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A technical report for the PIAC project



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Acknowledgments

Authorship

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Diane Gibson (University of Canberra) and Ann Peut (Ageing and Aged Care Unit, AIHW) designed the Pathways in Aged Care (PIAC) project. Stephen Duckett (University of Queensland) provided advice on research design, particularly in relation to maximizing policy relevance. Yvonne Wells (La Trobe University) provided advice on the interpretation and use of the Aged Care Assessment Program National Minimum Data Set. Rosemary Karmel was the principal developer of the linkage strategy and undertook the data linkage. Phil Anderson provided statistical advice on developing the linkage strategy.

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Abbreviations

ACAP	Aged Care Assessment Program
AIHW	Australian Institute of Health and Welfare
CACP	Community Aged Care Package
CBDC	Centre-based day care (HACC service)
DoHA	Department of Health and Ageing
EACH	Extended Aged Care at Home
EACH(D)	EACH and EACHD
EACHD	Extended Aged Care at Home Dementia
HACC	Home and Community Care
HF	other high frequency/intensity (HACC services, not N/AH or CBDC)
LF	low frequency (HACC services)
N/AH	nursing and allied health (HACC services)
NDI	National Death Index
NMDS	National Minimum Data Set
PIAC	Pathways in Aged Care
RAC	residential aged care
V1	version 1
V2	version 2
VHC	Veterans' Home Care

Symbols used in tables

–	nil or rounded to zero
..	not applicable
N	number

Summary

Background

The Pathways in Aged Care (PIAC) project is a cohort study designed to explore care transitions and care pathways for older Australians. For this project, a national database has been created that links data on assessments undertaken through the Aged Care Assessment Program (ACAP) to death records on the National Death Index, and to data on service use patterns (with dates of use) for five key aged care programs including Home and Community Care (HACC).

The issues

After linking HACC clients to the PIAC cohort, we needed to incorporate HACC use into the event pathway, that is, into the timeline of events that constitutes the care pathway. Three main issues arise due to complications with the HACC data:

- The HACC National Minimum Data Set (NMDS) data in the project only indicate quarterly use and not specific dates. How do we present HACC use in the PIAC pathways to allow for this? In particular, how can we tell if HACC services were accessed before or after the first ACAP assessment when they occurred in the same quarter?
- Just over 80% of HACC agencies participate in the NMDS. How do we deal with this problem of incomplete coverage?
- Some HACC services can be accessed by people on community care packages and some cannot, depending on the package type. How do we allow for this?

The analysis

Various approaches are examined for the representation of HACC service events in care pathways and, in particular, to derive and adjust HACC dates to allow for other pathway events. The report presents the analyses that led to the adoption of the final approach (see Section 8 for a summary of the final algorithm). The derived method could be applied more generally in analysing the use of HACC services over time. In addition, the analyses presented provide useful background for any further development of the HACC NMDS.

1. Background: the PIAC project

In 2006, a consortium of researchers from the Australian Institute of Health and Welfare (AIHW), University of Queensland and La Trobe University was successful in obtaining a National Health and Medical Research Council (NHMRC) grant to undertake analysis of care pathways in the aged care sector. The resulting Pathways in Aged Care (PIAC) project is a cohort study designed to explore care transitions and care pathways for older Australians.

For PIAC, a national database has been created that links data on assessments undertaken as part of the Aged Care Assessment Program (ACAP) – which determines eligibility for residential aged care (RAC) and aged care packages – to data on actual service use patterns for five key aged care programs: permanent and respite RAC, Community Aged Care Packages (CACPs), Extended Aged Care at Home (EACH) packages (including EACH Dementia (EACHD) packages), Home and Community Care (HACC) and Veterans' Home Care (VHC). The project centres around 105,077 people – called the PIAC cohort – who had a completed ACAP assessment in 2003–04 that was recorded on the ACAP National Minimum Data Set (NMDS) Version 2 (V2).

The 2003–04 PIAC cohort was linked to data showing use of the aged care programs between 2002–03 and 2005–06 (see AIHW 2007: chapter 3 for a description of the programs). Data on all ACAP assessments for 2004–05 (and on NMDS V2) were also included to allow analysis of reassessment. All data sets included dates of use so that the linked data could be used to describe program use over time. Clients were also linked to the national death register (National Death Index, or NDI) to establish whether and when cohort members died within the study period. The data came from two main sources: program-specific NMDSs (ACAP and HACC) and administrative data (RAC, CACP, EACH(D), VHC, NDI).

Data linkage was undertaken using multiple deterministic match passes based on components of a common statistical linkage key SLK-581 (also known as the HACC SLK), where the SLK-581 for a person is the concatenation of five letters of name, eight digit date of birth and sex (AIHW: Karmel 2005a). Additional common data items (but not full name) were incorporated into the linkage algorithm to improve the accuracy and sensitivity of the linkage process. Prior to data linkage, ethics approval and permission to use the required data were obtained from all relevant bodies. In addition, to protect the privacy of individuals, all linkage was carried out within the AIHW using the Institute's data linkage protocol (AIHW 2006).

2. The issues

Having linked HACC clients to the PIAC cohort, we needed to incorporate HACC use into the event pathway, that is, into the timeline of events that constitutes the care pathway. However, the HACC NMDS Version 1 (V1) used for data included in this project only indicates the quarter in which services were provided, and does not contain specific dates showing provision.¹ Additionally, while all HACC providers are required to submit data for the NMDS, not all do. Between 2002–03 and 2005–06, 82–83% of HACC agencies provided data to the NMDS (DoHA 2007:Table A.1). This incomplete coverage of the HACC NMDS means that people could drop in and out of the data set due to reporting processes rather than due to non-use of services. Moreover, some HACC services can be accessed by people on packages and some cannot, depending on the package type.

Three main questions arise from the above complications with the HACC NMDS data:

- Since the HACC NMDS data in the project only indicate quarterly use and not specific dates, how do we present HACC use in the PIAC pathways? In particular, how can we tell if HACC services were accessed before or after the first ACAP assessment when both were first accessed in the same quarter?
- How do we deal with the problem of incomplete coverage of the HACC NMDS?
- How do we allow for the fact that some HACC services can be accessed by people on packages and some cannot?

A further question is whether we want to distinguish between use of different HACC services – either grouped or individually – in the broad description of the pathways.

¹ HACC NMDS V2 includes dates of service provision. Implementation of NMDS V2 began in 2005–06; for that year less than 2% of records (within agency and quarter) had a service start date reported and less than 0.25% had a service end date reported.

3. The HACC data

HACC data are reported quarterly so we know in which quarter services were provided. The range of services reported on the HACC NMDS is listed in Table 1. For the PIAC study, HACC clients were defined as out of scope if they only used assessment and/or case management and/or carer services during the period of interest. In the HACC NMDS, carer services include respite care and carer counselling, with the latter only introduced with the implementation of HACC NMDS V2 in 2005–06. These exclusion rules were applied to the quarterly data prior to the linkage process.

People may use HACC services in several non-contiguous quarters. This is illustrated in Table 2 for annual data. Of the PIAC cohort, 72% were linked to HACC service use at some stage over the 4 years 2002–03 to 2005–06, with 3,307 people having (apparently) interrupted use of HACC from an annual perspective. This equates to 3.1% of the PIAC cohort and 4.3% of cohort HACC users.

4. Possible approaches

Possible approaches to the general question of representation of HACC in the care pathways include:

- Approach 1.** Take an ‘on the books’ approach and so assume a person had unbroken access to HACC services from the beginning of the first quarter for which HACC service use has been identified until either death, permanent entry into RAC, or the end of the study period.

This approach does not allow for disconnection from the program and assumes that having accessed HACC services once a person can easily access HACC services again. Underpinning this approach is the expectation that:

- people know when they are using HACC services and that (known) services can be obtained from a range of providers, or
- either different HACC providers ‘talk’ to each other about their clients or they inform clients about other providers.

- Approach 2.** Take the HACC service data at face value and report service use in terms of identified linked quarters, combining adjacent quarters into one period of program use.

This approach has the reverse problem to the first approach in that it assumes that all breaks in service use imply disconnection from the program.

