Movement from hospital to residential aged care: preliminary results

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Movement from hospital to residential aged care: preliminary results

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Symbols in tables

–	nil or rounded to zero
. .	not applicable
n.e.c.	not elsewhere classified
n.p.	not published
*	denotes statistically different at the 5% significance level
**	denotes statistically different at the 1% significance level

Abbreviations

ACAT	Aged Care Assessment Team
ACCMIS	Aged and Community Care Management Information System
ACT	Australian Capital Territory
AIHW	Australian Institute of Health and Welfare
AHMAC	Australian Health Ministers' Advisory Council
DOB	date of birth
E linkage	event-based data linkage (name data not used)
ICD-10-AM	International Classification of Diseases 10th revision Australian Modification, based on the World Health Organization's internationally accepted classification of diseases and related health conditions
MAD	mean absolute difference
N linkage	name-based data linkage
NHMD	National Hospital Morbidity Database
NSW	New South Wales
NT	Northern Territory
p	Probability of result occurring by chance (p = 0.05 equates to a 5% probability)
PPV	positive predictive value
Qld	Queensland
RAC	residential aged care
SA	South Australia
SLA	statistical local area
Tas	Tasmania
WA	Western Australia
YOB	year of birth

Executive summary

Linkage between hospital and residential aged care data

The movement of people between acute hospital care and residential aged care has long been recognised as an important issue, but existing national data sets provide only limited information on such movement. For some years the Australian Institute of Health and Welfare has been developing an event-based data linkage method (termed E linkage) to link national hospital morbidity data and residential aged care data.

A previous collaborative study compared the event-based linkage method with linkage using name data for Western Australia. This showed that the linked data resulting from the event-based method can be successfully used to look at the characteristics of people who move from hospital to residential aged care and compare them with those who move back to the community. However, E linkage underestimates the true number of transitions and so should not be used without adjustment to measure the volume of flow from hospital to residential aged care.

Having successfully demonstrated the utility of this method for examining the movement of people between the two sectors, data have now been linked for six states and territories for 2001–02 and preliminary results are now available.

Before data linkage for this project began, ethics approvals were obtained from required ethics committees, and permission to use the hospital morbidity and residential aged care data was obtained from all data custodians (national and state and territory).

Approximate estimates of flow

Using results from the Western Australian comparative study, the linked data for six jurisdictions were weighted to get estimates of the volume of flow. During 2001–02, across the six jurisdictions included in the study, there were 620,000 hospital separations for stays lasting at least 1 night for people aged 65 years and over. Of these, an estimated 10% were separations into residential aged care, with around two-thirds of this group being for people already living in permanent residential care and one-third being for people who were new admissions. Conversely, it is estimated that one-third of the 67,300 admissions into residential aged care in 2001–02 were from hospital, with about 70% of these admissions being for permanent care. Nearly one-quarter of all the admissions were for people transferring between different residential aged care facilities.

People moving from hospital to residential aged care

Of people moving to residential aged care, about two-thirds were women, and nearly three-quarters of them were aged 80 or older. Men and women each comprised about one-half of the older people returning to the community from hospital, and the majority were aged under 80 years.

Older people who moved into permanent residential care from hospital averaged longer hospital stays than people returning to residential aged care after an episode in hospital. About 10% of those moving into permanent residential care had hospital stays of at least 64 days.

People moving into permanent residential aged care from hospital generally had higher care needs than people moving from the community.

Transitions from hospital to the community via residential aged care

Of particular interest from a policy perspective is what happens to people who enter residential aged care from hospital: do they remain in aged care or do they return to the community?

Just over one-half of people who moved from hospital to respite care and about 8% who moved to permanent care returned to live in the community within 12 weeks and did not return to residential aged care within 4 weeks. One-fifth of people who moved into permanent residential care died within 12 weeks, compared with 6% of people who moved into respite care.

For those transferring into respite care the level of care needed by a person was associated with the likelihood of returning to the community within 12 weeks. Nearly two-thirds of people admitted into low-level respite care from hospital returned to the community within 12 weeks and did not return within 4 weeks compared with about just over 40% of people admitted to high-level respite care.

Conclusion

This project demonstrates the value of analysing linked data in providing new information to help understand the movement of people across service sectors. Such information can assist in planning and improving both hospital and residential aged care services for older Australians.

1 Background

The interface between acute hospital care and residential aged care (RAC) has long been recognised as an important issue in aged care services research. Despite this, existing national data provide very poor information on the movement of clients between the residential and acute care sectors. Current national data sets on the two sectors come from administrative by-product collections, and have been designed primarily to provide data on a specific program, rather than to look at program interfaces.

Data linkage is a statistical tool that can be used to link data from different sources, thereby expanding the types of statistical investigations that can be done (including analysis of movement over time) without increasing the reporting load of service providers or requiring special surveys. This suggests that data linkage could be used to develop data sets suitable for investigating movement between the hospital and aged care sectors. Data linkage of records for individuals is commonly carried out using detailed demographic data, including name and/or a person identification number. Yet, while the national RAC data and some of the state and territory hospital morbidity data sets may contain name, the national hospital morbidity data set does not. Furthermore, the national hospital and RAC data sets do not contain a common person identification number which could help data linkage.

While neither name nor a common person identification number are available for linking data from the two sectors, some demographic data are available. In addition, information on transition dates—that is entry and exit dates—is available for all periods of hospitalisation and RAC. To see if such event data are sufficient to allow data linkage, the feasibility of linking hospital morbidity and RAC data sets using a combination of demographic and event data was investigated. The Australian Institute of Health and Welfare (AIHW) carried out the study in 2001 and 2002 under the auspices of the Australian Health Ministers' Advisory Council (AHMAC) Care of Older Australians Working Group. Findings suggested that the set of linked client records resulting from an event-based anonymous linkage strategy could provide a valuable source of information on the client characteristics and service use patterns associated with movements between the two sectors (AIHW 2003b).

In the feasibility study, matching was based on date of birth, sex, region of usual residence, and hospital separation and RAC entry dates. Without validation against a gold standard linkage, doubts about the efficacy of the strategy were raised because of the lack of either name or a common person identifier on the two data sets. This issue has been addressed using two distinct methods.

First, in 2004 a study used statistical theory to investigate the effectiveness of the AIHW event-based strategy in a range of linkage situations, and, using these results, refined the strategy for use in future work (AIHW: Karmel 2004). Overall, estimates based on the theoretical analysis indicated that the Institute's linkage strategy results in acceptably low rates of false matches, and so can be used to derive a data set useful for investigating the hospital–aged care interface.

Second, direct comparisons between a name-based linkage strategy and the event-based linkage strategy were done to measure any differences between the two approaches, and to determine whether event-based matching leads to any biases in the match data set, compared with name-based matching. The scope of the comparisons was limited to movements from hospital to RAC in Western Australia during 2000–01. Western Australia was chosen for this study because of its unique position in having a well-established linked

health database which was recently expanded to include RAC data (see Holman et al. 1999; Brook et al. 2005). Results from this analysis confirmed that, although understating volume of flow, event-based matching could provide a useful statistical resource to examine patterns in transitions between hospital and RAC (AIHW: Karmel & Rosman 2007).

Having established the utility of event-based matching, hospital morbidity and RAC data were linked for all states and territories except Victoria and Western Australia (these two states were excluded as they had not provided permission to use their hospital morbidity data when this preliminary analysis began). This report provides preliminary results from this cross-jurisdictional event-based linkage process, and uses the linked data to investigate a particular issue—that of transitions from hospital to RAC and back to the community within 12 weeks of leaving hospital.

Before data linkage for this project began, ethics approvals for the project were obtained from required ethics committees, and permission to use the hospital morbidity and RAC data was obtained from all data custodians (national and state and territory).

1.1 Report structure

The report is structured as follows. First, the context of movements from hospital into RAC is outlined (Section 2), and the data used to link the data sets and to allow analysis of movements are described (Section 3). The event-based linkage strategy used is then described in detail in Section 4, including a summary of the results from the earlier comparison of the name-based and event-based linkage strategies. Section 5 examines data quality for linkage and presents broad results, while Section 6 looks at the characteristics of people moving from hospital to RAC. Transitions from hospital to RAC and back to the community are investigated in Section 7.

2 Types of transitions

When identifying transition events, detailed knowledge of both the service systems and the data collection practices within those systems is essential, irrespective of the data linkage method used. Such awareness ensures that the most appropriate event is selected as the transition event. In linking hospital and RAC data to investigate movement from hospital into RAC, the aim of any linkage strategy is to match hospital separations by people who then go into RAC.

In general, an episode in hospital may end with the patient either:

a returning home in the community or going to live temporarily with family and friends

b going to live temporarily with family and friends before returning to a RAC service

c going into a RAC service

d returning home to permanent RAC

e transferring to another hospital

f transferring to residential health care services

g changing episode type within the hospital

h dying.

Similarly, a person may enter RAC in a number of ways. An entry may be for a person:

A being admitted into RAC for permanent care

B being admitted into RAC for respite care

C transferring between RAC services (for either permanent or respite care)

D returning to RAC following an episode in hospital (termed 'hospital leave')

E returning to RAC following a stay with family or friends (termed 'social leave').

F In addition, a RAC permanent resident may die while on hospital leave or die in hospital while on social leave.

In terms of the events described above, linkage strategies try to match hospital separations of type *c* to the relevant RAC entries of types *A* and *B*; separations of type *d* to entries of type *D* (or occasionally *E*); separations of type *b* to the relevant entries of type *E,* and separations of type *h* to deaths of aged care residents while in hospital (type *F*).

3 Data

In the current analysis, the AIHW event-based linkage strategy was used to match event records using date of birth, sex, geographic region of usual residence and event dates and characteristics. Data for hospital episodes were linked to RAC events for 2001–02, and were limited to events for people who were aged at least 65 by 30 June 2002.

Two extracts were obtained for both hospital and RAC data: one to be used to establish links (linkage data set), and a second to be used for analysing transitions (analysis data set).

3.1 Hospital data

The hospital data used in this study came from the National Hospital Morbidity Database (NHMD), and included data for both public and private hospital separations. The hospital linkage data set contained only the information required to establish and check links, and included date of birth, sex, postcode of usual residence, country of birth, marital status, admission and separation dates, and modes of hospital admission and separation.

Two sets of records were excluded from the hospital data set:

- *Statistical discharges and transfers:* For two types of discharges the person remains within the hospital system. In a 'statistical discharge' the person in question changes from one hospital episode care type to another (for example, acute care to rehabilitation). A person may also transfer from one hospital to another. As these people do not leave the hospital system, trying to link to a RAC entry is not appropriate. In addition, if the person were on RAC hospital leave, statistical discharges would not relate to a return to RAC. Consequently, separation records relating to statistical discharges were excluded.
- *Same day hospital separations:* People admitted and discharged on the same day are unlikely to be discharged to a RAC facility unless they are going from a RAC facility to hospital for a day procedure. In this case the person is unlikely to be recorded as being on hospital leave by the RAC facility (analysis of recorded RAC hospital leave revealed only events with at least 1 night in hospital). So to avoid spurious matches between aged care admissions and hospital separations into the community, records with the same admission and separation dates were excluded. The effect of excluding same-day hospital separations on the links made will be negligible: during 2004–05, just 0.4% of same-day hospital separations for people aged 65 and over were reported as discharges to RAC or other health care (AIHW: Karmel et al. 2007).

In 2001–02, across the jurisdictions included in this project, for people aged 65 and over there were 620,400 hospital separations that lasted 1 or more nights and ended with the person leaving the hospital system (Table 3.1). Note that to allow for small gaps between hospital separation and RAC admissions (and for small differences in recording dates) separations for a few days at either end of the financial year were also included in the data set for data linkage (see Table 5.1).

A data set containing only the information needed to analyse transitions from hospital to RAC but not the more detailed information used to recognise links was also derived specifically for analysis. This data set included age, sex, region of usual residence, country of

birth, marital status, modes of hospital admission and separation, length of stay, and hospital diagnosis and procedure variables.

Table 3.1: Hospital separations for people aged 65+ by reported mode of separation, by state/territory, 2001–02

Mode of separation	NSW	Qld	SA	Tas	ACT	NT	All
To RAC	14,405	5,762	7,339	786	541	122	28,955
To other health care establishment	2,318	894	400	340	97	59	4,108
To usual residence/other	272,365	163,702	81,022	22,551	9,975	1,840	551,455
Left against medical advice/ statistical discharge from leave/unknown	1,754	391	180	162	12	27	2,526
Death	17,874	9048	4636	1074	591	105	33,328
Total	**308,716**	**179,797**	**93,577**	**24,913**	**11,216**	**2,153**	**620,372**

Notes

1. Table excludes same-day hospital episodes, statistical discharges and transfers to other hospitals.
2. State/territory relates to hospital from which separation occurred.
3. Age is at hospital admission.

Source: AIHW analysis of hospital morbidity linkage data set.

3.2 Residential aged care data

The RAC data included all RAC permanent and respite admissions and hospital and social leave events for the year of interest, totalling 147,200 events for people aged 65 and over (Table 3.2). The data was derived from the Department of Health and Ageing's Aged and Community Care Management Information System (ACCMIS).

Table 3.2: RAC events for people aged 65+ by event type, by state/territory, 2001–02

RAC event type	NSW	Qld	SA	Tas	ACT	NT	All
Permanent admission	20,986	10,103	5,475	1,340	560	102	38,566
Respite admission	15,410	7,255	3,816	1,474	740	201	28,896
Sub-total admissions	*36,396*	*17,358*	*9,291*	*2,814*	*1,300*	*303*	*67,462*
Hospital leave, ending with:							
Return from hospital	19,476	11,832	6,395	1,094	569	100	39,466
Discharge to hospital	663	422	104	15	9	—	1,213
Death in hospital	2,292	1,299	627	111	64	16	4,409
Sub-total	*22,431*	*13,553*	*7,126*	*1,220*	*642*	*116*	*45,088*
Social leave	17,663	10,847	4,028	1,361	593	129	34,621
Total	**76,490**	**41,758**	**20,445**	**5,395**	**2,535**	**548**	**147,171**

Notes

1. Table includes admissions within 2001–02, and RAC leave events (including deaths in hospital and discharges to hospital) with at least some days in the period 1 July 2001 to 30 June 2002.
2. Result of hospital leave is based on event dates and reason of discharge from RAC.
3. State/territory relates to the RAC outlet to which the admission occurred.
4. Age is at RAC admission or end of RAC leave.

Source: AIHW analysis of RAC linkage data set.

As stated above, two extracts were obtained: one for linkage and one for analysis. The RAC linkage file, containing data for establishing and checking event links, included a project-specific RAC client number, date of birth, sex, postcode of usual residence (for leave events this is the RAC facility's postcode), country of birth, marital status, event type, admission and discharge dates, leave event start and end dates, place and date of Aged Care Assessment Team (ACAT) assessment, and mode of discharge. Again, RAC entry events occurring a few days at either end of the financial year were also included in the data set for data linkage (see Table 5.1). The RAC analysis file contained the project-specific RAC client number, age, sex, postcode of residence before current event, postcode of RAC facility, country of birth, marital status, event dates, care needs assessment, place and date of ACAT assessment, and mode of discharge.

4 E linkage strategy

4.1 Linkage protocol

To protect the privacy of individuals, the AIHW carried out the E linkage, using the Institute's protocol *Data linkage and protecting privacy: a protocol for linking between two or more data sets held within the Australian Institute of Health and Welfare* (AIHW 2006). The principles underlying this protocol are that:

- Data linkage is not carried out directly between original complete data sets;
- Data linkage is undertaken using purpose-specific linkage data sets that contain only the data required for establishing and validating links;
- Links between data sets are recorded using project specific unique record identifiers so that links identified for a particular project (including longitudinal analyses) cannot be used to establish links between data sets outside the scope of the project using a chain of links ('consequential' linking);
- Analysis files do not contain identifying data (such as name, date of birth and address, or the record number from the original data set); and
- Intermediate data sets and the project specific record identifiers are deleted following completion of the final linked analysis data sets.

4.2 Linkage process: constrained E matching

In the comparative analysis mentioned in Section 1 (AIHW: Karmel & Rosman 2007), a number of event-based linkage—or E linkage—strategies were compared with the Western Australian name-based approach. Results from that work identified a constrained version of the linkage strategy as the most appropriate for national analyses.

The purpose of constrained E matching is to find the best match using all available event date information and event descriptors available on the national NHMD and ACCMIS data. To achieve this, matching procedures are specified separately when comparing different subsets of RAC and hospital events defined in terms of their type and/or admission and separation characteristics. Because two dates are available for RAC hospital leave, and the related hospital episode may end in a number of ways, match procedures for these events are the most complicated.

Event information may suggest that some matches are more likely to be correct than others (for example, a link of *hospital discharge reported as to RAC – RAC admission* has greater face validity than a link of *hospital discharge reported as to usual residence – RAC admission*). Thus, data set partitioning based on event characteristics not only minimises coincident records within data sets (with respect to variables used when matching) by reducing the number of records being compared, it also allows link priorities to be set later in the matching process. Consequently, matching within partitioned data sets helps select the most likely match should duplicate links occur when the links from the partitioned data sets are combined. For this project 12 such partitioned data set pairs were used (Table 4.1).

