Wiseman and Whiteford, 2009). Decisions about
87 retirement are similarly embedded in historical, cultural and social contexts (Kim and Moen, 2002)
88 and careers are becoming increasingly discontinuous and characterised by instability (Tams and
89 Arthur, 2010). Longer working lives will reflect multiple shifts in occupational and social patterns
90 and changes in labour market conditions associated with wider institutional, demographic and
91 macroeconomic change. The impacts of these changes are not distributed equally. For instance, the
92 current cohort of older workers appears to be particularly vulnerable to the increasing competitive
93 pressures associated with globalisation (Blossfeld, Buchholz & Kurz, 2011) especially in the UK where
94 the employment system is relatively uncoordinated by European standards (Schmelzer, 2011).
95 Capturing such variety and complexity is important to understanding how micro and macro level
96 factors impact on older people within the context of their working lives. This requires a method of
97 data collection that optimizes occupational recall and quality of recalled information (Lilley et al.,
98 2011). For older people, the need is paramount. Recalling work histories over an extended
99 trajectory can prove difficult, potentially leading to inaccurate reporting, recall bias and issues with
100 reliability, validity and credibility. Past experiences may be distorted or merge together into partial
101 truths. According to Parry, Thomson and Fowkes (1999), a significant factor in minimising recall
102 problems is the manner in which the data is collected.

103 A variety of methodological techniques have been developed to facilitate recall and collect accurate
104 retrospective data on employment histories. One such method is the occupational history calendar
105 (OHC); a grid based instrument developed by occupational epidemiologists which uses multiple
106 recall cues such as historical markers and visual aids to facilitate recall and enhance accuracy of data
107 (Engel, Keifer & Zahm, 2001; Hoppin, Tolbert, Flagg, Blair & Zahm, 1998; Lilley et al., 2011; Zahm et
108 al., 2001). Modelled on the Life Event Calendar (LEC) approach (Axinn, Pearce & Ghimire, 1999;
109 Caspi et al., 1996), the OHC provides researchers with an ideal platform to capture transitions and
110 multiple changes over the lifecourse (Scott-Ricks & Harrison, 2011; Sutton, 2010). Engel et al. (2001)
111 used an icon calendar-based questionnaire to assess the occupational histories of farm workers and
112 concluded that the grid based questionnaire was more effective in obtaining a complete picture of
113 occupational histories than traditional methods. Zahm et al. (2001) adapted Engel et al.'s (2001)
114 method in their study ascertaining occupational histories and other characteristics of migrant farm
115 workers. Results demonstrated that it was feasible to use OHCs to capture complex work histories.
116 Both studies corroborated previous work by Hoppin et al. (1998) who introduced the use of

117 personal and historical landmark events in the calendars, to anchor work activities in time and
118 facilitate the recall over the life course. More recently, Lilley et al. (2011) used an OHC with the
119 working population in New Zealand and concluded that a calendar approach was appropriate for
120 collecting occupational histories with the general public although cautioned that it was rather
121 resource intensive for large scale population surveys.

122 In line with positivist dominated lifecourse research (Verd and Lopez, 2011), the OHC approach
123 traditionally generates quantitative data and is typically analysed using statistical methods such as
124 event history analysis or more recently, life sequence analysis (Eerola & Helske, 2012; Pollock,
125 Antcliff & Ralphs, 2002; Wiggins, Erzberger, Hyde, Higgs, & Blane, 2007). This particular procedure
126 uses optimal matching and cluster analysis to identify the differences and similarities between the
127 individual work histories and groups them in a systematic way taking account of different
128 employment states and transitions between them. According to Eerola and Helske (2012), the
129 analysis of event sequences to describe life trajectories such as employment histories provides
130 detailed information about 'how things are' but not necessarily why they happen? Whilst event
131 history analysis may address this, 'why' questions are often best answered using qualitative
132 approaches.

133 To this end, some researchers have started to use calendar based life history review instruments
134 qualitatively (Harris & Parisi, 2007; Martyn & Martin, 2003; Nelson, 2010). The appeal of using
135 calendars in a qualitative context not only lies in their capacity to foster insights (Belli & Callegaro,
136 2009) but can lead to enhanced researcher – participant interaction and better understanding of
137 the issues under investigation (Harris & Parisi, 2007). Nelson (2010) considered the methodological
138 adaptation as good as the traditional quantitative method for capturing processes and complex
139 patterns and had the added advantage of capturing explanatory data to inform the 'hows and whys'
140 (p.42) of the transitions.

141 This interpretative approach has been successfully used in different permutations with older
142 participants across a range of disciplines. Berney and Blane (2003) developed the Lifegrid Method
143 which was shown to collect socio-demographic information with useful accuracy after 50 years.
144 Holland et al. (2000) used this method to collect full occupational, residential and household
145 histories, from which accumulated lifetime exposures to a range of environmental hazards were
146 estimated. Parry et al. (1999) also used the Lifegrid Method to explore associations between life
147 experiences and smoking; to gauge life course influences on patterns of persistent smokers aged 65-
148 85 years. Although Bell (2005) challenges the utility of the Lifegrid Method for qualitative
149 researchers, considering it 'non-reflective and too date and event centred'(p.65), he contends that it
150 encourages participants to address the issue of change over time and may prove suitable when
151 collecting relatively factual data. Meltzer (2001) developed the Self Discovery Tapestry to explore
152 the occupational careers of mature women. Although not specifically designed for older people, she
153 concluded that the tool was suitable for use with an elder population. This was borne out in the
154 work of Feldman and Howie (2009) who used her Self Discovery Tapestry with people aged 80 years
155 and over in Australia.