- Approach 3.** Allow for large breaks in service use, by assuming that a gap of two or more quarters (say) implies disconnection from the program for that period. Again, use (observed or assumed) in adjacent quarters is combined into a single period of use.

This method aims to find a balance between the first two approaches.

The three approaches are illustrated in Figure 1, using the example of a person who had HACC use before having an ACAP assessment, and who later went on to a CACP, dying more than a year later.

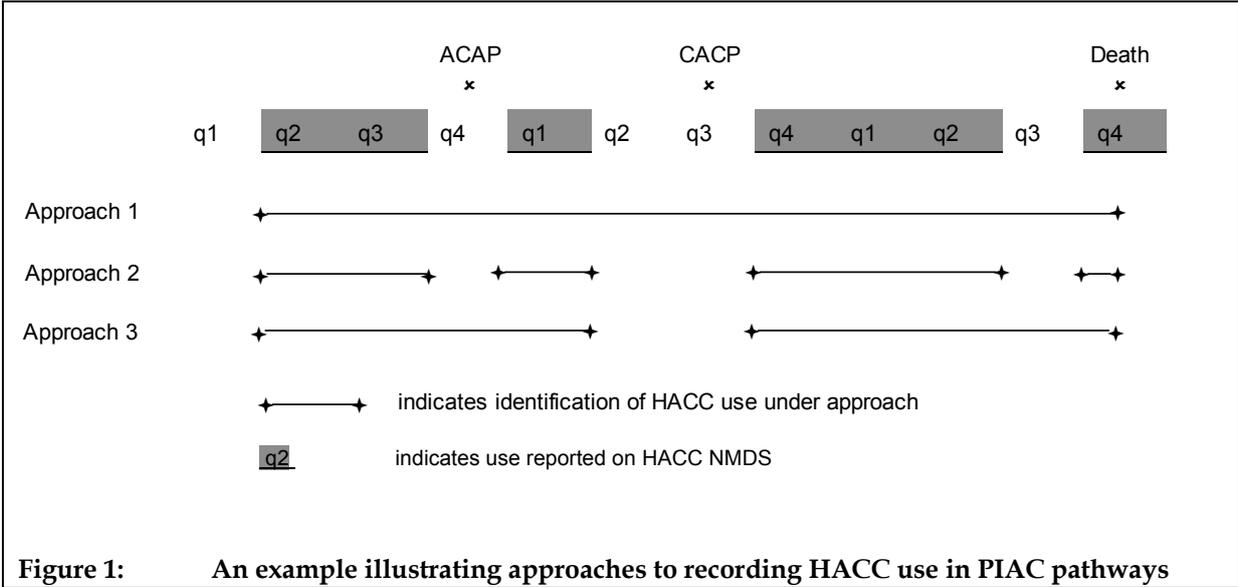


Figure 1: An example illustrating approaches to recording HACC use in PIAC pathways

5. Analysis of agency reporting and client service use

To investigate intermittent agency participation in the HACC NMDS and breaks in service use by clients, quarterly reporting in the HACC NMDS was examined in three ways:

- looking at agency participation in the HACC NMDS in each quarter over 2002–2006
- looking at client service use in agencies reporting on the NMDS for every quarter over 2002–2006
- comparing reported service use for HACC clients with agency reporting.

To look at reporting of different service types, the services listed in Table 1 were divided into six groups:

1. Nursing and allied health (N/AH) services, as these can be accessed by CACP recipients.
2. Centre-based day care (CBDC), as this can be accessed by CACP and EACH(D) recipients.
3. Other high frequency (HF) services, as these should not be accessed by CACP and EACH(D) recipients.
4. Low frequency (LF) services, as these should not be accessed by CACP and EACH(D) recipients and are likely to be provided intermittently.
5. Carer services.
6. Client management.

Some agencies specialise in the types of services they provide while others provide a wider range; for example 19% of agencies provided only HF services while 16% reported providing services from all service groups (Table 3). Note that only the first four service groups (N/HF, HF, LF and CBDC) were considered to be in-scope for the PIAC cohort study.

5.1 Agency participation

Consistency of reporting was examined for the 3,875 agencies who participated at least once in the HACC NMDS over 2002–2006 (Table 4 to Table 8).

Results summary:

- 25% of agencies participated in all 16 quarters in 2002–03 to 2005–06 (Table 4).
- A further 35% had no gaps in participation between when they first and last participated (Table 4).
- 47% participated in all subsequent quarters once they started participating (Table 4).
- Larger agencies were less likely to have interrupted participation than smaller agencies, although the maximum complete participation observed was 60% (for agencies averaging 500–1,000 clients per reported quarter) (Table 5).

- Small agencies (≤ 20 clients per reported quarter) were most likely to have not reported for six or more quarters (15% or more of small agencies) (Table 5).
- 69% of gaps in agency reporting were one quarter long; 20% were two quarters long (Table 7).
- Gaps in participation varied considerably with jurisdiction. Agencies in New South Wales and the Northern Territory were the most likely to have at least one gap; however, in all jurisdictions at least 70% of agencies had no or one gap (Table 8).

5.2 Client service use

Table 9 and Table 10 look at HACC service use for 624,255 clients reported by the 978 agencies that participated in the HACC NMDS in all 16 quarters.

Results summary:

- Around 80% of people using N/AH, CBDC or HF services had no gaps in service use within service group, and around 15% had only one gap in use (Table 9).
- Just under three quarters (72%) of people using LF services had no gaps in service use within service group, and 18% had only one gap in use (Table 9).
- Users of N/AH and LF service groups were more likely than others to have longer gaps: under half of the use gaps (about 45%) were for one quarter, and 20% were for two; compared with over 54% and 17%, respectively, for CBDC and HF service groups (Table 10).

5.3 Comparing person and agency reporting

Table 11 compares reported client service use with agency participation quarter by quarter, thereby allowing identification of gaps in reported service use caused by gaps in provision rather than breaks in agency NMDS participation. The method used to identify ‘true’ gaps is described below.

For an agency which provided services to a particular client at some stage, each reporting quarter is classified as:

- Not a gap (yes_yes): person reported as receiving a service in the quarter from the agency
- True gap (no_yes): person NOT reported as receiving a service from the agency even though the agency had reported in the quarter
- Suspect gap (no_no): person COULD NOT BE reported as the agency did not report at all for that quarter
- Out of scope: person COULD NOT BE reported as the quarter was either outside when they were first and last reported by any agency, and/or outside the first and last quarter that the particular agency ever participated.

Of necessity, the above method assumes that we see the first and last quarter that a client received any HACC service and also the first and last time the agency provided any HACC services to any clients. This reflects what would be seen in the data set as we cannot know if the person received services by other agencies in quarters outside ‘first seen’ and ‘last seen’ quarters. As a consequence, when counting reporting gaps we only considered those

quarters between when the person was first and last reported by any agency, and by dropping quarters outside the first and last quarter that the particular agency reported.

Results summary:

Analysis of the gaps identified above indicates that:

- The number of quarters with suspect non-reporting of service use for a client is relatively small, at less than 5% for all service group types (Table 11). Thus, any decisions on whether to collapse across gaps will affect a small number of quarters.
- 40% of quarters for HF and CBDC services were classified as real gaps in service use, so that gaps were relatively uncommon.
- Over 57% of quarters for N/AH and LF service groups were classified as real gaps in service use, so that gaps were relatively common.

5.4 Selecting the approach

The information in Table 9 to Table 12 suggests that there are two kinds of service groups:

- N/AH and LF services, which commonly have service use gaps (over 57% 'true gaps' versus under 43% 'not a gap' in Table 11), but those gaps are likely (about 55%) to be more than one quarter long (Table 10)
- HF services and CBDC, which are less likely to have service use gaps (about 40% 'true gaps' versus 60% 'not a gap' in Table 11), and those gaps are likely (over 50%) to be only one quarter long (Table 10).

However, in addition:

- under 5% of person quarters are affected by the unknown status of service gaps (Table 11)
- there are more true gaps than suspect gaps of all lengths (Table 12), with a ratio of over 3 to 1 for gaps of one quarter for N/AH and LF services, so that collapsing across these – the service groups which more commonly have service gaps – would lead to collapsing across valid gaps in over 75% of cases.