Table 4.1: Data set partitioning and event date match rules for E linkage constrained match selection

Partition code	Link priority	Hospital mode of separation	RAC type	RAC exit versus hospital entry dates	Hospital exit versus RAC entry dates
8ADM	11	To death, using person region[(a)]	Admissions	. .	
9ADM	8	To usual residence, using person region	Admissions		
0ADM	7	To other, using person region	Admissions		
H9ADM	10	To usual residence, using hospital region	Admissions with ACAT in hospital	(also Hospital entry ≤ ACAT date ≤ Hospital exit)	
H0ADM	9	To other, using hospital region	Admissions with ACAT in hospital		
9SOC	12	All	Social leave	RAC exit ≤ Hospital entry	Hospital exit ≤ RAC entry
NST8H	2	With non-statistical admission, to death	Hospital leave		
NST9H	1	With non-statistical admission, to usual residence	Hospital leave	|Hospital entry – RAC exit | = 0, 1, 2 days	(RAC entry – Hospital exit) ≤ 2 days[(b)]
NST0H	3	With non-statistical admission, to other	Hospital leave		
ST8H	5	With statistical admission, to death	Hospital leave		(RAC entry – Hospital exit) ≤ 2 days[(b)]
ST9H	4	With statistical admission, to usual residence	Hospital leave	(Hospital entry – RAC exit) ≥ –2	(RAC entry – Hospital exit) = 0, 1, 2 days[(c)]
ST0H	6	With statistical admission, to other	Hospital leave		

\|RAC entry – Hospital exit \| ≤ 2 days Or \|RAC pre-entry – Hospital exit \| ≤ 2 days

(a) Region used throughout the matching depends on the particular strategy.

(b) Allows for discharge to hospital (negative difference).

(c) Stricter rules on end-date because it is difficult to allow consistently for death in hospital for a statistical admission, and to compensate for the poorer match event start date.

Source: AIHW: Karmel & Rosman 2007.

Constrained E matching was done in two stages. Initial matches for each partitioned data set pair were selected using 1:1 probabilistic matching via the matching software *Websphere*® (previously known as *Automatch*® and *Integrity*®). In this stage, relatively broad match criteria were used to recognise possible matches between RAC and hospital partitioned data sets. While the matching was probabilistic, at least partial matches were required on each of date of birth, sex, region and event dates. Some variation was allowed in exactness of match, particularly for event dates where allowable date differences between the RAC and hospital events were specified according to the types of events being matched (Table 4.1). In addition, some variation in date of birth (matching on two out of day, month and year of birth) and region was considered.

The extent of variation allowed in the *Websphere*® matching process is shown in Table 4.2 which summarises the general approach taken to blocking (required match) and match variable (probabilistic match) specifications, with the particular specifications depending on the two data sets being compared (as per Table 4.1).

Table 4.2: Blocking variables and matching description used in *Websphere*® passes for constrained E linkage strategy

	***Websphere*® pass**						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Match description	Exact match	Exact match using first 3 postcode digits	1-sided event date(s) variation	2-sided event date variation	Variation in year of birth	Variation in month of birth	Variation in day of birth
Blocking variables	SLA sex DOB [date][(a)]	3-digit postcode sex DOB [date][(a)]	SLA sex DOB	SLA sex DOB	SLA sex day of birth month of birth [date][(a)]	SLA sex day of birth year of birth [date][(a)]	SLA sex month of birth year of birth [date][(a)]

(a) Dates are only used as blocking variables if an exact date match is appropriate for the particular partitioned data set pair being matched. This depends on whether RAC leave events or admissions are being compared, and whether a death/discharge to hospital is involved (see Table 4.1, see also diagrams in AIHW: Karmel & Rosman 2007: Appendix 2 for more detail).

Notes

1. Passes 5, 6 and 7 (date of birth variation) are not used when matching partition pairs 9ADM and H9ADM in Table 4.1. In addition, passes 3 and 4 (date variation) are not used for partition pair H9ADM.
2. Only pass 1 is used when matching to RAC social leave, where an exact match for RAC social leave means that the hospital episode dates are contained within the leave event dates (see partition pair 9SOC Table 4.1).
3. 3-digit postcode indicates that the first three digits of the postcode were used for region matching.

In the second stage of match selection, the results from matching within the 12 partitioned data set pairs were checked for compliance with the rules for acceptable variation, and possible discharges to hospital and deaths in hospital while on hospital leave were identified. The 12 data sets were then combined.

Combining the 12 linked sets resulting from the above process may end in many-to-many matches, due to an overlap across the partitioned data set pairs. For example, all RAC admissions were compared with the three data sets containing hospital separations to death, separations to usual residence/other and other separations. These duplicate links were reduced to a 1:1 match using priority ratings which rank matches based on RAC event type, reliability of region information and hospital separation mode (see Table 4.1). Overall, links to RAC hospital leave were given top priority, followed by those to RAC admissions and finally those to RAC social leave. RAC social leave was given lower priority because of the less reliable event date data available for these matches, and because people who go on social leave are likely to be the more robust RAC residents and so less likely to use hospitals. (More details about match specifications and priorities for constrained E linkage are given in AIHW: Karmel & Rosman 2007).

When comparing name-based and event-based linkage using Western Australian data, two types of constrained E linkage were considered. The first used statistical local area (SLA) groups to establish region of usual residence, where an SLA group is that set of SLAs that overlap a postcode and two postcodes are said to match if they have a common SLA in their SLA groups (for example, in Figure 4.1 postcodes 1 and 2 both contain SLAs 2 and 4 and so

match on SLA group, but postcodes 1 and 3 do not match on SLA group). The second constrained strategy used straight postcode when matching on region. Within limits, methods using broader regions when matching perform better than those using smaller regions. The SLA-based strategy was preferred for national analysis, and so is used here.

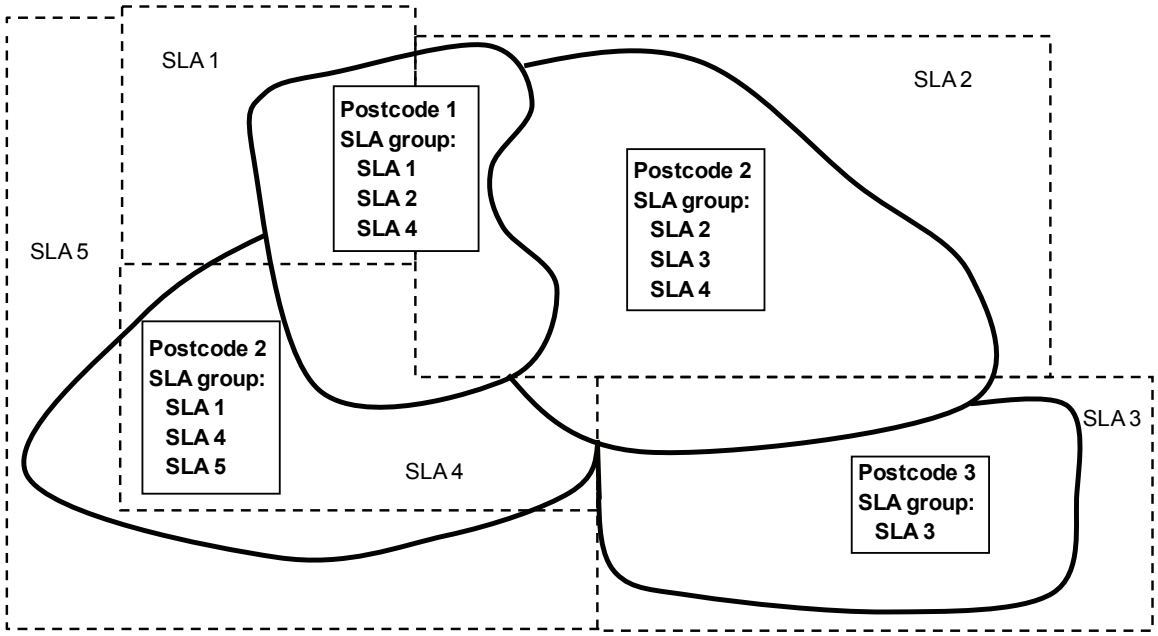


Figure 4.1: Illustrating the SLA group of a postcode

4.3 Validity of constrained E matching: results from comparing name-based and event-based linkage[1]

By expanding the event data used to recognise links and using detailed comparisons of name-based and event-based links to establish reliable linking procedures, it was possible to improve the general performance of the event-based linkage strategy from the initial feasibility study (AIHW 2003a). Key findings from the comparison of the constrained event-based linkage used in this study with name-based linkage are summarised below. The results relate to Western Australian for 2000–01.

Quality of E linked data

When linking records, four outcomes are possible: a true link, no link, a false link (false positive) and a missed link (false negative). The correspondence between two strategies can be gauged by seeing how many of the links are the same and how many are different. Although subject to some constraints imposed by the data providers, the Health Information Linkage Branch in the Western Australian Department of Health was able to use name and address to link transition events in Western Australian RAC and hospital data, supported by the availability of name and address reporting history across a range of health service events.

1 This section is drawn from the Executive Summary in AIHW: Karmel & Rosman 2007.

This results in this linkage (termed N linkage) being highly reliable and, consequently, it served as the reference standard against which the E linkage results were compared—that is, to determine whether an E link was 'true' or 'false'. Note, however, that no linkage system is error proof, and manual inspection indicated that an E linkage match was preferred over the N link for a number of cases. In addition, E linkage identified a small number of valid person links that had previously been missed using name and address information.

Two key measures were used when comparing matches:

1. Positive predictive value (PPV): the percentage of E links that were true links = E true links/E links.
2. Sensitivity: the percentage of all links identified by the E linkage strategy = E true links/N links.

Detailed comparisons of the various sets of links showed that the PPV and, in particular, the sensitivity of E links varied with RAC event type—that is, within transition destination. Differences were also apparent for categories within a range of other variables. However, much of this variation was explained by the RAC event profile of the events within particular categories. When modelling the propensity of E linkage to miss N links within RAC event type, only a small number of variables were found to have statistically significant effects.

Within transition destinations, links identified by event-based strategies are highly reliable: 95%–99% of links identified by E linkage were true matches when compared with links from N linkage (PPV in Table 4.3). Consequently, the event-based linkage strategy resulted in linked data sets that largely reflected the name-based linked data in terms of the distributions across key variables.

Table 4.3: Positive predictive value and sensitivity by RAC event type, using name-based linkage as the reference standard, Western Australia, 2000–01

	Links to RAC event type				
Validity measure	Permanent admission	Respite admission	Hospital leave	Social leave	Total
			Per cent		
PPV	95.1	98.2	98.7	95.5	97.9
Sensitivity	75.2	81.2	92.4	93.2	87.6
Relative size	78.9	82.6	93.8	95.7	89.5

(a) Analysis indicated that for a small number of links the event match chosen by the N linkage strategy was not the preferred link. In particular, for 18 matches (0.2% of N links) the preferred link was to a RAC hospital leave event rather than the chosen (earlier) admission event for the same person.

Source: AIHW: Karmel & Rosman 2007:Table S.2.

E linkage more often tends to miss matches than make false matches. Inconsistent event date and/or region data on the two databases are the main reasons for missing links. This was seen in the Western Australian study, with the sensitivity of the strategy being lower than its corresponding PPV (Table 4.3). Consequently, the volume of flow from hospital to RAC was underestimated when using E linkage.

In practice, the dominant effect of RAC event type on the efficiency of E linkage is largely mitigated by the logical requirement to look separately at different transition types—that is, movement into permanent admissions, into respite admissions, returning from RAC leave and into the community. Also, given that the E linkage strategy results in few false matches,

analysis indicated that E links provide a good basis for examining the demographic profile of people undertaking various transitions.

Utility of E linked data for analysis

When analysing transitions, it is the combined effect of missed links and false links that determines the overall utility of a linked data set. Examination of all records linked under the particular strategy showed that, overall, the E linkage strategy resulted in linked data that largely reflect the N linkage match set in terms of the distributions across key variables. That is, while not exactly the same, distributions based on the E linkage match set looked similar to those for the N linkage match set.

Analyses of movement between hospital and RAC will commonly aim to compare people who have moved between the two sectors with those who have not. To do this, both linked and unlinked records must be looked at. In the Western Australian study, examples of such analyses considered three broad groups of analysis: movement from hospital, movement into RAC, and an example looking at a specific issue—dementia. In all cases, analysis took into account the type of transition into RAC, thereby removing the principal source of possible bias.

In terms of practical utility, analysis by post-hospital destination or source of RAC admission indicated that, as expected from the sensitivity estimates, the E linkage strategy underestimated the volume of movement between hospital and RAC, with permanent RAC admissions being particularly affected. But illustrative examples looking at patterns of use and characteristics of people moving between the two sectors showed that analyses using links derived from the N and E strategies lead to very similar conclusions. Examination of results also indicated that, irrespective of the linkage strategy, care needs to be taken when drawing conclusions as some differences may not be statistically different due to small numbers in some cross-classifications.

In summary, the incidence of missed links in the event-based linkage strategies means that the volume of flow from hospital to RAC is underestimated by the E linkage strategy, when compared with the name-based strategy. However, analyses of transition patterns using links derived from the N and E strategies lead to very similar conclusions.

5 Linking the data

5.1 Input data quality

The quality of the final linked data set depends largely on the quality of the input data sets. To assess the quality of the NHMD and RAC data sets, the following aspects were investigated:

- missing data relating to match variables
- duplicates in the data sets based on match variables
- the over-occurrence of certain birth dates
- the seasonality of hospital separations and RAC admissions during certain weeks of the year.

The following analysis of data quality uses data from the complete linkage data sets, and so contains events for a few days at either end of the financial year and also a small number of events for people aged under 65 at the time (compare tables 3.1 and 3.2 with Table 5.1).

Missing values

Key match variables in both the NHMD and RAC data sets were looked at to determine the percentage of records which had missing values for these variables (Table 5.1).

The NHMD data set contained missing values for the following variables: date of birth, client postcode, client SLA group, hospital postcode and hospital SLA group (Table 5.1). A very small number (52 records) of hospital records were missing the client's date of birth—all records from New South Wales. Just under 0.5% of hospital records were missing client postcode, while just over 5% were missing client SLA group. This discrepancy between missing postcodes and missing SLA groups is due to a client's postcode not appearing on the SLA-postcode concordance file. Because the proposed linkage uses both postcode and SLA group as blocking variables, the number of records with missing SLA groups will have a small effect on the final linked data set.

A seemingly major quality issue with the NHMD data set was that more than one-third of all records were missing the hospital postcode and hospital SLA group. These records represent separations from private hospitals, for which postcodes are not recorded on the NHMD. However, because hospital postcodes (via SLA groups) were used to identify just over 1% of the total links in the WA linkage study (AIHW: Karmel & Rosman 2007), it is estimated that the large number of missing hospital postcodes, and consequently hospital SLA groups, in the present linkage project will result in only a relatively small number of missed links (about 1% of the final number of links).

The RAC data set had very low levels of missing data. A very small number of records were missing client postcode (3 records) or client SLA group (235 records). The records with missing SLA group make up only a very small percentage (0.2%) of the total number of RAC records being linked, and will have a negligible effect on the final linked data set, especially since postcode itself is incorporated into the linkage process (see pass 2, Table 4.2).

Table 5.1: Missing data in key match variables, by linkage data set and state/territory, 2001–02 (number)

	NSW	Qld	SA	Tas	ACT	NT	All
NHMD							
Date of birth	52	—	—	—	—	—	52
Sex	—	—	—	—	—	—	—
Client postcode	1,379	470	83	577	14	67	2,590
Client SLA group[(a)]	23,709	5,509	2,748	1,913	101	499	34,479
Hospital postcode[(b)]	91,455	90,178	35,620	13,209	4,168	—	234,630
Hospital SLA group[(b)]	99,939	90,178	35,620	13,209	4,168	—	243,114
Separation date	—	—	—	—	—	—	—
Admission mode	—	—	—	—	—	—	—
Separation mode	—	—	—	—	—	—	—
Total number of records	**320,621**	**186,789**	**96,961**	**25,855**	**11,702**	**2,277**	**644,205**
RAC data							
Date of birth	—	—	—	—	—	—	—
Sex	—	—	—	—	—	—	—
Client postcode	2	1	—	—	—	—	3
Client SLA group[(a)]	123	64	32	8	8	—	235
RAC entry date	—	—	—	—	—	—	—
Event type	—	—	—	—	—	—	—
Total number of records	**77,688**	**42,369**	**20,712**	**5,493**	**2,573**	**555**	**149,390**

(a) Based on ABS postcode-to-SLA concordance file. SLA group is missing if the postcode is missing or the reported postcode is not on the concordance file.

(b) Postcodes of private hospitals are not recorded on the NHMD.