156 To date, the traditional OHC has yet to be used qualitatively or exclusively with older people but a
157 number of methodological and practical considerations makes it a uniquely valuable tool for
158 conducting research with an elder cohort. Given the tendency of older people to 'construct their

159 biographies using a range of meaningful reference points' (Parry *et al.*, 1999, p. 2), the matrix design
160 provides an explicit framework that enables older participants to focus their attention on specific
161 topics and acts as a stimulus for dialogue (Feldman & Howie, 2009). Calendar methodology also
162 draws on reminiscence and potentially has therapeutic value (Berney & Blane, 2003). Importantly,
163 the OHC is a visual tool providing a graphic representation of the participants' occupational history
164 that enables gaps and contradictions to be easily determined (Freedman, Thornton, Camburn, Alwin
165 & Young-DeMarco, 1988). This visualisation not only supports recall of previous work experiences
166 (Meltzer, 2001) but provides opportunity for reflection and analysis of one's own occupational
167 biography (Feldman & Howie, 2009).

168 Exploring complex social phenomenon such as occupational or career transitions over long working
169 lives is difficult to do within a single paradigm; "the messiness of complexity demands multiple
170 investigative tools" (De Lisle 2011:89). Verd and Lopez (2011) similarly suggest that the combined
171 use of qualitative and quantitative data provides a holistic perspective that substantially improves
172 lifecourse research. Given the demonstrable reliability of the OHC approach in capturing lifetime
173 occupational histories and the acknowledged value of adopting a qualitative approach to lifecourse
174 data collection, in particular when working with older participants, both tools were selected for use
175 in an European Social Funded project on discrimination and older workers in the North West of
176 England (Carmichael, Hulme, Porcellato, Ingham & Prashar, 2011; Porcellato, Carmichael, Hulme,
177 Ingham & Prashar, 2010).

178 Despite evidence that calendar based instruments provide an ideal framework for collecting
179 multiple forms of data (Creswell & Plano Clark, 2007) and thus are amenable to mixed method
180 research (Sutton, 2010), there is a dearth of such studies. Scott-Ricks and Harrison (2011) attribute
181 this paucity to a 'lack of epistemologic clarity on how to use the tool' (p. 263). This paper seeks to
182 address this gap in procedural knowledge by discussing the development and application of our
183 mixed method OHC. Selected research findings will be used to illustrate how this tool can effectively
184 facilitate the exploration of the long working lives of older people. Advantages and limitations of
185 using this pragmatic approach will be considered.

186 **Development and application of the OHC**

187 A number of modifications to the conventional OHC (Engel *et al.*, 2001; Hoppin *et al.*, 1998; Lilley *et al.*
188 *et al.*, 2011 & Zahm *et al.*, 2001) were required to accommodate our research. Similar to Lilley *et al.*
189 (2011), A3 sheets in a landscape orientation were used and space to record demographic data (age,
190 ethnicity, date of birth, gender, marital status and current employment status) was earmarked at the
191 top of the first sheet. This size was considered large enough to clearly record data without being too
192 cumbersome to populate and transport to interview locations. Moreover, when spread out in front
193 of participants, the sheets emulated a timeline which provided a focal point for the interviews. As
194 shown in Figure 1., there were seven fixed columns from left to right: age, year, months on a
195 quarterly basis and significant historical events across time. Unlike traditional life event calendars,
196 only one central domain (employment) was used and each row of the grid was one year in the work
197 life of the participant. A time frame of at least 56 years set out in tri-monthly increments was
198 needed, to span lifetime employment of all the participants. Similar to Hoppin *et al.* (1998), a series
199 of computer generated stickers was used to represent other important domains (e.g. key life events
200 such as first job, leaving education, graduation, marriage, births, divorce, relocation). Open ended

201 interview questions were developed and asked upon completion of the OHC. Participants were
202 encouraged to reflect on their employment history as documented on the OHC and to consider
203 factors (both positive and negative) that they perceived influenced their employment experience
204 over time.

205 *Figure 1 about here*

206 Fifty-six men and women domiciled in North West England were interviewed in 2006-7. Participants
207 had responded to information flyers distributed at various publicity events for older people. The
208 sample was selected purposefully to reflect a range of ages 50 and over, different occupations and
209 comprise both men and women. The lower threshold of 50 years was selected to reflect existing
210 research and policy statements which generally consider those 50 and older as the demographic
211 group of interest (Khan, 2009; OECD, 2004; 2005; 2006). Table 1. summarises characteristics of the
212 sample at the time of the interview. An interview schedule informed by the review of literature was
213 developed to ensure consistency amongst four interviewers. Interviews were held at a location of
214 convenience for participants. Permission to audio record the dialogue during the completion of the
215 OHC and the follow on interview was obtained. Ethical approval for this study was obtained from the
216 University of Salford Ethics Committee.