Taken together, the above (in particular, the last two properties) suggests that, in terms of reported service provision gaps, HACC reporting should be taken at face value (Approach 2 of Section 4).

6. Allowing for non-HACC events

Taking HACC reporting at face value, and joining adjacent quarters can be used to derive rough HACC event start and end dates (based on quarters). However, information on other program use and death obtained through data linkage can be used to adjust these approximate dates. The approach taken to adjust HACC use dates in the light of other event information is described below.

6.1 Data informing setting HACC event dates

Allowable concurrent use of different programs can be used to inform HACC event dates. In particular:

- N/AH can be accessed while on a CACP, but not while on an EACH(D) package or in permanent RAC
- CBDC can be accessed while on a CACP or EACH(D) package, but not while in permanent RAC
- HF and LF service groups should generally not be accessed once on a CACP or EACH(D) package or when in permanent RAC.

These access differences suggest that HACC event dates should be refined using event data for the four distinct service groups.

Previous analyses have shown some inconsistencies with program access rules and reported concurrent use of HACC and community packages and HACC and permanent RAC (AIHW: Karmel 2005b; AIHW: Karmel & Braun 2004). These inconsistencies are most likely due to reporting errors (for example, common HACC and CACP providers reporting CACP-funded services on the HACC NMDS), or result from reporting HACC services used while a resident was on social leave from permanent RAC. In addition, given the better quality of the linkage data (AIHW: Karmel 2005a), ACAP links to the community packages, RAC and NDI are assumed to be more reliable than those to HACC. Therefore, where there are possible inconsistencies in links showing the use of HACC and community packages, permanent care or death, the latter three events take precedence over HACC events for the purpose of identifying care pathway event dates.

6.2 Identifying event dates for HACC service use

Using the above information, HACC event dates are refined as follows:

1. Initially, HACC event start dates are assumed to be the first day of the first quarter of a set of contiguous quarters in which service group use was identified; end dates are assumed to be the last day of the last quarter in the set.
2. All HACC services are considered to have stopped (or not to have started) when links in the care pathway that indicate the person:
 - was in permanent RAC, or
 - had died.
3. For other start and end dates:
 - Concurrent use of CBDC services and a CACP or EACH(D) package is allowed, and so does not affect HACC event dates.

- Concurrent use of N/AH services and a CACP is allowed, and so does not affect HACC event dates.
- N/AH service use is considered to have stopped once a person started on an EACH(D) package, or not to have started until a person ceased using the EACH(D) package.
- All other HACC service use is considered to have stopped once a person started on a CACP or EACH(D) package, or not to have started until a person ceased using a CACP or EACH(D) package.

6.3 Results

The adjustments when applying the proposed approach resulted in an overall reduction in the number of HACC events by between 3% (CBDC) and 12% (LF group) (Table 13). As would be expected, the number of reductions increased as the number of allowable concurrent program uses decreased. As discussed above, it is thought that this apparent 'illegal' use of services could be due to poor data recording practices (e.g. recording a service against the wrong program by service providers who get funding from more than one program), and/or by the use of services in one program when 'on leave' from another program (e.g. when on social leave from permanent RAC).

The final set of HACC events relates to 71,844 people. This compares with 75,357 HACC clients who were linked to the ACAP cohort. This difference is caused primarily by dropping HACC events due to incompatibilities with other care events.

6.3.1 Overall effects of the approach on HACC event dates

As expected, given the poor date information on the HACC NMDS, when applying the approach described above a number of scenarios arose:

1. *HACC event overlapped other incompatible program event (a 'covering' HACC event):*
The adopted approach assumes that HACC service use ceased when on the other program and so the start and/or end date of the HACC event was adjusted:
 - a. *End truncation:* cutting short the HACC event by bringing the end date forward.
 - b. *Initial truncation:* delaying the start date of the HACC event.
2. *HACC event covered by other incompatible program event (a 'covered' HACC event):*
In this case the start and end dates were completely within those for another incompatible program. For these cases it was assumed that the person was on leave from the incompatible program and so these HACC events were excluded from the care pathway.
3. *HACC event covered other incompatible program event (a 'covering' HACC event):*
In this case the start and end dates for the HACC event were before and after, respectively, those for an incompatible program event. Depending on the length of extension of the HACC event past the end event of the incompatible program, it was assumed that either HACC service use ceased while on the other program and then restarted (overhang of more than one quarter), or just ceased with the start of use of the other program (overhang of no more than one quarter)
4. *HACC event occurred after (linked) death:*
It was assumed that the link to HACC was poor and so the HACC event was dropped.

Data on the events and HACC quarters affected by these scenarios are presented in Table 14 and Table 15. For ease of presentation and discussion, all percentages relate to the original number of HACC events.

Table 14 shows that:

- No more than 0.6% of events (within each service group) were deleted due to a linked death occurring before the HACC event. Across all service groups, the 1,138 deleted events related to 895 people (or 1.2% of the original 75,357 HACC clients linked to the PIAC cohort).
- A total of between 4% (for CBDC) and 12% (for LF) of events were dropped due to inconsistencies with other identified program use or death. The overwhelming majority of these events were dropped as their start and end dates were within those for an incompatible program or programs (i.e. they were 'covered' events).
- Between 3% and 7% of events were truncated due to death.
- The proportion of events cut short due to subsequent incompatible program use varied depending on the service group: 22% truncated for the HF group, and 10–11% truncated for the LF and N/AH groups.
- In a large majority of cases, truncation cut fewer than 92 days from the event. HF services had the greatest proportion (2.5%) of events cut short by more than two quarters (183 days).
- Delaying the start date of a HACC event was much less common than cutting short at the end. This varied with service group and affected less than 3% of HACC events. Long delays were most common for the HF group (1.3%).
- Between 1.6% (LF group) and 4.6% (HF group) of HACC events completely covered another incompatible program event. However, covered events were commonly less than 3 months long.
- Additional events created by splitting the HACC event due to covering a long (more than 91 days) incompatible event was small, at under 0.5% relative to the original number of events for all but the HF group (1.2%).
- The number of HACC events dropped because they were covered by another incompatible program varied considerably with service group (maximum of 10.7% in total for the LF group, including both initial and later adjustments). All these covered events were dropped for the purposes of constructing a care pathway. The majority of these events were shorter than one quarter.

6.3.2 Effects of the approach on HACC event dates, by service group

A number of statistics were derived to examine the characteristics of quarterly HACC service data affected by inconsistencies with other pathway events. Results, as summarised in Table 15, are discussed below by service group.

Affected HACC quarters with provision of Nursing and allied health

Overall, 161,292 HACC quarters reported N/AH services for PIAC cohort clients.

- Both 'covering' and 'covered' non-HACC events were highly likely to be for permanent RAC (see Table 14).
- 2% of quarters with N/AH were dropped due to the HACC event being covered by an incompatible program event, 0.7% had delayed starts or were cut short (most commonly

cut short), and 1.1% related to quarters covering other incompatible program use (Table 15).

- Quarters deleted as belonging to covered events tended to have considerably less assistance recorded than other quarters. This effect was less pronounced for other deleted quarters and covering quarters.
- For all sets, nursing care at home was the most common service provided. However, this service was less common among covered quarters (49% compared with 67% for all quarters), and more common among covering quarters (76%).

Affected HACC quarters with provision of High frequency services

Overall, 351,949 HACC quarters reported HF services for PIAC cohort clients.

- Covered non-HACC events were slightly more likely to be packaged care than permanent RAC. However, covering non-HACC events were more than twice as likely to be for non-RAC programs (Table 14).
- 4.1% of quarters were dropped due to the HACC event being covered by an incompatible program event, 2.5% had delayed starts or were cut short (most commonly cut short), and 2.6% related to quarters covering other incompatible program use (Table 15).
- Quarters deleted as belonging to covered events tended to have less assistance recorded than other quarters (78% with only one service provided compared with 63% for all quarters). This effect was weaker for other deleted quarters and covering quarters, and was most apparent by looking at the proportion of quarters with no more than 5 hours of service provided (over 63% compared with 42% overall).
- Overall, domestic assistance was the most common service provided (67%). However, in our four 'affected quarter' subsets delivery of meals was the most common service provided, being reported for between 38% (start-truncation and covered sets) and 48% (covering quarters set) of affected quarters.