Notes

1. NHMD linkage data set:
   - included separations with date of birth on admission prior to 30 June 1937
   - included separations from 23 June 2001 to 30 June 2002.
   - excluded same-day hospital episodes, statistical discharges and transfers to other hospitals.
2. RAC linkage data set included:
   - clients of all ages: 5% of admissions in 2001–02 were for people aged under 65 (AIHW 2003b:table 3.1).
   - admissions from 28 June 2001 to 3 July 2002
   - RAC leave events (including deaths in hospital and discharges to hospital) with at least some days in the period 1 July 2001 to 30 June 2002.

Duplicates

Duplicates in the data sets based on match variables were examined. Higher numbers of duplicates within a data set for a given date of birth, sex, postcode and transition date combination would lead to an increased chance of an incorrect link being made. Both the NHMD and RAC data sets contained a very low number of duplicates (159 and 14 records, or 0.02% and 0.01% of records, respectively), so duplicates will have a negligible effect on the quality of the final linked data set (tables 5.2 and 5.3).

Table 5.2: Duplicates in linkage data in hospital data sets used in *Websphere*® matching, by reported hospital admission mode and separation mode, by state/territory, 2001–02

Admission mode/separation mode	NSW	Qld	SA	Tas	ACT	NT
Non-statistical admission						
Separation mode						
To death	<5	—	<5	—	—	—
To usual residence	53	20	39	<5	—	<5
Other	<5	<5	<5	—	—	—
Total duplicates	**60**	**21**	**43**	**<5**	**—**	**<5**
Total records	**276,820**	**172,218**	**85,232**	**21,838**	**10,811**	**2,197**
Statistical admission						
Separation mode						
To death	<5	—	<5	—	—	—
To usual residence	8	<5	5	<5	<5	—
Other	<5	—	—	—	<5	—
Total duplicates	15	<5	<10	<5	<5	—
Total records	**43,801**	**14,571**	**11,729**	**4,017**	**891**	**80**

Notes

1. For scope of NHMD linkage data set see note 1 of Table 5.1.
2. Duplicates are based on: date of birth, sex, SLA/postcode, hospital exit date within admission and separation mode. Number of duplicates when matching will be less than this due to more detailed matching procedures. Duplicates relate to data used for matching only and *do not* imply that the data sets contain multiple records for some hospital episodes.
3. Since matching is performed within region and admission mode (except for social leave), this table reports on region by admission mode. (See Table 4.1 for details of the matching strategy).
4. The number of pairs of duplicates is reported.

Table 5.3: Duplicates in linkage data in RAC data sets used in *Websphere*® matching, by RAC event type, by state/territory, 2001–02

RAC event type	NSW	Qld	SA	Tas	ACT	NT	All
Admission	7	<5	<5	—	<5	—	12
Hospital leave	—	—	—	—	—	—	—
Social leave	<5	<5	—	—	—	—	<5
Total duplicates	**<10**	**<5**	**<5**	**—**	**<5**	**—**	**14**
Total records	**77,688**	**42,369**	**20,712**	**5,493**	**2,573**	**555**	**149,390**

Notes

1. Duplicates are based on: date of birth, sex, SLA/postcode, RAC entry date within RAC event type. Number of duplicates when matching will be less than this due to more detailed matching procedures. Duplicates relate to data used for matching only and *do not* imply that the data sets contain multiple records for some RAC entries.
2. The number of pairs of duplicates is counted.
3. For scope of RAC linkage data set see note 2 of Table 5.1.

Date of birth

Date of birth is an extremely important match variable and, as such, the quality of the date of birth variable in the NHMD and RAC data sets will influence the final number of missed or

incorrect links. For correct links to be made, date of birth must be recorded similarly on both data sets (with a little leeway, see Table 4.2). Date of birth was analysed in two ways to determine whether any significant anomalies existed:

- Year of birth was investigated to determine if any years appeared more often than expected. Examples of over-occurrence could include a 'start of century' or 'start of decade' effect, where unknown years of birth are recorded as 1900, 1901 and 1910 (and so on).
- Combinations of day and month of birth were investigated to determine if any particular day of the year was recorded more often than expected (for example, 1 January).

The analysis of reported year of birth did not indicate any over-occurrence of certain years. However, the analysis of reported day and month of birth indicated that several dates occurred more often than expected. The analysis compared the number of records which had birth dates on particular days with the expected number of records having a particular birth date, assuming equal probability of a record having 1 of the 366 possible day/month combinations in the year (Table 5.4). The expected number of records for any day/month combination equals the number of records divided by the 366 possible annual dates, adjusting for leap years by multiplying the number of birth dates occurring on 29 February by four.

Comparisons were made between the expected number of records per birthday and the following:

- the number of records with birth dates of 1 January
- the number of records with birth dates of 1 July
- the mean number of records with birthdays falling on the first day of the other 10 months.

The analysis of NHMD birth dates (Table 5.4) revealed that:

- 82% more records than expected had birthdays falling on 1 January (3,196 versus 1,760; $p<0.01$)
- 29% more records than expected had birthdays falling on 1 July (2,278 versus 1,760; $p<0.01$)
- 5% more records than expected had birthdays falling on the first days of the other 10 months (1,854 versus 1,760; $p<0.05$).

All jurisdictions displayed a 1 January effect, and all jurisdictions except Tasmania displayed a 1 July effect. New South Wales was the only jurisdiction in which the mean number of records with birthdays falling on the first day of 1 of the other 10 months was significantly higher than the expected number (8% higher, 942 versus 876). Because New South Wales comprised half of the records in the NHMD linkage data set, this resulted in the overall statistically significant result.

In the NHMD, Northern Territory records showed very large and significant 1 January and 1 July effects. More than 46 times the expected number of Northern Territory hospital records had birthdays of 1 January (287 compared with 6) and 30 times the expected number of records had birthdays of 1 July (187 compared with 6). Overall, one-fifth of the Northern Territory's hospital records had birthdays falling on 1 January or 1 July. Such a disproportionate distribution of birth dates could have an effect on links made within the Northern Territory due to data quality, both in terms of missed and false links. But because

of its small size, duplicate records were rare in the Northern Territory's data, despite the limited date of birth distribution (tables 5.2 and 5.3).

Table 5.4: Hospital separations and RAC events, by birth date and state/territory, 2001–02

Day of birth	NSW	Qld	SA	Tas	ACT	NT	All
NHMD				**Number of records per birth date[(a)]**			
1 January	**1,658	**655	**447	**93	**56	**287	**3,196
1 July	**1,066	**583	**318	77	**47	**187	**2,278
Other 1st of month (mean)	*942.1	518.2	280.8	74.6	30.3	8.4	*1,854.4
All other days (mean)	871.3	509.5	263.8	70.4	31.9	4.9	1,751.8
Expected number	**875.9**	**510.4**	**264.9**	**70.6**	**32.0**	**6.2**	**1,760.0**
Total records	**320,569**	**186,789**	**96,961**	**25,855**	**11,702**	**2,277**	**644,153**
				Ratio[(b)]			
1 January	**1.89	**1.28	**1.69	**1.32	**1.75	**46.13	**1.82
1 July	**1.22	**1.14	**1.20	1.09	**1.47	**30.06	**1.29
Other 1st of month (mean)	*1.08	1.02	1.06	1.06	0.95	1.35	*1.05
RAC data				**Number of records per birth date[(a)]**			
1 January	**523	**145	**89	9	10	**117	**893
1 July	**266	106	*75	8	10	**23	**488
Other 1st of month (mean)	227.2	118.2	58.9	13.9	7.0	1.2	426.4
All other days (mean)	210.8	115.6	56.4	15.1	7.0	1.1	406.1
Expected number	**212.3**	**115.8**	**56.6**	**15.0**	**7.0**	**1.5**	**408.2**
Total records	**77,688**	**42,369**	**20,712**	**5,493**	**2,573**	**555**	**149,390**
				Ratio[(b)]			
1 January	**2.46	**1.25	**1.57	0.60	1.43	**78.00	**2.19
1 July	**1.25	0.92	**1.33	0.53	1.43	**15.33	**1.20
Other 1st of month (mean)	1.07	1.02	1.04	0.93	1.00	0.80	1.04

(a) For 1 January and 1 July, the number of records is the count of records which have a reported birth date of 1 January and 1 July, respectively. For 'other 1st of month' the number of records is the average number of records with birth dates falling on the 1st day of the other 10 months. For 'all other days' the number of records is the average number of records with birth dates falling on the other 354 days of the year. The 'expected number' is the total number of records divided by 366.

(b) The ratio is the observed number of birthdays divided by the expected number of birthdays. For ease of interpretation, indicators of statistical significance relating to the number of records per birth date have been transferred to the ratio.

* denotes that the observed number of records with those birth dates is statistically different at the 5% significance level to the expected number of records with birth dates falling on any day. Normal approximation of the binomial distribution was used to test for significant differences, except where the sample size was small, in which case the exact binomial distribution was used.

** denotes that the observed number of records with those birth dates are statistically different at the 1% significance level to the expected number of records with birth dates falling on any day.

Notes

1. For scope of NHMD and RAC linkage data sets see notes 1 and 2 of Table 5.1.
2. There were 366 distinct possible birth dates. The number of records with 29 February birth dates was multiplied by four to account for leap years.
3. For NHMD analysis, 52 records for New South Wales are excluded due to missing birth dates.

Source: AIHW analysis of hospital morbidity and RAC linkage data sets before linkage.

Analysis of RAC dates of birth (Table 5.4) revealed that:

- 119% more records than expected had birthdays falling on 1 January (893 versus 408.2; $p<0.01$)
- 20% more records than expected had birthdays falling on 1 July (488 versus 408.2; $p<0.01$).

New South Wales, Queensland, South Australia and the Northern Territory all displayed a 1 January effect, while New South Wales, South Australia and the Northern Territory displayed a smaller but significant 1 July effect (Table 5.4). As was the case with the hospital data, Northern Territory RAC records exhibited a very large and significant 1 January effect and a smaller 1 July effect (78 and 15 times more records than expected, respectively). One-quarter of the Northern Territory's RAC records had birthdays falling on either 1 January or 1 July.

The over-representation of records with birth dates of 1 January and 1 July in both the hospital and RAC data sets suggests that these dates are commonly used as a substitute code when a person's date of birth is unknown. This will influence the number of missed links. Correct links will be made if a person's date of birth is unknown and has been recorded as 1 January for the same (or close) year, for example, on both data sets. However, if one data set has the person's correct date of birth (which is not 1 January) and the other has recorded it as 1 January then a link could be missed, depending on the actual birth date and the quality of other data (see tables 4.1 and 4.2). It is expected that linked records with birth dates of 1 January are likely to have a high probability of being correct links, given that linkage is done using other criteria such as location and event dates, and duplicate records are rare. Based on the Western Australian experience a very small number of links are likely to be missed as a result of the over-occurrence of 1 January and 1 July birth dates.

Date of birth effects were investigated further to determine whether Indigenous status played a role. Because the linkage data sets did not contain an Indigenous identifier, ACCMIS data (namely, RAC admissions during 2001–02) were looked at. The analysis showed that birth dates of Indigenous Australians were far more likely to be recorded as 1 January or 1 July than for other Australians (Table 5.5). Admissions for Indigenous Australians with a reported birthday of 1 January occurred 75 times more than expected (113 versus 1.5) and those with 1 July birthdays occurred 23 times more than expected (34 versus 1.5).

The effects for Indigenous Australians were much larger in the Northern Territory (180 times for 1 January, 47 times for 1 July) than the other jurisdictions. For 2001–02, for the Northern Territory almost two-thirds of RAC admissions for Indigenous Australians related to people with reported birth dates of 1 January (49%) or 1 July (13%). Across all of the jurisdictions in this analysis, more than one-quarter of RAC admissions for Indigenous Australians had birth dates of 1 January (21%) or 1 July (6%). For RAC admissions for non-Indigenous Australians, there was a 1 January effect (38% more records than expected), but the percentage of admissions for the non-Indigenous population with this birth date was extremely small (less than 1%). The consequence of this is that there will most probably be a greater percentage of missed links among Indigenous Australians than other Australians, with the Northern Territory having the greatest percentage of missed links. Date of birth effects in the linked data are investigated later in this section.

Table 5.5: RAC admissions, by date of birth and Indigenous status of clients, 2001–02

Day and month of birth	Indigenous status			All
	Indigenous	Non-Indigenous	Unknown	
Northern Territory		**Number of records per birth date[(a)]**		
1 January	**108	**5	<5	**114
1 July	**28	<5	<5	**29
Expected number	**0.6**	**0.5**	**0.2**	**1.2**
Total records	**221**	**174**	**58**	**453**
		Ratio[(b)]		
1 January	**180.00	**10.00	5.00	**95.00
1 July	**46.67	2.00	—	24.17
All		**Number of records per birth date[(a)]**		
1 January	**113	**267	*31	**331
1 July	**34	214	20	*268
Expected number	**1.5**	**193.0**	**19.6**	**214.1**
Total records	**549**	**70,646**	**7,170**	**78,365**
		Ratio[(b)]		
1 January	**75.33	**1.38	*1.58	**1.55
1 July	**22.67	1.11	1.02	*1.25

(a) For 1 January and 1 July, the number of records is the count of records which have a reported birth date of 1 January and 1 July, respectively. For 'other 1st of month' the number of records is the average number of records with birth dates falling on the 1st day of the other 10 months. For 'all other days' the number of records is the average number of records with birth dates falling on the other 354 days of the year. The 'expected number' is the total number of records divided by 366.

(b) The ratio is the observed number of birthdays divided by the expected number of birthdays. For ease of interpretation, indicators of statistical significance relating to the number of records per birth date have been transferred to the ratio.

* denotes that the observed number of records with those birth dates is statistically different at the 5% significance level to the expected number of records with birth dates falling on any day. Normal approximation of the binomial distribution was used to test for significant differences, except where the sample size was small, in which case the exact binomial distribution was used.

** denotes that the observed number of records with those birth dates are statistically different at the 1% significance level to the expected number of records with birth dates falling on any day.

Notes

1. For scope of NHMD and RAC linkage data sets see notes 1 and 2 of Table 5.1.
2. There were 366 distinct possible birth dates. The number of records with 29 February birth dates was multiplied by four to account for leap years.
3. Analysis included RAC clients of all ages.

Source: AIHW analysis of ACCMIS.

Date of hospital separation and RAC entry

Weekly trends in the number of hospital separations and RAC entries throughout 2001–02 were analysed before linkage (Table 5.6). Natural patterns will exist in both of these data sets, and the main goal here is to determine whether any unusual or unexplained trends could affect linkage quality. To do so, the expected number of separations or admissions per week was compared with the number of separations or admissions during:

- the first week of the 2001–02 financial year (1 July to 7 July 2001)
- the last week of the 2001 calendar year (25 December to 31 December 2001)
- the first week of the 2002 calendar year (1 January to 7 January 2002)
- the last week of the 2001–02 financial year (24 June to 30 June 2002).

The analysis of hospital separations and RAC admissions during 2001–02 showed a significant difference in separations and admissions during the Christmas and New Year period, but in differing directions (Table 5.6):

- Hospital separations during the last and first weeks of the calendar year were lower than expected, with 43% and 31% fewer hospital separations, respectively, than expected during these times (6,885 and 8,391 versus 12,275).
- RAC entries during the last and first weeks of the calendar year were higher than expected (6,002 and 3,328, respectively, versus 2,734). This was particularly evident in the last week of the calendar year, when 113% more RAC admissions than expected occurred. The increase in admissions was not so significant in the first week of 2002, when 18% more admissions than expected occurred.

These results suggest real effects rather than data collection effects. That is, the general practice in hospitals is to admit fewer patients over the Christmas and New Year period. On the other hand, the large increase in RAC admissions just after Christmas suggests that a number of people wait until after Christmas to move into RAC.

Table 5.6: Hospital separations and RAC admissions, by week of separation/RAC entry and state/territory, 2001–02

Week	NSW	Qld	SA	Tas	ACT	NT	All
NHMD				**Number of separations per week[(a)]**			
1–7 July 2001	**6,495	3,499	1,905	469	*249	50	**12,667
25–31 December 2001	**3,331	**2,049	**1,066	**302	**98	39	**6,885
1–7 January 2002	**4,029	**2,483	**1,372	**337	**132	38	**8,391
24–30 June 2002	**6,394	3,590	1,847	481	206	45	**12,563
All other weeks (mean)	6,105.8	3,562.1	1,845.7	494.6	223.9	42.8	12,275.0
Expected number	**6,025.8**	**3,511.7**	**1,822.8**	**487.1**	**219.9**	**42.8**	**12,110.2**
Total records	**314,200**	**183,112**	**95,048**	**25,400**	**11,465**	**2,234**	**631,459**
				Ratio[(b)]			
1–7 July 2001	**1.08	1.00	1.05	0.96	*1.13	1.17	**1.05
25–31 December 2001	**0.55	**0.58	**0.58	**0.62	**0.45	0.91	**0.57
1–7 January 2002	**0.67	**0.71	**0.75	**0.69	**0.60	0.89	**0.69
24–30 June 2002	**1.06	1.02	1.01	0.99	0.94	1.05	**1.04
RAC data				**Number of entries per week[(a)]**			
1–7 July 2001	1,534	799	398	93	51	*18	2,893
25–31 December 2001	**3,155	**1,851	**683	**198	**97	*18	**6,002
1–7 January 2002	**1,703	**923	**477	**142	**67	16	**3,328
24–30 June 2002	1,460	849	354	103	51	11	2,828
All other weeks (mean)	1420.8	772.6	383.4	100.8	46.8	10.0	2,734.4
Expected number	**1,462.4**	**798.2**	**390.7**	**103.3**	**48.3**	**10.5**	**2,813.3**
Total records	**76,253**	**41,618**	**20,372**	**5,388**	**2,518**	**546**	**146,695**
				Ratio[(b)]			
1–7 July 2001	1.05	1.00	1.02	0.90	1.06	*1.72	1.03
25–31 December 2001	**2.16	**2.32	**1.75	**1.92	**2.01	*1.72	**2.13
1–7 January 2002	**1.16	**1.16	**1.22	**1.37	**1.39	1.53	**1.18
24–30 June 2002	1.00	1.06	0.91	1.00	1.06	1.05	1.01

(a) For individual weeks the number is the count of separations/RAC entries that occurred during that week of the year. For 'all other weeks' the number is the average number of separations/ RAC entries that occurred during all other weeks of the year. The 'expected number' of separations/ RAC entries is the average number of separations/ RAC entries per week for the year.