217 *Table 1 about here*

218 The OHC was introduced at the beginning of each face to face interview and positioned between the
219 interviewer and interviewee. Not only did this provide a central focus for the process but it signified
220 that populating the calendar was meant to be a collaborative effort and encouraged the narrative
221 exchange of information while collecting objective data. To begin with, demographic details were
222 recorded on the OHC and then important life events (graduation, first job, marriage, births,
223 relocation) based on month and year were mapped using the computer generated stickers. The
224 stickers, in conjunction with the historical markers listed on the side of the grid provided 'anchors' to
225 help participants logically sequence their work histories (Figure 1).

226 There is little evidence about the best way to move through the calendar, but Bradburn, Rips and
227 Shevel (1987) suggest that better levels of recall are achieved when individuals move backwards
228 from the present to the past. As such, detailed work histories (type of job, employment status,
229 location, duration on a job) were recorded as horizontal lines on the OHC, on a job by job basis in
230 reverse order from present day to first ever job (Engel et al., 2001). Different colours were used for
231 different employment states (e.g. black for unemployment, pink for part time employment). A
232 change in job or status was signalled by a short vertical line (Figure 2). With each new job recorded,
233 participants were asked the reasons for taking the new job, the reasons for leaving/ changing the
234 previous job and if they had remained in a job long term, the reasons for staying in this job. This
235 information was recorded on the calendar and captured in full on the audio recording as well. Once
236 the calendar was completed, it was spread out in front of the interviewee and used as a prompt for a
237 series of follow on questions to collect in-depth retrospective data relating to participants'
238 employment experiences, the barriers they may have faced in employment, particularly in later life
239 and perceptions about how the working environment had changed over the course of their lives.
240 The interview concluded with 3 standard demographic questions relating to educational attainment,
241 health status and household income.

242 *Figure 2 about here*

243

244 **Analysis**

245 The data from the occupational history calendars was collated in several ways and in different
246 stages; to facilitate a multi-method analysis of whole trajectories as well as individual transitions.
247 Initially, the data on individual work histories were input into an Excel file (see Figure 3) where we
248 recorded the employment status of each participant from the age they started their first job to their
249 age at the interview using colour and numerical codes for different broadly defined occupations and
250 employment status: professional/managerial; skilled; semi-skilled; unskilled; education/training; not
251 in paid work; child/family care. We experimented with narrower ways of coding the data including
252 differentiating part and full-time employment, but these alternatives suffered from infrequent
253 observations in some categories. The coded data were input into Stata 13 and we used the SQ-Ados
254 scripts (Brzinsky-Fay, Kohler, and Luniak *et al.* 2006) to analyse each of the 56 employment histories
255 or careers as a sequence or string of employment activity states over the lifecourse of the individual.

256 *Figures 3 and 4 about here*

257 Figure 4 provides a broad picture of life-history data using a state distribution plot. This plots the
258 distribution of employment states by age and represents aggregated views of successive slices of
259 time. The height of each of the coded segments at each observation is proportional to the frequency
260 of each state at each age. The graph usefully shows how the distribution of the states changes over
261 life histories. For example, as the sample age, incidences of time out of paid work for reasons other
262 than family care and time in managerial/professional employment both increase. After exploring the
263 raw sequence data we used optimal matching and cluster analysis to create a typology of the
264 employment histories of the sample members (Anyadike-Danes & McVicar, 2010, p. 486). The
265 optimal matching procedure compares all pairs of sequences and uses a non-parametric algorithm
266 to compute the minimum distance, in terms of costly operations, to turn one sequence into another.
267 The substitution costs were generated using a symmetric transition frequency-based substitution
268 cost matrix and insertion/deletion (indel) costs were fixed at half the maximum substitution cost and
269 standardised by the length of the longer sequence (Brzinsky-Fay *et al.* 2006; Potârca, Mills and
270 Lesnard, 2013). The resulting distance matrix was used in the cluster analysis with the widely used
271 Ward's algorithm. Using an iterative process (Potârca *et al.* 2013) five distinct employment patterns
272 were identified. Table 2 provides illustrative data on the five clusters which were characterised by
273 the predominance of: 1. unskilled career paths; 2. a patch worked mix of employment states
274 indicating varied careers with early periods as a child/family carer and higher incidences of time out
275 of paid employment with age; 3. skilled careers with some earlier employment in semi-skilled posts;
276 4. skilled employment with transitions into professional/managerial careers or, alternatively non-
277 employment (upward or out) and; 5. mainly professional and managerial careers with some early
278 skilled employment.

279

280

281

282 *Table 2 about here*

283 Parallel to the sequence analysis of the calendar data, recorded interviews were transcribed
284 verbatim and identifiable data was anonymised. Data management and thematic analysis was done
285 using QSR International's NVivo 2 qualitative data software. Data was analysed using a staged
286 thematic content analysis method espoused by Burnard (1991) and Burnard, Gill and Stewart (2008).
287 Based on grounded theory (Glaser and Strauss, 1967), this pragmatic approach involves the
288 systematic process of coding transcripts and identifying themes and patterns across the data set.
289 The first stage involved reading the transcripts and allocating open codes to individual concepts. In
290 the second stage, similar codes were collated together into a smaller number of conceptual
291 categories. In the third stage, themes were identified in relation to the coded extracts and the entire
292 data set. Saturation was assumed to be reached as no new codes were identified in the final
293 transcripts analysed. To establish trustworthiness of the analysis, a sample of the transcripts were
294 also analysed manually by the other researchers and cross checked with the computer- assisted
295 analysis to ensure congruence.