Affected HACC quarters with provision of Low frequency services

Overall, 84,091 HACC quarters reported LF services for PIAC cohort clients.

- Covered non-HACC events were slightly more likely to be for permanent RAC than community packages. However, community packages were much more likely than permanent RAC to be the cause of covered HACC events (Table 14).
- 6.4% of quarters were dropped due to the HACC event being covered by an incompatible program event, 1.8% had delayed starts or were cut short (most commonly cut short), and 1.5% related to quarters covering other incompatible program use (Table 15).
- Overall, and for all four 'affected quarter' sets, the provision of only one service in the quarter was very common – over 83% for all sets examined.
- Home maintenance was the most commonly provided service for all sets – in 44% (start-truncation) to 56% (overall) of quarters. Looking at the hours spent on either counselling or home maintenance did not suggest any big differences between the groups.

Affected HACC quarters with provision of Centre-based day care

Overall, 82,440 HACC quarters reported CBDC services for PIAC cohort clients.

- Covered and covering non-HACC events which affected deriving HACC event dates were always for RAC programs as CBDC can be accessed by people on all the package programs (Table 14).
- 1.7% of quarters were dropped due to the HACC event being covered by an incompatible program event, 0.9% had delayed starts or were cut short (most commonly cut short), and 0.8% related to quarters covering other incompatible program use (Table 15).
- Quarters affected by inconsistent program use tended to have less assistance recorded than other quarters: overall fewer than 6% of quarters had no more than 5 hours of assistance recorded compared with 9% to 13% for the four affected sets. Also, all but quarters affected by start-truncation were less likely than others to have more than 40 hours of assistance (under 53% with more than 40 hours, compared with 59% overall).

7. Adjusting HACC start date for date of first completed assessment

After adjusting HACC event dates based on program incompatibilities, HACC events can be brought into the event pathway. However, there are still cases where it is not clear whether the HACC event started before or after compatible events. That is, the HACC quarter-based event 'dates' may not exactly reflect the order of events if HACC and compatible non-HACC events start in the same quarter. Of particular interest in this respect is whether the initial ACAP assessment started before or after the first use of HACC.

The number of first HACC events with the initial ACAP assessment in the same quarter varied between 7% and 12%, depending on the HACC service group. When all types of HACC events are adjusted and combined, overall 8.5% (9,095 events) of these combined events have first use of HACC and first ACAP assessment in the same quarter (Table 13). These effects are therefore significant when looking at the order of care events in people's pathways.

7.1 Possible approaches

Two approaches were considered for deciding the order of first use of HACC and ACAP when both events start in the same quarter:

1. **Approach 1.** Assume that, for the first HACC event, the ACAP assessment led to the use of the HACC service. For care pathways, this can be achieved by adjusting the HACC commencement date to be one day after the start of the assessment (remembering that a completed ACAP assessment is not needed to access HACC). This approach ensures consistent identification of people who first used HACC services around the time of their first completed ACAP assessment.
2. **Approach 2.** Use client HACC assessment dates and first-ever quarter of HACC use to indicate whether HACC services were used/approached before the first ACAP assessment started.

Adjustments for deciding the order of later use of HACC and ACAP when both (later) events start in the same quarter could be considered, but the issue is much less clear cut as other program use and earlier ACAP assessments could have led to the use of HACC services. Therefore, at this stage no adjustments are proposed for this case. For other program use order, HACC services are assumed to start on the first day of the quarter unless there is other program use which is inconsistent with this assumption, as discussed in Section 6.

7.2 Analysis

Approach 1. Assume that, for the first HACC event, the assessment led to the use of the HACC service if both events start in the same quarter

These adjustments could be applied at the HACC service group level or for all services combined. At the service group level, under this approach the number of first-reported HACC events adjusted due to the timing of the first completed ACAP assessment would

vary between 7% and 12%, and is 8.5% (9,095 people) when combining all service groups (Table 13).

When looking at care pathways – that is, the order in which people use services – this approach may be considered appropriate in that the first assessment and first use of HACC were close (and perhaps related) events. Whether this approach is suitable for other types of analysis, or whether an indicator showing that the two events were close should be used in the analysis, would need to be decided on a case by case basis. The main drawback of this method is that it does not use all available information on first use of HACC services, and so in some cases makes unnecessary assumptions.

Approach 2. Use HACC assessment dates and first-ever quarter of HACC use to decide the order of first use of HACC and ACAP

Approach 2 incorporates additional information on first use of HACC services by looking at first HACC assessment dates (any service type) and the first quarter in which the person was reported in the HACC NMDS (including use of the PIAC out-of-scope services: assessment/case management/case planning and carer services).

Overall, of the 9,095 PIAC cohort members with the first HACC event and ACAP assessment in the same quarter (as seen in Table 13), using HACC assessment dates 12% (1,066) were identified as accessing HACC services in an earlier quarter (Table 17). However, 26% had no HACC assessment dates in the NMDS between 2002–03 and 2005–06. This high incidence of missing HACC assessment information is the main limitation of Approach 2 (between 25% and 37% before the 2005–06 collection, Table 16). In addition, as assessment dates may not be reported for a client for all quarters, a client may have had contact with HACC services in a quarter before that with a reported HACC assessment date. Note also that agencies report the last assessment date in a quarter on the quarterly HACC NMDS, so this also adds some uncertainty. However, having a reported HACC assessment date before the start of the first ACAP assessment provides definite evidence of HACC services being accessed before ACAP.

To overcome the problem of missing assessment dates, HACC records within quarter and agency without an assessment date were assigned a notional assessment date of the last date in the quarter. The client's HACC 'first seen' date that was then compared with the ACAP assessment date – to determine whether HACC services were accessed before the ACAP assessment – was the earliest date from among all the client's actual assessment and notional assessment dates (Table 18). Assigning the last day of the quarter for notional assessment dates means that, within a quarter, if assistance had been provided by several agencies, any reported HACC assessment dates were selected in preference to notional dates when identifying the client's 'first seen' HACC date.

Using the HACC 'first seen' dates derived from the above imputation resulted in 255 more clients (1,321 compared with 1,066 from the 9,095 clients with HACC/ACAP order identification problems) being identified as having used any HACC services in a quarter before the ACAP assessment (Table 17 and Table 18). This is because HACC services that are out-of-scope for PIAC (in particular, case planning/management and assessment) could have been accessed in a quarter before other services. The approach also reduced considerably the number identified from HACC assessment dates as being assessed for HACC in a quarter following the ACAP assessment, from 437 down to 46. These 46 relate to people who had an assessment date reported in their first HACC quarter that was actually after the end of that quarter. Among the remaining 7,728 clients identified as having been 'first seen' in HACC in the same quarter as the ACAP assessment started, two-thirds had a

known assessment date and one third (2,573) did not (Table 18). Overall, after the above adjustments, 28% of the 9,095 clients with HACC/ACAP order identification problems still had an unknown 'first seen in HACC' date in the same quarter as the first ACAP assessment start date.

Using Approach 2 results in HACC dates for comparing with the first ACAP assessment start date for 72% of clients where PIAC in-scope HACC services were first accessed in the same quarter as the first ACAP assessment. Analysis of those with HACC assessment dates (Table 17) suggests that the two thirds of the 28% without a suitable comparison HACC date either accessed HACC on or after starting the ACAP assessment. This suggests that for these clients it should be assumed that the ACAP assessment led to the use of HACC services (that is, Approach 1 should be used for these people).

7.3 Selected approach

To determine the order of first use of HACC and first use of ACAP, when there is some doubt, client HACC assessment dates and the first quarter in which HACC services were ever accessed are compared with the start of the first ACAP assessment (Approach 2). In cases where no HACC assessment dates were reported for a client on the NMDS and first HACC contact was in the same quarter as the start of the ACAP assessment, it is assumed that the ACAP assessment led to the use of HACC services (Approach 1). This latter approach is also taken for the 46 cases where people had an assessment date reported in their first HACC quarter that was after the end of that quarter. The adjustment used to specify the order of the first HACC and first ACAP events is based on the same 'first HACC' date, irrespective of the HACC service group being considered; that is, HACC use and assessment dates for all service groups are considered when deciding the order of the two events in question.