(b) The ratio is the observed number of separations/admissions divided by the expected number of separations/admissions. For ease of interpretation, indicators of statistical significance relating to the number of separations/admissions per week have been transferred to the ratio.

* denotes that the observed number of records with separations/ RAC entries in those weeks is statistically different at the 5% significance level to the expected number of records with separations/ RAC entries in those weeks. Normal approximation of the binomial distribution was used to test for significant differences, except where the sample size was small, in which case the exact binomial distribution was used.

** denotes that the observed number of records with separations/ RAC entries in those weeks are statistically different at the 1% significance level to the expected number of records with separations/ RAC entries in those weeks.

Notes

1. Table is based on separations/ RAC entries in 2001–02. For scope of NHMD and RAC linkage data sets with respect to client age see notes 1 and 2 of Table 5.1.
2. The 2001–02 financial year consisted of 365 days and 365/7 weeks (52.14 weeks).
3. Calculations relating to 'all other weeks' are based on 48.14 weeks.

Source: AIHW analysis of hospital morbidity and RAC linkage data sets before linkage.

5.2 Linkage results

The RAC and NHMD linkage data sets were matched using *Websphere*® and the E linkage strategy described in Section 4. The match set contained nearly 55,600 records after excluding poor links and dropping 102 duplicate links to a hospital separation (Table 5.7). Two types of duplicates occur due to overlap in the input data sets for the various match procedures. First, a hospital separation may match to two or more different RAC events. Usually these are the result of a person on RAC hospital leave moving to a different RAC facility on discharge from hospital. In these cases the link to the RAC leave record is selected over the link to the RAC admission (see link priority, Table 4.1). Duplicates may also involve two or more links to RAC admissions, resulting from both the hospital and person postcode being used for people assessed for RAC while in hospital. In these cases, the link made using person postcode is selected over the link made using hospital postcode.

After excluding 3,600 links to deaths in hospital, the final linked data set identified almost 52,000 transitions from hospital into RAC (Table 5.8). Based on the results from the Western Australian study (see Table 4.3), this is an underestimation of flows into RAC from hospital.

Table 5.7: Matches in E matching, by *Websphere*® procedure and pass (number after refining in *SAS*®)

	Websphere® pass							Total (after *SAS*® stage)
Procedure[(a)]	1	2	3	4	5	6	7	
Deaths				**Number**				
NST8H	2,530	13	483	—	69	34	104	3,233
ST8H	312	4	31	—	8	3	13	371
Total deaths	*2,842*	*17*	*514*	—	*76*	*37*	*117*	*3,604*
Not deaths								
0ADM	10,407	454	283	26	243	160	318	11,891
9ADM	4,981	220	423	207	. .	. .	. .	5,831
9SOC	892	. .	. .	. .	. .	. .	. .	892
0ADM	281	61	106	7	9	6	11	481
9ADM	84	15	. .	. .	. .	. .	. .	99
NST0H	7,207	39	1,601	38	231	130	264	9,510
NST9H	15,705	160	3,354	—	325	191	445	20,180
ST0H	874	10	32	2	16	10	39	983
ST9H	1,847	12	70	—	49	32	75	2,085
Total not deaths	*42,278*	*971*	*5,869*	*280*	*873*	*529*	*1,152*	*51,952*
All	**45,120**	**988**	**6,331**	**278**	**1,008**	**587**	**1,328**	**55,556**

(a) See Table 4.1 for description of procedures, with SLA group used as main match region. Table includes all matches identified between the NHMD and RAC linkage data sets (for scope of NHMD and RAC linkage data sets see notes 1 and 2 of Table 5.1).

The distribution of linked hospital separations and RAC entries in the six jurisdictions included in the study closely followed the distribution of hospital records (Table 5.8). New South Wales accounted for just over one-half (52%) of links made to hospital episodes that did not end with the death of the patient, followed by Queensland (28%) and South Australia (16%). Tasmania, the Australian Capital Territory and the Northern Territory accounted for

just over 6% of links. For these smaller jurisdictions, only a relatively small number of non-death links were made (for example, 746 in the ACT and 124 in the Northern Territory), and as a result, only limited analysis can be done.

Table 5.8: Final links (excluding deaths), by movement type, by state/territory, 2001–02

Movement type (from hospital)	NSW	Qld	SA	Tas	ACT	NT	All
				Number			
To permanent RAC admission	7202	2984	1705	469	146	24	12,530
To respite RAC admission	3212	1286	947	67	93	17	5,622
Return to RAC: hospital leave	15746	9881	5347	934	488	76	32,472
Return to RAC: social leave	479	207	146	23	19	7	881
Total	**26,639**	**14,358**	**8,145**	**1,493**	**746**	**124**	**51,505**
				Row per cent			
To permanent RAC admission	57.5	23.8	13.6	3.7	1.2	0.2	100.0
To respite RAC admission	57.1	22.9	16.8	1.2	1.7	0.3	100.0
Return to RAC: hospital leave	48.5	30.4	16.5	2.9	1.5	0.2	100.0
Return to RAC: social leave	54.4	23.5	16.6	2.6	2.2	0.8	100.0
Total	**51.7**	**27.9**	**15.8**	**2.9**	**1.4**	**0.2**	**100.0**
All hospital separations for people aged 65+, 2001–02	**49.8**	**29.0**	**15.1**	**4.0**	**1.8**	**0.4**	**100.0**

Notes

1. Table includes all links to RAC admissions or returns in 2001–02. For scope of NHMD and RAC linkage data sets see notes 1 and 2 of Table 5.1.

2. Distribution of hospital separations from Table 3.1.

Validation

Influence of date of birth

The numbers of linked records with birth dates on 1 January and 1 July were consistent with the earlier analysis of the NHMD and RAC birth dates, with relatively high numbers of links relating to 1 January and 1 July birth dates (tables 5.4 and 5.9). In particular:

- 75% more linked records than expected had birthdays falling on 1 January, which was not significantly different to the 82% increase seen for hospital separations but was significantly less than the 119% over-representation seen for RAC events
- 35% more records than expected had birthdays falling on 1 July, which was not significantly different to the over-representation seen for either hospital separations (29%) or for RAC events (20%).

These results indicate that 1 January and 1 July dates of birth do not appear to result in false links but may lead to missed links due to inconsistencies in reported date of birth.

Table 5.9: Final links (excluding deaths), by date of birth and state/territory, 2001–02

Date of birth	NSW	Qld	SA	Tas	ACT	NT	All
				Number of links per birth date[(a)]			
1 January	**137	47	30	<5	<5	**27	**246
1 July	89	**56	**37	<5	<5	**<5	**192
Other 1st of month (mean)	82.8	41.7	24.0	5.0	2.6	0.2	156.3
All other days (mean)	72.3	39.1	22.1	4.1	2.0	0.3	139.8
Expected number	**72.8**	**39.2**	**22.3**	**4.1**	**2.0**	**0.3**	**140.7**
Number of links	**26,639**	**14,358**	**8,145**	**1,493**	**746**	**124**	**51,505**
				Ratio[(b)]			
1 January	**1.88	1.20	1.35	0.49	1.47	**79.69	**1.75
1 July	1.22	**1.43	**1.65	0.74	1.96	**8.85	**1.36
Other 1st of month (mean)	1.14	1.06	1.08	1.23	1.27	0.59	1.11
All other days (mean)	0.99	1.00	0.99	1.00	0.99	0.77	0.99

(a) For 1 January and 1 July, the number of records is the count of records which have a reported birth date of 1 January and 1 July, respectively. For 'other 1st of month' the number of records is the average number of records with birth dates falling on the 1st day of the other 10 months. For 'all other days' the number of records is the average number of records with birth dates falling on the other 354 days of the year. The 'expected number' is the total number of records divided by 366.

(b) The ratio is the observed number of birthdays divided by the expected number of birthdays. For ease of interpretation, indicators of statistical significance relating to the number of records per birth date have been transferred to the ratio.

* denotes that the observed number of records with those birth dates is statistically different at the 5% significance level to the expected number of records with birth dates falling on any day. Normal approximation of the binomial distribution was used to test for significant differences, except where the sample size was small, in which case the exact binomial distribution was used.

** denotes that the observed number of records with those birth dates are statistically different at the 1% significance level to the expected number of records with birth dates falling on any day.

Notes

1. Table includes all links to RAC admissions or returns in 2001–02. For scope of NHMD and RAC linkage data sets see notes 1 and 2 of Table 5.1.
2. There were 366 distinct possible birth dates. The number of records with 29 February birth dates was multiplied by four to account for leap years.

Source: AIHW analysis of linked data.

Week of event

Linked hospital separations and RAC admissions during certain weeks of the year largely reflect the earlier analysis of weekly hospital separations in the NHMD linkage data set (Table 5.10):

- There were 37% fewer linked hospital separations and RAC entries than expected during the last week of 2001 (assuming a constant separation rate throughout the year), which was statistically different from the 43% fewer hospital separations reported for this period.
- There were 14% fewer linked hospital separations and RAC entries than expected during the first week of 2002, compared with 31% fewer hospital separations—also a statistically significant difference.
- There were 10% more linked hospital separations and RAC entries than expected during the last week of the 2001–02 financial year (Table 5.10) compared with 4% more hospital separations (Table 5.6). This difference (10% versus 4%) was not statistically significant.

This analysis of links by week of transition suggests that more links were likely to be made for hospital separations occurring during the first week of 2002 (1–7 January) than expected. This could reflect a longer stay in hospital for people waiting to go into RAC, in turn, dampening the downturn of hospital separations in the first week of 2002.

Table 5.10: Final links (excluding deaths), by week of RAC admission or return and state/territory, 2001–02

Week of RAC admission/return	NSW	Qld	SA	Tas	ACT	NT	All
				Number of links[(a)]			
1–7 July 2001	*560	288	155	23	17	5	1,048
25–31 December 2001	**299	**189	**92	27	11	2	**620
1–7 January 2002	**400	*241	175	30	*6	3	**858
24–30 June 2002	**570	**322	151	28	14	3	**1,088
All other weeks (mean)	515.3	276.6	157.3	28.8	14.5	2.3	994.8
Expected number	**510.9**	**275.4**	**156.2**	**28.6**	**14.3**	**2.4**	**987.8**
Total links	**26,639**	**14,358**	**8,145**	**1,493**	**746**	**124**	**51,505**
				Ratio[(b)]			
1–7 July 2001	*1.10	1.05	0.99	0.80	1.19	2.10	1.06
25–31 December 2001	**0.59	**0.69	**0.59	0.94	0.77	0.84	**0.63
1–7 January 2002	**0.78	*0.88	1.12	1.05	*0.42	1.26	**0.87
24–30 June 2002	**1.12	**1.17	0.97	0.98	0.98	1.26	**1.10
All other weeks (mean)	**1.01**	**1.00**	**1.01**	**1.00**	**1.01**	**0.97**	**1.01**

(a) For individual weeks the number is the count of RAC admissions that occurred during that week of the year. For 'all other weeks' the number is the average number of RAC admissions that occurred during all other weeks of the year. The 'expected number' of RAC admissions is the average number of RAC admissions per week for the year.

(b) The ratio is the observed number of RAC admissions divided by the expected number of RAC admissions. For ease of interpretation, indicators of statistical significance relating to the number of RAC admissions per week have been transferred to the ratio.

* denotes that the observed number of records with RAC admissions in those weeks is statistically different at the 5% significance level to the expected number of records with RAC admissions in those weeks. Normal approximation of the binomial distribution was used to test for significant differences, except where the sample size was small, in which case the exact binomial distribution was used.

** denotes that the observed number of records with RAC admissions in those weeks are statistically different at the 1% significance level to the expected number of records with RAC admissions in those weeks.

Notes

1. The 2001–02 financial year consisted of 365 days and 365/7 weeks (52.14 weeks).
2. Calculations relating to 'all other weeks' are based on 48.14 weeks.
3. Table includes all links to RAC admissions or returns in 2001–02. For scope of NHMD and RAC linkage data sets see notes 1 and 2 of Table 5.1.

Source: AIHW analysis of linked data set.

Links to RAC hospital leave

One way to check the coverage of the data linkage is to see how well episodes of RAC hospital leave ending in a return to RAC are identified. The current linkage strategy understates the number of residents who return to RAC after visiting hospital, identifying 88% of returns to RAC from hospital (Table 5.11). Some of this difference is caused by people going from RAC to hospital but either being recorded as same-day episodes in the hospital system (and so not included in the data linkage strategy) or never actually being admitted (for example, spending the night in the hospital's emergency section, which is not recorded

in the NHMD) (see AIHW: Karmel & Rosman 2007:section 7.1). This tendency to link relatively few 1-night episodes of RAC hospital leave is reflected in the smaller proportion of reported 1-day leave identified by data linkage compared with those identified as returns to RAC using just the RAC data (Table 5.11). Similar results were found in the Western Australian linkage comparison study. Furthermore, the name-based linkage itself identified just 94% of returns from hospital leave (AIHW: Karmel & Rosman 2007:table 8.11).

The preceding validation analysis provides evidence that the characteristics of the link set are similar to those expected from the characteristics of the input data sets. The results also reflect the Western Australian study, so analysis of the link set can be carried out with confidence.

Table 5.11: Returns to permanent RAC after hospital leave for people aged 65+, by length of leave, 2001–02

Length of leave (days)	RAC hospital leave identified as ending with return to RAC[(a)]		Returns to RAC identified by data linkage[(b)]		
	Number (A)	Per cent	Number (B)	Per cent	Per cent identified (B/A)
1	5,579	15.0	3,855	11.9	69.1
2	3,592	9.7	3,197	9.9	89.0
3	3,240	8.7	2,932	9.0	90.5
4–6	8,338	22.5	7,591	23.4	91.0
7–13	9,371	25.3	8,523	26.3	91.0
14–20	3,240	8.7	2,956	9.1	91.2
21 days or longer	3,720	10.0	3,391	10.5	91.2
Total	**37,080**	**100.0**	**32,445**	**100.0**	**87.5**

(a) Classification is based on RAC data only. If the permanent RAC care period and hospital leave end on the same day (after allowing for transfers between RAC facilities), the leave period is classified as ending with death in hospital if the reason for discharge from RAC is recorded as 'death'. Otherwise it is classified as a discharge to hospital (note that the few cases where people transfer between permanent and respite residential care at the end of the hospital leave are identified as being discharged to hospital). Other periods of hospital leave are assumed to end with the person returning to RAC.

(b) Based on linked hospital and residential aged care records.

Note: Table excludes death in hospital while on hospital leave, and discharge to hospital while on hospital leave. Age is at RAC return.

Reported post-hospital destination

Previous analyses have shown that the destination of a patient on separation from hospital is not always well recorded (AIHW: Karmel 2004; AIHW: Karmel & Rosman 2007). Movement types identified by linkage were compared with the hospital separation mode as recorded in the NHMD (Table 5.12). This gives an indication of how often post-hospital destination was incorrectly recorded in the NHMD in 2001–02. Nearly one-half (46%) of hospital separations which had a reported separation mode in the NHMD of *discharge/transfer to a Residential Aged Care service, unless this is the usual place of residence* (code 2) were identified by linkage as returning to RAC from hospital leave, and so should have been coded as *other (includes discharge to usual residence/own accommodation/welfare institution (includes prisons, hostels and group homes providing primarily welfare services))* (code 9). On the other hand, one-fifth (21%) of linked hospital separations which had a reported separation mode in the NHMD of *to usual residence/other* were identified by linkage as admissions to RAC (Table 5.9). These

percentages are higher than those found in the Western Australian study where 31% of hospital separations reported as going to RAC were identified by linkage as returning to RAC, and 12% of hospital separations reported as returning to usual residence/other were identified by linkage as admissions to RAC (AIHW: Karmel & Rosman 2007). This difference may be explained by different hospital separation mode coding protocols between the jurisdictions in this study and Western Australia.