296 The two approaches were then integrated by using the employment trajectories embodied in the
297 cluster groupings to explore how different career paths were associated with the themes that
298 emerged from the qualitative analysis. One illustration is that in the thematic analysis of health and
299 ageing, there were different experiences of mental and physical ill-health over lifecourses and in
300 later life depending on different career trajectories. For example, people on unskilled and patchwork
301 career paths in clusters 1 and 2 were observed to have experienced more incidences of ill-health
302 than others with prolonged ill-health precipitating early retirement in some cases (Carmichael,
303 Hulme, Porcellato, 2013). People in cluster 1 also tended to view today's labour market more
304 negatively than the labour market which had shaped their early careers in the 1960s and early
305 1970s. In another example, the thematic analysis of education and training revealed that transitions
306 into professional/managerial careers in cluster 4 were linked to time spent in full-time education
307 mid-career. Interestingly, members of cluster 4 were also particularly vocal in the thematic
308 exploration of age discrimination.

309
310 Whilst the qualitative analysis enabled themes to be highlighted, the trajectories and time or career
311 dependent elements were less evident. The quantitative analysis was able to bring out these more
312 hidden nuances – in particular those that related to changes over time or were time dependent over
313 employment histories that spanned up to 5 decades. The mixed method approach, given the
314 individual participants were of different ages and each followed a unique employment
315 path/trajectory, provided a systematic method which enabled patterns and trends to be identified
316 and allowed us to explore the interrelationships between time in paid work, family commitments
317 and other aspects of individuals' lives that underpinned their different career histories. In
318 particular, the mix of methodologies facilitated an examination of the individual occupational
319 histories over time, how they had evolved and how they had continued to shape the lives of the
320 participants.

321 **Discussion**

322 The focus of this article is on the application of a mixed methods research approach rather than
323 study findings. The intention is to illustrate the utility of embedding an OHC into a semi-structured
324 interview, to effectively capture data on the long working lives of older people in a systematic
325 manner and in doing so, to address the dearth in research reporting on mixed methods studies using

326 time-line techniques as well as contribute to the burgeoning evidence base on mixed methods in
327 gerontological research (Happ 2009).

328 Given the effect of ageing on memory recall and the lengthy, complex and often transient nature of
329 contemporary employment, accurately documenting occupational biographies can be difficult for
330 older people. To enhance the accuracy of self-reporting, it is imperative to use tools which optimise
331 recall via visual and verbal cues. There is a substantive body of evidence that demonstrates the
332 effectiveness of calendar based tools in systematically capturing high quality, time-based data,
333 retrospectively (Freedman et al., 1988; Axinn et al., 1999; Caspi et al., 1996; Belli & Callegaro, 2009).
334 OHCs in particular have been used successfully to elicit complex work histories from farm workers
335 (Hoppin et al., 1998; Engel et al., 2001; Zahm et al., 2001) and the general working population (Lilley
336 et al., 2011) but have yet to be used exclusively with an elder population. Traditional OHCs use
337 empirical analysis of data to statistically explore patterns in data across the lifecourse. However, this
338 quantitative approach does not allow for individual explanations of behaviour and decision-making
339 (Harris & Parisi, 2007). Moreover, the highly structured nature of the OHC limits the type of data
340 collected (timing and sequence of jobs). Although easier to analyse, the data lacks the depth and
341 breadth needed for in-depth understanding of complex social phenomenon and cannot provide
342 meaningful explanations of emergent patterns; in essence the 'whys' behind participants'
343 trajectories.

344 There is an emerging body of work that has adopted a more interpretative stance and used life
345 history calendar methods qualitatively which has greater scope for capturing explanatory data;
346 allowing for greater insights and shedding light on patterns and employment transitions over the
347 lifecourse. According to Harris and Parisi (2007), a qualitative approach contributes to explaining
348 differences in work histories across people, places and time, illuminating interactions between
349 history, biography and context. This ability to capture individual heterogeneity is vital, given that
350 older workers form a very heterogeneous group in terms of health, skills, types of jobs, and the local
351 labour market (OECD 2006). Some researchers have used life history calendar techniques in
352 conjunction with interviews (e.g. Martyn & Martin, 2003; Harris & Parisi, 2007; Nelson, 2010; Scott-
353 Ricks & Harrison, 2011). In these studies, priority was given to the qualitative data with basic
354 descriptive statistics used to demonstrate trends in calendar data. But as far as we are aware no
355 studies give equal priority to each paradigm, as is done in our study, where the integration of data
356 enables a far richer analysis of the data collected than would be possible individually.

357 *Advantages of mixed-method OHCs*

358 Adopting a mixed methods design to obtain full work histories on a sample of older people and as
359 part of this process to identify different career pathways and the factors shaping them, proved to be
360 a sound methodological strategy. Taking this 'pragmatic' approach enabled the older participants to
361 map out their work lives in a systematic and comprehensive fashion whilst at the same time enabled
362 the research team to capture the participants' whole labour market career and explore the factors
363 motivating occupational transitions and changes in employment status. In particular, we could
364 explore the factors underlying individual occupational histories and how different pathways had
365 impacted on the lives of the participants in older age including their perspectives on ageing, their
366 wellbeing and transitions into retirement. The quantitative clustering of the sample according to
367 their different work histories additionally lends itself to consideration of how perspectives on age
368 and experiences of ageing are shaped by individual life courses. This fostered new insights and lines

369 of enquiry that would not have been possible using a single method. Overall, the integration of
370 mixed methodologies enabled an in-depth examination of the complex interplay between work,
371 family and personal circumstances that shapes employment histories.