8. Summary of the algorithm for the determination of HACC dates

HACC service events to be used in the presentation of care pathways are given dates that are derived using the following algorithm:

1. Use of HACC services is assumed to be as reported on the NMDS; that is, no adjustment or imputation is made for agency non-participation.
2. HACC events are initially identified in terms of four service groups:
 - Nursing and allied health services
 - Centre-based day care
 - Other high-frequency services
 - Low-frequency services.
3. To start with, HACC event start dates are assumed to be the first day of the first quarter of a set of contiguous quarters in which the service group use was identified; end dates are assumed to be the last day of the last quarter in the set.
4. All HACC services are considered to have stopped (or not to have started) when links in the care pathway that indicate the person:
 - was in permanent RAC, or
 - had died.
5. For other start and end dates:
 - Concurrent use of HACC Centre-based day care services and a CACP or EACH(D) package is allowed, and so does not affect HACC event dates.
 - Concurrent use of HACC Nursing and allied health services and a CACP is allowed, and so does not affect HACC event dates.
 - Nursing and allied health service use is considered to have stopped once a person started on an EACH(D) package, or not to have started until a person ceased using the EACH(D) package.
 - All other HACC service use is considered to have stopped once a person started on a CACP or EACH(D) package, or not to have started until a person ceased using a CACP or EACH(D) package.
6. To derive HACC events across service groups, derived HACC service group events are combined if they overlap at all. (Note, however, that pathways can also be presented using HACC service group types.)
7. HACC assessment dates and first-ever quarter of HACC use (including HACC services that are out-of-scope for PIAC) are used to identify a 'first use of HACC' date and so to indicate whether HACC services were used/approached before the first ACAP assessment started. In cases where no HACC assessment dates were reported for a client on the NMDS and first HACC contact was in the same quarter as the start of the ACAP assessment, it is assumed that the ACAP assessment led to the use of HACC services.

Appendix: Tables

Table 1: HACC services recorded on the NMDS

Service	Collection	Service category
Assessment (hours)	V1,V2	Client management
Care coordination (hours)	V2	Client management
Case management (hours)	V1,V2	Client management
Case planning / review (hours)	V1	Client management
Carer counselling (hours)	V2	Carer services
Respite care (hours)	V1,V2	Carer services
Nursing care received at centre (hours) *	V1,V2	Nursing/allied health
Nursing care received at home (hours) *	V1,V2	Nursing/allied health
Allied Health care received at centre (hours) *	V1,V2	Nursing/allied health
Allied Health care received at home (hours) *	V1,V2	Nursing/allied health
Centre based care (hours) **	V1,V2	High frequency (mainly)
Personal care (hours)	V1,V2	High frequency (mainly)
Domestic assistance (hours)	V1,V2	High frequency (mainly)
Meals at home (number meals)	V1,V2	High frequency (mainly)
Meals received at centre (number meals)	V1,V2	High frequency (mainly)
Other food services (hours)	V1,V2	High frequency (mainly)
Formal linen service (deliveries)	V1,V2	High frequency (mainly)
Social support (hours)	V1,V2	High frequency (mainly)
Transport (one way trips)	V1,V2	High frequency (mainly)
Counselling (hours)	V1,V2	Low frequency (mainly)
Home maintenance (hours)	V1,V2	Low frequency (mainly)
Aids		
Communication Aids	V1, V2	Low frequency (mainly)
Medical Care Aids	V1,V2	Low frequency (mainly)
Reading aids	V1,V2	Low frequency (mainly)
Self care aids	V1,V2	Low frequency (mainly)
Support and mobility aids	V1,V2	Low frequency (mainly)
Other Goods/Equipment	V1,V2	Low frequency (mainly)
Home modification (\$)	V1,V2	Low frequency (mainly)
Car modifications	V1,V2	Low frequency (mainly)

Note: NMDS V2 was implemented during 2005–06.

* can be accessed by people on CACP

** can be accessed by people on CACP/EACH(D)

Table 2: Multiple matches to HACC, matches between the ACAP 2003–04 cohort and HACC 2002–03 to 2005–06

				Use of:	
HACC 02_03	HACC 03_04	HACC 04_05	HACC 05_06	Number	Per cent
HACC 02_03	..	..	..	5,923	5.6
HACC 02_03	..	..	HACC 05_06	374	0.4
HACC 02_03	..	HACC 04_05	..	642	0.6
HACC 02_03	..	HACC 04_05	HACC 05_06	576	0.5
HACC 02_03	HACC 03_04	..	..	15,380	14.6
HACC 02_03	HACC 03_04	..	HACC 05_06	881	0.8
HACC 02_03	HACC 03_04	HACC 04_05	..	9,908	9.4
HACC 02_03	HACC 03_04	HACC 04_05	HACC 05_06	14,920	14.2
<i>First use: 2002–03</i>				48,604	46.3
..	HACC 03_04	..	..	8,672	8.3
..	HACC 03_04	..	HACC 05_06	834	0.8
..	HACC 03_04	HACC 04_05	..	5,003	4.8
..	HACC 03_04	HACC 04_05	HACC 05_06	5,849	5.6
<i>First use: 2003–04</i>				20,358	19.4
..	..	HACC 04_05	..	2,329	2.2
..	..	HACC 04_05	HACC 05_06	2,256	2.1
<i>First use: 2004–05</i>				4,585	4.4
<i>First use: 2005–06</i>	..	..	HACC 05_06	1,810	1.7
No HACC use	..	..	..	29,720	28.3
Total	..	..	..	105,077	100.0

Note: 'First use' relates to use reported on HACC MDS for 2002–03 to 2005–06.

Table 3: Agency service provision, by service category, HACC NMDS 2002-03 to 2005-06

Service category provided				Number	Per cent
			Carer services	14	0.4
		Client mangt.		^(a) 10	0.3
		Client mangt.	Carer services	21	0.5
	Low freq.			50	1.3
	Low freq.		Carer services	9	0.2
	Low freq.	Client mangt.		92	2.4
	Low freq.	Client mangt.	Carer services	16	0.4
	High freq.			739	19.1
	High freq.		Carer services	105	2.7
	High freq.	Client mangt.		336	8.7
	High freq.	Client mangt.	Carer services	124	3.2
	High freq.	Low freq.		134	3.5
	High freq.	Low freq.	Carer services	48	1.2
	High freq.	Low freq.	Client mangt.	292	7.5
	High freq.	Low freq.	Client mangt.	510	13.2
Nursing/AH.				72	1.9
Nursing/AH.		Client mangt.		44	1.1
Nursing/AH.		Client mangt.	Carer services	10	0.3
Nursing/AH.	Low freq.			13	0.3
Nursing/AH.	Low freq.		Carer services	2	0.1
Nursing/AH.	Low freq.	Client mangt.		39	1.0
Nursing/AH.	Low freq.	Client mangt.	Carer services	28	0.7
Nursing/AH.	High freq.			110	2.8
Nursing/AH.	High freq.		Carer services	15	0.4
Nursing/AH.	High freq.	Client mangt.		134	3.5
Nursing/AH.	High freq.	Client mangt.	Carer services	55	1.4
Nursing/AH.	High freq.	Low freq.		19	0.5
Nursing/AH.	High freq.	Low freq.	Carer services	15	0.4
Nursing/AH.	High freq.	Low freq.	Client mangt.	205	5.3
Nursing/AH.	High freq.	Low freq.	Client mangt.	614	15.8
All agencies				3,875	100.0

(a) Includes one agency with no valid service data.

Note: Table is based on reported service provision by agency. Centre-based day care is included in high frequency services.

A1. Agency participation

Table 4: Gaps in agency participation in HACC NMDS 2002-03 to 2005-06

Gaps in participation between first and last participation	HACC agencies	
	Number	Per cent
No gaps	2,344	60.5
1	966	24.9
2	409	10.6
3	128	3.3
4	26	0.7
5	2	0.1
Total	3,875	100.0
Missed quarters after first participation (up to qtr 16)		
None	1,803	46.5
Participated in all 16 quarters	978	25.2
1	557	14.4
2	355	9.2
3	204	5.3
4 ^(a)	415	10.7
5	185	4.8
6-15	356	9.2
Total	3,875	100.0

(a) A relatively large number of agencies ceased reporting in the last quarter of 2004-05 and a similar number started reporting in the first quarter of 2005-06 (around 450, compared with around 30 for the preceding quarter).