Table 5.12: Final links, by reported hospital separation mode and identified movement type, by state/territory, 2001–02 (number)

	Movement type from hospital–RAC linkage				
Reported hospital separation mode (NHMD)	**To RAC**	**Return to RAC: hospital leave**	**Return to RAC: social leave**	**Died in hospital**	**All**
To RAC	11,662	9,800	246	—	21,708
Other health care	672	630	17	—	1,319
To usual residence/other	5,930	22,265	626	—	28,821
Statistical discharge from leave/left against medical advice/unknown	35	63	3	—	101
Died	—	—	—	3,604	3,604
Total	**18,299**	**32,758**	**892**	**3,604**	**55,553**

Note: Table includes all links to RAC admissions and returns (for scope of NHMD and RAC linkage data sets see notes 1 and 2 of Table 5.1). Three records were missing separation mode data.

5.3 Weighting for estimates of total flow

The results from the Western Australian linkage study (AIHW: Karmel & Rosman 2007) found that the E linkage strategy in that state had a PPV of 98% and a sensitivity of 88% (Table 4.3). Thus, while a high percentage (98%) of links made were true links, the E linkage strategy identified a smaller percentage (88%) of all links. Further, different types of RAC events were found to have differing sensitivities, ranging from 75% for permanent admissions from hospital to 92–93% for returns from hospital by RAC residents on leave. The high PPV of links provides a good basis for analysing the profile of people experiencing a particular transition. However, E linkage underestimates the true number of transitions and so cannot be used without adjustment to measure the volume of flow from hospital to RAC or to measure relativities between different types of transitions into RAC. While the Western Australian project was a one-off study limited to 1 year in one state, it was felt important to produce some estimates for the overall flow of older people from hospital to RAC. To this end, *approximate estimates* were derived using a weighting system based on the results from the Western Australian study.

Weighting strategy

The approach taken when developing the weighting system was to find a broad cross-classification within which simple multiplicative factors—derived from the Western

Australian study—could be applied to the E links, resulting in overall estimates of flow close to those observed using N linkage for Western Australia.

A number of stratifications were compared:

- by RAC event type
- by RAC event type and hospital care type
- by RAC event type and hospital separation mode
- by age group and sex.

The weights to be used within each stratum were computed as:

$$Weight_j = \frac{N_{j,N}}{N_{j,E}},$$

where *j* is a stratum within the particular stratification, $N_{j,N}$ is the number of links identified in the *j*th stratum by N linkage in the Western Australian study and $N_{j,E}$ is the corresponding number of links identified in the *j*th stratum by E linkage. Each E link in stratum *j* is counted $Weight_j$ times to derive estimates of flow, $\hat{N}$.

To gauge the relative merit of the different stratifications the weights from each of the above four stratifications were applied to the Western Australian E links to get weighted estimates of flow cross-classified as follows:

- age by sex
- hospital separation mode by hospital care type
- RAC event type by hospital care type
- principal diagnosis chapter by sex
- principal diagnosis chapter by hospital care type.

These cross-classifications were chosen to cover a range of possible analysis tables. Within each cross-classification level, the weighted estimates were compared with the number of N links to establish the best weighting strategy for estimates of flow. For each weighting method, the mean absolute difference (MAD) between the weighted E estimates and the observed N links was calculated:

$$\text{MAD}_{c_1 \times c_2} = \frac{\sum_{k=1}^{m} \sum_{l=1}^{n} \left| \hat{N}_{k,l} - N_{k,l} \right|}{m \times n},$$

where $N_{k,l}$ is the number of N links from the Western Australian linkage study and $\hat{N}_{k,l}$ is the estimate from the weighted E links at the *k*th level of the first classification variable, c_1, with $k = 1 \ldots m$, and the *l*th level of the second classification variable, c_2, with $l = 1 \ldots n$.

In general, weights calculated at the RAC event type by hospital care type level produced the lowest mean absolute differences (Table 5.13). The one exception was for the age group by sex cross-classification estimates for which the RAC event type by hospital care type weighting had slightly greater differences than the other two weighting strategies using RAC event type. The age by sex weighting strategy performed very well for the age by sex estimates (as it should) but quite poorly for some of the other estimated cross-classifications.

Given these results, it was decided to weight at the RAC event by hospital care type level. The weights for this method range from 1.06 to 1.61 (Table 5.14). A valuable property of this weighting strategy is that the weights are derived using broad event types rather than personal characteristics. As noted above, weights using the age/sex stratification generally gave much poorer results than the others. This reflects the finding that age and sex were not related to the propensity of E linkage to miss links (AIHW: Karmel & Rosman 2007).

It must be remembered that these weights were derived using Western Australian data for the 2000–01 financial year and are now being applied to other jurisdictions for the 2001–02 financial year. As a result, they provide an estimate only for the present study, and are used in this report solely for approximate estimates of the volume of flow. Future projects may adopt different methodologies.

Table 5.13: Mean absolute differences for different weighting strategies

	Weighting strategies			
Cross-classification for estimates	RAC event type	RAC event type by hospital care type	RAC event type by hospital separation mode	Age group by sex
	Mean absolute difference (MAD)			
Age group by sex	6.2	6.8	5.7	0.7
Hospital separation mode by hospital care type	8.5	5.1	7.5	23.4
RAC event type by hospital care type	9.5	1.1	8.4	30.6
Principal diagnosis group by sex	5.9	4.2	6.0	10.3
Principal diagnosis group by hospital care type	3.3	2.6	3.3	6.9

Table 5.14: Final weights for estimates of flow by RAC event type and hospital care type, from Western Australian linkage study for 2000–01

RAC event type	Hospital care type	Number of E links	Number of N links	Weight[(a)]
Admitted to Respite RAC	Acute	475	582	1.23
	Rehabilitation	129	149	1.16
	Psychogeriatric and maintenance	14	20	1.43
	Other (excluding unknown)	86	101	1.17
Admitted to Permanent RAC	Acute	650	829	1.28
	Rehabilitation	295	359	1.22
	Psychogeriatric and maintenance	69	111	1.61
	Other (excluding unknown)	346	424	1.23
Return from RAC leave	Acute	4721	4986	1.06
	Rehabilitation	337	384	1.14
	Psychogeriatric and maintenance	89	111	1.25
	Other (excluding unknown)	42	50	1.19

(a) A very small number of records (243 or 0.4%) were missing hospital care type. These records were assigned weights based only on the RAC event type. For permanent admissions, respite admissions and leave events the weights were 1.27, 1.21 and 1.07, respectively.

Approximate estimates of flow

Approximate estimates of the flow of people from hospital into RAC were calculated by adjusting the number of links according to the weights outlined above. The flow of people can be looked at from two viewpoints: (a) the destination of people who are leaving hospital (hospital separations), and (b) the source of people who are entering permanent or respite RAC. Table 5.15 shows the estimated flows in both directions.

During 2001–02, across the six jurisdictions included in the study, there were nearly 620,400 hospital separations for stays lasting at least 1 night for people aged 65 years and older (Table 5.15). Of these hospital separations, an estimated 10% (61,700) were separations into RAC, either as returns to RAC or as new admissions. Almost twice as many of these transitions were due to people living in RAC having episodes of hospitalisation (an estimated 39,200 separations, or 6%), rather than the result of people being admitted into RAC (about 22,500 or 4% of separations).

During 2001–02, across the six jurisdictions there were over 67,300 admissions into RAC, either from the community, from hospital or as the result of transfers between RAC facilities. An estimated one-third (33%) of admissions into RAC were from hospital, with over two-thirds (70%) of these admissions (that is, 23% of total admissions) being for permanent care. Nearly one-half (45%) of RAC admissions were from the community, with about one-third (13.6/44.8 = 30%) of these admissions being for permanent care. The remaining one-fifth (22%) of admissions related to transfers within RAC.

There is very little difference in the age/sex distribution within transition type between the unweighted links and the estimates (Table 5.16). For the movement of people from hospital, all differences between the distributions for transitions from hospital into RAC were 0.3 percentage points or less. For the movement of people into RAC the percentages by age and sex also showed no or little difference (generally 0.2 percentage point differences or less per category) between the weighted and unweighted estimates. The only exception was for movement from the community into permanent RAC which had slightly larger differences (Table 5.17). This category of movement was the one most likely to be affected by misclassification of people due to missed links. Such an effect was not seen for the movements from hospital to the community because of the much larger number of people moving back into the community following a period in hospital.

These results of limited differences in age/sex distribution within transition group confirm the utility of group analysis within transition type. The remainder of this report analyses the unweighted links in detail because the weighted estimates are suitable only to provide a broad indication of flows.

Table 5.15: Movement types for hospital separations and RAC admissions, people aged 65+, 2001–02

Movement type	Unweighted links		Weighted links	
	Number	Per cent	Number	Per cent
Hospital separations				
Return to permanent RAC[(a) (b)]	36,881	5.9	39,200	6.3
To permanent RAC[(a) (b) (c)]	12,493	2.0	15,700	2.5
To respite RAC[(b) (c)]	5,610	0.9	6,800	1.1
All to RAC	*54,984*	*8.9*	*61,700*	*9.9*
To community/other[(d)]	535,633	86.3	528,900	85.3
Died in hospital[(d)]	29,755	4.8	29,755	4.8
All	**620,372**	**100.0**	**620,372**	**100.0**
RAC admissions				
From hospital to permanent RAC[(a) (c)]	12,449	18.5	15,600	23.2
From hospital to respite RAC[(a) (c)]	5,605	8.3	6,800	10.1
Transfer into permanent RAC[(e)]	13,730	20.4	13,730	20.4
Transfer into respite RAC[(e)]	1,007	1.5	1,007	1.5
From community into permanent RAC[(e)]	12,332	18.3	9,200	13.6
From community into respite RAC[(e)]	22,225	33.0	21,000	31.2
All	**67,348**	**100.0**	**67,348**	**100.0**

(a) Links to a permanent admission on the same or next day as the end of a period of hospital leave for the same person have been reassigned as linking to the hospital leave. This affected 102 links to permanent admissions.

(b) Based on linked hospital and RAC records. Same day and next day re-admissions into permanent RAC are treated as transfers and so have been combined into a single period of care when identifying returns to RAC after hospital leave. Links to RAC hospital and social leave are both classified as returns to RAC.

(c) Estimates between hospital and RAC vary slightly depending on whether movements from hospital or into RAC are being looked at due to transitions occurring across either the beginning or end of the financial year or at different ages.

(d) Unlinked hospital separations. Deaths are based on reported hospital mode of separation.

(e) Unlinked RAC admissions (includes people changing RAC facility on return from hospital). 43% of transfers into permanent RAC were from respite RAC and 86% of transfers into respite RAC were from respite RAC.

Notes

1. Age is as at time of hospital admission or RAC admission/return.
2. Table excludes same-day hospital episodes, statistical discharges and transfers to other hospitals.
3. Table includes all states/territories except Victoria and Western Australia.
4. Weighted numbers for movements from hospital are rounded to the nearest hundred. Percentages are based on the unrounded numbers.

Table 5.16: Post-hospital destination of people aged 65+, by movement type, age and sex, separations, 2001–02

	Male			Female			
Movement type	**65–79**	**80+**	**All**	**65–79**	**80+**	**All**	**All**
			Row per cent (unweighted)				
Return to permanent RAC[(a) (b)]	11.7	21.2	32.8	13.8	53.4	67.2	100.0
To permanent RAC[(a) (b)]	15.1	23.9	38.9	15.6	45.5	61.1	100.0
To respite RAC[(b)]	14.5	20.4	35.0	19.1	46.0	65.0	100.0
All to RAC	*12.7*	*21.7*	*34.4*	*14.7*	*50.8*	*65.6*	*100.0*
To community/other[(c)]	35.5	13.9	49.5	31.8	18.7	50.5	100.0
Died in hospital[(c)]	31.3	23.5	54.8	20.6	24.5	45.2	100.0
All	**33.3**	**15.1**	**48.4**	**29.7**	**21.9**	**51.6**	**100.0**
			Row per cent (weighted)[(d)]				
Return to permanent RAC[(a) (b)]	11.7	21.1	32.8	13.8	53.4	67.2	100.0
To permanent RAC[(a) (b)]	15.1	23.9	39.0	15.6	45.5	61.0	100.0
To respite RAC[(b)]	14.5	20.5	35.0	19.1	45.9	65.0	100.0
All to RAC	*12.9*	*21.8*	*34.6*	*14.8*	*50.5*	*65.4*	*100.0*
To community/other[(c)]	35.8	13.8	49.7	32.0	18.4	50.3	100.0
Died in hospital[(c)]	31.3	23.5	54.8	20.6	24.5	45.2	100.0
All	**33.3**	**15.1**	**48.4**	**29.7**	**21.9**	**51.6**	**100.0**
All separations (number)	**206,738**	**93,614**	**300,352**	**184,427**	**135,592**	**320,019**	**620,371**

(a) Links to a permanent admission on the same or next day as the end of a period of hospital leave for the same person have been reassigned as linking to the hospital leave. This affected 102 links to permanent admissions.

(b) Based on linked hospital and RAC records. Same day and next day re-admissions into permanent RAC are treated as transfers and so have been combined into a single period of care when identifying returns to RAC after hospital leave. Links to RAC hospital and social leave are both classified as returns to RAC.

(c) Unlinked hospital separations. Deaths are based on reported hospital mode of separation.

(d) Weighted numbers for movements from hospital are rounded to the nearest hundred. Percentages are based on the unrounded numbers.

Notes

1. Age is as at time of hospital admission.
2. Table excludes same-day hospital episodes, statistical discharges and transfers to other hospitals
3. Table includes all states/territories except Victoria and Western Australia.

Table 5.17: RAC admissions for people aged 65+, by source of admission, 2001–02

	Male			Female			
Movement type	**65–79**	**80+**	**All**	**65–79**	**80+**	**All**	**All**
			Row per cent (unweighted)				
From hospital to permanent RAC[(a) (b)]	15.0	23.9	38.9	15.3	45.8	61.1	100.0
From hospital to respite RAC[(a)]	14.5	20.5	35.0	18.9	46.1	65.0	100.0
Transfer into permanent RAC[(c)]	11.0	20.0	31.0	15.7	53.3	69.0	100.0
Transfer into respite RAC[(c)]	14.3	21.3	35.6	18.5	46.0	64.4	100.0
From community into permanent RAC[(c)]	11.1	20.8	31.9	17.1	51.0	68.1	100.0
From community into respite RAC[(c)]	15.7	21.3	36.9	17.3	45.8	63.1	100.0
All	**13.6**	**21.4**	**35.0**	**16.7**	**48.3**	**65.0**	**100.0**
			Row per cent (weighted)[(d)]				
From hospital to permanent RAC[(a) (b)]	15.0	24.0	38.9	15.3	45.8	61.1	100.0
From hospital to respite RAC[(a)]	14.4	20.6	35.0	18.9	46.1	65.0	100.0
Transfer into permanent RAC[(c)]	11.0	20.0	31.0	15.7	53.3	69.0	100.0
Transfer into respite RAC[(c)]	14.3	21.3	35.6	18.5	46.0	64.4	100.0
From community into permanent RAC[(c)]	9.7	19.7	29.4	17.8	52.8	70.6	100.0
From community into respite RAC[(c)]	15.7	21.3	37.0	17.2	45.8	63.0	100.0
All	**13.6**	**21.4**	**35.0**	**16.7**	**48.3**	**65.0**	**100.0**
All admissions (number)	**9,167**	**14,386**	**23,553**	**11,254**	**32,541**	**43,795**	**67,348**

(a) Links to a permanent admission on the same or next day as the end of a period of hospital leave for the same person have been reassigned as linking to the hospital leave. This affected 102 links to permanent admissions.

(b) Based on linked hospital and residential aged care records. Same day and next day re-admissions into permanent RAC are treated as transfers and so have been combined into a single period of care when identifying returns to RAC after hospital leave. Links to RAC hospital and social leave are both classified as returns to RAC.

(c) Unlinked RAC admissions. 43% of transfers into permanent RAC were from respite RAC and 86% of transfers into respite RAC were from respite RAC.

(d) Weighted numbers for movements from hospital are rounded to the nearest hundred. Percentages are based on the unrounded numbers.

Notes

1. Age is as at time of RAC admission.
2. Table excludes same-day hospital episodes, statistical discharges and transfers to other hospitals.
3. Table includes all states/territories except Victoria and Western Australia.

6 Movements from hospital to RAC

The following aspects of people moving from hospital to RAC and the community were investigated:

- age and sex profiles
- length of stay of last hospital episode
- principal diagnosis on discharge for transition event
- care needs upon entry into RAC.

The analysis looks at the characteristics of people leaving hospital as well as people entering RAC.

6.1 Age and sex

Among transitions for people aged 65 and over from hospital to the community (that is, a place other than RAC), about one-half (51%) were for women (Table 6.1). On the other hand, almost two-thirds (66%) of moves from hospital to RAC were for women, which largely reflects the differing age distributions of men and women among the very old population. People returning to RAC from hospital were older than people admitted to RAC. Nearly four-fifths of returns from hospital for women (79%) and two-thirds (64%) for men were for people aged 80 and over, compared with 75% and 61%, respectively, for admissions to permanent RAC from hospital. Overall, about 78% of transitions from hospital to RAC for women were for those aged 80 and over compared with 63% for men. Men accounted for more than one-half of the deaths in hospital (55%).