372

373 In practical terms, the integrated approach was implemented by combining the typologies resulting
374 from the sequence analysis with the qualitative methods by grouping sample members and
375 comparing their experiences and observations. As an illustration, the use of the OHC nested within
376 an interview facilitated the exploration of the multi-causal factors and underlying reasons for the
377 identified transitions between employment states, including transitions into retirement, and career
378 changes that were in themselves too disparate to model in a formal way. For example, the reasons
379 for the changes in employment status and occupational transitions recorded in the calendars were
380 scrutinised in the qualitative component of the interviews. In this way we were able to identify five
381 main reasons for the transitions between employment states and occupations identified in the
382 quantitative component. The significance of these influences varied between the clusters but there
383 were also differences between them as well as commonalities across the clusters notably by gender
384 and at different stages in people's lives. Moreover, it was possible to unpack the impact of decisions
385 made earlier in an individual's working life on transitions made in later life. For example, for one
386 interviewee (F1, age 54, self-employed part-time (cluster 2)) her decisions to work for an academic
387 publisher and set up a training business were related to her earlier career as a teacher; for another
388 (M43, age 59, unemployed (cluster 4)) his decision to take voluntary redundancy and go into full-
389 time education in his 40s was linked to an unsettled period in his life due to divorce and the death of
390 a close relative.

391 Using a mixed methodology enabled us to capture the underlying structure of the long life histories
392 of older people and derive typologies of those histories over an extended period of time. This is
393 important advantage in ageing research given that panel data at the national level are not widely
394 available for the length of time necessary to assess the employment histories of people in their 50s
395 and 60s in a comparable way. For example, full data for the original British Household Panel
396 Survey/Understanding Society sample are currently only available for 20 years. The shortest
397 sequence used in our analysis is 33 years. However, some purpose specific, retrospectively
398 constructed datasets are available over longer time-frames e.g. the British Household Panel Survey
399 Combined Work-Life History files (Haplin, 2000).

400 The research also suggest that OHCs used within an interview are aptly suited to the needs of older
401 respondents. The OHCs provided a useful focal point for the interview, giving it structure. This made
402 it easier for the respondents to construct their narrative and enabled the researchers to gather a
403 coherent and comprehensive mix of data. The physical and visual nature of the OHCs highlighted
404 patterns and trends at a glance and where information gaps were evident or additional further
405 understanding was needed, probe further. Consistent with other studies (e.g. Engel et al., 2001)
406 participants were keen to ensure their timelines were as complete as possible which enhanced the
407 quality of the data in terms the validity and reliability.

408 A particular attraction of using the OHC in a mixed methods design with older people is the reflective
409 nature of the tool. The opportunity to '*walk down memory lane*' was appreciated and often acted as
410 a catalyst for further reflection. The process of 'thinking back' on significant life events is known to
411 have significant therapeutic value for older people. Recalling past experiences can enhance self-

412 esteem and heighten sense of identity (Yen-Chun Lin, Yu-Tzu Dai & Shioh-Li Hwang, 2003). In
413 relation to occupational histories, the OHCs and the follow on interviews provided an opportunity
414 for older people to visualise their working lives on paper, to reminisce about past accomplishments
415 and provide explanations and justification for actions taken and decisions made. The reflective
416 nature of the tool, the cathartic benefit of telling their life story, of being listened to and feeling
417 valued engendered a positive and enjoyable research experience for many of the participants. This
418 satisfaction in the research process, as evidenced below can have a positive impact on the data,
419 enhancing both accuracy and reliability of the data (Glasner and van der Vaart 2009).

420 'I think it's given me an opportunity to really think about how I do feel about it all. And I guess
421 that what attracted me about it, about being interviewed was how I feel now, this sort of
422 transition period and it's sort of very frightening going into retirement' (F13, female age 59,
423 employed full-time)

424 'It is, it is interesting isn't it, it is, and yes you know, it's given me food for thought too' (M26, male
425 age 54, employed full-time)

426 The participatory nature of the chosen methods provided an opportunity for older people to be
427 engaged in co-producing meaningful data for research. Not only is this empowering, active
428 engagement promotes shared responsibility of the research process which creates a desire to
429 produce high quality data and gives the message that their contribution is valued. This is important
430 for a population who tend to hold a minority status in society today. In our opinion, it was this
431 collaborative component, the working together to populate the OHC that also enhanced the
432 research experience for our participants. Co-constructing their work biographies ensured that the
433 difficulty and frustration encountered by Feldman and Howie's (2009) older sample when self-
434 completing their life history review tool would not be experienced by our participants.

435 A further point is that the interactive format makes for pleasant data collection conditions not only
436 for the interviewees but the researchers as well. Similar to Harris and Parisi (2007), our researchers
437 enjoyed listening to the respondents narratives and working collaboratively with them to co-
438 construct the OHC.