Notes

1. Non-participation in adjacent quarters was counted as a single gap.
2. Non-participation 'gaps' before the first observed participation and after the last observed participation were not included as these could be due to agency start-up or closure. Therefore, agencies which only participated in a small number of adjacent quarters are included in the 'no gaps' category.
3. Missed quarters include those after the last quarter with participation.

Table 5: Number of missed quarters after first participation in HACC NMDS 2002-03 to 2005-06, by HACC agency size

Missed quarters	Agency size (mean number of clients per observed quarter)								Total
	<= 10	10 – 20	20 – 50	50 – 100	100 – 200	200 – 500	500 – 1000	> 1000	
	Per cent								
None	38.2	32.1	40.3	50.0	52.9	53.8	59.7	53.6	46.5
1	14.7	15.9	16.9	14.2	12.0	13.5	11.2	10.7	14.4
2	8.8	13.5	12.2	7.7	8.7	6.6	4.1	1.4	9.2
3	5.1	7.6	6.4	6.0	5.1	3.5	0.5	0.7	5.3
4	5.5	10.7	8.0	9.1	11.9	15.0	14.3	20.7	10.7
5	4.1	4.8	5.0	4.8	4.3	3.5	6.1	9.3	4.8
6-15	23.5	15.4	11.2	8.2	5.1	4.1	4.1	3.6	9.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total	5.6	10.9	25.5	19.8	16.3	13.2	5.1	3.6	100.0
Number	217	421	989	768	631	513	196	140	3,875

Note: Size ranges do not include the start integer, but include the end integer.

Table 6: Quarters of first and last participation in HACC NMDS 2002-03 to 2005-06, by number of gaps in participation

Quarter first participated	Gaps in participation between first and last participation							Total
	None	1	2	3	4	5		
1-4	1,526	758	360	120	24	2	2,790	
5-8	137	100	39	8	2	—	286	
9-12	124	69	10	—	—	—	203	
13-16	557	39	—	—	—	—	596	
Qtr 13	418	33	—	—	—	—	451	
Total	2,344	966	409	128	26	2	3,875	
Quarter last participated								
1-4	78	5	—	—	—	—	83	
5-8	42	11	6	—	—	—	59	
9-12	328	145	47	8	—	—	528	
Qtr 12	299	118	39	8	—	—	464	
13-16	1,896	805	356	120	26	2	3,205	
Total	2,344	966	409	128	26	2	3,875	

Table 7: Size of gaps in participation in HACC NMDS 2002-03 to 2005-06

Quarters (N)	1 st gap	2 nd gap	3 rd gap	4 th gap	5 th gap	All gaps
	Number of agencies					Number of gaps
1	1,028	418	110	20	2	1,578
2	324	100	27	6	—	457
3	74	22	13	1	—	110
4	50	11	3	1	—	65
5	23	7	2	—	—	32
6	9	4	1	—	—	14
7+	23	3	—	—	—	26
Total	1,531	565	156	28	2	2,282
	Per cent					
1	67.1	74.0	70.5	71.4	100.0	69.1
2	21.2	17.7	17.3	21.4	—	20.0
3	4.8	3.9	8.3	3.6	—	4.8
4	3.3	1.9	1.9	3.6	—	2.8
5	1.5	1.2	1.3	—	—	1.4
6	0.6	0.7	0.6	—	—	0.6
7+	1.5	0.5	—	—	—	1.1
Total	100.0	100.0	100.0	100.0	100.0	100.0

Notes

1. Non-participation in adjacent quarters was counted as a single gap.
2. Non-participation 'gaps' before the first observed participation and after the last observed participation were not included as these could be due to agency start-up or closure. Therefore, agencies which only participated in a small number of adjacent quarters are included in the 'no gaps' category.

Table 8: Gaps in participation in HACC NMDS 2002-03 to 2005-06, by state/territory

Number of gaps for an agency	NSW	Vic	Qld	SA	WA	Tas.	NT	ACT	Total
	Number of agencies								
None	663	691	588	114	181	44	33	30	2,344
1	565	138	123	55	23	24	34	4	966
2	283	36	40	18	4	8	19	1	409
3	99	3	10	3	—	5	8	—	128
4	19	—	6	—	—	—	1	—	26
5	1	—	—	—	—	—	1	—	2
Total	1,630	868	767	190	208	81	96	35	3,875
	Per cent								
None	40.7	79.6	76.7	60.0	87.0	54.3	34.4	85.7	60.5
1	34.7	15.9	16.0	28.9	11.1	29.6	35.4	11.4	24.9
2	17.4	4.1	5.2	9.5	1.9	9.9	19.8	2.9	10.6
3	6.1	0.3	1.3	1.6	—	6.2	8.3	—	3.3
4	1.2	—	0.8	—	—	—	1.0	—	0.7
5	0.1	—	—	—	—	—	1.0	—	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

A2. Client use

Table 9: Gaps in client use of HACC, by service category, NMDS 2002-03 to 2005-06 for 978 agencies that participated continuously in the collection

Number of gaps for a client	Gaps use by clients of:						
	N/AH	CBDC	HF	LF	Client management services	Carer services	All services
	Number of clients						
Never used by client	429,124	566,682	243,821	456,866	285,495	573,796	0
None	154,413	46,712	305,497	119,696	230,116	44,244	479,055
1	30,340	8,106	56,691	30,194	65,014	5,232	104,562
2	7,923	2,087	13,177	11,402	27,975	748	29,006
3	1,962	526	3,824	4,426	11,468	197	8,836
4	432	130	1,013	1,362	3,411	32	2,324
5	61	12	232	309	776	6	472
Total	195,131	57,573	380,434	167,389	338,760	50,459	624,255
Total (%)	31.3	9.2	60.9	26.8	54.3	8.1	100.0
	Per cent						
None	79.1	81.1	80.3	71.5	67.9	87.7	76.7
1	15.5	14.1	14.9	18.0	19.2	10.4	16.7
2	4.1	3.6	3.5	6.8	8.3	1.5	4.6
3	1.0	0.9	1.0	2.6	3.4	0.4	1.4
4	0.2	0.2	0.3	0.8	1.0	0.1	0.4
5	0.0	0.0	0.1	0.2	0.2	0.0	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Notes

1. Non-use in adjacent quarters was counted as a single gap.
2. Non-use 'gaps' before the first observed participation and after the last observed use were not included as these could be due to agency start-up or closure. Therefore, clients which only use services in a small number of adjacent quarters are included in the 'no gaps' category.

Table 10: Size of gaps in client use of category, NMDS 2002–03 to 2005–06 for 978 agencies that participated continuously in the collection

Gap length (in quarters)	Number of gaps in use by clients of:						
	N/AH	CBDC	HF	LF	Client manage- ment services	Carer services	All services
	Number of gaps						
1	23,529	8,505	53,650	33,352	74,904	4,302	95,483
2	10,439	2,470	17,589	14,900	34,148	1,475	38,082
3	6,493	1,440	9,969	9,225	24,793	722	22,926
4	4,003	649	5,657	4,983	13,644	271	13,154
5	2,826	413	3,718	3,473	8,448	171	9,014
6	1,985	300	2,596	2,389	5,579	172	6,436
7	1,441	233	1,970	1,639	3,963	84	4,755
8	1,094	145	1,469	1,184	2,634	65	3,575
9	785	98	1,075	762	1,838	59	2,499
10	608	53	785	579	1,249	86	1,811
11	408	67	557	369	793	44	1,365
12	285	40	393	213	491	15	895
13	157	16	198	142	287	8	547
14	52	9	103	59	121	3	196
Total	54,105	14,438	99,729	73,269	172,892	7,477	200,738
	Per cent						
1	43.5	58.9	53.8	45.5	43.3	57.5	47.6
2	19.3	17.1	17.6	20.3	19.8	19.7	19.0
3	12.0	10.0	10.0	12.6	14.3	9.7	11.4
4	7.4	4.5	5.7	6.8	7.9	3.6	6.6
5	5.2	2.9	3.7	4.7	4.9	2.3	4.5
6+	12.6	6.7	9.2	10.0	9.8	7.2	11.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Notes

1. Non-use in adjacent quarters was counted as a single gap.
2. Non-use 'gaps' before the first observed participation and after the last observed use were not included as these could be due to agency start-up or closure. Therefore, clients which only use services in a small number of adjacent quarters are included in the 'no gaps' category.