Looking at all admissions into RAC, about two-thirds (65%) were for women. However, there was a slightly higher proportion of women among people admitted to permanent RAC from the community (68% of admissions) compared with those from hospital (61%). Three-quarters (75%) of admissions for women who entered permanent RAC were for those aged 80 and over, whether from hospital or from the community. For men, 62% of admissions to permanent RAC from hospital and 65% of admissions from the community were for people aged 80 and over.

Table 6.1: Hospital separations and RAC admissions for people aged 65+, by movement type, 2001–02

Movement type	Male			Female			All	
	65–79	80+	All	65–79	80+	All	Per cent 80+	Per cent female
				Hospital separations (per cent)				
Return to permanent RAC[(a))]	35.6	64.4	100.0	20.6	79.4	100.0	74.5	67.2
To permanent RAC[(a)]	38.7	61.3	100.0	25.5	74.5	100.0	69.3	61.1
To respite RAC[(a)]	41.5	58.5	100.0	29.3	70.7	100.0	66.4	65.0
All to RAC	*37.0*	*63.0*	*100.0*	*22.5*	*77.5*	*100.0*	*72.5*	*65.6*
To community/other[(b)]	71.8	28.2	100.0	62.9	37.1	100.0	32.7	50.5
Died in hospital[(b)]	57.1	42.9	100.0	45.7	54.3	100.0	48.1	45.2
All	**68.8**	**31.2**	**100.0**	**57.6**	**42.4**	**100.0**	**36.9**	**51.6**
All separations (number)	**206,738**	**93,614**	**300,352**	**184,427**	**135,592**	**320,019**	**620,371**	**620,371**
				RAC admissions (per cent)				
From hospital to permanent RAC[(a)]	38.5	61.5	100.0	25.0	75.0	100.0	69.7	61.1
From hospital to respite RAC[(a)]	41.3	58.7	100.0	29.0	71.0	100.0	66.7	65.0
Transfer into permanent RAC[(b)]	35.2	64.8	100.0	20.6	79.4	100.0	75.2	70.6
Transfer into respite RAC[(b)]	36.3	63.7	100.0	26.3	73.7	100.0	70.3	66.4
From community into permanent RAC[(b)]	34.7	65.3	100.0	25.1	74.9	100.0	71.8	68.1
From community into respite RAC[(c)]	42.4	57.6	100.0	27.4	72.6	100.0	67.1	63.1
All	**38.9**	**61.1**	**100.0**	**25.7**	**74.3**	**100.0**	**69.7**	**65.0**
All admissions (number)	**9,167**	**14,386**	**23,553**	**11,254**	**32,541**	**43,795**	**67,348**	**67,348**

(a) Based on linked hospital and RAC records. See also notes (a) and (b) to Table 6.1 for additional information.

(b) Unlinked records. Deaths are based on reported hospital mode of separation. 43% of transfers into permanent RAC were from respite RAC and 86% of transfers into respite RAC were from respite RAC.

Notes

1. Age is as at time of hospital admission or RAC admission.
2. Table excludes same-day hospital episodes, statistical discharges and transfers to other hospitals.
3. Table excludes 1 hospital separation with missing sex.
4. Table includes all states/territories except Victoria and Western Australia.

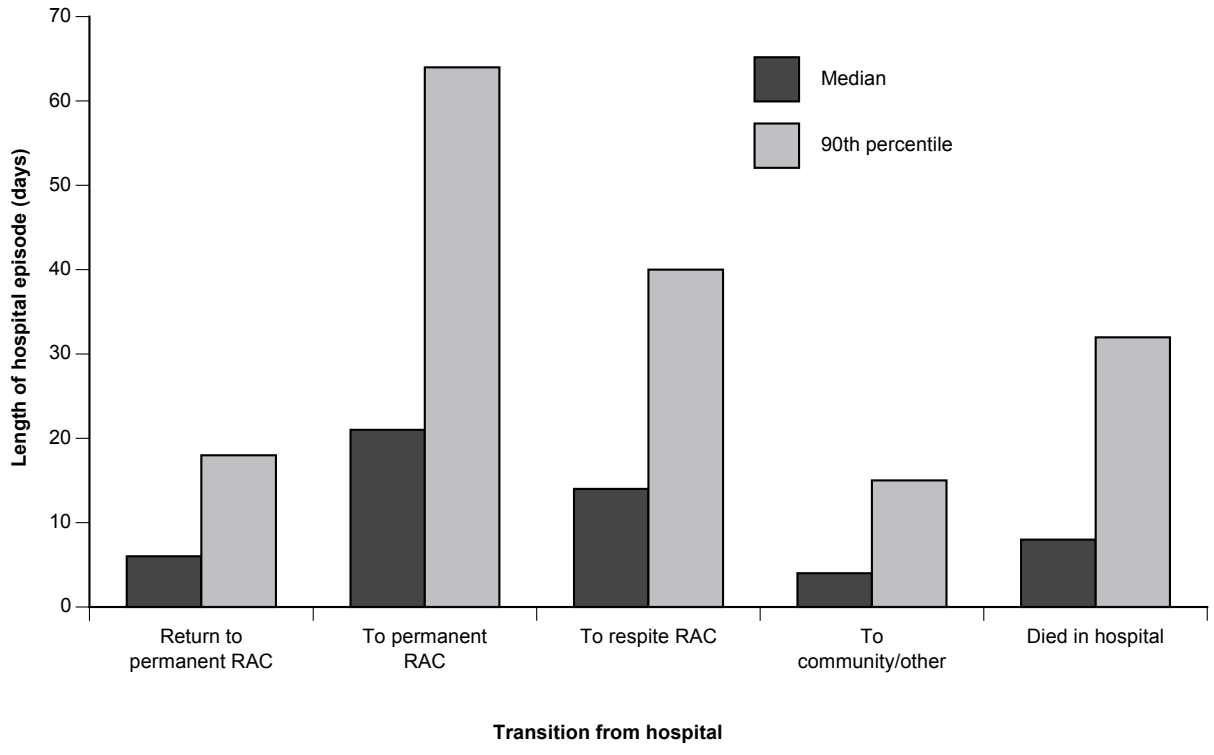
6.2 Length of stay in hospital

Measures of length of hospital stay based on data recorded on hospital episodes understate the total length of stay in hospital. This is because information on hospital use is collected with respect to episodes of care rather the entire stay in hospital and, as discussed in Section 3.1, people may both transfer between hospitals and change their care type within a hospital

during a period of hospitalisation. It is not possible to string together a person's episodes of care into a single stay because a person identifier is not available on the NHMD. Consequently, measures of length of hospital episode understate the total length of stay in hospital to the extent that people change care type or transfer within the hospital system. In the following discussion length of stay refers to the length of the final hospital episode before the person leaves the hospital system.

For people aged 65 and over the time spent in their last episode before leaving hospital varies considerably according to the type of transition from hospital (Figure 6.1). People returning to the community from hospital, on average, had the shortest lengths of stay, with a median time of 4 days in hospital, compared with 8 days for people who died in hospital. People making the transition from the community into RAC via hospital tended to spend more time in hospital, with people going into permanent RAC having longer stays than those accessing respite care (median stay of 21 days for the last episode compared with 14).

Some people were admitted into RAC after long stays in hospital. This can be seen by examining the 90th percentile for length of stay, which shows that at least 10% of people moving into permanent RAC stayed in hospital for 64 days or more, compared with 18 days for those on hospital leave from RAC (Table 6.2).



Source: Table 6.2.

Figure 6.1: Length of stay by post-hospital destination, 2001–02

Table 6.2: Hospital separations for people aged 65+: length of stay, by movement type, age at admission and sex, 2001–02

	Male			Female			
Movement type	**65–79**	**80+**	**All**	**65–79**	**80+**	**All**	**All**
			Median (days)				
Return to permanent RAC[(a)]	6	5	5	6	6	6	6
To permanent RAC[(a)]	23	22	22	22	20	21	21
To respite RAC[(a)]	15	13	14	14	14	14	14
To community/other[(b)]	4	5	4	4	5	5	4
Died in hospital[(b)]	7	8	8	8	8	8	8
All	**4**	**5**	**4**	**4**	**6**	**5**	**5**
			90th percentile (days)				
Return to permanent RAC[(a)]	17	17	17	20	18	19	18
To permanent RAC[(a)]	75	64	69	71	57	61	64
To respite RAC[(a)]	45	39	41	41	37	39	40
To community/other[(b)]	13	16	14	14	19	16	15
Died in hospital[(b)]	30	32	31	32	34	33	32
All	**15**	**20**	**16**	**16**	**22**	**19**	**17**
All separations (number)	**206,738**	**93,614**	**300,352**	**184,427**	**135,592**	**320,019**	**620,371**

(a) Based on linked hospital and RAC records. See also notes (a) and (b) to Table 6.1 for additional information.

(b) Unlinked hospital separations. Deaths are based on reported hospital mode of separation.

Notes

1. Age is as at time of hospital admission.
2. Table excludes same-day hospital episodes, statistical discharges and transfers to other hospitals.
3. Table excludes 1 hospital separation with missing sex.
4. Table includes all states/territories except Victoria and Western Australia.

6.3 Principal diagnosis for transition event

Information about the health conditions that cause or contribute to admission, or which influence, impact, or arise during treatment is recorded on the patient record. Of all the diagnoses recorded, the principal diagnosis is defined as that found to be chiefly responsible for the episode of care. However, where multiple complex health conditions are present, it may be difficult to identify one condition apart from all others that caused admission to hospital. The interaction of multiple health conditions, medication use and social factors can also contribute significantly to the need for care in hospital among older people and to the complexity and cost of treatment. Noting this limitation, the following discussion looks at the principal diagnoses for older patients within transition type, with diagnoses combined into 18 groups corresponding to diagnosis chapters in the International Classification of Diseases 10th revision Australian Modification (ICD-10-AM; NCCH 1998).

In 2001–02, for older people diseases relating to the circulatory system were the most common principal diagnosis for hospital episodes ending with discharge from hospital, accounting for one-fifth (20%) of such overnight hospital episodes. This was almost twice as common as *Neoplasms* (cancers or tumours, 11%)—the second most frequent set of conditions

given as principal diagnosis (Table 6.3). Diseases of the digestive and respiratory systems were the next most commonly reported principal diagnoses in overnight hospital episodes ending with the patient leaving the hospital (10% and 9%, respectively).

There were considerable differences between transition types in the prevalence of principal diagnoses associated with hospital stays (Table 6.3). As would be expected, the principal diagnosis trends for the largest transition group, namely those who left hospital and returned to the community, follow those described above. But there were considerable differences between people returning to RAC or moving into RAC and those who died in hospital. Diseases of the circulatory system, respiratory system and digestive system were more prevalent as principal diagnoses among people returning to RAC (17%, 14% and 10% of separations, respectively) than among those entering RAC as new admissions (12%, 6% and 2%, respectively). *Mental and behavioural disorders* as the principal diagnosis were about three times as common for people moving into permanent RAC than those returning to RAC (9% versus 3%). Among these hospital episodes, dementia was the most often recorded principal diagnosis for people moving into permanent RAC (64%, compared with 30% for people returning to RAC; unpublished AIHW analysis). However, it should be remembered that while some principal diagnoses were less common among those returning to RAC than those entering RAC—and vice versa— this does not necessarily imply that such conditions were less common among the former, but just that they were not chiefly responsible for the episode of care.

The prevalence of *Injury, poisoning and other consequences of external causes* as a principal diagnosis was similar for new admissions to permanent RAC and for people returning to the community (8% versus 7%). This group of conditions was most prevalent as a principal diagnosis among people returning to RAC (13%) and for those going to respite RAC (12%). For people returning to or moving into RAC following a hospital episode with a principal diagnosis of injury, falls were the major cause of injury (79%; unpublished AIHW analysis).

Conditions grouped under *Factors influencing health status and contact with health services* (not including *Awaiting admission elsewhere*) were more likely to be the principal diagnosis for people moving into RAC than for people returning to RAC (16% versus 6%). One-fifth (21%) of people moving into permanent RAC and 7% of people moving into respite RAC were in hospital with a principal diagnosis of *Awaiting admission elsewhere*, compared with 1% across all groups. This, along with the high prevalence of *Factors influencing health status*, suggests that the final hospital episode for people moving into RAC from hospital was often as a result of the need to organise a RAC place or waiting for a place in RAC to become available rather than time spent being treated for specific health conditions.

Three groups of conditions accounted for 70% of people who died in hospital: neoplasms (31%), circulatory diseases (26%) and respiratory diseases (14%).

Table 6.3: Hospital separations for people aged 65+ by principal diagnosis and movement type, 2001–02 (column per cent, in decreasing overall order of prevalence)

Principal diagnosis chapter (ICD-10-AM)	Returning to permanent RAC[(a)]	To permanent RAC[(a)]	To respite RAC[(a)]	To community /other[(b)]	Died in hospital[(b)]	All
Diseases of the circulatory system (I00–I99)	17.2	12.0	12.3	19.9	25.6	19.8
Neoplasms (tumours and cancers) (C00–D48)	5.8	5.8	4.9	10.3	31.3	10.9
Diseases of the digestive system (K00–K93)	9.5	2.1	3.7	10.4	5.8	9.9
Diseases of the respiratory system (J00–J99)	14.4	5.6	7.3	8.9	13.5	9.4
Symptoms, signs and abnormal findings n.e.c. (R00–R99)	6.8	4.7	6.0	7.7	1.8	7.3
Injury, poisoning and other consequences of external causes (S00–T98)	13.0	7.8	11.8	6.9	4.4	7.2
Diseases of the musculoskeletal system and connective tissue (M00–M99)	3.0	2.6	5.9	7.9	1.1	7.2
Factors influencing health status and contact with health services (excluding code Z75.1)	5.9	16.2	19.8	7.1	3.0	7.1
Diseases of the genitourinary system (N00–N99)	6.0	2.9	3.0	6.2	3.2	5.9
Diseases of the nervous system (G00–G99)	2.6	5.2	4.5	2.7	1.3	2.7
Endocrine, nutritional and metabolic diseases (E00–E89)	3.3	2.1	2.4	2.5	1.7	2.5
Diseases of the eye and adnexa (H00–H59)	1.2	0.2	0.4	2.4	0.0	2.1
Mental and behavioural disorders (F00–F99)	2.9	8.8	7.5	1.8	0.8	2.0
Diseases of the skin and subcutaneous tissue (L00–L99)	3.3	1.5	2.0	1.8	0.7	1.8
Blood, blood-forming organs and immunological disorders (D50–D89)	2.1	0.4	0.7	1.3	0.5	1.3
Infectious and parasitic diseases (A00–B99)	2.1	0.7	0.9	1.1	3.2	1.2
Awaiting admission elsewhere (diagnosis code Z75.1)	0.5	21.3	6.8	0.3	1.9	0.9
Diseases of the ear and mastoid process (H60–H95)	0.1	0.1	0.1	0.4	—	0.4
Other/unknown	0.3	0.1	0.1	0.2	0.1	0.2
Congenital malformations (Q00–Q99)	—	—	—	0.1	—	0.1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) Based on linked hospital and RAC records. See also notes (a) and (b) to Table 6.1 for additional information.

(b) Unlinked hospital separations. Deaths are based on reported hospital mode of separation.

Notes

1. Age is as at time of hospital admission.
2. Table excludes same-day hospital episodes, statistical discharges and transfers to other hospitals.
3. Table includes all states/territories except Victoria and Western Australia.

6.4 Care needs and moving into RAC

Different patterns of care needs were seen for people with different types of RAC entries (Table 6.4, Figure 6.2). People moving into permanent RAC from hospital generally had higher care needs than those moving into respite RAC from hospital (86% of admissions with high care needs versus 49%), while people returning after a period of hospital leave had care need levels between the two (61% high care). People moving into permanent RAC from hospital or transferring from another RAC facility generally had higher care needs than people moving into permanent RAC from the community (86%, 75% and 45%, respectively).