439 *Limitations of mixed-method OHCs*

440 Adopting a mixed methods approach to collecting and analysing the long working lives of older
441 people poses several methodological challenges. Consideration must be given to aspects of the tools
442 used and the population with which they are being administered. One such consideration is paper
443 size. According to Nelson (2010) paper size is important and has implications on where interviews
444 can be conducted and what data can be analysed. She used blank A0 easel paper rather than a pre-
445 printed matrix but this unstructured format meant that the calendar data could not be formally
446 analysed. Our choice of paper size (A3) proved suitable for use with older people. The size was large
447 enough to record data that was legible to the respondents and easily accommodated the stickers
448 earmarking key life events. The use of the stickers to record personal events helped to personalise
449 the data collection: 'was that after your son George was born?' which in turn maintained the interest
450 and focus of the participants. This cross-referencing of personal information with job histories
451 additionally helped to reduce discrepancies; for example, by clarifying dates that might otherwise
452 simply be guessed or only roughly estimated.

453 Pragmatically, the OHC can be cumbersome and complicated to complete. The number of sheets
454 required (up to seven in some cases) to obtain full work histories made management of the OHCs
455 somewhat unwieldy during the interviews. Equally, co-ordination of the various pens and multiple
456 stickers needed for coding was burdensome and could detract interviewers from other tasks such as
457 following up on important details and correcting inconsistencies. The unwieldiness of the traditional
458 pen and paper method could potentially be circumvented by using a tablet or laptop computer but
459 this format may not be best suited to all older people as some may be more comfortable using pen
460 and paper methods rather than technological interfaces. As noted by an anonymous reviewer, the
461 use of a computer in the interviews could also inhibit rapport building.

462 Some inconsistencies in how different researchers recorded the data were also noted although
463 these did not surface until the analysis stage. For example, different colour codes used, and multiple
464 jobs were recorded in different ways. The value of using a mixed methods design became apparent
465 here as interview transcripts were then used to help clarify any resulting inconsistencies in the data.
466 Further inconsistencies emerged in how interviewers moved through the OHC. One interviewer
467 began interviews with the participant's first job rather than last. This was not deemed an issue of
468 particular concern as Belli and Callegaro (2009) are of the opinion that priority should be given to the
469 respondent's preferences for moving through the calendar, but it does highlight the need for
470 training of researchers using OHCs, to ensure consistency in approach. Further research is needed
471 to assess the impact of different approaches to recording data on the OHC to maximise
472 methodological benefits (Roberts and Horney, 2010).

473 Collecting data on an older population also poses challenges. Despite efforts to maximise recall by
474 using OHCs, there were still some difficulties in remembering periods of employment, especially
475 when the participants had only been in a particular job for a short time or had held multiple jobs
476 simultaneously (this was also difficult to code in the calendars). Gaps in work histories were
477 inevitable given respondents age but we found that discussion during the follow-on interviews could
478 jog their memory and gaps in the time line were subsequently filled as part of the interview process
479 further highlighting the benefit of using a mixed methods design.

480 Time is another factor that merits consideration when collecting data from an elderly cohort. An
481 OHC administered within a semi-structured interview increases the amount of time needed to
482 complete the data collection process. Duration ranged between one and two and half hours with
483 most lasting longer than an hour and a half. Although not particularly excessive time-wise, recalling
484 and reflecting on significant events sequentially across a long life span can be difficult for older
485 participants (Feldman & Howie, 2009). Researchers need to be cognisant of the emotional demands
486 that timeline tools can bring to bear on participants.

487 Additional limitations relate to the analysis of the OHC data as sequences which requires the
488 application of optimal matching. This method has been criticised because of concerns about how
489 researchers determine the substitution and indel costs that are used to calculate the dissimilarity
490 matrix (Halpin, 2003, 2010; Piccarreta 2012). Ideally these costs should be determined by theory but
491 this is not usually practical (Davia and Legazpe, 2014). Using a transition based substitution cost
492 structure as here treats non-frequent transitions as more costly and setting indel costs equal to one
493 (the Levenshtein I OM parameterization, see Potârca et al 2013) attaches importance to preserving
494 the timing of sequences but does not restrict the procedure to using only substitution operations.

495 While sequence analysis has been more commonly used to find patterns in large data sets, the non-
496 parametric Needleman-Wunsch alignment algorithm used in the optimal matching procedure makes
497 no distributional assumptions. In addition, embedding the OHC in a qualitative interview has the
498 advantage of allowing for detailed inspection of the patterns identified and their relevance. As
499 suggested by an anonymous reviewer, future research could nevertheless benefit from using large
500 national data sets to perform parallel sequence analysis and using the findings to inform new
501 qualitative research.