A3. Unexplained reporting gaps

Table 11: Comparing person reporting and agency participation for each quarter for each person in each agency

	Service group				All
	N/AH	HF	LF	CBDC	
Agency-person quarters					
Not a gap (yes_yes)	1,904,134	5,199,793	1,214,041	834,633	8,521,383
True gap (no_yes)	2,480,910	3,363,603	2,308,367	559,712	6,497,937
<i>Subtotal</i>	<i>4,385,044</i>	<i>8,563,396</i>	<i>3,522,408</i>	<i>1,394,345</i>	<i>15,019,320</i>
Suspect gap (no_no)	205,021	303,402	146,544	51,869	591,994
Total	4,590,065	8,866,798	3,668,952	1,446,214	15,611,314
Out-of scope	8,074,287	10,204,930	4,760,856	1,684,378	23,681,678
As per cent of all agency-person quarters					
Not a gap (yes_yes)	41.5	58.6	33.1	57.7	54.6
True gap (no_yes)	54.0	37.9	62.9	38.7	41.6
<i>Subtotal</i>	<i>95.5</i>	<i>96.6</i>	<i>96.0</i>	<i>96.4</i>	<i>96.2</i>
Suspect gap (no_no)	4.5	3.4	4.0	3.6	3.8
Total	100.0	100.0	100.0	100.0	100.0
As per cent of agency-person quarters for which the agency participated					
Not a gap (yes_yes)	43.4	60.7	34.5	59.9	56.7
True gap (no_yes)	56.6	39.3	65.5	40.1	43.3
Subtotal	100.0	100.0	100.0	100.0	100.0

Note: Person is based solely on HACC SLK. Table excludes SLKs with completely missing name data; this affected 520 records in the unlinked HACC data. Table includes data for 1,496,510 people who had services from 1.64 agencies each (equating to 2,455,812 agency-persons). The 'All' column includes case management and carer services not included in the service groups.

Method:

yes_yes: person reported as receiving a service by reporting agency in the quarter

no_yes: person NOT reported as receiving a service by the reporting agency in the quarter, counting only those quarters between when the person was first reported and last reported by any agency, dropping quarters outside the first and last quarter that the particular agency reported.

no_no: person COULD NOT BE reported as the agency did not report at all for that quarter, counting only those quarters between when the person was first reported and last reported by any agency, dropping quarters outside the first and last quarter that the particular agency ever participated.

Out of scope: person COULD NOT BE reported as the quarter was either outside when the person was first reported and last reported by any agency, and/or outside the first and last quarter that the particular agency ever participated.

Table 12: Comparing true and suspect gap lengths, by looking at person reporting and agency participation for each quarter for each person in each agency

Gap length	Service group				All
	N/AH	HF	LF	CBDC	
True gaps (no_yes)	Number of gaps				
1	267,975	338,797	226,587	63,964	670,609
2	136,882	167,778	123,329	30,594	343,509
3	85,591	110,388	84,496	19,082	227,566
4+	245,778	331,815	234,238	54,070	641,912
Total	736,226	948,778	668,650	167,710	1,883,596
1	36.4	35.7	33.9	38.1	35.6
2	18.6	17.7	18.4	18.2	18.2
3	11.6	11.6	12.6	11.4	12.1
4+	33.4	35.0	35.0	32.2	34.1
Total	100.0	100.0	100.0	100.0	100.0
Suspect gaps (no_no)					
1	87,186	178,523	73,361	29,213	320,817
2	37,522	33,120	18,552	6,820	78,079
3	6,273	7,512	4,675	1,585	15,286
4+	4,431	7,544	4,201	892	13,932
Total	135,412	226,699	100,789	38,510	428,114
1	64.4	78.7	72.8	75.9	74.9
2	27.7	14.6	18.4	17.7	18.2
3	4.6	3.3	4.6	4.1	3.6
4+	3.3	3.3	4.2	2.3	3.3
Total	100.0	100.0	100.0	100.0	100.0
Ratio of true to suspect gaps					
1	3.07	1.90	3.09	2.19	2.09
2	3.65	5.07	6.65	4.49	4.40
3	13.64	14.69	18.07	12.04	14.89
4+	55.47	43.98	55.76	60.62	46.07
Total	5.44	4.19	6.63	4.35	4.40

Note: See notes to Table 11 for method used to define gaps.

A4. Results and issues arising from approach

Table 13: Summary of HACC event adjustments for ACAP cohort, NMDS 2002–03 to 2005–06, clients in PIAC cohort

	HACC service group								All combined ^(a)	
	N/AH		HF		LF		CBDC			
	N	%	N	%	N	%	N	%	N	%
Events before adjusting	65,461	100.0	80,419	100.0	46,287	100.0	20,889	100.0	..	..
Adjusted events for pathway	62,831	96.0	72,642	90.3	40,909	88.4	20,209	96.7	107,443	..
First HACC event in same quarter as first ACAP assessment ^(b)	7,197	11.5	6,472	8.9	4,249	10.4	1,432	7.1	9,095	8.5

(a) Overlapping HACC events of different types are combined into single HACC events for more general analysis of HACC use in pathways.

(b) Per cent given as per cent of 'Adjusted events for pathway'.

Table 14: HACC event data for ACAP cohort, NMDS 2002–03 to 2005–06, clients in PIAC cohort

Event adjustment type	HACC service group							
	N/AH		HF		LF		CBDC	
	N	%	N	%	N	%	N	%
Events before adjusting	65,461	100.0	80,419	100.0	46,287	100.0	20,889	100.0
Events with adjusted dates								
Initial adjustments								
Truncated due to death	4,228	6.5	5,063	6.3	1,352	2.9	742	3.6
Cut short by start of next program event	6,941	10.6	17,462	21.7	4,489	9.7	3,473	16.6
Cut by ≤ 91 days	6,153	9.4	13,752	17.1	3,787	8.2	3,028	14.5
Cut by 92–182 days	549	0.8	1,696	2.1	432	0.9	211	1.0
Cut by > 183 days	239	0.4	2,014	2.5	270	0.6	234	1.1
Delayed start to end of previous program event	455	0.7	1,973	2.5	710	1.5	119	0.6
Delayed by >91 days	95	0.1	1,033	1.3	198	0.4	39	0.2
Completely covers next program event	1,291	2.0	3,682	4.6	735	1.6	380	1.8
Covered event ≤ 91 days**	1,144	1.7	2,225	2.8	563	1.2	318	1.5
Events split due to overhang > 91 days	180	0.3	969	1.2	125	0.3	94	0.4
Next event is P RAC	1,196	1.8	1,646	2.0	443	1.0	38	0.2
Next event is package	95	0.1	2,036	2.5	292	0.6	..	..
Dropped events								
Initial adjustments								
Deleted due to death	349	0.5	460	0.6	257	0.6	72	0.3
Events dropped due to illogical adjusted dates*	130	0.2	787	1.0	287	0.6	38	0.2
Completely covered by previous program event (dropped)	1,963	3.0	5,727	7.1	3,822	8.3	545	2.6
Longer than >91 days	545	0.8	2,793	3.5	844	1.8	273	1.3
Previous event is P RAC	1,779	2.7	1,673	2.1	691	1.5	545	2.6
Previous event is package	184	0.3	4,054	5.0	3131	6.8	..	..
Later adjustments								
Additional events dropped due to illogical adjusted dates*‡	29	0.0	177	0.2	21	0.0	15	0.1
Additional events completely covered by previous program event (dropped) ‡	348	0.5	1,650	2.1	1,123	2.4	107	0.5
Total events for pathway	62,831	96.0	72,642	90.3	40,909	88.4	20,209	96.7

* Illogical dates: adjusting start and end dates due to incompatible pre- and post- program use resulted in admission date ≥ discharge date. Includes some events derived by splitting HACC events which covered other incompatible program events.