Table 6.4: RAC entries for people aged 65+: movement type by care level, 2001–02

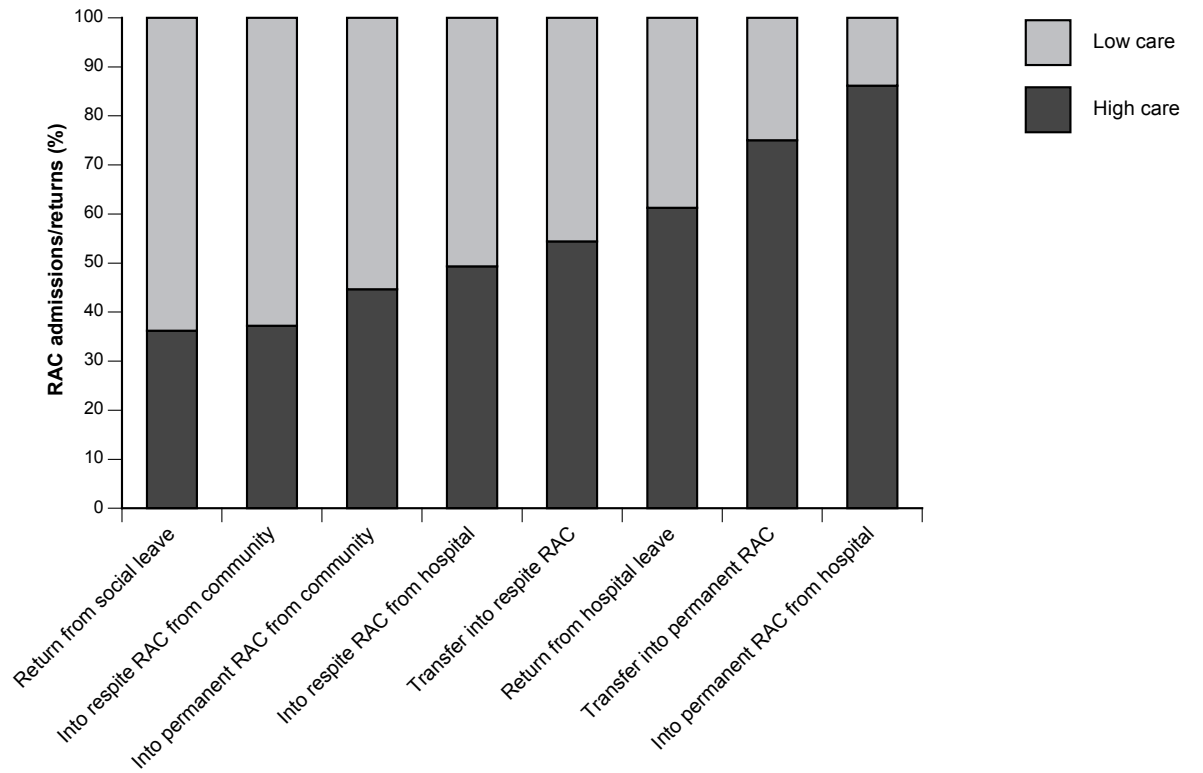
	Care level		
Movement type	**High**	**Low**	**All**
		Per cent	
Return from hospital leave[(a)]	61.3	38.7	100.0
Return from social leave[(b)]	36.2	63.8	100.0
Into permanent RAC from hospital[(a)]	86.2	13.8	100.0
Into respite RAC from hospital[(a)]	49.3	50.7	100.0
Transfer into permanent RAC[(b)]	75.0	25.0	100.0
Transfer into respite RAC[(b)]	54.4	45.6	100.0
Into permanent RAC from community[(b)]	44.7	55.3	100.0
Into respite RAC from community[(b)]	37.2	62.8	100.0
All	**52.7**	**47.3**	**100.0**
Total admissions (number)	**72,568**	**65,050**	**137,618**

(a) Based on linked hospital and RAC records. See also notes (a) and (b) to Table 6.1 for additional information.

(b) Unlinked RAC events. 43% of transfers into permanent RAC were from respite RAC and 86% of transfers into respite RAC were from respite RAC.

Notes

1. Age is as at time of RAC admission/return.
2. Table includes all states/territories except Victoria and Western Australia.
3. Table excludes unlinked RAC leave events.



Source: Table 6.4.

Figure 6.2: Transitions into RAC for people aged 65+, by level of care, 2001–02

7 Transitions from hospital to the community via RAC

A policy question of particular interest is what happens to people who enter residential respite care from hospital: do they remain in aged care or do they return to the community? If they return to the community, do they remain there, or are they re-admitted into RAC soon after? The answers to these questions provide information on whether residential respite care following hospitalisation helps recovery following hospitalisation or is a transition into permanent RAC.

To answer these questions, movements following a person's first transition from hospital to RAC in 2001–02 were analysed using several rules to define a return or non-return to the community. A time of 12 weeks was used to set the cut-off time for return to the community because most respite stays (99%) last for 13 weeks or less (AIHW 2005:table A4.4). If people did return to the community within 12 weeks, a further assessment of their status was made to determine whether they re-entered RAC within the next 4 weeks. Note, however, that people may die during this period of 4 weeks but for this study it was not possible to determine the number of such cases. Some people also reported that they were moving to another aged care service, yet were not re-admitted to any service within 4 weeks. People who did not return to the community within 12 weeks were classified as being in respite or permanent RAC at the 12 week mark, discharged to hospital within 12 weeks or dying in RAC within 12 weeks. Because a 16 week window is required to establish whether there was successful return to the community, the first 36 weeks of 2001–02 are used to analyse returns and non-returns to the community. See Figure 7.1 for some examples of transition events.

7.1 Type of RAC

The situation of people 12 weeks after their admission to RAC from hospital differed according to whether they were admitted into respite or permanent care (Table 7.1, Figure 7.2). Over one-half (57%) of people who were admitted into respite care returned to the community within 12 weeks, with 9% of this group (that is, 5% of all admitted to respite care) re-admitted into RAC within 4 weeks of returning to the community. Of those not re-admitted within 4 weeks, one-fifth (21%) left RAC reporting they were going to another RAC service but had not been re-admitted within 4 weeks of returning to the community.

Just 9% of people who were admitted into permanent care returned to the community within 12 weeks, and 11% of this group were re-admitted into RAC within 4 weeks. Nearly 15% of those who returned to the community within 12 weeks also reported they were going to another RAC service, yet had not been re-admitted within 4 weeks of returning to the community.

More than two-thirds (69%) of people admitted to permanent care were still living in RAC after 12 weeks (all still in permanent care), compared with about a quarter (26%) of people admitted to respite care. In addition, 4% of this latter group had transferred into permanent care within the 12 weeks. People admitted into respite care from hospital were less likely to die but more likely to be discharged to hospital within 12 weeks than those admitted into

permanent care (6% versus 21% and 12% versus 2%, respectively; both differences statistically significant at the 5% level).

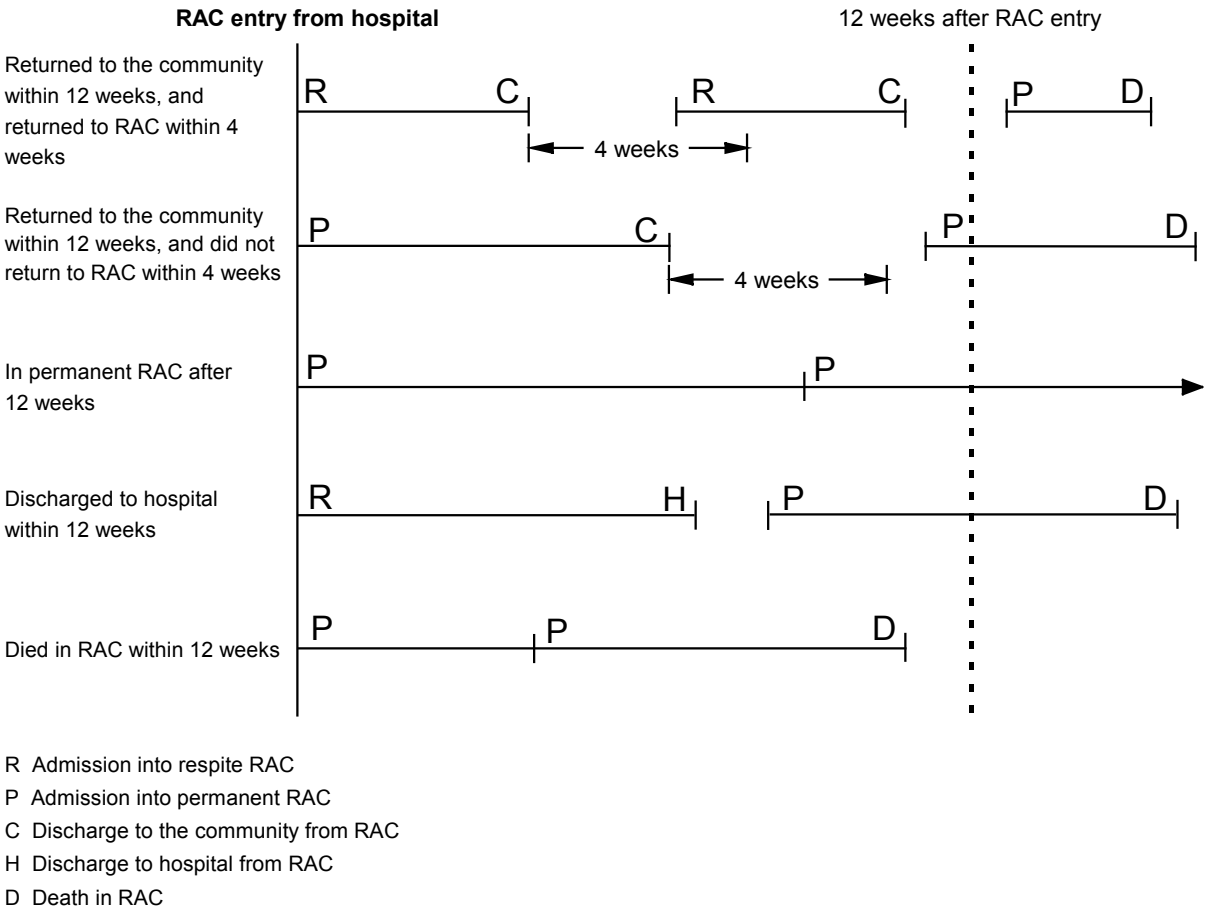
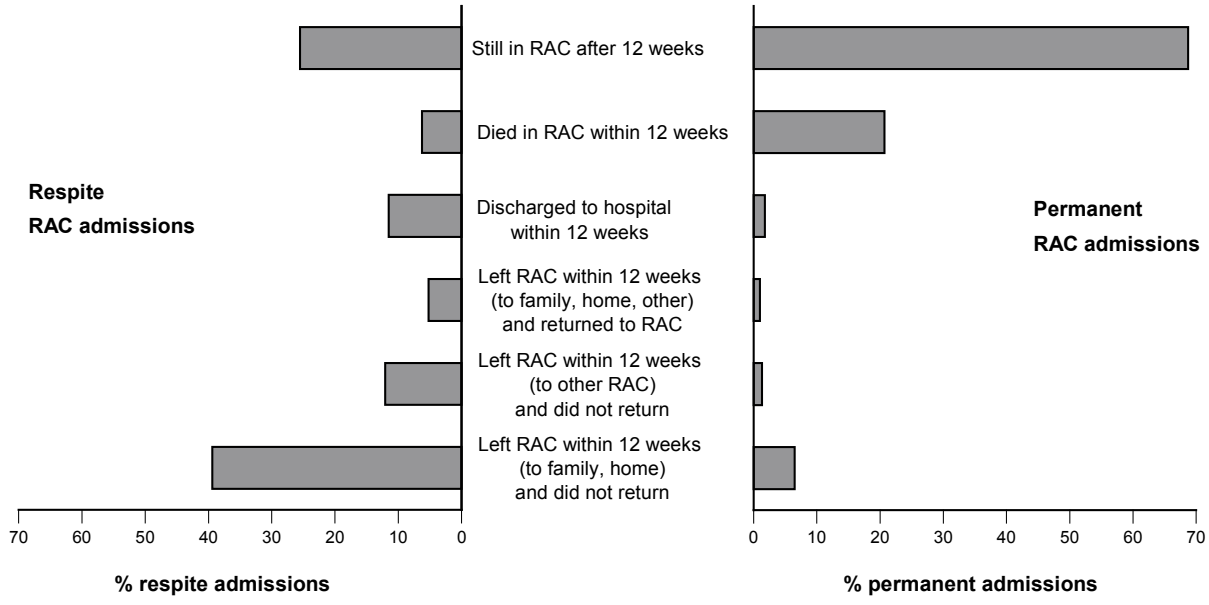


Figure 7.1: Short-term use of RAC: example pathways

Of particular interest are the within-RAC transfer rates for people who were admitted to respite care from hospital and who were still in RAC after 12 weeks. Analysis of the ACCMIS data has shown that about 20% of all respite admissions during 2001–02 later resulted in a transfer to permanent care (unpublished AIHW analysis). But analysis of respite admissions from hospital shows that just 1% of these admissions resulted in a transfer to permanent care within 12 weeks (Table 7.1). This difference suggests that people moving into respite care from hospital have different care needs and characteristics from people entering respite care straight from the community. For example, of all RAC admissions in the states and territories included in this analysis, the level of respite and permanent RAC admissions were about equal (49% and 51%, respectively (AIHW 2003b)). For those people entering RAC from hospital, far fewer were admitted into respite care than permanent care (31% versus 69%, respectively) (Table 7.1). That is, the majority of people entering RAC from hospital were admitted into permanent RAC. This result is supported by data from the Aged Care Assessment Program National Minimum Data Set annual report: among 2003–04 assessments, clients were twice as likely to be recommended to permanent RAC if assessed in hospital than if assessed elsewhere (Aged Care Assessment Program National Data

Repository 2005). That is, people are less likely to be assessed as having the capacity to return home when assessed in hospital.



Source: Table 7.1.

Figure 7.2: Movement after first admission to RAC from hospital in 2001–02

Table 7.1: People aged 65+ returning to the community following RAC admission from hospital, by admission type, 2001–02

Status following admission to RAC	Respite admissions	Permanent admissions	Total
Returned to the community within 12 weeks		**Column per cent**	
Did not return to RAC within 4 weeks			
Left reported going to RAC	12.0	1.3	4.7
Other	39.4	6.5	16.8
Subtotal	*51.4*	*7.8*	*21.5*
Returned to RAC within 4 weeks			
Re-admission into respite RAC	4.2	—	1.3
Re-admission into permanent RAC	1.0	1.0	1.0
Subtotal	*5.2*	*1.0*	*2.3*
Total returners to the community	*56.7*	*8.8*	*23.8*
Did not return to the community within 12 weeks			
In respite RAC after 12 weeks	24.6	—	7.7
In permanent RAC after 12 weeks	1.0	68.7	47.4
Discharged to hospital within 12 weeks	11.5	1.8	4.8
Died in RAC within 12 weeks	6.3	20.7	16.2
Total non-returners to the community	*43.3*	*91.2*	*76.2*
Total	**100.0**	**100.0**	**100.0**
Persons	**3,927**	**8,570**	**12,497**

Notes

1. Table is based on linked hospital and RAC records.
2. Table includes admissions occurring during the first 36 weeks of the financial year. This allows for a 12 week window to identify returns to the community followed by a 4 week window to identify unsuccessful returns. Table shows transitions following a person's first admission into RAC from hospital within the 36 week period.
3. Age is as at time of initial RAC admission from hospital.
4. Table includes all states/territories except Victoria and Western Australia.

7.2 Age and sex

The pattern of outcomes after a RAC admission differed for women and men (Table 7.2). Women entering respite RAC from hospital were less likely than men to die in RAC within 12 weeks of admission (5% versus 8%, $p<0.05$), but were just as likely as men to return to the community within 12 weeks (57% versus 56%, not statistically significant at 5% level). Younger women, however, were more likely than older women to return to the community within 12 weeks of moving into respite care (62% versus 56%, $p<0.05$), while younger and older men were equally as likely to return to the community within 12 weeks of moving into respite care (56% versus 55%, not statistically significant at the 5% level).

Women entering permanent RAC from hospital were more likely than men to still be in permanent RAC 12 weeks after admission (72% versus 64%) and less likely to have died in RAC within 12 weeks of admission (18% versus 25%).

There were only small differences between the two age groups (65 to 79 years, and 80 years and over) regarding their situation 12 weeks after permanent RAC admission, but larger differences among people admitted into respite care (Table 7.2). Of men who were still in RAC 12 weeks after respite admission, older men (80+) were more likely to have transferred into permanent RAC than their younger counterparts (6% versus 4%, $p<0.05$). This difference was reversed for women still in RAC 12 weeks after respite admission (2% for very old women versus 4% for the younger women, $p<0.05$). Older men were just as likely as younger men to die in RAC within 12 weeks of admission to respite care (9% versus 8%), and there was also little difference between the older and younger women (5% versus 6%).