502

503 **Summary**

504 This paper provides procedural knowledge on the adapted use of an OHC nested within a semi-
505 structured interview, to analyse the employment histories of a sample of older people. Given the
506 age of the participants, their life histories were predictably long and complex. Adopting a mixed
507 methods research design to capture both qualitative and quantitative data not only enabled us to
508 explore patterns but helped us develop a more holistic understanding of the data and uncover some
509 new insights about the interrelationships between age and employment over the lifecourse. The use
510 of the mixed method OHC was central to this study and allowed us to collate data over relatively
511 long periods of time. Further, by integrating semi-structured interview questions within the OHC
512 format in this study, we were able to contextualise the employment experiences of the sample
513 members and better understand how older people themselves perceive the relationship between
514 age and work, the barriers to employment they face and their perceptions of the changing work
515 environment. In particular, the complexities of individual decisions, both at a moment in time and
516 over the lifecourse could be explored. This is an important consideration in research on ageing and
517 employment where snapshots of individual lives can potentially give misleading information. The
518 research reported here can be viewed as a first step in the application of this particular mix of
519 methodologies to research the employment histories of older workers. In this paper we have tried to
520 illustrate some of the gains from adopting this approach and how it may be used by others.

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676 Table 1: Characteristics of interviewees

Characteristic	Statistic
<i>Age (n=56)</i>	Mean years (range)
	58.9 (50-68)
<i>Gender (n=56)</i>	n (%)
Male	32 (55.4)
<i>Employment status (n=56)</i>	n (%)
Employed	22 (39.3)
Employed full-time	8 (14.3)
Employed part-time	5 (8.9)
Self-employed (full or part-time)	12 (21.4)
Unemployed	16 (30.4)
Retired not looking for employment	1 (0.2)
Retired and looking for employment Voluntary work	6 (11)
<i>Educational attainment (n=56)</i>	n (%)
Low; none or below GCSE*/equivalent	18 (32.1)
Intermediate 1; GCSE/equivalent	7 (12.5)
Intermediate 2; 'A' level/diploma/equivalent (e.g. teaching certificate, nursing certificate)	13 (17.9)
Higher; university (undergraduate and postgraduate):	18 (32.1)
<i>Annual household income (n=38)**</i>	n (%)
Below £10,000	6 (15.8)
£10,000-£20,000	8 (21.1)
£20,000 - £30,000	8 (21.1)
Over £30,000	16 (42.1)
<i>Health status (n= 44)**</i>	n (%)
Fair to poor	2 (4.6)
Fair	16 (36.4)
Good	10 (22.7)
Very good	11 (25)
Excellent	4 (9)

677 Notes:

678 *The General Certificate of Secondary Education (GCSE) is an academic qualification awarded in a
 679 specified subject by students usually aged 14-16 in secondary education in England, Wales and
 680 Northern Ireland.

681 **The questions on income and health were asked at the end of the interview. The sample
 682 sizes are smaller as not all the participants responded to these questions, some because they
 683 were unable and/or unwilling to select a precise category

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Figure 1: The Occupational History Calendar

Older Workers in the North West Life Event Calendar						
ID #	Date:		Time:		Place:	
Interviewer:	D.O.B:		Age:		Ethnicity :	
Gender:	Marital Status:		Current Employment Status:			
Age	Year	JAN to MAR	APR to JUN	JUL to SEP	OCT to DEC	Historical Context
	1950					•Korean War started •Uruguay win World Cup
	1951					•Churchill re-elected
	1952					•King George VI dies •Helsinki Olympics
	1953					•Coronation of Elizabeth II
	1954					•Bannister 4 minute mile •West Germany win World Cup
	1955					•Anthony Eden elected
	1956					•Suez Crisis •Melbourne Olympics
	1957					•Space Race Sputnik Launch

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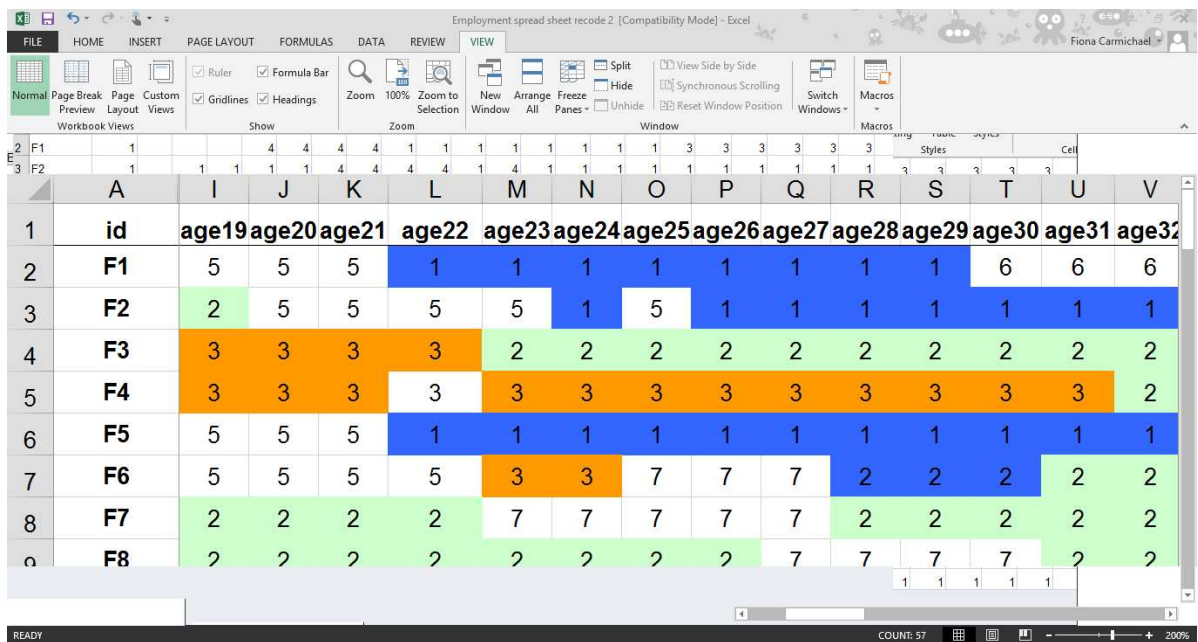
Figure 2: Recording and coding in the Occupational History Calendar