** unsplit events are truncated to end at the beginning of the next event.

‡ Additional events were adjusted after the initial adjustments due to adjacent non-HACC events (6 iterations were needed to finalise the HACC events).

Note: P RAC = permanent RAC.

Table 15: HACC event data for ACAP cohort: dropped quarters with HACC service provision when this should be ineligible NMDS 2002-03 to 2005-06, clients in PIAC cohort (quarters)

Affected quarter subsets	N/AH		HF		LF		CBDC	
	N	%	N	%	N	%	N	%
Number of distinct service types	4	..	8	..	10	..	1	..
Quarters covered by last event (% all)		(1.9)		(4.1)		(6.4)		(1.7)
With 1 service	2,768	91.0	11,166	78.2	4,799	89.1	..	..
With all services	2	0.1	—	—	—	—	..	..
Most common service	NC@H		del m		hm		..	..
	1478	48.6	5,223	36.6	2,725	50.6	..	..
With ≤ 5 hrs	2,441	80.2	10,821	75.8	5,387	100.0	175	12.8
With > 40 hrs	56	1.8	532	3.7	..	..	633	46.4
<i>Quarters (subtotal)</i>	<i>3,043</i>	<i>100.0</i>	<i>14,273</i>	<i>100.0</i>	<i>5,387</i>	<i>100.0</i>	<i>1,364</i>	<i>100.0</i>
Quarters that cover next event (% all)		(1.1)		(2.6)		(1.5)		(0.8)
With 1 service	1,470	82.4	5,688	62.4	1,056	83.1	..	..
With all services	1	0.1	—	—	—	—	..	..
Most common service	NC@H		del m		hm		..	..
	1,363	76.4	4,350	47.7	624	49.1	..	..
With ≤ 5 hrs	1,121	62.9	6,022	66.1	1,270	100.0	81	12.6
With > 40 hrs	59	3.3	480	5.3	..	..	274	42.5
<i>Quarters (subtotal)</i>	<i>1,783</i>	<i>100.0</i>	<i>9,116</i>	<i>100.0</i>	<i>1,270</i>	<i>100.0</i>	<i>645</i>	<i>100.0</i>
Events cut short > 91 dy (% all)		(0.6)		(1.9)		(1.4)		(0.8)
With 1 service	806	81.8	4,563	69.1	1,020	83.7	..	..
With all services	1	0.1	—	—	—	—	..	..
Most common service	NC@H		del m		hm		..	..
	593	60.2	3,006	45.5	623	51.1	..	..
With ≤ 5 hrs	641	65.1	4,621	69.9	1,219	100.0	54	8.7
With > 40 hrs	42	4.3	281	4.3	..	..	335	53.8
<i>Quarters (subtotal)</i>	<i>985</i>	<i>100.0</i>	<i>6,608</i>	<i>100.0</i>	<i>1,219</i>	<i>100.0</i>	<i>623</i>	<i>100.0</i>
Events with start delayed > 91 dy (% all)		(0.1)		(0.6)		(0.4)		(0.1)
With 1 service	147	77.4	1,444	70.1	254	84.4	..	..
With all services	2	1.1	—	—	—	—	..	..
Most common service	NC@H		del m		hm		..	..
	128	67.4	777	37.7	133	44.2	..	..
With ≤ 5 hrs	127	66.8	1,323	64.2	301	100.0	13	11.0
With > 40 hrs	3	1.6	212	10.3	..	..	75	63.6
<i>Quarters (subtotal)</i>	<i>190</i>	<i>100.0</i>	<i>2,060</i>	<i>100.0</i>	<i>301</i>	<i>100.0</i>	<i>118</i>	<i>100.0</i>
All quarters (% all)		(100.0)		(100.0)		(100.0)		(100.0)
With 1 service	134,232	83.2	223,426	63.5	72,258	85.9	..	..
With all services	280	0.2	—	—	—	—	..	..
Most common service	NC@H		dom.a		hm		..	..
	108,506	67.3	177,054	50.3	46,889	55.8	..	..
With ≤ 5 hrs	94,192	58.4	149,192	42.4	83,891	99.8	5,001	6.1
With > 40 hrs	6,659	4.1	30,248	8.6	..	..	48,815	59.2
Total quarters	161,292	100.0	351,949	100.0	84091	100.0	82,440	100.0

Note: Table is based on initial adjustments only (see Table 14). For the HF group, 'hours' only include those services measured in hours (excludes linen deliveries, meals or transport), for the LF group, 'hours' include only aids provided (i.e. excludes counselling, home maintenance, home modifications).

NC@H = nursing care at home

dom. a = domestic assistance

del m = delivered meals

hm = home maintenance

A5. Adjusting the HACC start date

Table 16: First HACC assessment for HACC clients within annual collections, missing status by quarterly collection, NMDS 2002–03 to 2005–06

HACC NMDS quarter first seen	HACC assessment date			HACC assessment date		
	Missing/poor	Other	Total	Missing/poor	Other	Total
	Number of clients			Per cent		
2002–03						
2002/3	97,466	278,426	375,892	25.9	74.1	100.0
2002/4	36,900	72,544	109,444	33.7	66.3	100.0
2003/1	31,070	60,781	91,851	33.8	66.2	100.0
2003/2	26,651	48,905	75,556	35.3	64.7	100.0
2003–04						
2003/3	108,075	301,819	409,894	26.4	73.6	100.0
2003/4	39,201	78,884	118,085	33.2	66.8	100.0
2004/1	33,591	66,325	99,916	33.6	66.4	100.0
2004/2	32,440	56,236	88,676	36.6	63.4	100.0
2004–05						
2004/3	135,781	297,698	433,479	31.3	68.7	100.0
2004/4	44,480	80,191	124,671	35.7	64.3	100.0
2005/1	34,667	66,075	100,742	34.4	65.6	100.0
2005/2	32,303	62,607	94,910	34.0	66.0	100.0
2005–06						
2005/3	4,610	428,130	432,740	1.1	98.9	100.0
2005/4	921	115,474	116,395	0.8	99.2	100.0
2006/1	3,249	125,285	128,534	2.5	97.5	100.0
2006/2	3,676	102,415	106,091	3.5	96.5	100.0
Total	665,081	2,241,795	2,906,876	22.9	77.1	100.0

Note: Clients are counted within the year before linking to ACAP. HACC assessment missing/poor date includes HACC assessment dates that were 'missing', '1 January 1900', 'before 1 January 1998', 'same as date of birth'

Table 17: First HACC assessment for HACC clients compared with ACAP assessment, HACC assessment date not missing and not reported as before 1998, PIAC cohort with first HACC and first ACAP event in the same quarter

HACC assessment qtr compared with ACAP assessment qtr	Number	Per cent
Earlier quarter	1,066	11.7
Same quarter	5,215	57.3
Later quarter	437	4.8
HACC assessment missing/poor date	2,377	26.1
Total	9,095	100.0
Same quarter		
HACC assessment before start of ACAP assessment	1,665	31.9
HACC assessment on same day as start of ACAP assessment	203	3.9
HACC assessment after start of ACAP assessment	3,347	64.2
Total	5,215	100.0

Note: HACC assessment missing/poor date includes HACC assessment dates that were 'missing', '1 January 1900', 'before 1 January 1998', 'same as date of birth'.

Table 18: 'First seen' HACC date compared with first ACAP assessment date, PIAC cohort with first HACC and first ACAP event in the same quarter

HACC use/assessment compared with ACAP assessment qtr	Number	Per cent
Earlier quarter	1,321	14.5
Same quarter		
With known assessment date before ACAP assessment	1,655	18.2
With known assessment date same or after ACAP assessment	3,500	38.4
<i>Sub-total</i>	<i>5,155</i>	<i>56.7</i>
With unknown assessment date	2,573	28.3
<i>Total</i>	<i>7,728</i>	<i>85.0</i>
Later quarter	46	0.5
Total	9,095	100.0

Note: 'First seen' on HACC includes use of PIAC 'out-of-scope' HACC services. HACC assessment date for comparing to ACAP assessment date is derived as the earliest date out of the first HACC assessment date and the last date of first quarter that a client is reported for HACC.

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