Table 7.2: People aged 65+ returning to the community following RAC admission from hospital, by age, sex and admission type, 2001–02

Status following admission to RAC	Male			Female			All	N
	65–79	80+	All	65–79	80+	All	All	N
Respite admissions				Column per cent				
Returned to the community within 12 weeks								
Did not return to RAC within 4 weeks								
Left reported going to RAC	11.6	11.5	11.6	10.6	13.0	12.3	12.0	473
Other	39.1	38.9	39.0	45.9	37.1	39.6	39.4	1,547
Subtotal	*50.6*	*50.4*	*50.5*	*56.5*	*50.1*	*51.9*	*51.4*	*2,020*
Returned to RAC within 4 weeks								
Re-admission into respite RAC	4.3	3.6	3.9	3.8	4.5	4.3	4.2	164
Re-admission into permanent RAC	0.9	1.1	1.0	1.4	0.9	1.1	1.0	41
Subtotal	*5.2*	*4.7*	*4.9*	*5.1*	*5.5*	*5.4*	*5.2*	*205*
Total returns to the community	*55.9*	*55.2*	*55.5*	*61.7*	*55.5*	*57.3*	*56.7*	*2,225*
Did not return to the community within 12 weeks								
In respite RAC after 12 weeks	21.2	22.8	22.2	20.9	27.9	25.9	24.6	965
In permanent RAC after 12 weeks	0.9	1.6	1.3	0.9	0.7	0.8	1.0	38
Discharged to hospital within 12 weeks	14.3	11.9	12.9	11.0	10.8	10.8	11.5	453
Died in RAC within 12 weeks	7.8	8.5	8.2	5.6	5.1	5.2	6.3	246
Total non-returners to the community	*44.1*	*44.8*	*44.5*	*38.3*	*44.5*	*42.7*	*43.3*	*1,702*
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**. .**
Persons	**553**	**823**	**1,376**	**738**	**1,813**	**2,551**	**. .**	**3,927**
Permanent admissions				Column per cent				
Returned to the community within 12 weeks								
Did not return to RAC within 4 weeks								
Left reported going to RAC	1.7	1.3	1.4	1.3	1.2	1.3	1.3	114
Other	7.6	7.2	7.4	5.7	5.9	5.9	6.5	554
Subtotal	*9.3*	*8.5*	*8.8*	*7.1*	*7.2*	*7.1*	*7.8*	*668*
Returned to RAC within 4 weeks								
Re-admission into respite RAC	—	—	—	—	—	—	—	—
Re-admission into permanent RAC	0.8	0.8	0.8	1.6	1.0	1.1	1.0	86
Subtotal	*0.8*	*0.8*	*0.8*	*1.6*	*1.0*	*1.1*	*1.0*	*86*
Total returns to the community	*10.1*	*9.3*	*9.6*	*8.7*	*8.1*	*8.3*	*8.8*	*754*
Did not return to the community within 12 weeks								
In respite RAC after 12 weeks	—	—	—	—	—	—	—	—
In permanent RAC after 12 weeks	64.1	63.3	63.6	72.3	71.9	72.0	68.7	5,888
Discharged to hospital within 12 weeks	1.7	1.5	1.6	1.8	1.9	1.9	1.8	153
Died in RAC within 12 weeks	24.1	25.8	25.2	17.2	18.1	17.9	20.7	1,775
Total non-returners to the community	*89.9*	*90.7*	*90.4*	*91.3*	*91.9*	*91.7*	*91.2*	*7,816*
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**. .**
Persons	**1,262**	**2,088**	**3,350**	**1,290**	**3,930**	**5,220**	**. .**	**8,570**

Notes

1. Table is based on linked hospital and RAC records.
2. Table includes admissions occurring during the first 36 weeks of the financial year. This allows for a 12 week window to identify returns to the community followed by a 4 week window to identify unsuccessful returns. Table shows transitions following a person's first admission into RAC from hospital within the 36 week period.
3. Age is as at time of initial RAC admission from hospital.
4. Table includes all states/territories except Victoria and Western Australia.

7.3 Care needs

Not surprisingly, the level of care a person needs also tends to be associated with the likelihood of a return to the community within 12 weeks. Differences are particularly noticeable among people admitted to respite care following a period of hospitalisation (Table 7.3). Two-thirds (68%) of people admitted into low-level respite care after hospitalisation returned to the community within 12 weeks of admission, with 8% (5% out of 68%) of this group being re-admitted to RAC within 4 weeks of discharge. On the other hand, less than one-half (46%) of people admitted into high-level respite care returned to the community within 12 weeks of admission, with 11% of this group (that is, 5% of all people admitted to high-level respite care) being re-admitted to RAC within 4 weeks of discharge. Of people who returned to the community within 12 weeks, 22% of those admitted to low-level respite care and 20% of those admitted to high-level respite care left RAC reporting that they were going to another RAC service, but were not re-admitted within 4 weeks of returning to the community.

People admitted to high-level respite care from hospital were more likely to still be living in RAC 12 weeks following admission than those admitted to low-level respite care (30% versus 21%, $p<0.05$). The likelihood of being discharged to hospital within 12 weeks of admission was higher for people admitted to high-level respite care than those admitted to low-level respite care (14% versus 9%, $p<0.05$). Dying in RAC within 12 weeks of admission was also more likely for people admitted to high-level respite care than those admitted to low-level respite care (10% versus 2%, $p<0.05$).

As previously discussed, few people admitted to permanent RAC from hospital return to the community. Those admitted to low-level care were less likely than those admitted to high-level care to die in RAC within 12 weeks of admission (6% versus 23%) (Table 7.3).

Among people who returned to the community within 12 weeks of admission, there were only small differences between respite and permanent residents in the time it took: 70% of people returning to the community within 12 weeks of admission to respite care did so within 4 weeks, compared with 72% of those leaving permanent RAC (Table 7.4).

Table 7.3: People aged 65+ returning to the community following RAC admission from hospital, by care level and admission type, 2001–02

Status following admission to RAC	Respite admissions			Permanent admissions			All	N
	Low care	High care	All	Low care	High care	All		
Returned to the community within 12 weeks	**Column per cent**							
Did not return to RAC within 4 weeks								
Left reported going to RAC	15.2	9.3	12.0	1.1	1.4	1.3	4.7	587
Other	*47.8*	*32.1*	*39.4*	*6.3*	*6.5*	*6.5*	*16.8*	*2,101*
Subtotal	*63.0*	*41.4*	*51.4*	*7.4*	*7.9*	*7.8*	*21.5*	*2,688*
Returned to RAC within 4 weeks								
Re-admission into respite RAC	4.7	3.7	4.2	—	—	—	1.3	164
Re-admission into permanent RAC	0.7	1.4	1.0	1.2	1.0	1.0	1.0	127
Subtotal	*5.4*	*5.1*	*5.2*	*1.2*	*1.0*	*1.0*	*2.3*	*291*
Total returners to the community	*68.4*	*46.5*	*56.7*	*8.6*	*8.8*	*8.8*	*23.8*	*2,979*
Did not return to the community within 12 weeks								
In respite RAC after 12 weeks	20.1	28.4	24.6	—	—	—	7.7	965
In permanent RAC after 12 weeks	0.4	1.4	1.0	82.7	66.7	68.7	47.4	5,926
Discharged to hospital within 12 weeks	9.3	13.5	11.5	2.3	1.7	1.8	4.8	606
Died in RAC within 12 weeks	1.8	10.2	6.3	6.4	22.8	20.7	16.2	2,021
Total non-returners to the community	*31.6*	*53.5*	*43.3*	*91.4*	*91.2*	*91.2*	*76.2*	*9,518*
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**. .**
Persons	**1,823**	**2,104**	**3,927**	**1,069**	**7,501**	**8,570**	**. .**	**12,497**

Notes

1. Table is based on linked hospital and RAC records.
2. Table includes admissions occurring during the first 36 weeks of the financial year. This allows for a 12 week window to identify returns to the community followed by a 4 week window to identify unsuccessful returns. Table shows transitions following a person's first admission into RAC from hospital within the 36 week period.
3. Age is as at time of initial RAC admission from hospital.
4. Table includes all states/territories except Victoria and Western Australia.

Table 7.4: Time to successful return to the community for people aged 65+ returning to the community following RAC admission from hospital, by age and admission type, 2001–02

Time to successful return to community[(a)]	Respite admissions			Permanent admissions			All	N
	65–79	80+	All	65–79	80+	All		
	Column per cent							
1 week or less	10.8	10.7	10.7	19.2	13.9	15.6	11.9	321
1–2 weeks	30.1	26.5	27.8	27.9	31.1	30.1	28.3	762
2–4 weeks	29.0	33.4	31.9	23.1	27.8	26.3	30.5	820
4–6 weeks	13.2	14.4	14.0	10.1	12.2	11.5	13.4	359
6–8 weeks	8.3	6.6	7.2	7.7	5.7	6.3	7.0	187
8–10 weeks	6.3	7.0	6.7	5.3	4.6	4.8	6.3	168
10–12 weeks	2.3	1.4	1.7	6.7	4.8	5.4	2.6	71
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**. .**
Persons	**697**	**1,323**	**2,020**	**208**	**460**	**668**	**. .**	**2,688**

(a) 1 week or less equates to 7 days or less, 1–2 weeks as 8–14 days, 2–3 weeks as 15–21 days, etc.

Notes

1. Table is based on linked hospital and RAC records.
2. Table includes admissions occurring during the first 36 weeks of the financial year. This allows for a 12 week window to identify returns to the community followed by a 4 week window to identify unsuccessful returns. Table refers to transitions following a person's first admission into RAC from hospital within the 36 week period.
3. A successful return is a return to the community within 12 weeks of admission and without re-admission within 4 weeks.
4. Age is as at time of initial RAC admission from hospital.
5. Table includes all states/territories except Victoria and Western Australia.

7.4 People with selected conditions

The linkage of hospital and RAC data provides the capacity to examine particular issues of interest about specific diseases or causes of hospitalisation. Here, we look at the issues of dementia and falls.

Dementia

A diagnosis of dementia in any of the recorded diagnoses for the transition hospital episode was more likely among permanent RAC admissions from hospital than respite RAC admissions (33% versus 10%, $p<0.05$) (Table 7.5). For people admitted to respite or permanent RAC, those with any diagnosis of dementia were more likely to return to the community within 12 weeks (71% versus 55% for respite, 10% versus 8% for permanent; both with $p<0.05$). Of people admitted to respite care who returned to the community, those with dementia were just as likely to be re-admitted to RAC as those without dementia (7% and 10%, respectively; not statistically significant with $p>0.05$). However, four-fifths (78%) of the re-admissions for people with dementia were into permanent RAC, compared with 14% for those without dementia. Of people admitted into respite care who returned to the community within 12 weeks, dementia sufferers were significantly more likely than non-

dementia sufferers to have left reporting that they were going to another RAC service without being re-admitted in the next 4 weeks (31% versus 22% respectively).

Among people admitted to permanent RAC, those with dementia were significantly more likely than those without dementia to still be in permanent RAC after 12 weeks (70% versus 68%), and less likely to have died (18% versus 22%) (Table 7.5).

Table 7.5: People aged 65+ with any diagnosis of dementia returning to the community following RAC admission from hospital, by admission type, 2001–02

	Respite admissions			Permanent admissions				
	Any diagnosis of dementia			Any diagnosis of dementia				
Status following admission to RAC	**Yes**	**No**	**All**	**Yes**	**No**	**All**	**All**	**N**
Returned to the community within 12 weeks				**Column per cent**				
Did not return to RAC within 4 weeks								
Left reported going to RAC	20.9	11.1	12.0	1.2	1.4	1.3	4.7	587
Other	45.5	38.7	39.4	7.4	6.0	6.5	16.8	2,101
Subtotal	*66.4*	*49.8*	*51.4*	*8.6*	*7.4*	*7.8*	*21.5*	*2,688*
Returned to RAC within 4 weeks								
Re-admission into respite RAC	1.1	4.5	4.2	—	—	—	1.3	164
Re-admission into permanent RAC	3.7	0.8	1.0	1.1	1.0	1.0	1.0	127
Subtotal	*4.8*	*5.3*	*5.2*	*1.1*	*1.0*	*1.0*	*2.3*	*291*
Total returns to the community	*71.2*	*55.1*	*56.7*	*9.7*	*8.3*	*8.8*	*23.8*	*2,979*
Did not return to the community within 12 weeks								
In respite RAC after 12 weeks	4.2	26.7	24.6	—	—	—	7.7	965
In permanent RAC after 12 weeks	2.1	0.8	1.0	70.1	68.0	68.7	47.4	5,926
Discharged to hospital within 12 weeks	14.6	11.2	11.5	2.1	1.6	1.8	4.8	606
Died in RAC within 12 weeks	7.9	6.1	6.3	18.1	22.0	20.7	16.2	2,021
Total non-returners to the community	*28.8*	*44.9*	*43.3*	*90.3*	*91.7*	*91.2*	*76.2*	*9,518*
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**. .**
Persons (number)	**378**	**3,549**	**3,927**	**2,803**	**5,767**	**8,570**	**. .**	**12,497**
Persons (row per cent)	**9.6**	**90.4**	**100.0**	**32.7**	**67.3**	**100.0**	**. .**	**. .**

Notes

1. Table is based on linked hospital and RAC records with any diagnosis in the linked hospital record of ICD-10-AM codes F00–F03 and G30.
2. Table includes admissions occurring during the first 36 weeks of the financial year. This allows for a 12 week window to identify returns to the community followed by a 4 week window to identify unsuccessful returns. Table shows transitions following a person's first admission into RAC from hospital within the 36 week period.
3. Age is as at time of initial RAC admission from hospital.
4. Table includes all states/territories except Victoria and Western Australia.

Injury from a fall

The majority of dementias are progressive and the symptoms irreversible, so people with dementia entering RAC are more likely to be making a long-term move. However, injuries from falls can be relatively transient, so a short period in respite care may be all that is needed to recover from a fall, and once that has happened the person can return to the community.

A principal diagnosis of injury with fall as an external cause for the related hospital episode was equally likely among people with respite admissions as for people with permanent admissions (5% versus 6%, not statistically significant with $p>0.05$) (Table 7.6). For people admitted to respite RAC, those with a principal diagnosis of injury due to a fall for the transition hospital episode were more likely than others to return to the community within 12 weeks (76% versus 56%, $p<0.05$). Of people who returned to the community within 12 weeks, those with and without a principal diagnosis of injury due to a fall were equally likely to have reported going to another RAC service without being re-admitted within 4 weeks (22% versus 21%, respectively).

For people admitted to permanent RAC, return to the community within 12 weeks was significantly less likely for those who had a fall leading to a principal diagnosis of injury (7% and 9%, respectively) (Table 7.6).

Table 7.6: People aged 65+ with principal diagnosis of injury with any cause of fall, returning to the community following RAC admission from hospital, by admission type, 2001–02

	Respite admissions			Permanent admissions				
	With fall and injury			With fall and injury				
Status following admission to RAC	**Yes**	**No**	**All**	**Yes**	**No**	**All**	**All**	**N**
Returned to the community within 12 weeks				**Column per cent**				
Did not return to RAC within 4 weeks								
Left reported going to RAC	16.5	11.8	12.0	1.0	1.4	1.3	4.7	587
Other	56.6	38.4	39.4	4.0	6.6	6.5	16.8	2,101
Subtotal	*73.1*	*50.2*	*51.4*	*5.0*	*8.0*	*7.8*	*21.5*	*2,688*
Returned to RAC within 4 weeks								
Re-admission into respite RAC	0.5	4.4	4.2	—	—	—	1.3	164
Re-admission into permanent RAC	1.9	1.0	1.0	1.6	1.0	1.0	1.0	127
Subtotal	*2.4*	*5.4*	*5.2*	*1.6*	*1.0*	*1.0*	*2.3*	*291*
Total returns to the community	*75.5*	*55.6*	*56.7*	*6.6*	*8.9*	*8.8*	*23.8*	*2,979*
Did not return to the community within 12 weeks								
In respite RAC after 12 weeks	3.3	25.8	24.6	—	—	—	7.7	965
In permanent RAC after 12 weeks	0.9	1.0	1.0	72.4	68.5	68.7	47.4	5,926
Discharged to hospital within 12 weeks	14.6	11.4	11.5	1.2	1.8	1.8	4.8	606
Died in RAC within 12 weeks	5.7	6.3	6.3	19.9	20.8	20.7	16.2	2,021
Total non-returners to the community	*24.5*	*44.4*	*43.3*	*93.4*	*91.1*	*91.2*	*76.2*	*9,518*
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**. .**
Persons (number)	**212**	**3,715**	**3,927**	**536**	**8,034**	**8,570**	**. .**	**12,497**
Persons (row per cent)	**5.4**	**94.6**	**100.0**	**6.3**	**93.7**	**100.0**	**. .**	**. .**

Notes

1. Table is based on linked hospital and RAC records with a principal diagnosis in the linked hospital record of injury with fall as an external cause, identified by ICD-10-AM codes S00–T98 with external cause W00–W19.
2. Table includes admissions occurring during the first 36 weeks of the financial year. This allows for a 12 week window to identify returns to the community followed by a 4 week window to identify unsuccessful returns. Table shows transitions following a person's first admission into RAC from hospital within the 36 week period.
3. Age is as at time of initial RAC admission from hospital.
4. Table includes all states/territories except Victoria and Western Australia.

8 Conclusion

The development of an event-based linkage method to link administrative by-product data for hospital separations and residential aged care admissions of older people moving from hospital into residential aged care has made detailed analysis of the hospital–RAC interface possible (AIHW 2003a; AIHW: Karmel 2004; AIHW: Karmel & Rosman 2007; Karmel & Gibson 2007). This method enables the characteristics of the people moving to be identified, even though common identifying data are not available on the national hospital and residential aged care data sets.

This preliminary analysis for 2001–02 for six states and territories concentrated on approximate estimates of flow, characteristics of people moving from hospital to residential aged care and transitions from hospital to the community via residential aged care. The information about a person's most recent hospital episode enabled analysis of length of stay and principal diagnosis by post-hospital destination. This report demonstrates the utility of linked information to examine transitions from hospital to residential aged care.

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