Older Workers in the North West Life Event Calendar							
ID#	Age	Year	JAN to MAR	APR to JUN	JUL to SEP	OCT to DEC	Historical Context
		1999					•Min. Wage introduced •Y2K panic
		2000	FT Researcher at Faith College				Millennium Dome •Dr. Shipman •Sydney Olympics
		2001					Foot and Mouth •9/11 Tragedy •Blair re-elected
		2002					•Commonwealth Games - Manchester •Brazil win World Cup
		2003	 Funding Ends	 Unemployed			•War in Iraq •Space Shuttle explodes
		2004					•Asian Tsunami •Greece win UEFA Cup
		2005	PT Lecturer at Hope University				London Bombings •England win Ashes •George Best dies
		2006					Winter Olympics Italy

Present to Past 

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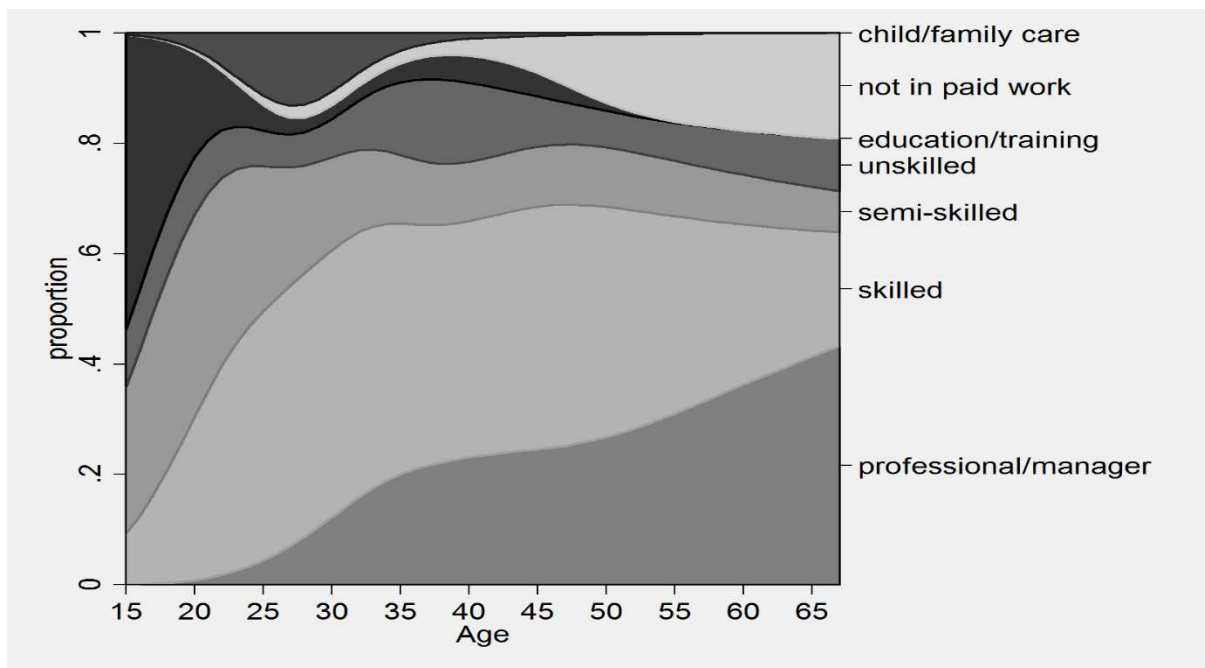
700 Figure 3: Screenshot of OHC data input in excel spreadsheet



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703 Figure 4: State distribution plot of employment status by age



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705 Notes: 17.98%, of employment states within the sample were recorded as professional/managerial,
 706 39.67% as skilled, 17.00% as semi-skilled, 9.30% as unskilled, 6.67% as in education/training, 5.88%,
 707 as not in paid work and 3.50% as a family carer.

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710 Table 2: Distributional properties of the cluster groupings

Cluster number/name	1	2	3	4	5
	Unskilled	Patchwork	Skilled	Upward or out	Prof. & man.
% of employment states in each cluster recorded as:					
Managerial and professional	0.00	4.71	0.00	22.26	60.92
Skilled occupation	21.08	26.02	77.41	48.17	18.53
Semi-skilled occupation	3.01	38.29	10.97	5.98	2.57
Unskilled occupation	63.86	<i>11.65</i>	2.62	0.00	1.83
Education or training	5.42	4.34	4.91	<i>10.30</i>	<i>10.46</i>
Not in paid employment	1.81	<i>9.79</i>	0.49	11.63	4.22
Family carer	<i>4.82</i>	<i>5.20</i>	<i>3.60</i>	1.66	1.47
No. of sequences in cluster	4	19	14	7	12

711 Notes: bold indicates largest percentage within cluster; italics indicates larger than sample
 712 percentage within cluster

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